



ANTHROPOGENIC CHANGES OF LICHEN BIOTA OF THE BIAŁOWIEŻA TOWN (PODLASIE, EASTERN POLAND)

ANNA MATWIEJUK

A. Matwiejuk, Department of Botany, Institute of Biology, University of Białystok,
Świerkowa 20 B, 15-950 Białystok, Poland, e-mail: matwiej@uwb.edu.pl

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ABSTRACT. The paper presents a list of 119 species found in Białowieża (weronal data and from literature). The study conducted in 2008-2009 confirmed the existence of 73 out of 109 lichen species in the Białowieża research area (literature data). It also showed that 10 new species. 18 species are considered to be threatened in Poland. They are: *Anaptychia ciliaris*, *Bryoria crispa*, *Physconia distorta*, *Pleurosticta acetabulum*, *Ramalina fraxinea*, *Usnea subfloridana* and others.

KEY WORDS: lichens, diversity of species, changes of lichen biota, Białowieża, E Poland

INTRODUCTION

Lichens (Lichenes; Ascomycota lichenisati) are a biological group characterised by a high susceptibility to changes in habitat conditions influenced by diverse human activity (CIEŚLIŃSKI and CZYŻEWSKA 1992, CZYŻEWSKA 2003). A very high threat level to these organisms in Poland – over 55% of the overall number of biota, results from the increasing anthropogenic transformation of the natural environment. The main reasons causing extinction, disappearance of stands and shrinking of the range of native components of lichen biota include: indirect activity – changes in environmental conditions: air and soil contamination by toxic substances, local and supraregional industrial emissions, destruction of natural phytocoenosis, dynamic processes occurring in forest communities, changes in water conditions and in ecoclimate, as well as direct activity – physical elimination of species (CIEŚLIŃSKI and CZYŻEWSKA 1992, CIEŚLIŃSKI 2003 and others).

The best method allowing to track changes in the lichen biota in the investigated area is the comparison of the earlier lichen resources (published data, herbarium material) with the contemporary ones.

In the face of the necessity of investigating lichen biota transformations caused by human activity (species retreat, remaining on stands and spreading in new habitats and stands) the present study makes an attempt at assessing the phenomenon of anthropogenic transformation of lichen biota. Białowieża has been chosen as the area of investigation. It meets all the necessary conditions for carrying out comparative studies: it was examined lichenologically in the past, possesses high differentiation of habitats and substrata and lies on the Białowieża Glade (Polana Białowieska), the centre of the biggest forest complex on the lowland of Eastern Europe,

the Białowieża Forest. The aim of the study is to establish a complete species composition of lichens in Białowieża on the basis of the species reported before 1988 by other researchers (historical data) and the species reported in the years 2008-2009 (contemporary data), and to demonstrate undergoing transformations in the species composition of lichens.

The lichen biota of Białowieża has aroused interest among lichenologists for a long time. The Palace Park (Park Pałacowy) in Białowieża (RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988, CIEŚLIŃSKI 2003) and the Management Park (Park Dyrekcyjny) (LECEWICZ 1954) have been best documented. Moreover, RYDZAK (1957), CIEŚLIŃSKI and TOBOLEWSKI (1988) name several dozen of lichen species from a number of stands located on the territory of Białowieża. KUKWA (2002) compiled a list of species of genus *Lepraria* and *Leproloma* of the Białowieża Forest, also recording three species for Białowieża.

The research material included lichens deriving from two sources: 1. my own fieldwork carried out in the years 2008-2009 and 2. from literature. My own investigation has been carried out on 47 research stands (Fig. 1). The scope of research encompassed natural and anthropogenic habitats populated by lichens on the territory of Białowieża. Epiphytic, epixyloous, epilythic, epigeic and epibryophytic lichens have been examined. Notes have been taken for each stand and their number depended on the differentiation of habitats and substrata populated by lichens. Each register includes a list of species and substrata. In laboratory work methods of morphological-anatomical and chemotaxonomic analysis have been used (ORANGE et AL. 2001). Lichens have been analysed by methods accepted in lichenology. An alphabetical list of lichen species encountered on the investigated area (own and historical data) has been compiled. Each taxon has been given the kind of substratum it has been

