



## LICHENS OF THE JEWISH CEMETERY IN BIAŁYSTOK (NORTH-EASTERN POLAND)

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**ABSTRACT.** Of the six Jewish cemeteries in Białystok before the war, only one remains. The Jewish cemetery in Białystok was founded in 1892. It is located in Wschodnia Street, at the north-eastern part of the town. Only seven Jewish cemeteries in Poland (two in Warsaw, two in Wrocław, Łódź, Kraków, Białystok) have over 5000 gravestones. The last burial took place in 1969. It is one of the largest Jewish cemeteries in Poland (its area measures about 12.5 ha). Among its monuments there is the obelisk to the victims of pogroms of 14th, 15th and 16th June 1906. The paper presents a list of lichen species collected in the Jewish cemetery in Białystok in north-eastern Poland. In total 57 species have been recorded five of which belong to the group threatened lichens in Poland (*Stereocaulon condensatum*, *S. tomentosum*, *Evernia prunastri*, *Neofuscelia pulla*, *Psilolechia lucida*). The Jewish cemetery is sole support of occurrence many rare species of lichens in city. There are: *Cladonia rei*, *C. squamosa*, *Diploschistes muscorum*, *Lecanora rupicola*, *Neofuscelia pulla*, *Psilolechia lucida*, *Rhizocarpon reductum*, *Scoliciosporum umbrinum*, *Stereocaulon condensatum* and *S. tomentosum*. Predominate epilithic lichens (32 species). Other ecological groups are represented by smaller number of species – epiphytic (15) and epigeic (14).

**KEY WORDS:** lichens, floristics, the Jewish cemetery, Białystok, north-eastern Poland

## INTRODUCTION

Cemeteries are inseparable elements of city landscape. They constitute a unique cultural, religious and also natural value. These are places where numerous plant species occur. One can find here a diversity of habitats and substrata colonized by numerous lichen species.

Publications concerning lichens on the territories of Polish cemeteries are rare. This might result from the difficulties caused by the way the study material is collected in places of worship. A dozen or so lichen species colonizing monuments of municipal cemeteries in Lublin and small towns of a resort character have been reported by RYDZAK (1953, 1956 a, b, 1957 a, b), the ones in Słupsk have been reported by ŚPIEWAKOWSKI and IZYDOREK (1981) and those in Przemyśl by KISZKA (1999). Lichens on the monuments of cemeteries dating back to World War I in the Carpathian Foothills (Pogórze Karpackie) have been listed by KOZIK (1994). The rock lichenbiota found on boulders on the prehistorical burial ground "Stone Circles" ("Kęgi Kamienne") in the Tuchola Forest (Bory Tucholskie) has been described by KISZKA and LIPNICKI (1994). Lichens of the cemetery in Bogusław have been studied by GROCHOWSKI (2002), lichens in Ugoszcz situated on the territory of the Nadbużański Landscape Park (Nadbużański Park Krajobrazowy) by JASTRZĘBSKA (2005).

## STUDY AREA

The Jewish cemetery in Białystok, situated at Wschodnia Street (Fig. 1), was officially founded in 1892 in the neighbourhood of a churchyard within the area of a former village Bagnówka. The most successful period of development of the Jewish community in Białystok fell at the close of the 19th century. In 1912 the population of Jews numbered 75% of all the citizens and the town was called "Jerusalem of the north". The cemetery was open until 1941.

Since then the "ghetto" cemetery at Żabia Street, which is no longer in existence, started to function. As a consequence of the ghetto liquidation by the Nazis on the 16th August, 1943 the Jewish community ceased to exist. The last known burial on the cemetery at Wschodnia Street took place in 1969. In 1966 the cemetery was taken over by the state (DOBROŃSKI 2001).

The Jewish cemetery in Białystok is one of the biggest Jewish cemeteries in Poland, along with others in Warsaw, Wrocław, Łódź and Kraków. On the area of 12.5 ha 5000 headstones have been preserved, many of them with rich and interesting decor. Almost all headstones have inscriptions in Hebrew, but there are also ones in Polish, Yiddish, German and Russian. The oldest headstone dates from 1876. Marble, granite, limestone and sandstone were used for making them. The cemetery grounds are surrounded by a concrete wall.



