



MATERIALS TO THE LICHEN BIOTA OF WESTERN POMERANIA (NORTHERN POLAND). PART 3. LICHENS ALONG THE SHORE OF THE BALTIC SEA

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ABSTRACT. Lichens of the Baltic coast are strongly endangered, mainly as a result of high tourist pressure. At the same time, this area is poorly penetrated by lichenologists. The paper contains a list of 211 lichen species collected during last several dozen years, mainly by author, and also by a few lichenologists, along the Polish shore of the Baltic Sea.

KEY WORDS: lichens, Baltic Sea shore, Western Pomerania, northern Poland

INTRODUCTION

The Polish coast of the Baltic Sea, which is only about 500 km long, is differently shaped. About 65 km are covered by cliffs, 380 km by dunes, and the rest is by marsh systems, estuaries and urban areas. Each of these coastal forms creates different conditions for lichen growth. Soil from slopes of active and abraded cliffs is transferred inland by the wind. It settles on all substrates, including the bark of trees and significantly changes their chemical composition and pH. On the top of stabilized cliffs, and sometimes on their slopes, mainly deciduous forests grow. Tree stands are mainly composed of *Fagus sylvatica* and *Quercus petraea*. *Populus tremula* is also common there, and on sandy places grows *Pinus sylvestris*. The dunes in significant parts are overgrown with grassland (*Elymo-Ammophiletum* and *Helichryso-Jasionetum* associations) and anthropogenic pine forests. These forests are usually planted in the *Betulo-Quercetum* habitat (see e.g. PIOTROWSKA 2002a). Drier patches of the pine forests form different stages of the *Empetro nigri-Pinetum* association. Epigeic lichens play a major role there (see WOJTERSKI 1964), as well as in psammophilous grasslands (PIOTROWSKA 2002b). Wetlands and wet forests with *Alnus glutinosa* play a relatively small role along the coast of the sea.

The whole coast is subjected to important environmental factor absent in the interior – constant wind (breeze), which brings a shore small droplets of water torn from waves of the sea. Numerous chemical elements and compounds are present in the water which significantly change the nature of the substrates. For example, under the influence of the breeze pH of pine bark changes from acidic to neutral or even alkaline, becoming a convenient habitat for numerous lichens that usually avoid this tree, e.g. for species of the genus *Physcia* or *Evernia prunastri* (WATERS & BRODO 2015, FAŁTYNOWICZ 2016). The strongest impact of the breeze is in a narrow zone of several hundred meters adjacent to the seashore. So called “enrichment zone” is described mainly in relation to vascular plants (see PIOTROWSKA et al. 2000, PIOTROWSKA 2002a), but is also observed in epiphytic species composition (e.g. NASH III & LANGE 1988).

Some additions have been presented also in several phytosociological works (e.g. WOJTERSKI 1964, KROTOSKA & TOBOLEWSKI 1980, FAŁTYNOWICZ 1987, 1988, CZYŻEWSKA 1992, PIOTROWSKA 2002a, b, BRZEG et al. 2004). Major data for a lichen diversity of the Polish Baltic Sea coast include lichenological works by DZIABASZEWSKI (1962), FAŁTYNOWICZ & MIĄDLIKOWSKA (1990, 1997), FAŁTYNOWICZ et al. (1991), MIĄDLIKOWSKA (1993), SAĞIN (1993, 1998), FAŁTYNOWICZ & SAĞIN

(1995), FAŁTYNOWICZ & WOJTYŁA-KUCHTA (1995), JAN-DO & KUKWA (2000), KOWALEWSKA et al. (2000), KUKWA (2000), OPANOWICZ (2002), IZYDOREK (2005), KUKWA et al. (2012), WIECZOREK & ŁYSKO (2012) et al., focused on the local lichen biota. In addition, the localities of individual species are given in lichenological notes, mainly from eastern part of the coast. Nevertheless, level of examination of lichens biota of the Polish Baltic coast is far from satisfactory.

MATERIALS AND METHODS

Lichens collected along the Polish Baltic Sea shore (under the phrase “sea shore” in this article I understand a belt with a width of up to 10 km along the Baltic coast) by the author and by other researchers have been examined for over 40 years. In the summary of these studies presented here revised collections and a dozen or so data by Tadeusz Sulma in the 1950s and 1960s have been included; specimens are deposited in the UGDA and WRSL. With the consent of the author, I also gave a dozen or so lichen localities collected by Dr Beata Sągín for her doctoral thesis (SĄGIN 1998), as well as several species of ground lichens collected in the heathlands by Dr Ryszard Markowski and I also put their localities in this article. For identification of sterile crustose species, thin layer chromatography (TLC) in solvents A and C was applied (KUBIAK & KUKWA 2011). The nomenclature of taxa is based on Polish checklist of FAŁTYNOWICZ & KOSSOWSKA (2016), with the exception of *Lepora* (WEI et al. 2017). Species threatened in Poland are presented based on the proposition by CIEŚLIŃSKI et al. (2006) and mentioned in the list as: EN – endangered species, CR – critically endangered, VU – vulnerable species, etc. (2006). A list of protected species were prepared on the basis of Regulation of the Minister for Environment in a relation to the protection of fungi species and listed below using an abbreviation: CH – protected species (REGULATION... 2014).

Taxa are listed in an alphabetical order in the following layout: Latin name of species; numbers of its localities; ecological remarks and others.