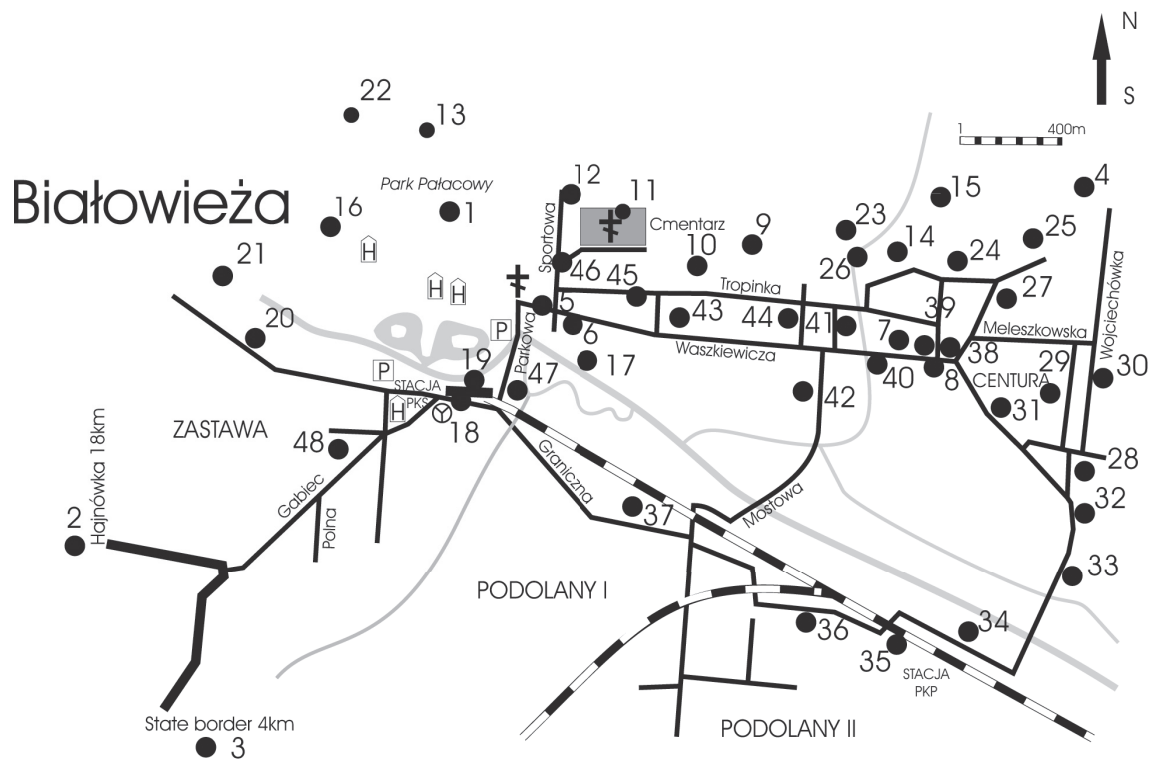


FIG. 1. Distribution of stands in Białowieża

found on and the numbers of stands. Research stands quoted in literature have been noted in the stand register: stand 1 (RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988, KUKWA 2002), stands 2-4 (CIEŚLIŃSKI and TOBOLEWSKI 1988), stands 5-22 (RYDZAK 1957), stand 23 (LECEWICZ 1954), floristic documentation has been made for those stands one more time. At present the investigations have been carried out on 25 new stands.

The species have been named according to SANTESON et AL. (2004), genus *Melanelia* according to BLANCO et AL. (2004) and genus *Bryoria* and *Usnea* to BYSTREK (1986, 1994).

The lichen material has been deposited at the Herbarium of the Institute of Biology, University of Białystok.

STUDY AREA

Białowieża is a large settlement situated in the Podlaskie Province, in Hajnówka County, Białowieża District, on the Bielsk Plain, on the river Narew (KONDRACKI 2002). The settlement lies on the vast Białowieża Glade. Around the settlement there are arable fields and partly in the south there are damp meadows on the river Narewka. The Białowieża Glade lies in the middle of the biggest forest complex on the lowland of Central Europe, the Białowieża Forest. Białowieża is the seat of the Białowieża National Park which comprises 17% of the Polish part of the Białowieża Forest. In Białowieża one can also find scientific institutions, such as the Białowieża Geobotanical Station of Warsaw University, the Mammals Research Institute of the Polish Academy of Sciences and the Forest and Nature Museum with

a viewing tower. The central part of Białowieża is the Palace Park where there used to be a hunting manor, tsar's palace, and now there is the seat of the Białowieża National Park. Białowieża has retained a characteristic 17th-18th century spatial layout with numerous, well-preserved wooden houses, often richly ornamented.

On the territory of Białowieża four most densely forested areas can be differentiated. These are: the Palace Park, Management Park, cemetery and streets.

The Palace Park was established after 1895 as an integral part of the private hunting manor house of Russian tsars built in the years 1889-1894. The name of the park refers to the most important object, the manor house which served as tsar's palace (burnt down in 1944, eventually pulled down in 1962). On the territory of the Palace Park, on the area of 49.04 ha grow 124 species of trees and shrubs, mostly native, and around one third of them constitutes a natural element of flora of the Białowieża Forest (KOWALCZYK and PABIAN 2004).

The Management Park established at the turn of the 19th and 20th centuries covers the area of around 20 ha. On its territory there is a former seat of the Forest Management, which now holds a Forestry Technical College. In 1976 the Heritage Board in Białystok compiled a detailed description of the Management Park, making an inventory of the trees (65 species and varieties) and shrubs (33 species) growing here.

The cemetery in Białowieża, managed by the local Orthodox parish, is of ecumenical character. It was established in the first half of the 18th century. The oldest preserved graves date from the sixties of the 19th century. The older part of the cemetery is overgrown by trees. On the Białowieża cemetery there are buried, among others, Capt. Mikołaj Abramov (died 1910)

– father of the Polish writer Igor Newerly, prof. Zdzisław Pucek (1930–2007) – zoologist, prof. Janusz B. Faliński (1934–2004) – geobotanist, ecologist.

RESULTS

Based on literature data, on the territory of Białowieża there have been registered 109 lichen species, including 13 species (LECEWICZ 1954), 58 species (RYDZAK 1957), 80 species (CIEŚLIŃSKI and TOBOLEWSKI 1988), three species (KUKWA 2002).

Investigations carried out in the years 2008–2009 confirmed the occurrence of 73 species out of the 109 species and additionally revealed 10 new species.

The whole of lichen biota comprises 119 species belonging to 41 genera. The most abundant numbers of species represented here are those of genera *Lecanora* (19), *Physcia* (6) and *Ramalina* (5).

Historical data

Based on the analysis of literature (LECEWICZ 1954, RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988, KUKWA 2002) 109 lichen species have been recorded on the territory of Białowieża. In the process of the present investigations 36% of the species formerly recorded from Białowieża have not been confirmed (which constitutes 33%). Many of them should be regarded as extinct on this territory, and others might still exist but have not been confirmed during the recent investigations. The group of extinct species mainly includes macrolichens, e.g. *Bryoria implexa*, *Flavoparmelia caperata*, *Hypotrachyna revoluta*, *Lobaria pulmonaria*, *Melanohalea elegantula*, *M. olivacea*, *Melanelixia subaurifera*, *Punctelia subrudecta*, *Ramalina obtusata* and crustose lichens *Lecanora albella*, *L. intumescens*, *L. impudens*, *L. subrugosa*. The extinct species are forest epiphytes growing on tree bark in the past, mainly in the forest adjacent to Białowieża and within the parks.