FIG. 1. Site of the Jewish cemetery in Białystok

The cemetery is divided into several parts. In the part closest to the former main entrance quite many macevas have been preserved. Judging from the material used, mainly granite with rich ornamentation, the headstones belonged to distinguished burgesses. The further part of the cemetery is occupied by modest, uniform-looking concrete headstones, the third part comprises a neglected area mostly without headstones. In the central part of the cemetery one can find an ohel of rabbi Chaim Herz Halpern who died in 1919 and a monument commemorating the pogrom of 1906. After the war many valuable headstones made of marble were stolen, the

remaining headstones – macevas, sarcophaguses, obelisks date from the end of the 19th and the beginning of the 20th century and the later years of the first half of the 20th century.

The Jewish cemetery in Białystok has been included in the project the Golden Maze by sociology students of the University of Białystok – members of the Scientific Association. They wish to preserve the memory of those who used to live here. They hand over the documentation concerning the cemetery to the American organization JewishGen which deals with creating database on Jewish cemeteries in Europe.

The investigations on the territory of the Jewish cemetery in Białystok aimed to:

- present floristic documentation illustrating biodiversity of lichenbiota including habitat conditions of species, as complementary studies to those carried out in this area by sociologists and historians, in order to provide special care and protection not only as cultural heritage but also the natural one,
- point out aspects of synanthropization process of lichens on the cemetery being the object of anthropogenic origin.

#### MATERIAL AND METHODS

The investigations were carried out in 2005. The majority of species were listed, part of them, however, required laboratory work. The obtained samples of lichens were of minimum size in order not to damage the headstones and not to disturb their lichenbiota. The only collected fragments were those of the specimens which could not be determined in the field. Notes on the flora as well as photographic documentation were made in the study area. The herbarium material and floristic documentation can be found at the Herbarium of the Institute of Biology, University of Białystok. Species have been named according to SANTESSON ET AL. (2004).

#### RESULTS

On the territory of the Jewish cemetery in Białystok 57 lichen taxa of 29 genera have been reported. The lichens grow on stone (mainly granite) and concrete headstones (32 species), on the layer of humus, soil and dead moss (16 species) and on tree bark (15 species) of Norway maple *Acer platanoides*, plane-tree maple *Acer pseudoplatanus*, common birch *Betula pendula*, durmast (brown oak) *Quercus robur*, golden ash *Fraxinus excelsior* and robinia *Robinia pseudacacia*.

Rock lichens comprise the most dominant habitat group, including species with crustose thalli. The stone (granite) headstones have been colonized by lichens recorded exclusively on rock substratum (obligatory epilithic lichens) as well as nitrophilous, coniofilous, calciphilous facultative epilithic lichens also encountered on other substrata. Eight species have been identified on granite headstones exclusively. Lichens rare in lowland Poland dominate here, e.g. *Aspicilia cinerea*, *Lecanora rupicola*, *Neofuscelia loxodes*, *N. pulla*. Layers of concrete sarcophaguses, frequently sloping and buried in soil, are colonized by calciphilous synanthropic lichens which are also found on erratic boulders in north-east Poland (ZIELIŃSKA 1980, KARCZMARZ ET AL. 1988), e.g. *Caloplaca saxicola*, *Lecanora dispersa*, *Lecidea fuscoatra*, *Physcia caesia*, *Verrucaria nigrescens*. Several rare species populate only concrete substratum, e.g. *Psilolechia lucida*. Species such as *Cladonia fimbriata* and *Stereocaulon condensatum*, which show preference for soil, have been recorded directly on concrete sarcophaguses and their vertical side walls. *Acarospora fuscata* and *Lecanora polytropa* are equally frequent and numerous colo-

nizers on natural and anthropogenic stands. Lichens of epiphytic nature have been recorded on few headstones, e.g. *Physcia dubia*, *Xanthoria polycarpa*.

Most headstones are covered by multicoloured lichen mosaic. Numerous macevas are favoured by communities of crustose lichens with dominant species of *Lecanora polytropa*, *Candelariella vitellina*, *Acarospora fuscata* and *Lecidea fuscoatra*. Frequently encountered species of *Xanthoparmelia conspersa*, *Neofuscelia loxodes* and *N. pulla* with foliose thalli reaching 50 cm in diameter occupy the whole surface of a headstone. Less numerous are *Candelariella coralliza*, *Lecanora rupicola*, *Porpidia crustulata*, *Rhizocarpon reductum* and *Scoliciosporum umbrinum*.