List of the localities (in brackets are listed numbers of squares according to the ATPOL grid – see CIEŚLIŃSKI & FAŁTYNOWICZ (1993); abbreviation: WF means Wiesław Fałtynowicz; RM – Ryszard Markowski; BS – Beata Sągín; TS – Tadeusz Sulma). The numbers (e.g. 1979, 1981) indicate the date of collecting herbarium specimens or the date of making field notes:

1 – Wolin Island, central part of Przytyr peninsula, WF 1975, 1978, 1981 (Ba-22); 2 – between Łukęcin and Dziwnówek, cliffs slope and top, WF 1986 (Ba-15); 3 – Łukęcin, cliffs slope and top, WF 1978, 1986 (Ba-16); 4 – between Pobierowo and Łukęcin, cliffs slope and top, WF 1978, 1986 (Ba-16); 5 – Pobierowo, WF 1986 (Ba-16); 6 – between Gostyń and

Gostyniec, WF 1986 (Ba-16); 7 – Rewal, WF 1986 (Ba-17); 8 – Śliwin, cliff top, WF 1986 (Ba-17); 9 – Karnice, WF 1986 (Ba-17); 10 – between Rewal and Trzęsacz, cliff top, WF 1986 (Ba-16); 11 – Niechorze, near the lighthouse on the cliffs slope and top, WF 1986 (Ba-7); 12 – Mrzeżyno, to the E from the village, in *Scotch-pine* forest, WF 1986 (Ba-8); 13 – Kołobrzeg, W part of the town, WF 1986 (Bb-0); 14 – Kołobrzeg, 1 km to the E, WF 1986 (Bb-1); 15 – Ustronie Morskie, near cliff, WF 1979 (Ab-91); 16 – Ustronie Morskie, 5 km to the E, WF 1986 (Ab-92); 17 – Gąski, cliffs slope and top, WF 1978, 1986 and BS 1994 (Ab-92); 18 – between Sarbinowo and Chłopy, WF 1986 (Ab-93); 19 – between Mielno and Chłopy, WF 1986 and BS 1994 (Ab-93); 20 – Unieście, WF 1986 (Ab-93); 21 – Jamno Lake sand-bar and Łazy village, WF 1986 and BS 1994 (Ab-85); 22 – Bobolin, WF 1986 (Ab-85); 23 – between Żukowo Morskie and Darłówko, WF 1986 and BS 1994 (Ab-75); 24 – Wicie, WF 1986 (Ab-66); 25 – Jarosławiec, cliffs slope and top, WF 1978, 1986 (Ab-67); 26 – Ustka, 3 km to the E, WF 1978 (Ab-59); 27 – Orzechowo near Ustka, WF 1986 (Ab-59); 28 – Charnowo, TS 1964 (Ab-69); 29 – Ulinia, 1 km to the N, WF 1982 (Ac-34); 30 – Dymnica near Ulinia, WF 1985 (Ac-44); 31 – Stilo, WF 1984 (Ac-34); 32 – Szklana Huta, TS 1956 and WF 1987 (Ac-35); 33 – “Choczewskie Cisy” nature reserve, WF 1984–1986 (Ac-44); 34 – Sasino, WF 1985 (Ac-44); 35 – Lubiatowo, 2 km to the NW, heathland, RM 1982, WF 1993 and BS 1993 (Ac-35); 36 – Białogóra, dunes and forests along the seashore, RM 1982 and WF 1982, 1987, 1999, 2001 (Ac-36); 37 – Wierzchucino, WF 1987 (Ac-36); 38 – Odargowo, “Zielone” nature reserve, WF 1981 (Ac-37); 39 – Dębki, WF 1988, 1990 (Ac-36); 40 – Karwia, TS 1966 and WF 1988 (Ac-37); 41 – Jastrzębia Góra, WF 1982, 1983 (Ac-38); 42 – Rozewie, TS 1967 and WF 1988 (Ac-38); 43 – Puck, TS 1964 (Ac-49); 44 – Mrzezino, WF 1982, 1987 (Ac-59); 45 – Beka, WF 1987 (Ac-59), 46 – Gdańsk-Górki Wschodnie, WF 1978 (Ad-81); 47 – Gdańsk-So-bieszewo, WF 1980 (Ad-81); 48 – Gdańsk-Orlinki, WF 1980 (Ad-82); 49 – Gdańsk-Komary, WF 1980 (Ad-82); 50 – Gdańsk-Świbno, WF 1978–1985, 1987, 1990 (Ad-82).

LIST OF SPECIES

- Acarospora fuscata* (Nyl.) Arnold – on boulders: 33, 34, 43, 44, 50.
Acarospora veronensis A. Massal. – on boulders: 34, 44, 45, 50.
Alyxoria varia (Pers.) Ertz & Tehler – on bark of *Fagus*: 27.
Amandinea punctata (Hoffm.) Coppins & Scheidegger – on bark of *Acer*, *Quercus*, *Fagus*, *Fraxinus*, *Populus*, *Tilia*, *Salix*, and *Malus*: 5, 6, 9, 14–17, 21–24, 28, 30, 37, 42, 44, 45, 50.