Among the species which have not been confirmed in the present study and which might still be growing in Białowieża there are mainly lichens with tiny, inconspicuous thalli, e.g. *Bacidia rosella*, *Chaenotheca furfuracea*, *Opegrapha atra*, *O. rufescens*, *Pertusaria pertusa*.

Contemporary lichen resources

Lichenological studies carried out in the years 2008–2009 confirmed the occurrence of 73 lichen species on the territory of Białowieża out of all the registered 109 species of the investigation area and revealed 10 new species. The highest lichen species diversity has been registered in the area of the Palace Park, Management Park and cemetery. This results from the dense tree cover and higher habitat diversity.

In the built-up zone the lichen biota is impoverished, which is connected with anthropopressure. The occurrence of lichens is usually limited to common species colonizing bark of roadside trees, concrete, plastered and wooden constructions. In the present biota species with crustose thallus (41%) dominate over foliose lichens (32%) and fruticose lichens (13%). The remaining forms are represented less numerously. Placoid lichens constitute 6%, dimorphous lichens 5% and squamose lichens 3%.

Lichen species new for Białowieża

Field investigations have enriched the lichen biota of Białowieża with 10 species formerly not reported from this area. The new lichen species noted in Białowieża should be examined in two different aspects:

1. as species known for a long time, with established taxonomic position or connected with one type of habitat, which have not been reported in previous studies. There are: *Aspicilia cinerea*, *Buellia griseovirens*, *Cladonia floerkeana*, *Lecanora albescens*, *L. pulicaris*, *Parmeliopsis ambigua*, *Scoliciosporum umbrinum*, *Xanthoria elegans*;
2. as species which are the result of increasing anthropopressure, such as *Caloplaca saxicola*, *Lecanora conizaeoides*.

Habitat analysis of lichens

In the overall biota of lichens in Białowieża the most dominant species are epiphytes – 94 species, epixyloous lichens – 24 species and epilythes – 24 species. The lowest participation is represented by lichens growing exclusively on soil – one species and on moss – one species.

The biggest decrease in the number and multitude of species is observed among epiphytes. This group has been depleted by as much as 27% of species. Slightly less significant changes have been noted among epixyloous and epilythic lichens. A considerable depletion of lichens, mainly epiphytes, has caused significant loss among fruticose and foliose lichens.

Epiphytes lichens

Epiphytes constitute the most numerous habitat group. Out of 119 lichen species recorded in the area under study, 94 grew on tree bark, including 73 obligatory epiphytes. At present only 66 epiphytic species, 47 exclusive ones, have been registered. In the past a significant group of epiphytic lichens in this area included the so-called macrolichens, that is species with large, disjointed, foliose or fruticose thalli, such as *Bryoria implexa*, *Flavoparmelia caperata*, *Lobaria pulmonaria*, *Melanohalea olivacea*, *Melanelixia subaurifera*, *Punctelia subrudecta*, *Ramalina obtusata*. Epiphytic lichens constitute a group of Białowieża lichens which have undergone considerable reconstruction. The place of a previously rich and diversified lichen vegetation has been taken over by common, mainly crustose toxicotolerant lichens, among which one should mention *Lecanora conizaeoides*. In places it is also accompanied by *Hypocenomyce scalaris*, *Scoliciosporum chlorococcum*, common species of genera *Xanthoria*, *Physcia*, *Lecanora*, *Physconia* and *Hypogymnia physodes*, *Parmelia sulcata*. The remains of the former richness of epiphytic lichens have survived on the territories of parks, the forest adjacent to the built-up area and within town.

Lichens growing on trees in the Palace Park show the highest participation. A strong relationship between lichen occurrence and habitat conditions has been noted here. In places densely populated by trees, in shaded areas, forest species (hygrophilous and sciophilous) have been registered on tree bark, such as: *Melanelixia fuliginosa*, *Pseudevernia furfuracea*, *Phlyctis argena*, *Pertusaria coccodes*, *P. amara*. Places with scarcer plantings, where trees are well-illuminated, become colonized by

Anaptychia ciliaris, *Evernia prunastri*, *Hypogymnia physodes*, *Parmelia sulcata*, *Ramalina farinacea* and others. One can also find species characteristic of roadside trees and human settlements, such as *Xanthoria parietina* and species of genus *Physcia*.

A similar character has been demonstrated by lichen biota in the Management Park located around 1 km eastwards. Within the Park groups of trees are denser and a higher degree of shading does not favour the development of photophilous species.

In forest communities surrounding the town rare species have been registered, such as *Bryoria fuscescens*, *Hypogymnia tubulosa*, *Tuckermannopsis chlorophylla*, *Usnea subfloridana*.

In built-up areas the most frequent are synanthropic species, e.g. *Candelariella xanthostigma*, *Phaeophyscia orbicularis*, *Physcia adscendens*, *P. caesia*, *P. tenella*, *Xanthoria parietina*, *X. polycarpa*. In these habitats several rare species have also been noted, e.g. *Melanohalea exasperatula* (stand 1), *Physcia aipolia* (stands 1, 3, 5, 17, 19, 22, 37), *Pleurosticta acetabulum* (stands 1, 3, 5, 17), *Ramalina fastigiata* (stands 1, 2, 3, 4, 6). On most roadside trees macrolichens of genera *Evernia*, *Pseudevernia*, *Ramalina* exhibit high participation in lichen biota.