Such abundance and diversity of epilithic lichen thalli has not been observed within Białystok. This is due to the fact that most headstones are found in the exposed area, many of them are knocked over or sloping in different directions, which creates favourable microhabitats for lichens. Another meaningful fact is the location of the cemetery in considerable distance from the city centre. What makes this stand unique is the fact that the Jewish cemetery is the refuge for 10 lichen species which are absent in the area of Białystok. These are: *Cladonia rei*, *C. squamosa*, *Diploschistes muscorum*, *Lecanora rupicola*, *Neofuscelia pulla*, *Psilolechia lucida*, *Rhizocarpon reductum*, *Scoliciosporum umbrinum*, *Stereocaulon condensatum* and *S. tomentosum*.

On the layer of humus and moss growing on many headstones the dominant lichens are epigeic species of genus *Cladonia* (10 species) and *Diploschistes muscorum*, species characteristic for dry xerothermic grass, as well as *Mycobilimbia tetramera* – obligatory epibryophyte. Among lichens of genus *Cladonia* there can be found rare species, such as *Cladonia grayi*, *C. rei*, *C. squamosa*, *C. pyxidata*.

The headstones in shaded places or the ones shielded by tree and shrub undergrowth or by herbaceous vegetation lack lichens completely.

Numerous headstones with multispecies mosaic of lichens are situated mainly in the southern, south-western, central and eastern parts of the cemetery in places exposed to the sun. The headstones in the western and northern part of the cemetery in shaded places are poor in lichens. These are likely to be the youngest monuments of the cemetery.

On tree bark of deciduous trees only few most common lichen species have been found: *Hypogymnia physodes*, *Parmelia sulcata*, *Phaeophyscia orbicularis*, *Physcia adscendens*, *P. dubia* and *Xanthoria parietina*.

Of all the 56 lichen species of the Jewish cemetery, four have been put under legal protection, three of which are totally – *Peltigera rufescens*, *Stereocaulon condensatum* and *S. tomentosum* and one of which is partially protected – *Evernia prunastri*.

Five species have been put on the Red List of extinct and threatened lichens in Poland (CIEŚLIŃSKI ET AL. 2003), including one species in the endangered category (EN) – *Stereocaulon tomentosum*, one species in the vulnerable category (VU) – *Stereocaulon condensatum*, two in the category of near threatened (NT) – *Evernia prunastri*, *Neofuscelia pulla* and one in the least concern (LC) – *Psilolechia lucida*, as well as three species

on the Red list of lichens threatened in north-eastern Poland (CIEŚLIŃSKI 2003), including one species in the category EN – *Stereocaulon tomentosum* and two in the category DD (Data Deficient) – *Psilolechia lucida* and *Cladonia rei*.

Human influence on lichens is reflected in two parallel processes: spreading of some species over new habitats and stands or remaining in their old stands (the phenomenon of hemerophilia) and retreating of other species (the phenomenon of hemerophobia). The reasons for lichen retreat are usually the outcome of anthropogenic factors and natural phenomena such as vegetation succession. The process of lichen synanthropization is certainly as old as the history of settlement (FAŁTYNOWICZ 1994). The contemporary stage of synanthropization can be distinguished by new, man-made habitats (substrata) frequently unfamiliar in the given area. Constructing artificial rock substrata has created favourable conditions for calciphilous rock lichens to spread onto the area formerly inaccessible to them because of lack of natural limestone rocks (FAŁTYNOWICZ 1994). This way geographical and habitat barriers have been removed. Optimal conditions have been found by anthropophytes – nitrophilous lichens (*Acarospora fuscata*, *Aspicilia cinerea*, *Caloplaca citrina*, *Lecidella stigmataea*, *Xanthoparmelia conspersa*), coniofilous and calciphilous species of genera *Lecanora*, *Physcia*, *Phaeophyscia* and *Xanthoria*. The manifestation of synanthropization is the passage of indigenous species from their natural habitats (erratic boulders, stones) onto secondary habitats (headstones). The lichenbiota in anthropogenic habitats is characterised by low substratum dependence, variety of morphological forms of thalli, populations with numerous individuals and a small number of species obligatory to individual habitats.