- Anaptychia ciliaris* (L.) Körb. – on bark of *Populus tremula*: 15. CH; EN.
- Arthonia atra* (Pers.) A. Schneid. – on bark of *Fraxinus*: 20. EN.
- Arthonia radiata* (Pers.) Ach. – on bark of *Quercus*, *Fagus*, *Sorbus*, *Alnus incana*, *Corylus avellana* and *Populus tremula*: 2–4, 11, 17, 20, 24, 33, 50.
- Arthonia spadicea* Leight. – on bark of *Quercus*, *Alnus*, *Sorbus*, *Padus*, *Corylus avellana*, and *Fraxinus*: 2, 3, 11, 17, 20, 24, 25, 33.
- Arthonia vinosa* Leight. – on bark of *Quercus*: 36.
- Arthothelium ruanum* (Körb.) Vězda – on bark of *Alnus*: 4.
- Aspicilia cinerea* (L.) Körb. – on boulders: 49.
- Athalia holocarpa* (Hoffm.) Arup, Frödén & Söchting – on concrete: 1, 2, 7, 11–16, 19, 23, 27, 42, 44, 48–50.
- Athalia pyracea* (Ach.) Arup, Frödén & Söchting – on bark of *Populus tremula* and *Carpinus*: 3.
- Bacidia rubella* (Hoffm.) A Massal. – on bark of *Ulmus*: 42. VU.
- Bacidina chlorotricula* (Nyl.) Vězda & Poelt – on bark of *Padus*: 20.
- Baeomyces rufus* (Huds.) Rebert. – on soil: 50.
- Biatora globulosa* (Flörke) Fr. – on bark of *Fraxinus*: 19.
- Biatora tetramera* (De. Not.) Coppins – on sand in sward on cliff: 2.
- Bilimbia sabuletorum* (Schreb.) Arnold – on bryophytes on concrete: 20.
- Bryoria fuscescens* (Gyeln.) Brodo & D. Hawksw. – on bark of *Pinus sylvestris*, *Alnus*, *Betula*, *Fagus* and *Quercus* and on wood, exceptionally on sand on dune: 1, 3, 12, 19, 20, 26, 27, 31, 38, 39, 46–48. CH; VU.
- Bryoria implexa* (Hoffm.) Brodo & D. Hawksw. – on bark of *Betula*: 31. CH; CR. In the past, listed from numerous localities in the country (FAŁTYNOWICZ 2003), almost extinct probably due to the air pollution and extremely rare nowadays.
- Buellia griseovirens* (Turner & Borrer ex Sm.) Almb. – on bark of deciduous trees and shrubs, rare on *Pinus*: 2, 3, 8, 11, 16, 20, 24, 25, 27, 32, 39.
- Buellia schaereri* De Not. – on bark of *Salix*: 16. EN.
- Calicium glaucellum* Ach. – on bark of *Quercus* and on wood: 1, 36. VU.
- Calicium salicinum* Pers. – on bark of *Quercus*: 27, 36. VU.
- Calicium viride* Pers. – on bark of *Quercus*, *Salix*, *Betula*, and *Alnus incana*: 1, 4, 14, 16, 24, 25, 30, 31, 39, 50. VU.
- Calogaya decipiens* (Hoffm.) Arup, Frödén & Söchting – on concrete: 10–15, 17, 19, 23, 34(c.ap.), 36, 42–44, 48–50.
- Calogaya pusilla* (A. Massal.) Arup, Frödén & Söchting – on concrete: 1–3, 7, 8, 10–13, 15, 17, 19, 23, 25, 27, 34, 44, 47, 48.
- Candelaria concolor* s.l. – on bark of *Acer platanoides* and *Tilia*: 6, 44.
- Candelariella aurella* (Hoffm.) A. Zahlbr. – on concrete: 1, 2, 4, 7, 10–17, 19, 23, 25–27, 34, 36, 42, 44, 45, 47.
- Candelariella vitellina* (Hoffm.) Müll. Arg. – on boulders and on concrete: 1, 23, 34, 35, 42–44, 46, 48–50.
- Candelariella xanthostigma* (Ach.) Lettau – on bark of *Betula*, *Acer*, *Salix*, *Fraxinus*, *Tilia*, *Populus*, and *Malus*: 5, 6, 9, 10, 16, 21, 23, 37, 42, 44, 45, 50.
- Catillaria erysiboides* (Nyl.) Th. Fr. – on wood: 3, 4. EN.
- Cetraria aculeata* (Schreb.) Fr. – on sandy soil: 1, 12, 27, 29, 31, 35, 41, 46–50.
- Cetraria ericetorum* Opiz – on soil: 50. CH.
- Cetraria islandica* (L.) Ach. – on soil in dry pine forests, swards, and heathlands: 1, 11, 31, 30, 33, 46–50. CH; VU.
- Cetraria muricata* (Ach.) Eckfeldt – on sand on dune: 29. CH.
- Cetraria sepincola* (Ehrh.) Ach. – on *Betula* twigs: 1, 46–50. CH; EN.
- Chaenotheca chrysocephala* (Ach.) Th. Fr. – on bark of *Quercus*, *Betula*, *Populus tremula*, and *Pinus*, and on wood: 1, 14, 17, 24, 31, 36, 39, 50.
- Chaenotheca ferruginea* (Turner ex Sm.) Migula – on bark of *Pinus*, *Quercus*, and *Betula*: 1–3, 6, 12, 19, 20, 24, 27, 38, 47–50.
- Chaenotheca furfuracea* (L.) Tibell – on bark of *Quercus* and *Betula*: 3, 4, 47.
- Chaenotheca trichialis* (Ach.) Th. Fr. – on bark of *Alnus* and *Quercus*: 3, 4.
- Chrysothrix candelaris* (L.) J.R. Laundon – on bark of *Quercus* and *Fagus*: 1, 3, 27, 30, 32, 39. CH; CR.
- Chrysothrix flavovirens* Tønsberg – on bark of *Betula pendula* in pine forest: 36. In Poland found for the first time recently (KOWALEWSKA & JANDO 2004) and known only from several sites in Gdańsk Pomerania [(KUKWA 2007 (2006)]. Probably more frequent along the Baltic coast. Numerous on bark of trees in well studied areas of European seashores (e.g. SUIJA et al. 2010, RODRIGUES et al. 2011).
- Circinaria calcarea* (L.) A. Nordin, Savič & Tibell – on concrete: 23, 50.
- Circinaria contorta* (Hoffm.) A. Nordin, Savič & Tibell – on concrete: 50.
- Cladonia arbuscula* (Wallr.) Flot. & Ruoss – on sandy soil: 1, 3, 5, 11, 12, 19, 24, 27, 29–31, 33, 35, 36, 38, 41, 46–50. CH.
- Cladonia botrytes* (Hagen) Willd. – on the upper surface of pine stumps: 46–48. EN. Taxon in the past very common, especially on the upper surface of pine trunks (por. TOBOLEWSKI & KUPCZYK 1976, FAŁTYNOWICZ 1992), but after changes in the forest management (collecting of felled stumps)