On roadside trees there grow many lichens with a big, foliose and fruticose thallus, a part of which, e.g. *Parmelia sulcata*, *Ramalina fraxinea*, *Xanthoria parietina* show preference for such synanthropic habitats.

Among lichens which at present have not been confirmed there are many highly sensitive, stenotopic species, e.g. *Bryoria implexa*, *Hypotrachyna revoluta*, *Lecanora intumescens*, *L. albella*, *Lobaria pulmonaria*, *Melanohalea olivacea*, *Melanelixia subaurifera*.

Epixylous lichens

The second largest habitat group – 24 species, comprises wood lichens. They are related mainly of wooden structures (fences, poles, benches, crosses). Epixylous lichens are dominated, which often occurs on the bark of trees, among others *Candelariella xanthostigma*, *Cladonia coniocraea*, *Evernia prunastri*, *Hypocnomyces scalaris*, *Hypogymnia physodes*, *H. tubulosa*, *Melanelixia fuliginosa*, *Parmelia sulcata*, *Physcia tenella*, *Pseudevernia furfuracea*, *Ramalina farinacea*, *R. fraxinea*, *Usnea hirta*. The exclusive species are: *Cladonia floerkeana*, *Micarea denigrata*, *Parmeliopsis ambigua*. Among the epixylous lichens currently no confirmed four species: *Melanelixia subaurifera*, *Parmelina tiliacea*, *Thelocarpon laureri* and *Usnea filipendula*.

Epilythes lichens

Epilythes are represented by 24 species, of which 17 are obligatory epilythes. They colonize both natural and anthropogenic substrata. Stones are rare, mainly in the town and buildings (walls, foundations and tombs). Obligatory species are: *Aspicilia cinerea*, *Phaeophyscia sciastra*, *Xanthoparmelia conspersa*. Rich lichen biota occurs also on artificial substrata with properties resembling those of rocks, such as concrete, mortar and bricks. These become colonized by calciphilous species and also by species tolerant towards the presence of calcium carbonate, such as: *Caloplaca citrina*, *C. decipiens*, *C. saxicola*, *Lecanora albescens*, *L. dispersa* and

Xanthoria parietina. They are accompanied by numerous nitrophilous species of family *Physciaceae*.

Epigeits lichens

Epigeits are very rare in Białowieża. In addition to city buildings only *Bacidia bagliettoana* has been observed.

Participation of vulnerable and protected lichens

Of the 83 lichen species identified in Białowieża, 18 species have been put on the Red list of extinct and vulnerable lichens of Poland (CIEŚLIŃSKI et AL. 2006), including six species in the endangered category – EN (*Anaptychia ciliaris*, *Bryoria crispa*, *Physconia distorta*, *Pleurosticta acetabulum*, *Ramalina fraxinea*, *Usnea subfloridana*), six species in the vulnerable category – VU (*Bacidia bagliettoana*, *Bryoria fuscescens*, *Ramalina farinacea*, *R. pollinaria*, *Tuckermannopsis chlorophylla*, *Usnea hirta*), five species in the category of near threatened – NT (*Evernia prunastri*, *Hypogymnia tubulosa*, *Opegrapha varia*, *Pertusaria coccodes*, *Physcia aipolia*) and one species in the category least concern – LC (*Phaeophyscia sciastra*).

The epiphytic lichens are the most vulnerable of ecological group of Białowieża.

Of all the 83 lichen species of Białowieża, 18 have been put under legal protection, 17 of which are totally and one which are partially protected.

