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CHECKLIST

New and other noteworthy lichens from Poland

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Abstract

New lichenological data of thirteen rare, protected, and noteworthy lichen species found in Central and North-Eastern Poland are presented. One species – *Absconditonia rubra* is new to Poland and six of them – *Biatora veteranorum*, *Normandina pulchella*, *Lepraria umbricola*, *Micarea isidioprasina*, *M. soralifera*, *Mycoblastus sanguinarius*, and *Trapelia involuta* are new to Central Poland. In addition, new localities of five rare and protected lichen species – *Cetraria ericetorum*, *Chaenotheca brachypoda*, *Cladonia stellaris*, *Parmelia submontana* and *Peltigera malacea*, are also presented.

Keywords

Absconditonia rubra; lichenized fungi; protected species; endangered species; species distribution

Dedicated to Professor Lucyna Śliwa

1. Introduction

In early 2024, the updated lichen checklist of Poland was published, in which data on the occurrence of species in all regions of the Country are given (Fałtynowicz et al., 2024). However, new and detailed lichenological studies conducted in Poland still provide new data on the presence of lichen species (e.g., Hachułka et al., 2024; Szczepańska et al., 2023). This data enriches information about lichen distribution and their environmental preferences. Central and North-Eastern Poland are the regions where lichenological research has been conducted for a long time. Many lichen species were found here, and their distribution was summarised (e.g., Cieśliński, 2003; Czyżewska, 2020; Fałtynowicz et al., 2024). However, large parts of this area have still not been studied, especially in terms of the distribution of species recently described (e.g., Guzow-Krzemińska et al., 2016, 2019) and small, inconspicuous species easy to overlook in the field. The lichens distribution and population size change over time (Czyżewska, 2003). Therefore, field data on the lichen

populations should be obtained regularly to keep up with the actual state of knowledge on them. Thus, the knowledge state of the species occurrence in Central and North-Eastern Poland requires supplementation and actualization. Particularly noteworthy are the protected and endangered species, as well as those that are rarely recorded in Poland, which have specific microhabitat preferences and are associated with a specific habitat type. The full distribution of such species has not yet been well recognized. In this context, describing new sites of lichen species occurrence is of great scientific and nature conservation value.

This work aimed to provide new distribution data of rare, threatened, and protected lichen species and to supplement the knowledge of their habitat preferences.

2. Material and methods

The lichenological fieldwork was conducted from 2011 to 2023 in Central and North-Eastern Poland. The easily distin-

guishable lichen species were identified in the field, while the remaining specimens were collected for laboratory analysis. The material was morphologically and anatomically analyzed using standard microscope techniques (Smith et al., 2009). The chemical properties of lichen thalli were determined using 10% potassium dioxide (K), sodium hypochlorite (C), p-phenylenediamine in ethanol (Pd), and Lugol's iodine (I). The presence of secondary metabolites was determined by thin-layer chromatography (TLC) in solvent C (Orange et al., 2001).

The presented brief characteristics of lichen species were based on species description (e.g., Smith et al., 2009), as well as own analyses and observations. Localities of species were provided using the degrees of World Geodetic System '84 (WGS84) and according to the 10 km ATPOL grid square system by Cieśliński and Fałtynowicz (1993). The localities of epigeic, protected lichen species (*Cetraria ericetorum*, *Cladonia stellaris*, and *Peltigera malacea*) were described additionally as centroid coordinates of the 1 km APOL grid (Komsta, 2016; Verey, 2017), and the numbers of these cartogram squares were given with the asterisk. The nomenclature of physico-geographical mesoregions of Poland follows Solon et al. (2018). The nomenclature of species follows Fałtynowicz et al. (2024), while the nomenclature of *Absoconditonia rubra* follows Suija and van den Boom (2023). The collected material was deposited in the KTC and UGDA lichen herbaria.