- the number of its localities has dramatically decreased.
- Cladonia cariosa* (Ach.) Spreng. – on soil in swards on dunes: 50.
- Cladonia cenotea* (Ach.) Schaer. – on wood and on soil: 4, 44, 47–50.
- Cladonia cervicornis* (Ach.) Flot. subsp. *verticillata* (Hoffm.) Ahti – on soil in dry swards and dry pine forests: 46–50.
- Cladonia chlorophaea* s.l. – on soil and on bark of *Pinus*, *Alnus*, and *Betula*: 1–3, 6, 10–12, 16–20, 24, 25, 27, 29, 31, 33, 35, 38, 41, 45–50.
- Cladonia ciliata* (Stirt.) Harm. var. *tenuis* (Flörke) Nimis – on soil: 1, 5, 46–50. CH.
- Cladonia coccifera* (L.) Willd. – on soil in heathland: 29, 30, 35, 36, 46–50.
- Cladonia coniocraea* (Flörke) Spreng. – on bark of *Betula*, *Alnus*, *Picea*, *Quercus* and *Pinus*, and on soil: 1–4, 6, 10–12, 19, 20, 24, 25, 27, 31–33, 36, 41, 46, 48–50.
- Cladonia cornuta* (L.) Hoffm. – on soil: 1, 12, 19, 26, 29–31, 35, 36, 41, 46–50.
- Cladonia crispata* (Ach.) Flot. – on soil in heathland: 29.
- Cladonia deformis* (L.) Hoffm. – on soil and on bark of *Pinus*: 27, 35, 46–50.
- Cladonia digitata* (L.) Hoffm. – on bark at the base of *Pinus* and *Betula* trunks, on wood, and on soil: 1–4, 12, 17, 19, 20, 25, 27, 32, 36, 38, 46–50.
- Cladonia fimbriata* (L.) Fr. – on wood, bark of *Betula* and on soil: 3, 4, 10, 11, 16, 17, 19, 20, 25, 26, 30, 32, 45–50.
- Cladonia floerkeana* (Fr.) Flörke – on soil: 1, 27, 29, 30, 35, 36, 41, 43, 46–50.
- Cladonia foliacea* (Huds.) Willd. – on soil: 1, 27, 36, 41, 46–50.
- Cladonia furcata* (Huds.) Schrad. – on soil: 1, 3, 11, 12, 16, 17, 19, 26, 27, 29–31, 33, 35, 36, 38, 41, 46–50.
- Cladonia glauca* Flörke – on soil, wood, and on bark of *Pinus* and *Betula*: 1–4, 11, 17, 19, 27, 29, 31, 33, 35, 36, 41, 44–50.
- Cladonia gracilis* (L.) Willd. – on soil: 1, 3, 12, 19, 26, 27, 29–31, 35, 36, 38, 41, 46–50.
- Cladonia grayi* Merrill ex Sandst. – on soil: 1, 24, 29, 30.
- Cladonia macilenta* Hoffm. – on bark of *Betula* and *Pinus*, on sandy soil, and on wood: 1, 3, 10–12, 16, 19, 24, 27, 29, 31, 33, 35, 36, 41, 46–50.
- Cladonia phyllophora* Hoffm. – on soil: 1, 19, 24, 27, 29, 36, 41, 46–50.
- Cladonia pleurota* (Flörke) Schaerer – on soil: 27, 29, 31, 35, 36, 46–48.
- Cladonia portentosa* (Dufour) Coem. – on sandy soil: 3, 11, 12, 19, 24, 27, 29–32(c.ap.), 35, 36, 46–50. CH.
- Cladonia pyxidata* (L.) Hoffm. – on soil: 1, 12, 29, 31, 35, 36, 41, 47, 48.
- Cladonia ramulosa* (With.) J.R. Laundon – on soil on dune: 1, 46, 50.
- Cladonia rangiferina* (L.) Weber – on soil: 1, 19, 29, 31, 46–50. CH.
- Cladonia rangiformis* Hoffm. – on soil: 1, 44, 45, 47, 48, 50.
- Cladonia scabriuscula* (Delise) Nyl. – on soil: 1–3, 11, 12, 16–19, 24, 25, 27, 29, 31, 35, 36, 38, 41, 46–50.
- Cladonia squamosa* (Scop.) Hoffm. – on soil: 47, 48, 50.
- Cladonia subulata* (L.) Weber in Wigg. – on soil: 1, 10, 12, 16, 19, 27, 29, 30, 35, 36, 41, 45–50.
- Cladonia sulphurina* (Michx.) Fr. – on soil in heathland: 35.
- Cladonia uncialis* (L.) Wigg. – on soil: 1, 3, 12, 27, 29, 31, 35, 36, 41, 46–50.
- Cliostomum griffithii* (Sm.) Coppins – on bark of deciduous trees and shrubs, and *Pinus*: 2, 3, 7, 8, 10, 11, 15, 17, 24–27, 31, 32, 36, 39, 42. VU. Subatlantic species, not endangered in the coastal zone, where grows frequently. In the inland extremely rare (FAŁTYNOWICZ 1992).
- Coenogonium pineti* (Schrad.) Lücking & Lumbsch – on bark of *Quercus*, *Sorbus* and *Alnus*: 4, 11, 17, 24, 25, 33, 39.
- Diplotomma alboatrum* (Hoffm.) Flot. – on concrete: 11.
- Enchylium limosum* (Ach.) Otálora, P.M. Jørg. & Wedin – on marl on cliff slope: 3, 41. Probably common lichen in the country, especially in anthropogenic habitats (gravel pits, clay slopes along roads), but overlooked due to its small size, hence a small number of known localities.
- Evernia prunastri* (L.) Ach. – on bark of deciduous trees and shrubs, and *Pinus*: 1–5, 8–11, 16, 17, 19, 20, 22–28, 31–33, 37–40, 46–50.
- Flavoparmelia caperata* (L.) Hale – on bark of *Alnus*, *Quercus*, and *Fagus*: 33, 39. CH; EN.
- Flavoplaca citrina* (Hoffm.) Arup, Frödén & Søchting – on concrete: 1(c.ap.), 3, 4, 7–10, 11 (c.ap.), 12(c.ap.), 15(c.ap.), 18, 19, 21, 23, 27, 34, 36, 43, 44, 50.
- Flavoplaca marina* (Wedd.) Arup, Frödén & Søchting – on concrete: 11. EN. Known from only two localities at western coast of Baltic Sea, but numerous on Wolin island (FAŁTYNOWICZ, unpubl. data).
- Goidanichia ambrosiana* (A. Massal.) Tomas. & Cif. – on concrete and on boulders: 12, 19, 50. VU.
- Graphis scripta* (L.) Ach. – on bark of *Sorbus*, *Fraxinus*, *Padus*, *Fagus*, and *Corylus avellana*: 3, 4, 20, 24, 27, 32, 42, 50.
- Hypocenomyce scalaris* (Ach.) M. Choisy – on bark of *Pinus*, *Acer*, *Quercus*, *Fagus*, *Cerasus*, and *Betula*, rarely on wood: 1–6, 9–12, 16, 19, 20, 24, 25, 27, 28, 31, 32, 34, 46–50.
- Hypogymnia physodes* (L.) Nyl. – on bark of deciduous and coniferous trees and shrubs, rarely on