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- Bacidia rubella* (Hoffm.) A. Massal. – bark of trees; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Bryoria crispa* (Motyka) Bystr. – bark of trees; stand: 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Alectoria crispa*).
- Bryoria fuscescens* (Gyeln.) Brodo & D. Hawksw. – bark of *Betula pendula*; stand: 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Alectoria crispa*).
- Bryoria implexa* (Hoffm.) Brodo & D. Hawksw. – bark of trees; stand: 2 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Alectoria implexa*).
- Bryoria* sp. – wood, bark of *Quercus robur*; stands: 1 (served by RYDZAK 1957 as *Alectoria* sp.), 16 (served by RYDZAK 1957), 22 (served by RYDZAK 1957).
- Buellia griseovirens* (Turner & Borrer ex Sm.) Almb. – bark of *Acer pseudoplatanus*, *Tilia cordata*; stands: 11, 25.
- Caloplaca citrina* (Hoffm.) Th. Fr. – concrete constructions, stones; stands: 1-3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 10, 19, 27-30, 32, 40-43.
- Caloplaca decipiens* (Arnold) Blomb. & Forss. – concrete constructions; stands: 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 10, 11, 19, 29-31, 33, 38, 40, 41, 43-45, 47.
- Caloplaca holocarpa* (Hoffm.) A.E. Wade – bark of *Populus tremula*, concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 29, 32, 33.
- Caloplaca saxicola* (Hoffm.) Nordin – concrete constructions; stands: 11, 10, 19, 20, 29-31, 38, 41-43, 45, 47.
- Candelaria concolor* (Dicks.) Stein – bark of trees; stands: 3, 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Candelariella aurella* (Hoffm.) Zahlbr. – concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 10, 29, 32.
- Candelariella vitellina* (Hoffm.) Müll. Arg. – concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 9 (served also by RYDZAK 1957), 43.
- Candelariella xanthostigma* (Ach.) Lettau – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 19, 20 (served also by RYDZAK 1957), 24-26, 32, 33, 38, 40, 43, 48.
- Chaenotheca furfuracea* (L.) Tibell – bark of *Quercus robur*; stands: 1 (served by RYDZAK 1957 as *Coniocybe furfuracea*), 22 (served by RYDZAK 1957).
- Chrysothrix candelaris* (L.) J.R. Laundon – bark of *Quercus robur*; stand: 2 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Cladonia coniocraea* aut. – bark of trees, wood; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 11.
- Cladonia fimbriata* (L.) Fr. – bark of *Betula pendula*; stand: 1 (served also by RYDZAK 1957).
- Cladonia floerkeana* (Fr.) Flörke – wood; stand: 11.
- Cladonia ochrochlora* Flörke – bark of trees; stand: 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Evernia prunastri* (L.) Ach. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 10-14 (served also by RYDZAK 1957), 16-20 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 24-27, 29, 31, 35-37, 39, 40, 43.
- Flavoparmelia caperata* (L.) Hale – bark of *Betula pendula*, *Tilia cordata*, *Alnus glutinosa* stands: 1, 21 (served by RYDZAK 1957 as *Parmelia caperata*).
- Graphis scripta* (L.) Ach. – bark of *Platanoides*; stand: 1 (served by RYDZAK 1957).
- Hypocenomyce scalaris* (Ach.) Choisy – bark of trees, wood; stands: 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 11, 24, 25, 27, 31, 35, 39.
- Hypogymnia physodes* (L.) Nyl. – bark of trees, wood, stones; stands: 1 (served also by RYDZAK 1957 as *Parmelia physodes*, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 11 (served also by RYDZAK 1957), 13, 14 (served also by RYDZAK 1957), 16 (served also by RYDZAK 1957), 18-20, 22 (served also by RYDZAK 1957), 24-37, 39, 40, 43, 44, 47, 48.
- Hypogymnia tubulosa* (Schaer.) Hav. – bark of trees, wood; stands: 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 13, 16 (served also by RYDZAK 1957 as *Parmelia tubulosa*).
- Hypotrachyna revoluta* (Flörke) Hale – bark of *Tilia cordata*; stand: 1 (served by RYDZAK 1957 as *Parmelia revoluta*).
- Imshaugia aleurites* (Ach.) S.L.F. Meyer – bark of *Pinus sylvestris*, wood; stands: 1 (served also by RYDZAK 1957 as *Parmeliopsis pallescens*), 11.
- Lecanora albella* (Pers.) Ach. – bark of trees; stands: 1 (served by RYDZAK 1957 as *Lecanora pallida*), 5 (served by RYDZAK 1957).
- Lecanora albescens* (Hoffm.) Branth & Rostr. – concrete structure; stands: 1, 5, 10, 19, 20, 26, 29-31, 38, 40, 42-48.
- Lecanora allophana* Nyl. – bark of trees, wood; stands: 2, 23 (served by LECEWICZ 1954), 40.
- Lecanora argentata* (Ach.) Malme – bark of trees; stands: 1-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 24, 25, 32.
- Lecanora carpinea* (L.) Vain. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 25, 26, 36, 38, 39.
- Lecanora chlarotera* Nyl. – bark of trees; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora conizaeoides* Nyl. ex Cromb. – bark of *Picea abies*, *Pinus sylvestris*; stands: 11, 35.
- Lecanora dispersa* (Pers.) Sommerf. – concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 10, 19, 20, 25, 28-31, 38, 40, 41-46, 48.
- Lecanora expallens* Ach. – bark of trees; stand: 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora hagenii* (Ach.) Ach. – bark of trees; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 35.
- Lecanora impudens* Degel. – bark of trees; stands: 1 (served by RYDZAK 1957 as *Pertusaria maculata*), 22 (served by RYDZAK 1957).