The phenomenon of synanthropization of lichens within the territory of the Jewish cemetery concerns mainly epilythic lichens, colonizing artificial rock substrata: concrete headstones. These substrata are characterized by smaller or bigger amounts of calcium carbonate content. Due to this fact they become populated by calciphilous species. Common species show preference for these habitats, e.g. *Lecanora dispersa*, *Candelariella aurella*, *Caloplaca citrina*. They are also accompanied by nitrophilous and coniofilous lichens, e.g. of genus *Physcia*. Noteworthy is the fact that, unlike synanthropic plants, these “synanthropic lichens” are not invasive organisms and do not pose a threat to natural lichenbiota as they are limited in their expansion by their own habitat demands (KOSSOWSKA 2007).

The analysis of the effects of synanthropization process in the area under study implies its positive aspects, which can be observed in:

- floristic diversity of lichens, especially among epilythic lichens colonizing headstones as compared to other cemeteries in the capital of Podlasie,
- occurrence of 10 species of rock lichens not found elsewhere in Białystok,
- mass occurrence of obligatory epilythic macrolichens, such as *Xanthoparmelia conspersa*, *Neofuscelia pulla* and *N. loxodes*,
- spreading of calciphilous species related to calcareous substrata,

- in Podlasie and Białystok, due to the lack of natural exposed rocks, the most numerous epilythic lichenbiota can be found on headstones and cemetery walls.

## SPECIES INDEX

The index comprises 57 lichen taxa listed alphabetically. The species have been described according to the pattern: species name and kind of substratum it is found on.

- Acarospora fuscata* (Schrad.) Th. Fr. – stone tombstones
- Amandinea punctata* (Hoffm.) Coppins & Scheid. – bark of *Betula pendula*
- Aspicilia calcarea* (L.) Mudd – concrete tombstones
- Aspicilia cinerea* (L.) Körb. – stone tombstones
- Caloplaca citrina* (Hoffm.) Th. Fr. – concrete tombstones
- Caloplaca decipiens* (Arnold) Blomb. & Forssell – concrete tombstones
- Caloplaca holocarpa* (Hoffm. ex Ach.) A.E. Wade – concrete and stone tombstones
- Caloplaca saxicola* (Hoffm.) Nordin – concrete and stone tombstones
- Candelariella aurella* (Hoffm.) Zahlbr. – concrete and stone tombstones
- Candelariella coralliza* (Nyl.) H. Magn. – stone tombstones
- Candelariella vitellina* (Hoffm.) Müll. Arg. – concrete and stone tombstones
- Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Cladonia coniocraea* (Flörke) Spreng., nom. cons. – bark of *Robinia pseudacacia* and concrete tombstone
- Cladonia fimbriata* (L.) Fr. – layer of the humus, bryophytes growing on stone and concrete tombstones and on concrete tombstone directly
- Cladonia furcata* (Huds.) Schrad. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Cladonia grayi* G. Merr. ex Sandst. – layer of the humus
- Cladonia macilenta* Hoffm. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Cladonia pyxidata* (L.) Hoffm. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Cladonia rei* Schaer. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Cladonia squamosa* Hoffm. – layer of the humus and bryophytes growing on concrete tombstones
- Cladonia subulata* (L.) Weber ex F.H. Wigg. – layer of the humus and bryophytes growing on stone and concrete tombstones
- Diploschistes muscorum* (Scop.) R. Sant. in Hawksworth, James & Coppins – layer of the humus and bryophytes growing on stone and concrete tombstones
- Evernia prunastri* (L.) Ach. – bark of *Quercus robur*, single thallus
- Hypocenomyce scalaris* (Ach.) M. Choisy – bark of *Robinia pseudacacia*, *Betula pendula*