- sand on dunes, exceptionally on the boulder: 1–6, 8–12, 14, 16–29, 31–41, 44, 46–50.
- Hypogymnia tubulosa* (Schaer.) Havaas – on bark of *Populus*, *Betula*, *Pinus*, *Fagus*, *Acer*, *Cerasus*, *Hippophae rhamnoides*, *Aesculus*, and *Quercus*: 1, 6, 11, 25, 31, 32, 38, 46, 48, 50. CH.
- Imshaugia aleurites* (Ach.) Fricke Meyer – on wood and on bark of *Pinus sylvestris*, and *Alnus*: 1, 3, 31, 33, 47–49. CH.
- Lecania cyrtella* (Ach.) Th. Fr. – on bark of *Populus tremula*: 3, 25.
- Lecania erysibe* (Ach.) Mudd – on concrete: 11, 12, 17, 21, 42, 50.
- Lecania naegelii* (Hepp) Diederich & van den Boom – on bark of *Fagus* and *Fraxinus*: 20, 21.
- Lecanora argentata* (Ach.) Malme – on bark of deciduous trees and shrubs, and *Pinus*: 1–3, 5, 9–11, 14–17, 19–27, 30, 32, 36, 37, 40, 41, 44, 45, 50.
- Lecanora carpinea* (L.) Vain. – on bark of *Quercus*, *Fagus*, *Acer*, *Betula*, *Fraxinus*, *Alnus*, *Sambucus*, and *Populus tremula*: 2, 3, 8, 10, 16, 17, 19–26, 28, 32, 33, 40, 43, 46–50.
- Lecanora chlarotera* Nyl. – on bark of *Populus tremula*, *Acer*, *Alnus*, *Salix*, *Fagus*, *Tilia*, and *Quercus*: 2, 3, 5, 11, 15, 16, 19–21, 24, 32, 40, 43–47, 49, 50.
- Lecanora conizaoides* Nyl. ex Crombie – on bark of deciduous and coniferous trees and shrubs: 1–4, 6, 8–12, 14, 16–20, 22, 24–28, 31–33, 36, 43, 44, 46–50.
- Lecanora expallens* Ach. – on bark of *Quercus*, *Fagus*, *Populus tremula*, *Tilia*, and *Sambucus*: 1–6, 8–11, 14, 16, 17, 19, 20, 22–25, 27, 28, 31–33, 40, 41, 44, 45, 50.
- Lecanora glabrata* (Ach.) Malme – on bark of *Fagus*: 42.
- Lecanora intricata* (Ach.) Ach. – on boulders: 33.
- Lecanora intumescens* (Rebent.) Rabenh. – on bark of *Fagus* and *Populus*: 20, 32, 41. EN.
- Lecanora polytropa* (Ehrh.) Rabenh. – on boulders: 33, 34, 42–44.
- Lecanora populicola* (DC.) Duby – on bark of *Populus tremula*: 32, 50.
- Lecanora pulicaris* (Pers.) Ach. – on bark of deciduous trees and *Pinus*: 2–4, 10, 14, 20, 31–33, 44, 45, 50.
- Lecanora saligna* (Schrad.) A. Zahlbr. – on bark of *Populus tremula*, *Fraxinus*, *Acer*, and *Salix*: 6, 9, 17, 22, 44, 45, 50.
- Lecanora subrugosa* Nyl. – on bark of *Populus tremula*: 3, 32.
- Lecanora symmicta* (Ach.) Ach. – on bark of *Pinus*, *Betula*, and *Populus tremula*: 24, 40, 50.
- Lecanora varia* (Ehrh.) Ach. – on bark of *Acer*, *Alnus*, and *Pinus*, and on wood: 6, 14, 25, 32, 50.
- Lecidella elaeochroma* (Ach.) M. Choisy – on bark of *Populus tremula*, *Fagus*, *Fraxinus*, *Acer*, *Quercus*, *Betula*, *Alnus*, *Sambucus*, and *Salix*: 2–5, 8–11, 16, 17, 19–23, 25, 31, 32, 38, 40, 43, 44, 46–50.
- Lecidella stigmathea* (Ach.) Hertel & Leuckert – on concrete: 1, 2, 10–13, 16, 19, 23, 27, 36, 44, 47, 50.
- Lepra albescens* (Huds.) Hafellner – on bark of *Alnus*, *Acer*, *Quercus*, *Betula*, and *Fagus*: 1, 2, 16, 21, 26–28, 31, 36, 40, 43, 50.
- Lepra amara* (Ach.) Hafellner – on bark of *Quercus*, *Salix*, *Sorbus*, *Fagus*, *Alnus*, *Betula*, *Populus tremula*, *Pinus*, and *Corylus avellana*: 1, 3, 4, 14, 20, 24, 29, 31–33, 39–41.
- Lepraria incana* (L.) Ach. – on bark of *Quercus*, *Fagus*, *Salix*, *Pinus*, *Robinia*, and *Betula*: 1, 3, 14–16, 19, 20, 23, 24, 27, 31–33, 38, 44–50.
- Lepraria membranacea* (Dicks.) Vain. – on bark of *Quercus*: 3, 24, 33, 42.
- Lobaria pulmonaria* (L.) Hoffm. – on bark of *Fagus*: 32. CH; EN.
- Melanelixia glabrata* (Lamy) O. Blanco et al. – on bark of deciduous trees and shrubs, and *Pinus*: 1–3, 6, 8, 11, 14, 16, 17, 19, 20, 24, 25, 27, 32, 33, 39, 40, 50.
- Melanelixia subaurifera* (Nyl.) O. Blanco et al. – on bark of *Betula*, *Fagus*, *Sambucus*, *Quercus*, *Pinus*, *Salix*, and *Populus tremula*: 2, 3, 17, 25, 39, 40. CH.
- Melanohalea elegantula* (Zahlbr.) O. Blanco et al. – on bark of *Quercus*, *Fagus*, and *Salix*: 27, 28. CH; VU.
- Melanohalea exasperatula* (Nyl.) O. Blanco et al. – on bark of *Quercus*, *Salix*, *Fraxinus*, *Fagus*, *Prunus*, *Tilia*, and *Acer*: 1, 9, 11, 22, 23, 26, 28, 37, 42, 44, 45, 50.
- Micarea denigrata* (Fr.) Hedl. – on wood: 4, 19, 34, 50.
- Micarea prasina* Fr. – on bark of *Fraxinus*: 2.
- Myriolecis albescens* (Hoffm.) Śliwa et al. – on concrete and bricks: 1–3, 8, 10–17, 19, 23, 25, 27, 34, 36, 42–44, 45, 50.
- Myriolecis crenulata* (Hook.) Śliwa et al. – on concrete: 2, 11, 15, 23, 27, 42, 47, 49, 50.
- Myriolecis dispersa* (Pers.) Śliwa et al. – on concrete: 1–5, 8–19, 21, 23, 29, 34, 36, 42–45, 47–50.
- Myriolecis hagenii* (Ach.) Śliwa et al. – on concrete and on bark of *Populus tremula*, *Salix*, *Tilia*, *Alnus*, and *Acer*: 3, 11, 15, 23, 43–45, 50.
- Ochrolechia androgyna* Räsänen – on bark of *Fagus* and on wood on cliff slope: 14, 27. VU.
- Ochrolechia microstictoides* (Hoffm.) Arnold – on bark of *Betula* and *Pinus*: 12.
- Opegrapha niveoatra* (Borrer) J.R. Laundon – on bark of *Salix*: 16.
- Opegrapha vermicellifera* (Kunze) J.R. Laundon – on bark of *Quercus*: 14. EN. Species considered a relic of primeval forests (CZYŻEWSKA & CIEŚLIŃSKI 2003), very rare, frequent only in the Białowieża Forest (CIEŚLIŃSKI 2003).
- Parmelia barreñoae* Divakar, M.C. Molina & A. Crespo – on bark of *Fagus* and *Sambucus*: 21, 36.
- Parmelia saxatilis* s.l. – on bark of *Betula*, *Quercus*, *Fagus* and *Pinus sylvestris*: 1, 3, 27.