- Lecanora intumescens* (Rebent.) Rabenh. – bark of trees; stands: 1 (served by RYDZAK 1957), 22 (served by RYDZAK 1957).
- Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh. – bark of trees; stand: 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora pulicaris* (Pers.) Ach. – bark of *Acer pseudoplatanus*, *Populus nigra*; stands: 25, 28, 38, 39.
- Lecanora saligna* (Schröd.) Zahlbr. – bark of trees; stand: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora subrugosa* Nyl. – bark of trees; stand: 1 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora symmicta* (Ach.) Ach. – bark of *Alnus glutinosa*, *Tilia cordata*; stands: 12, 23 (served by LECEWICZ 1954).
- Lecanora umbrina* (Ach.) A. Massal. – bark of trees; stand: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lecanora varia* (Hoffm.) Ach. – bark of *Pinus sylvestris*, *Betula pendula*, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 16 (served also by RYDZAK 1957), 29, 31, 39.
- Lecidella elaeochroma* (Ach.) Choisy – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Lecidea euphorea*, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 35.
- Lecidella stigmatea* (Ach.) Hertel & Leuckert – concrete; stand: 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Lepraria incana* (L.) Ach. – bark of trees; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988, KUKWA 2002), 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 11, 24, 25, 27, 29.
- Lepraria rigidula* (de Lesd.) Tønsberg – bark of *Malus* sp., *Tilia cordata*; stand: 1 (served by KUKWA 2002).
- Lepraria vouaxii* (Hue) R. C. Harris – bark of *Fraxinus excelsior*, mortar; stands: 1 (served by KUKWA 2002), 5 (served by KUKWA 2002).
- Lobaria pulmonaria* (L.) Hoffm. – bark of *Carpinus betulus*, *Tilia cordata*; stand: 1 (served by RYDZAK 1957).
- Loxospora elatina* (Ach.) A. Massal. – bark of trees; stand: 2 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Haematomma elatinum*).
- Melanelixia fuliginosa* (Fr. ex Duby) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch subsp. *fuliginosa* – bark of trees, wood, stones; stands: 1, 5 (served also by RYDZAK 1957 as *Parmelia fuliginosa*), 10 (served also by RYDZAK 1957), 11 (served also by RYDZAK 1957), 12 (served also by RYDZAK 1957), 18, 22 (served also by RYDZAK 1957), 23 (served also by LECEWICZ 1954 as *Parmelia fuliginosa*), 26, 32, 35.
- Melanelixia fuliginosa* (Fr. ex Duby) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch subsp. *glabratula* (Lamy) J.R. Laundon – bark of trees; stand: 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia glabratula*).
- Melanelixia subargentifera* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch – bark of trees; stands: 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia subargentifera*), 4 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Melanelixia subaurifera* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch – bark of trees, wood; stands: 1 (served by RYDZAK 1957 as *Parmelia subaurifera*), 12 (served by RYDZAK 1957), 16 (served by RYDZAK 1957).
- Melanohalea elegantula* (Zahlbr.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch – bark of *Fraxinus excelsior*; stand: 4 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia elegantula*).
- Melanohalea exasperatula* (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch – bark of trees; stands: 1 (served by RYDZAK 1957 as *Parmelia exasperatula*), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia exasperatula*), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 24, 25, 35, 39.
- Melanohalea olivacea* (L.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch – bark of *Tilia cordata*, *Alnus glutinosa*; stand: 1 (served by RYDZAK 1957 as *Parmelia olivacea*).
- Micarea denigrata* (Fr.) Hedl. – wood; stand: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Mycobilimbia tetramera* (De Not.) Vitik., Ahti, Kuusinen, Lommi & T. Ulvinen ex Hafellner & Türk – bryophytes; stand: 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Bacidia fusca*).
- Ochrolechia microstictoides* Räsänen – bark of *Betula pendula*; stand: 4 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Pertusaria leprarioides*).
- Opegrapha atra* Pers. – bark of *Betula pendula*; stand: 1 (served by RYDZAK 1957).
- Opegrapha rufescens* Pers. – bark of *Tilia cordata*, *Acer platanoides*, *A. pseudoplatanus*; stand: 1 (served by RYDZAK 1957 as *Opegrapha herpetica*).
- Opegrapha varia* Pers. – bark of *Tilia cordata*, *Acer platanoides*, *Fraxinus excelsior*; stand: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Parmelia saxatilis* (L.) Ach. – bark of *Fraxinus excelsior*; stands: 1 (served by RYDZAK 1957), 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Parmelia sulcata* Taylor – bark of trees, wood, stones; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 7, 11-14 (served also by RYDZAK 1957), 15-20 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 23 (served also by LECEWICZ 1954), 24-26, 29-30, 32, 34-41, 43, 47, 48.
- Parmelina tiliacea* (Hoffm.) Hale – wood; stand: 11 (served by RYDZAK 1957 as *Parmelia scortea*).
- Parmeliopsis ambigua* (Wulfen) Nyl. – wood; stand: 11.
- Pertusaria albescens* (Huds.) Choisy & Werner in Werner var. *albescens* – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Pertusaria discoidea*, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 15 (served also by RYDZAK 1957), 18, 19, 22 (served also by RYDZAK 1957), 23 (served also by LECEWICZ 1954), 24, 25, 35.
- Pertusaria albescens* (Huds.) Choisy & Werner in Werner var. *globulifera* (Turner) Poelt – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Pertusaria globulifera*), 5 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957).