3. Results and discussion

During the lichenological studies conducted in various areas of Poland, we obtained new data on the localities of thirteen lichen species. One of them, *Absoconditonia rubra*, is new to Poland. In addition, six of them, *Biatora veteranorum*, *Normandina pulchella*, *Lepraria umbricola*, *Micarea isidioprasina*, *M. soralifera*, *Mycoblastus sanguinarius* and *Trapelia involuta* are new to Wyżyna Kielecka Upland mesoregion and Central Poland, when five species, *Cetraria ericetorum*, *Chaenotheca brachypoda*, *Cladonia stellaris*, *Parmelia submontana* and *Peltigera malacea* are rare or scattered in Poland. Five of the provided taxa, *Cetraria ericetorum*, *Cladonia stellaris*, *Normandina pulchella*, *Parmelia submontana*, and *Peltigera malacea*, are protected in Poland.

3.1. *Absoconditonia rubra* (van den Boom, M. Brand & Suija) Suija & van den Boom

The species is characterized by very thin thallus visible as pale greenish, roundish patches, 1–1.5 cm wide in size, containing small cells of *Coccomyxa*-like algae. Apothecia are very small, creamy to pale-orange and orange-reddish, 0.06–0.15 mm in diam. (please see Fot.1 A in Malíček et al., 2018). Apothecia produce cylindrical-acicular, slightly curved, 3–7-septate ascospores with a size of 33–40 × 1.2–1.8 μm (van den Boom et al., 2015). Thallus and apothecia do not react with chemical reagents and do not contain any secondary metabolites. Very similar to *A. rubra* are *Absoconditella pauxilla* Vězda & Vivant and *Absoconditella annexa* Vězda & Vivant, but both of these species have inconspicuous thallus, paler (yellowish-white) and bigger (0.2–0.4 μm) apothecia and occur on wood, stumps and plant debris.

So far in Europe, *A. rubra* has been noted in France, Netherlands, Germany (van den Boom et al., 2015), and Czechia (Malíček et al., 2018). It is the only species of the genus *Absoconditella* in Europe that grows as an epiphyte on trunks of different trees, e.g., *Carpinus*, *Fagus*, *Salix*, *Quercus*, and *Sarothamnus*. Malíček et al. (2018) state that it is a pioneer species. It occurs in acidophytic and species-poor communities in different forests, from managed to old-growth. This agrees with our findings, as *A. rubra* grew on the bark of *Pinus sylvestris* and *Abies alba* in the transformed forest habitats surrounding the quarry where quartzite sandstone is extracted. The species was recognized in the field by distinct pale green spots with little orange apothecia.

Specimens examined. Ee-64 – Wyżyna Kielecka Upland, Góry Świętokrzyskie Mts, Wiśniówka stone quarry near Kielce, 50.9329°N, 20.6912°E, forest with dominant *Abies alba*, on the trunk of *Abies alba* Sept. 2021, leg. A. Łubek, det. P. Czarnota (KTC); Wyżyna Kielecka Upland, Góry Świętokrzyskie Mts, Wiśniówka stone quarry near Kielce, 50.9366°N, 20.7030°E, forest with domination of *Pinus sylvestris*, on the trunk of *Pinus sylvestris*, Sept. 2021, leg., det. A. Łubek (KTC).

3.2. *Biatora veteranorum* Coppins & Sérus.

The species is distinguished by thin, pale and indistinct thallus, and white to pale brown apothecia, 0.16–0.4 mm in diam. (not present in collected materials). It also has distinctive, sessile to short-stalked, white-pruinose pycnidia, with aseptate, bacilliform conidia, with a size of 2.8–3.5 × 0.8–1 μm.

This species is very rare in Poland. Its occurrence was known only from mountainous areas such as Karpaty Zachodnie and Bieszczady Mountains (Czarnota & Węgrzyn, 2012). It was also recorded in the Ukrainian Carpathians (Kondratyuk & Coppins, 2000). Sites in the Góry Świętokrzyskie Mountains are the most northern sites in Poland. *B. veteranorum* prefers decayed wood of decorticated conifer snags within shady mixed and spruce montane forests (Czarnota & Węgrzyn, 2012). Species can be mistaken with similar *Biatora lignimollis* T. Sprib. & Printzen (Cannon et al., 2021), which has a UV+ white thallus and globose pycnidia, *Micarea pycnidiophora* Coppins & P. James – having white stalked pycnidia that turn red with C and *M. stipitata* Coppins & P. James – having conidia with the size of 6–8 × 1–1.8 μm.