- Parmelia sulcata* Taylor – on bark of deciduous trees and shrubs and on *Pinus*, rarely on sandy soil: 1–6, 8–11, 14–17, 19–28, 30–33, 37–40, 44–50.
- Parmeliopsis ambigua* (Wulfen in Jacq.) Nyl. – on bark of *Pinus*, *Betula*, *Alnus*, *Fagus*, *Populus tremula*, and *Quercus*, and on wood: 1, 20, 31–32, 50.
- Peltigera canina* (L.) Willd. – on soil: 1–3, 7, 17–19, 24, 41, 47, 50. CH; VU.
- Peltigera didactyla* (With.) Laundon – on soil: 3, 16, 17, 27, 30, 31, 44, 45, 50.
- Peltigera hymenina* (Ach.) Delise – on soil: 4, 17, 26. CH.
- Peltigera neckeri* Hepp ex Müll. Arg. – on soil: 18, 41. CH.
- Peltigera polydactylon* (Neck.) Hoffm. – on soil: 1–3, 5, 12, 17, 19, 20, 24, 27, 36, 50. CH.
- Peltigera praetextata* (Flörke) Zopf – on mosses on *Quercus* bark: 32. CH; VU.
- Peltigera rufescens* (Weiss) Humb. – on soil in dry swards: 1–3, 8, 16, 17, 19, 44, 45, 50.
- Pertusaria coccodes* (Ach.) Nyl. – on bark of *Acer platanoides*, *Alnus*, *Fagus*, *Quercus*, and *Fraxinus*: 6, 14, 21, 22, 32, 39.
- Pertusaria flavida* (DC.) J.R. Laundon – on bark of *Fagus* and *Quercus*: 27, 32, 40. EN.
- Pertusaria leioplaca* DC. – on bark of *Corylus avellana*, *Fagus*, and *Sorbus*: 3, 4, 20, 24, 39.
- Pertusaria pertusa* (L.) Tuck. – on bark of *Fagus*, *Acer*, *Alnus*, *Populus tremula*, *Sorbus*, and *Quercus*: 1, 14, 15, 24, 27, 28, 30, 32, 39, 41. VU.
- Phaeophyscia nigricans* (Flörke) Moberg – on concrete: 2, 4, 10–13, 17, 19, 23, 34, 44, 47, 49, 50.
- Phaeophyscia orbicularis* (Neck.) Moberg – on concrete and on bark of *Acer*, *Tilia*, and *Populus*: 1, 2, 4–6, 9–14, 16, 17, 19, 23, 25, 27, 34, 36, 40, 42, 44, 46–50.
- Phlyctis agelaea* (Ach.) Flot. – on bark of *Fagus*: 26. EN. Very rare, more often found only in the Białowieża Forest (CIEŚLIŃSKI 2003).
- Phlyctis argena* (Ach.) Flot. – on bark on deciduous trees and shrubs, and *Pinus*: 1–6, 8–10, 14–17, 19–21, 24–26, 28, 30–33, 37–39, 43–45, 50.
- Physcia adscendens* (Fr.) H. Olivier – on concrete and on bark of *Populus tremula*, *Ulmus*, *Betula*, *Fagus*, *Quercus*, *Sambucus*, *Fraxinus*, *Tilia*, *Salix*, and *Acer*: 1–3, 6, 9–11, 14, 16, 17, 19, 21–24, 27, 34, 37, 38, 42, 44, 46–50.
- Physcia caesia* (Hoffm.) Fűrnrrohr – on concrete: 1, 2, 10–13, 19, 34, 36, 42, 44–50.
- Physcia dubia* (Hoffm.) Lettau – on bark of *Fraxinus* and *Acer*: 42, 50.
- Physcia stellaris* (L.) Nyl. – on bark of *Populus tremula*, *Salix*, and *Quercus*: 3, 17, 24, 25, 32, 44, 50.
- Physcia tenella* (Scop.) DC. – on bark of *Quercus*, *Populus tremula*, *Salix*, *Fraxinus*, *Acer*, *Betula*, *Malus*, *Tilia*, and *Sambucus*, and on concrete: 1–5, 10–12, 14, 17, 19–25, 30, 31, 36, 38, 40, 42, 44–50.
- Physconia distorta* (With.) J.R. Laundon – on bark of *Acer platanoides*, *Fraxinus*, *Quercus*, and *Populus*: 5, 6, 9, 16, 21, 26, 28, 36, 37. EN.
- Physconia enteroxantha* (Nyl.) Poelt – on bark of *Acer platanoides*, *Tilia*, and *Salix*: 37, 44, 45, 50.
- Physconia grisea* (Lam.) Poelt – on bark of *Sambucus*, and on concrete: 5, 10, 16, 24, 47, 49, 50.
- Physconia perisidiosa* (Erichsen) Moberg – on bark of *Populus*: 5, 50. EN.
- Placynthiella dasaea* (Stirt.) Tønsberg – on bark of *Sambucus nigra* and *Padus avium*: 21, 39.
- Placynthiella oligotropha* (Vain.) Coppins & P. James – on soil: 44–50.
- Placynthiella uliginosa* (Schrad.) Coppins & P. James – on soil, wood and on bark of *Pinus* and *Betula*: 1 4, 6, 10, 16, 17, 19, 20, 24, 25, 27, 29, 31, 32, 34–36, 41, 46–50.
- Placynthium nigrum* (Huds.) Gray – on concrete on fortifications on the bank of the Vistula: 50.
- Platismatia glauca* (L.) W. Culb. & C. Culb. – on bark of *Quercus*, *Cerasus*, *Alnus*, *Padus*, *Betula*, and *Pinus*, exceptionally on soil in heathland on dunes: 1–4, 6, 8, 11, 12, 19, 20, 24, 25, 27, 31–33, 35, 36, 46–50.
- Pleurosticta acetabulum* (Neck.) Elix & Lumbsch – on bark of *Acer platanoides*, *Quercus*, *Tilia*, *Acer*, *Fraxinus*, and *Populus*: 5, 6, 8, 9, 19, 21–23, 26, 28, 30, 32. CH; EN.
- Polycauliona candelaria* (L.) Frödén, Arup & Søchting – on bark of *Populus tremula*, *Tilia*, *Fraxinus*, and *Acer*: 5, 9(c.ap.), 20–22, 37, 42(c.ap.), 44, 50.
- Polycauliona polycarpa* (Hoffm.) Frödén, Arup & Søchting – on bark of *Sambucus*, *Acer*, *Alnus*, *Betula*, *Salix*, *Fraxinus*, *Quercus* and *Populus tremula*: 3, 6, 8–11, 16, 17, 20, 22–25, 30, 37, 42, 44, 45, 50.
- Porina aenea* (Wallr.) A. Zahlbr. – on bark of *Sorbus*, *Acer*, *Padus*, *Populus tremula*, *Fagus* and *Alnus incana*: 6, 17, 20, 24, 40, 41, 50.
- Porpidia crustulata* (Ach.) Hertel & Knoph – on a boulder: 32.
- Porpidia tuberculosa* (Sm.) Hertel & Knoph – on bricks and boulders: 11, 32.
- Protoparmeliopsis muralis* (Schreb.) M. Choisy – on concrete and on boulders: 2, 11, 23, 34, 36, 42–44, 47–50.
- Pseudevernia furfuracea* (L.) Zopf – on bark of *Pinus*, *Acer*, *Fagus*, *Fraxinus*, *Aesculus*, *Padus*, *Cerasus*, *Alnus*, and *Betula*: 1, 2, 6, 11, 12, 22–27, 31, 36–38, 46–50.
- Pseudoschismatomma rufescens* (Pers.) Ertz & Tehler – on bark of *Populus*: 50. VU.
- Pyrenula nitida* (Weigel) Ach. – on bark of *Fagus*: 14, 32. VU.
- Pyrenocollema halodytes* (Nyl.) R.C. Harris – on concrete, wood, and on barnacles: 17, 19, 23. Very rare species, known so far only from two localities on the coast (FAŁTYNOWICZ & SAĞIN 1995). VU.