- Pertusaria amara* (Ach.) Nyl. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 18, 22 (served also by RYDZAK 1957), 24, 26, 35.
- Pertusaria coccodes* (Ach.) Nyl. – bark of trees; stand: 1 (served by RYDZAK 1957).
- Pertusaria coccodes* (Ach.) Nyl. var. *coccodes* – bark of trees; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 2 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 24.
- Pertusaria pertusa* (Weigel) Tuck – bark of *Populus tremula*; stand: 23 (served by LECEWICZ 1954).
- Phaeophyscia nigricans* (Flörke) Moberg – bark of *Populus tremula*; stands: 1 (served also by RYDZAK 1957 as *Physcia nigricans*), 41, 48.
- Phaeophyscia orbicularis* (Neck.) Moberg – bark of trees, betonowe konstrukcje; stands: 1 (served also by RYDZAK 1957 as *Physcia orbicularis*, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 6 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 20 (served also by RYDZAK 1957), 24, 25, 28, 30, 31-33, 35, 36, 38, 40, 41-46, 48.
- Phaeophyscia sciastra* (Ach.) Moberg. – concrete; stand: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Phlyctis agelaea* (Ach.) Flot. – bark of trees; stand: 1 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Phlyctis argena* (Spreng.) Flot. – bark of trees, wood; stands: 1-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 11, 15 (served also by RYDZAK 1957), 18-20, 24-26, 29, 34-36, 38-40, 43, 47, 48.
- Physcia adscendens* (Fr.) H. Olivier – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 6 (served also by RYDZAK 1957), 9 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 13-15 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 18, 20, 22 (served also by RYDZAK 1957), 24, 27-30, 32, 35, 38-40, 43, 47, 48.
- Physcia aipolia* (Ehrh. ex Humb.) Fürnrrohr subsp. *aipolia* – bark of trees; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 18 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 38.
- Physcia caesia* (Hoffm.) Fürnr. – concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 32, 40.
- Physcia dubia* (Hoffm.) Lettau – bark of trees; stands: 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 24, 28, 32, 33, 38, 43.
- Physcia stellaris* (L.) Nyl. subsp. *stellaris* – bark of trees; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 19, 24, 40.
- Physcia tenella* (Scop.) DC. in Lam. & DC. – bark of trees, concrete constructions, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 11, 15 (served also by RYDZAK 1957), 18, 20, 22 (served also by RYDZAK 1957), 26, 28, 29, 32, 33, 35, 40, 48.
- Physconia distorta* (With.) J.R. Laundon – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Physcia pulverulenta*, CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Physconia pulverulacea*), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 6 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 19 (served also by RYDZAK 1957), 20 (served also by RYDZAK 1957), 22, 23 (served also by LECEWICZ 1954 as *Physcia pulverulenta*), 25, 40, 43.
- Physconia enteroxantha* (Nyl.) Poelt – bark of trees; stands: 1-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 24, 25, 41, 43.
- Physconia grisea* (Lam.) Poelt – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Physcia grisea*), 5 (served also by RYDZAK 1957), 6 (served also by RYDZAK 1957), 8 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 18 (served also by RYDZAK 1957), 20 (served also by RYDZAK 1957), 22, 40.
- Physconia perisidiosa* (Erichsen) Moberg – bark of trees; stands: 1 (served by RYDZAK 1957 as *Physcia farrea*), 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988), 23 (served by LECEWICZ 1954 as *Physcia farrea*).
- Platismatia glauca* (L.) W.L. Culb & C.F. Culb – bark of *Pinus sylvestris*, *Tilia cordata*, wood; stands: 1 (served also by RYDZAK 1957 as *Cetraria glauca*), 11, 16 (served also by RYDZAK 1957).
- Pleurosticta acetabulum* (Neck.) Elix & Lumbsch – bark of *Fraxinus excelsior*, *Populus tremula*; stands: 1, 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia acetabulum*), 5, 17 (served also by RYDZAK 1957).
- Protoparmeliopsis muralis* (Schreb.) M. Choisy – concrete constructions; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Lecanora muralis*), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Pseudevernia furfuracea* (L.) Zopf. – wood, bark of trees; stands: 1, 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 11 (served also by RYDZAK 1957 as *Parmelia furfuracea*), 16 (served also by RYDZAK 1957), 19-21 (served also by RYDZAK 1957), 23 (served also by LECEWICZ 1954), 39.
- Punctelia subrudecta* (Nyl.) Krog – bark of *Populus tremula*, *Pinus sylvestris*; stands: 1 (served by RYDZAK 1957 as *Parmelia dubia*), 23 (served by LECEWICZ 1954).
- Ramalina farinacea* (L.) Ach. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957), 5, 11, 12 (served also by RYDZAK 1957), 14-15 (served also by RYDZAK 1957), 18, 19, 20 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 24-27, 29, 35-39, 47.
- Ramalina fastigiata* (Pers.) Ach. – bark of *Tilia cordata*; stands: 1 (served by RYDZAK 1957 as *Ramalina populina*), 24, 47.

- Ramalina fraxinea* (L.) Ach. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 12 (served also by RYDZAK 1957), 14-15 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 18, 20 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 24-26, 35, 37, 39, 47.
- Ramalina obtusata* (Arnold) Bitter – bark of *Acer platanoides*; stand: 1 (served by RYDZAK 1957).
- Ramalina pollinaria* (Westr.) Ach. – bark of trees, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 10 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 20 (served also by RYDZAK 1957), 24, 35, 38, 47.
- Rinodina pyrina* (Ach.) Arnold – bark of trees; stand: 1 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Scoliosporum chlorococcum* (Graeve ex Stenh.) Vezda – bark of trees; stand: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Scoliosporum umbrinum* (Ach.) Arnold – stones; stand: 29.
- Thelocarpon laureri* (Flot.) Nyl. – wood; stand: 1 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988).
- Tuckermannopsis chlorophylla* (Willd.) Hale – bark of trees; stands: 1 (served also by RYDZAK 1957 as *Cetraria chlorophylla*), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Cetraria chlorophylla*), 16 (served also by RYDZAK 1957), 22 (served also by RYDZAK 1957), 25, 35.
- Tuckermannopsis sepincola* (Ehrh.) Wale – bark of trees; stand: 3 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Cetraria sepincola*).
- Usnea filipendula* Stirt. – bark of *Tilia cordata*, wood; stands: 1, 2 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served by CIEŚLIŃSKI and TOBOLEWSKI 1988), 16 (served by RYDZAK 1957 as *Usnea dasypoga*).
- Usnea hirta* (L.) Weber ex F.H. Wigg. – bark of trees, wood; stands: 1, 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 11 (served also by RYDZAK 1957), 15 (served also by RYDZAK 1957), 16 (served also by RYDZAK 1957), 19 (served also by RYDZAK 1957), 24, 39.
- Usnea subfloridana* Stirt. – wood, bark of *Carpinus betulus*; stands: 1 (served by RYDZAK 1957 as *Usnea comosa*), 11 (served by RYDZAK 1957), 16 (served by RYDZAK 1957), 20 (served also by RYDZAK 1957), 21 (served also by RYDZAK 1957).
- Verrucaria nigrescens* Pers. – concrete; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5.
- Vulpicida pinastri* (Scop.) J.-E. Mattsson & M.J. Lai – bark of *Betula pendula*; stand: 1 (served by RYDZAK 1957 as *Cetraria pinastri*).
- Xanthoparmelia conspersa* (Ach.) Hale – stones; stand: 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988 as *Parmelia conspersa*).
- Xanthoria candelaria* (L.) Th. Fr. – bark of trees; stands: 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 10 (served by RYDZAK 1957).
- Xanthoria elegans* (Link) Th. Fr. – concrete constructions; stands: 31, 41.
- Xanthoria parietina* (L.) Th. Fr. – bark of trees, concrete constructions, wood; stands: 1 (served also by RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988), 2-4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5-8 (served also by RYDZAK 1957), 10 (served also by RYDZAK 1957), 13-15 (served also by RYDZAK 1957), 17 (served also by RYDZAK 1957), 19, 20, 22 (served also by RYDZAK 1957), 23 (served also by LECEWICZ 1954), 24, 26-32, 36, 38-48.
- Xanthoria polycarpa* (Hoffm.) Rieber – bark of trees; stands: 1 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 3 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 4 (served also by CIEŚLIŃSKI and TOBOLEWSKI 1988), 5, 10 (served also by RYDZAK 1957), 13-15 (served also by RYDZAK 1957), 18, 19, 28, 29, 32, 40, 43, 48.