Specimens examined. Ee-86 – Wyżyna Kielecka Upland, Góry Świętokrzyskie Mts, Cisowsko-Orłowski Landscape Park, Cisów im. prof. Zygmunta Czubińskiego nature reserve, 50.7716°N, 20.8905°E, beech forest, on the trunk of *Abies alba*, 14 June 2023, leg., det. R. Szymczyk (KTC); Wyżyna Kielecka Upland, Góry Świętokrzyskie Mts, Cisowsko-Orłowski Landscape Park, Cisów im. prof. Zygmunta Czubińskiego nature reserve, 50.7726°N, 20.8958°E, beech forest, on wood, 14 June 2023, leg., det. R. Szymczyk (KTC).

3.3. *Cetraria ericetorum* Opiz

The species can be easily distinguished from *C. islandica* by the presence of only strictly marginal pseudocyphellae and more narrow, canaliculate lobes. Its thallus also does not react with Pd (Smith et al., 2009). It grows on soil in psammophilous grasslands, heathlands, and young pine plan-

tations in oligotrophic, sandy habitats (Cieśliński, 1979, 2003; Czyżewska, 1986; Faliński et al., 1993; Halicz & Godlewski, 1968; Zielińska, 1967).

The species was relatively frequent in the Polish lowlands in the 20th Century (Cieśliński, 1979, 2003; Czyżewska, 1986; Faliński et al., 1993; Halicz & Godlewski, 1968; Zielińska, 1967). However, it is getting scattered nowadays. Recently, it was reported i.e., by Adamska (2014), Fałtynowicz (2018), Fałtynowicz and Fałtynowicz (2022), Hachułka (2012), Kiercul (2020), Matwiejuk (2009a, 2009b). The species is under strict species protection in Poland (Dz.U. z 2014 r. Poz. 1408) and classified in the NT (Near Threatened) category on the red list of lichens in Poland (Cieśliński et al., 2006). However, its threat is probably much higher nowadays.

Specimens examined. Cf-07 (*FC7095) – Dolina Dolnego Bugu Valley, Kamieńczyk village, 52.60407°N, 21.59149°E, in the small path of psammophilous grassland on the edge of a dirt road and dune slope with xeric Scots-pine forest, May 2011, det. P. Zaniewski (field observation); De-39 (*ED9353) – Dolina Biało-brzeska Valley, Różanna village, 51.58250°N, 20.49355°E, in psammophilous grassland and nearby heathland with common juniper, 28 Aug. 2021, det. P. Zaniewski (field observation).

3.4. *Chaenotheca brachypoda* (Ach.) Tibell

The species is characterized by very thin, often endosubstratic, crustose thallus, with long-stalked, pin-like, 0.4–1.4 mm high apothecia, with dark brown mazaedium that is visible as yellowish to green due to being heavily pruinose. Ascospores are 1-celled and 3–4 µm wide. It contains pulvinic and vulpinic acids (Smith et al., 2009).

In Poland, *Ch. brachypoda* is found mainly on deadwood and old deciduous trees in well-preserved forest ecosystems. However, it is sometimes found in old village parks (Cieśliński, 2003; Kubiak, 2017). The species is known from scattered localities in Central and North-Eastern Poland (Cieśliński, 2003; Czyżewska, 2020; Kukwa et al., 2020). It is listed in the EN (Endangered) category in Poland (Cieśliński et al., 2006).

Specimens examined. De-64 (*ED46) – Równina Warszawska Plain, Górki Szymona Park, 52.0593°N, 21.0219°E, on an old willow near the stream, 13 Oct. 2023, leg., det. P. Zaniewski (private herbarium).

3.5. *Cladonia stellaris* (Opiz) Pouzar & Vězda

It is a bright, fruticose, mat-forming *Cladonia* species. The species is easily distinguishable in the field from most of the other reindeer lichen species by the presence of different orientations (star-like) of podetial tips, usually dividing into four. It differs from *C. portentosa* (Dufour) Coem. mainly by podetial tips (in that species usually divided into three tips), denser branching, and a “cauliflower-like” appearance (Smith et al., 2009).