- Ramalina farinacea* (L.) Ach. – on bark of *Betula*, *Acer*, *Malus*, *Alnus*, *Fraxinus*, *Fagus*, *Pinus*, *Salix*, *Populus tremula*, *Sambucus*, *Rhamnus*, and *Quercus*: 2–6, 8, 9, 11, 15–17, 19, 21–27, 31, 32, 37–39, 43, 46–48, 50. CH; VU.
- Ramalina fastigiata* (Pers.) Ach. – on bark of *Quercus*, *Sambucus*, *Acer*, *Fraxinus*, *Ulmus*, *Fagus*, *Populus tremula*, *Betula*, *Aesculus*, *Alnus*, *Rhamnus*, and *Salix*: 2–6, 8, 9, 11, 14, 16, 17, 19, 21–25, 27, 30, 31, 37, 38, 49, 50. CH; EN.
- Ramalina fraxinea* (L.) Ach. – on bark of *Populus tremula*, *Aesculus*, *Alnus*, *Acer*, and *Fraxinus*: 2, 5, 6, 9, 16, 17, 21–23, 25, 30, 32, 37–39, 47, 49, 50. CH; EN.
- Ramalina pollinaria* (Westr.) Ach. – on bark of *Fraxinus* and *Acer*: 42, 50. CH; VU.
- Rhizocarpon reductum* Th. Fr. – on bricks: 11, 23.
- Rinodina oleae* Bagl. – on bricks and concrete: 11, 13, 15, 23, 42, 49, 50.
- Rinodina pyrina* (Ach.) Arnold – on bark of *Populus* 17.
- Rufoplaca arenaria* (Pers.) Arup, Søchting & Frödén – on concrete: 11, 12, 23, 49.
- Rusavskia elegans* (Link.) S.Y. Kondr. & Kärfnefelt – on concrete: 50.
- Sarcogyne regularis* Kőrb. – on concrete: 12, 21, 42, 49, 50.
- Scoliciosporum chlorococcum* (Graeve ex Stemham.) Vězda – on bark of *Quercus*, *Betula*, *Salix*, *Fagus*, *Populus tremula*, *Padus*, *Pinus*, *Alnus*, and on twigs of *Lonicera xylosteum* and *Corylus avellana*: 1, 3, 10–12, 17, 24, 25, 32, 46–50.
- Scytinium lichenoides* (L.) Otálora, P.M. Jørg. & Weidin – on stone fortifications on the bank of the Vistula: 50.
- Steinia geophana* (Huds.) Hafellner – on marl on cliff slope: 3. Known from a few localities in the country, probably overlooked due to the small apothecia hidden on the soil among plants (FAŁTYNOWICZ 2003).
- Stereocaulon tomentosum* Fr. – on sand on dune in *Helichryso-fasionetum*: 50. The first locality of this species on the seashore; has dispersed localities throughout the country, the nearest in the Kashubian Lake District (OSET 2014). CH; EN.
- Strangospora pinicola* (Massal.) Korb. – on bark of *Pinus*: 50.
- Tephromela atra* (Huds.) Hafellner – on a small stone in concrete and on bark of *Populus tremula*: 11, 40.
- Thelidium zwackhii* (Flot.) Nyl. – on marl on cliff slope: 3. Probably overlooked; see note at *Steinia geophana*.
- Thelocarpon laureri* (Schrad.) Coppins & P. James – on boulder: 44, 45.
- Trapelia coarctata* (Sm.) M. Choisy – on bricks and on concrete: 11, 19, 31.
- Trapelia obtegens* (Th. Fr.) Hertel – on boulders: 34.
- Trapeliopsis flexuosa* (Fr.) Coppins & P. James – on wood and on bark of *Pinus* and *Betula*: 2–4, 19, 36.
- Trapeliopsis granulosa* (Hoffm.) Lumbsch – on wood, soil, and on bark of *Betula*: 1–4, 17, 19, 27, 29, 31, 32, 46–50.
- Tuckermannopsis chlorophylla* (Willd.) Hale – on bark of *Pinus*, *Acer*, *Quercus*, *Betula*, *Alnus*, *Fagus*, and *Cerasus*: 4, 6, 12, 17, 19, 20, 23, 24, 26, 27, 31, 37, 46–50. CH; VU.
- Umbilicaria polyphylla* (L.) Baumg. – on boulders: 44. Very rare, in the lowlands grows mainly on erratic boulders. The new locality is unusual due to the fact that this finding grew on a recently exposed boulder in a gravel pit.
- Usnea dasopoga* (Ach.) Röhl. – on bark of *Betula*: 31, 36. CH; VU.
- Usnea hirta* (L.) Weber ex F.H. Wigg. – on bark of *Quercus*, *Fraxinus*, *Pinus*, *Populus tremula*, *Betula*, *Robinia*, and *Alnus*, and on twigs of *Empetrum nigrum*, rare on wood: 4, 26, 27, 29, 31, 36–38, 46–50. CH; VU.
- Usnea subfloridana* Stirton – on bark of *Salix*, *Betula*, *Quercus*, *Fraxinus*, *Alnus*, and *Fagus*: 26, 31, 32, 37–39, 43, 47, 48, 50. CH; EN.
- Varicellaria hemisphaerica* (Flk.) Schmitt & Lumbsch – on bark of *Fagus* and *Quercus*: 14, 27, 46, 50. VU.
- Verrucaria nigrescens* Pers. – on concrete: 1–3, 10, 27, 36, 44.
- Vulpicida pinastri* (Scop.) J.E. Mattsson & Lai – on bark of *Betula* and *Populus*, and on wood: 32, 33, 46–50. CH.
- Xanthoparmelia conspersa* (Ach.) Hale – on boulder: 35.
- Xanthoria calcicola* Oxner – on concrete: 11, 23, 42, 50. VU.
- Xanthoria parietina* (L.) Th. Fr. – on concrete, boulders and on bark of *Populus tremula*, *Fraxinus*, *Fagus*, *Quercus*, *Tilia*, *Salix*, *Acer*, *Pinus*, and *Betula*: 1–6, 9–17, 19–27, 30, 31, 34, 37, 38, 40, 42, 44, 46–50.
- Xylopsora caradocensis* (Nyl.) Bendiksby & Timdal – on dry wood on dune: 36.
- Zwackhia viridis* (Ach.) Poetsch. & Schied. – on bark of *Quercus* and *Fagus*: 3, 32. VU.