Changes in lichen biota of Białowieża

Previous researchers of lichen biota of Białowieża emphasized high taxonomic diversity and considerable richness of lichen biota within this town. As a result of previous investigations LECEWICZ (1954) recorded the occurrence of 13 species in the Management Park, RYDZAK (1957) on his own stands – 58, CIEŚLIŃSKI and TOBOLEWSKI (1988) on three stands – 80. RYDZAK (1957) reports the richest lichen biota from the Palace Park, the Management Park, the cemetery and old trees in the northern part on the side of the forest. Of special interest to him was the richness of macrolichen species of genera *Usnea*, *Ramalina*, *Evernia* and *Anaptychia ciliaris* in the Palace Park, not encountered in other parks in Poland. In this park he registered a mass occurrence of forest species as well as those characteristic of roadside trees.

The results of the current observations and studies imply that Białowieża has not avoided negative aspects of human activity and, as a consequence, a process of lichen biota impoverishment has been noted. This refers mainly to epiphytic lichens with fruticose and foliose thalli, most sensitive to anthropogenic factors. Macrolichens of genera *Bryoria*, *Usnea* and *Lobaria pulmonaria*, as well as crustose lichens of genera *Ochrolechia*, *Opegrapha*, which colonize tree trunks and boughs, constituted a considerable complement of the natural character of park trees of Białowieża. Currently many of them are the species whose occurrence has not been confirmed. Within the investigated area some species have considerably decreased in frequency and abundance of occurrence. These are mainly species of genera *Usnea*, *Melanohalea*, *Melanelixia*. A symptom of deterioration of living conditions is a decrease in vitality of some lichen species. Former researchers emphasized in their studies a phenomenon of forming apothecia by numerous common species, e.g. *Hypogymnia physodes*, *Ramalina farinacea*, *Parmelia sulcata*. At present the above mentioned lichens are still widely spread organisms, however specimens with apothecia have not been found.

The impoverishment of lichen biota as a result of economic activity of man is a commonly known phenomenon at the moment, progressing at a higher rate

and on more extensive territories (CIEŚLIŃSKI and TOBOLEWSKI 1988). With regard to Białowieża this phenomenon is of a special significance because the process has been going on within a town situated in the vicinity of a large and dense forest complex – the Białowieża Forest.

Species such as *Chaenotheca furfuracea*, *Flavoparmelia caperata*, *Graphis scripta*, *Hypotrachyna revoluta*, *Lecanora albella*, *L. intumescens*, *L. impudens*, *Lobaria pulmonaria*, *Melanohalea olivacea*, *Melanelixia subaurifera*, *Opegrapha atra*, *O. rufescens*, *Parmelina tiliacea*, *Pertusaria pertusa*, *Punctelia subrudecta*, *Ramalina obtusata*, *Usnea subfloridana*, *Vulpicida pinastri*, which have retreated from Białowieża, used to grow there in the fifties (LECEWICZ 1954, RYDZAK 1957). In comparison with the studies carried out in the eighties of the 20th century by CIEŚLIŃSKI and TOBOLEWSKI (1988), *Lecanora subrugosa*, *Loxospora elatina*, *Melanohalea elegantula*, *Melanelia subargentifera*, *Ochrolechia microstictoides*, *Phlyctis agelaea*, *Thelocarpon laureri*, *Tuckermanopsis sepincola* have not currently been found. Investigations carried out at present within Białowieża have enriched the list of lichens with new species: *Aspicilia cinerea*, *Buellia griseovirens*, *Caloplaca saxicola*, *Cladonia floerkeana*, *Lecanora albescens*, *L. conizaeoides*, *L. pulicaris*, *Parmeliopsis ambigua*, *Scoliciosporum umbrinum*, *Xanthoria elegans*.

Analysing the present biota it is worth emphasising that many species occur on single stands. Only with regard to epiphytes this results from limited habitat possibilities.

The once rich lichen biota of Białowieża, mainly epiphytes, has now become impoverished. This comes as a consequence of the increased traffic volume, as well as local emissions of domestic and industrial pollution.

CONCLUSION

The thesis presents the results of the research conducted in the years 2008-2009 in Białowieża (Eastern Poland). In the available historical works (LECEWICZ 1954, RYDZAK 1957, CIEŚLIŃSKI and TOBOLEWSKI 1988, KUKWA 2002) concerning the researched area 109 lichen species were listed. During the current research 36 of them have not been found again, the existence of 73 has been confirmed and, additionally, 10 species, new for this town, have been discovered. The list of lichens in Białowieża encompasses includes 119 taxa. Comparing the historical and contemporary data, an attempt has been made to determine the lichen biota dynamics over the years. As a result of the field work 83 lichen species have been found, including 66 species growing in trees, 24 in the rocks and concrete, 24 on wood and one on soil.

Amongst the 83 species lichen registered in Białowieża, 18 (c. 22%) are placed on the "Red list of the lichens in Poland" (CIEŚLIŃSKI et al. 2006).

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