In Poland, *C. stellaris* occurs in the mountains and raised bogs (Cieśliński, 2004) but is especially abundant in Scots pine forests (Juraszek, 1927; Kobendza, 1930), being the indicator of the best-developed communities of *Cladonio-Pinetum* Juraszek 1927 (Cieśliński, 1979; Zielińska, 1967). The species was quite frequently reported from Poland, especially in

the central and north-eastern, more continental parts (i.e., Cieśliński, 1979, 1987, 2003; Czyżewska, 1986; Halicz & Godlewski, 1968; Juraszek, 1927; Kobendza, 1930; Zielińska, 1967). Nowadays, the species is under decline (i.e., Cieśliński, 2004; Zaniewski et al., 2012, 2015), more frequently found in pine forests and heathlands of Biebrza river valley (Bernatowicz et al., 2015; Bystrek & Kolanko, 1997; Cieśliński, 2003). Despite this, new localities are still described (i.e., Kiercul, 2015; Szczepańska et al., 2023; Zaniewski & Siedlecki, 2021). However, they are probably the remnants of the old populations. The newly found localities highlight the Równina Kurpiowska Plain mesoregion as a significant area of the present species occurrence.

Specimens examined. Be-79 (*EB9797) – Równina Kurpiowska Plain, Czarnia nature reserve, 53.32908°N, 21.21427°E, on the edge of the paved road and xeric Scots pine forest, a very small, vanishing population, July 2022, det. P. Zaniewski (field observation); Ec-60 (*EC0640) – Równina Kurpiowska Plain, Chorzele-Kolonia village, 53.28866°N, 20.95718°E, on the edge of a dirt road and xeric Scots pine forest, Sept. 2017, det. P. Zaniewski (field observation); Ce-70 (*EC0739) – Równina Kurpiowska Plain, Zawady village, 53.29270°N, 21.24243°E, in *Cladonia*-Scots pine forest and the edge of dirt road, Sept. 2017, det. P. Zaniewski (field observation); Ce-70 (*EC0749) – Równina Kurpiowska Plain, Zawady village, 53.28374°N, 21.24196°E, in *Cladonia*-Scots pine forest, Sept. 2017, det. P. Zaniewski (field observation); Ce-80 (*EC0872) – Równina Kurpiowska Plain, Nadlesie village, 53.25603°N, 21.28551°E, in *Cladonia*-Scots pine forest, Sept. 2017, det. P. Zaniewski (field observation); Ce-80 (*EC0883) – Równina Kurpiowska Plain, Nadlesie, 53.24679°N, 21.30001°E, in *Cladonia*-Scots pine forest, and on the edge of psammophilous grassland, Sept. 2017, det. P. Zaniewski (field observation); De-94 (*ED4993) – Dolina Środkowej Wisły Valley, Pogorzal village, 51.980481°N, 21.38060°E, in the vanishing path of *Cladonia*-Scots pine forest near the dirt road, July 2017, det. P. Zaniewski (field observation).

3.6. *Lepraria umbricola* Tønsberg

The species is characterized by green, grey-green, relatively thick, powdery, and finely-soeradiate thallus, with visible projecting hyphae. Thallus turns bright yellow with Pd and K. The diagnostic feature of species is the presence of thamnolic acid as a secondary metabolite (Smith et al., 2009).

So far, this species has been known from North-Eastern Poland – from Eastern Baltic lakelands and Podlesie-Belarus highlands, as well as Southern Poland – from Sudety Mountains and Sudety foothills (Fałtynowicz et al., 2024). It usually grows as an epiphyte on the acidic bark of *Abies*, *Betula*, and *Pinus* and as epixylic on wood. Our findings are new to Central Poland.