RESULTS

The list contains 211 species. Many of them are rare in the country, and a very large part of them is highly endangered in Poland. Especially noteworthy are the taxa of CR and EN categories in the Polish red list of lichens, including two CR taxa: *Bryoria implexa* and *Chrysothrix candelaris*, and 20 EN taxa: *Anaptychia ciliaris*, *Arthonia atra*, *Buellia schaeereri*, *Catillaria erysiboides*, *Cetraria sepincola*, *Cladonia botrytes*, *Flavoparmelia caperata*, *Flavoplaca marina*, *Lecanora intumescens*, *Lobaria pulmonaria*, *Opegrapha vermicellifera*, *Perpetusaria flavida*, *Phlyctis agelaea*, *Physconia distorta*, *Ph. persidiosa*, *Pleurosticta acetabulum*, *Ramalina fastigiata*,

R. fraxinea, *Stereocaulon tomentosum*, and *Usnea subfloridana*. Most of these species are indeed highly threatened or dying nationwide, but in the Western Pomerania their situation is not so bad. Only few of them are really endangered: *Bryoria implexa*, *Arthonia atra*, *Buellia schaeereri*, *Cetraria sepincola*, *Cladonia botrytes*, and *Phlyctis agelaea*.

Numerous epiphytic lichen species in the studied area reflect changes in the bark chemistry caused by a sea water application to the bark by the breeze. On the pine bark, has been found species that prefer alkaline or neutral substrates, such as: *Buellia griseovirens*, *Cliostomum griffithii*, *Evernia prunastri*, *Lecanora argentata*, *Melanelixia glabrata*, *M. subaurifera*, *Phlyctis argenta*, *Ramalina farinacea*, and *Xanthoria parietina*. In the interior they become pine epiphytes extremely rare, only in places where tree bark is encrusted with calcium carbonate, e.g. around limestone plants (e.g. CIEŚLIŃSKI & JAWORSKA 1986, ZALEWSKA 1991, CIEŚLIŃSKI & CHOJNACKA 1996).

Scarce presence of certain species is due to the fact that they were overlooked during fieldwork. Taxa such as *Enchylium limosum*, *Steinia geophana* and *Thelidium zwackhii* usually grow on moist, loamy soil with poor vegetation. Progressive succession eliminates these taxa from a community. More attention should be paid to these habitats, because so far they were usually avoided by lichenologists. The anthropogenic substrates on the sea shore are also poorly researched. Breakwaters, concrete fortifications, etc., from which some noteworthy species were formerly noted, such as *Lecanora helicopis*, *L. salina*, *Flavoplaca marina* (ERICHSEN 1933) or *Pyrenocollema halodytes* (FAŁTYNOWICZ & SĄGIN 1995) nowadays are often omitted.

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