*Hypogymnia physodes* (L.) Nyl. – bark of *Quercus robur*  
*Lecania erysibe* (Ach.) Mudd – bryophytes growing on concrete tombstone  
*Lecanora albescens* (Hoffm.) Branth & Rostr. – concrete tombstones  
*Lecanora conizaeoides* Nyl. ex Cromb. – bark of *Robinia pseudacacia*, *Betula pendula*, *Quercus robur*  
*Lecanora dispersa* (Pers.) Sommerf. – concrete tombstones  
*Lecanora polytropa* (Ehrh. ex Hoffm.) Rabenh. – stone tombstones  
*Lecanora rupicola* (L.) Zahlbr. – stone tombstones  
*Lecidea fuscoatra* (L.) Ach. – concrete and stone tombstones  
*Lecidella stigmatea* (Ach.) Hertel & Leuckert – concrete tombstones  
*Lepraria* sp. – stone and concrete tombstones and bark of *Robinia pseudacacia*  
*Mycobilimbia tetramera* (De Not.) Vitik. et al. in Hafellner & Türk – bryophytes growing on tombstones  
*Neofuscelia loxodes* (Nyl.) Essl. – stone tombstones, numerous, big thallus  
*Neofuscelia pulla* (Ach.) Essl. – stone tombstones, numerous, big thallus  
*Parmelia sulcata* Taylor – concrete tombstones and bark of *Robinia pseudacacia*, *Quercus robur*, *Fraxinus excelsior*  
*Peltigera rufescens* (Weiss) Humb. – layer of the humus on concrete tombstones  
*Phaeophyscia orbicularis* (Neck.) Moberg – bark of *Acer pseudoplatanus*  
*Physcia adscendens* H. Olivier nom. cons. – bark of *Acer platanoides*  
*Physcia caesia* (Hoffm.) Fűrnr. – concrete and stone tombstones  
*Physcia dubia* (Hoffm.) Lettau – bark of *Quercus robur*, concrete and stone tombstones  
*Physcia tenella* (Scop.) DC. in Lamarck & Candolle nom. cons. – bark of *Acer pseudoplatanus*  
*Porpidia crustulata* (Ach.) Hertel & Knoph in Hertel – stone tombstones  
*Protoparmeliopsis muralis* (Schreb.) M. Choisy – concrete tombstones  
*Psilolechia lucida* (Ach.) M. Choisy – concrete tombstones  
*Rhizocarpon reductum* Th. Fr. – concrete and stone tombstones  
*Scoliciosporum chlorococcum* (Graeve ex Stenh.) Vězda – bark of *Betula pendula*  
*Scoliciosporum umbrinum* (Ach.) Arnold – stone tombstones  
*Stereocaulon condensatum* Hoffm. – layer of the humus on tombstones and concrete tombstone  
*Stereocaulon tomentosum* Fr. – layer of the humus on concrete tombstone  
*Verrucaria nigrescens* Pers. – concrete and stone tombstones  
*Verrucaria* sp. – concrete and stone tombstones  
*Xanthoparmelia conspersa* (Ach.) Hale – big thallus, on stone tombstones (the biggest thallus up to 0.5 m of the diameter)  
*Xanthoria elegans* (Link) Th. Fr. – concrete and stone tombstones

*Xanthoria parietina* (L.) Th. Fr. – bark of *Acer platanoides*, *Acer pseudoplatanus*, *Quercus robur*, *Fraxinus excelsior*  
*Xanthoria polycarpa* (Hoffm.) Th. Fr. ex Rieber – bryophytes growing on concrete tombstones and bark of *Quercus robur*.

#### THREATS AND POSTULATE OF PROTECTION

Threats to lichenbiota on headstones of the Jewish cemetery in Białystok result from natural causes, among which one ought to name:

- succession of vegetation around headstones, which leads to changes in microclimatic conditions favouring the development of bryophytes,
  - erosion of stone and concrete headstones, which causes the fall of lichen thalli along with stone and concrete fragments,
  - settlement of plant remains on headstones and formation of humus, which favours the succession of bryophytes and vascular plants,
- and from anthropogenic causes including:
- headstone degradation and devastation,
  - burning down grass around headstones,
  - influence of pollutants contained in the atmosphere.

The essential condition for ensuring the continuity of lichen growth is permanent protection of cemetery headstones. The Jewish cemetery in Białystok is not only the place of Jewish heritage cult, evidence of the nation's presence in the city but also the habitat of the occurrence of many interesting and rare lichen species.

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