Specimens examined. Ee-45 – Wyżyna Kielecka Upland, Garb Gielniowski Ridge, S of the Ciechostowice nature reserve, 51.1481°N, 20.7320°E, upland fir mixed forest, on the trunk of *Larix polonica*, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Garb Gielniowski Ridge, Ciechostowice nature reserve, 51.1531°N, 20.7390°E, upland fir mixed forest, on the trunk of *Abies alba*, Oct. 2021, leg., det. A. Łubek (KTC); Ee-55 – Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgarski Landscape Park,

Dalejów nature reserve, 51.0741°N, 20.7322°E, upland fir mixed forest with old beeches and oaks, on the trunk of *Abies alba*, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Świnia Góra nature reserve, 51.0546°N, 20.7038°E, upland fir mixed forest, on the trunk of *Pinus sylvestris*, July 2023, leg., det. R. Szymczyk (UGDA L-63786).

3.7. *Micarea isidioprasina* Brand, van den Boom, Guzow-Krzemińska, Sérusiaux & Kukwa

The species is characterized by green to dark green thallus with a bluish tinge, composed of branched isidia. Apothecia are white to beige-white, flat to convex, very rare (not present in collected materials), and producing ovoid, 0–1-septate ascospores, reaching the size of 11–14 × 3.5–4.5 μm. Thallus of this species contains micareic acid and Sedifolia-grey pigment, which reacts violet with K (Guzow-Krzemińska et al., 2019).

This species belongs to the *Micarea prasina* group, and it was described in 2019 (Guzow-Krzemińska et al., 2019). It has been noted from a few sites of North-East and East Poland so far, i.e., Białowieża Primeval Forest, Roztocze Środkowe (Guzow-Krzemińska et al., 2019), Pojezierze Kaszubskie Lakeland (Kossowska et al., 2022) and Wybrzeże Słowińskie Coast (Szczepańska et al., 2023). *M. isidioprasina* grows mainly on wood and the acidic bark of *Alnus* and *Picea*. It prefers humid places in forests. Our findings are new to the Wyżyna Kielecka Upland and Central Poland.

Specimens examined. Ee-45 – Wyżyna Kielecka Upland, Garb Gielniowski Ridge, to the S of the Ciechostowice nature reserve, 51.1481°N, 20.7320°E, upland fir mixed forest, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Ee-55 – Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Dalejów nature reserve, 51.0741°N, 20.7322°E, upland fir mixed forest with old *Fagus* and *Quercus*, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Dalejów nature reserve, 51.0705°N, 20.7380°E, subcontinental oak-hornbeam forest with old *Larix polonica*, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Dalejów nature reserve, 51.0715°N, 20.7446°E, upland fir mixed forest with old *Fagus* and *Quercus*, on stone, Oct. 2021, leg., det. A. Łubek (KTC).

3.8. *Micarea soralifera* Guzow-Krzemińska, Czarnota, Łubek & Kukwa

The species is characterized by green to greyish-green crustose thallus and green soralia with a bluish-grey or brownish tinge. Soralia develop both from endosubstratal, as well as areolate thallus. Soredia are farinose, bright to pale green. In some of our collected materials, *M. soralifera* has convex, immarginate, and pale greyish apothecia, 0.1–0.3 mm in diam., with ovoid, ellipsoid or oblong, 0–1(–2)-septate ascospores with a size of 6–12 × 3.5–4.5 μm. Thallus and soralia of this species contain micareic acid, and soredia contain Sedifolia-grey pigment, which reacts violet with K and C (Guzow-Krzemińska et al., 2016).

This species belongs to the *Micarea prasina* group, and it was described in 2016 (Guzow-Krzemińska et al., 2016). It has been noted so far from many sites in the north, east, and south of Poland (Fałtynowicz et al., 2024), but it has not yet been recorded in Central Poland. *Micarea soralifera* grows mainly on wood and sometimes on the bark of *Alnus*, *Quercus*, and *Tilia* in humid places. The species appears to be quite common, but in the field, it can be confused with other sorediate species, e.g., *Trapeliopsis flexuosa* (Fr.) Coppins & P. James.

Specimens examined. Ee-45 – Wyżyna Kielecka Upland, Garb Gielniowski Ridge, S of the Ciechostowice nature reserve, 51.1481°N, 20.7320°E, upland fir mixed forest, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Garb Gielniowski Ridge, Ciechostowice nature reserve, 51.1565°E, 20.7382°E, upland fir mixed forest, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Garb Gielniowski Ridge, Ciechostowice nature reserve, 51.1549°N, 20.7382°E, upland fir mixed forest, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Garb Gielniowski Ridge, Ciechostowice nature reserve, 51.1531°N, 20.7390°E, upland fir mixed forest, on wood, Oct. 2021, leg., det. A. Łubek (KTC); Ee-55 – Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Dalejów nature reserve, 51.0752°N, 20.7382°E, upland fir mixed forest, on wood in wet place, Oct. 2021, leg., det. A. Łubek (KTC); Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Dalejów nature reserve, 51.0705°N, 20.7380°E, subcontinental oak-hornbeam forest with old *Larix polonica*, on wood, Oct. 2021, leg., det. A. Łubek (KTC).

3.9. *Mycoblastus sanguinarius* (L.) Norman

The species is characterized by pale to dark grey, very irregular, thick, verrucose, and warted, continuous, or cracked thallus. It usually has frequent apothecia, that are black, convex or almost spherical, appressed or sessile, reaching 0.5–3.0 mm in diam. The typical feature of the species is bright carmine-red tissue visible under abraded apothecia, which reacts bright red with K. This species contains atranorin, chloratranorin, rhodocladonic acid, and caperatic acid as secondary metabolites (Smith et al., 2009).

This circumboreal species prefers cool and moist environments. It grows typically on conifer bark and wood (Spribille et al., 2011). In Poland, *M. sanguinarius* primarily grows on the bark of old trees, e.g., *Abies*, *Betula*, *Fagus*, and *Picea*, and also on siliceous stones and wood (Fałtynowicz et al., 2024). It is known mainly from the south and north regions of Poland (Fałtynowicz et al., 2024) and has not been noted in Central Poland so far.

Specimens examined. Ee-55 – Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorski Landscape Park, Skalki Piekło Dalejowskie Rocks nature monument, 51.08001°N, 20.76004°E, upland fir mixed forest, on acidic stone, Oct. 2021, leg., det. A. Łubek (KTC).

3.10. *Normandina pulchella* (Borrer) Nyl.

The species is composed of rounded and shell-like squamules with sharply raised margins, which can be plain to concave in

pale grey to green color. On the surface and along the squamules' margin, greenish soredia are present. Squamules and soredia do not react with chemical reagents. Nevertheless, as secondary metabolites, zeorin is present (Smith et al., 2009).

The species has been recorded so far in North-Eastern and Southern Poland (Fałtynowicz et al., 2024), and it has not been reported from Góry Świętokrzyskie Mountains and Central Poland so far. The species is listed in category EN (Endangered) on the red list of lichens in Poland (Cieśliński et al., 2006), and it is under strict species protection (Dz.U. z 2014 r. Poz. 1408). It occurs mainly on the bark of old trees and occasionally on bryophytes and other lichens in shady and moist places, in forests, and in open habitats.

Specimens examined. Ee-86 – Wyżyna Kielecka Upland, Góry Świętokrzyskie Mts, Cisowsko-Orłowski Landscape Park, Cisów im. Prof. Zygmunta Czubińskiego nature reserve, 50.7696°N, 20.8919°E, beech forest, on the trunk of *Quercus robur*, June 2023, leg., det. R. Szymczyk (KTC).

3.11. *Parmelia submontana* Hale

Parmelia submontana is an epiphytic species. It is characterized by a foliose thallus, loosely attached to the substrate, composed of elongated, pendulous, and characteristically wrapped lobes. Non-typical specimens, less well-formed and mixed with other species of the genus *Parmelia*, make identification in the field difficult. The appearance of circular to irregular soralia, with soredia being similar to isidia, may be helpful in identification (Hachułka et al., 2024; Ossowska, 2021). The upper cortex with atranorin reacts yellow with K, orange-yellow with Pd, and does not react with C and KC. Medulla with salazinic and consalazinic acids reacts yellow turning orange-red with K and orange-red with Pd, but does not react with C and KC. This species is most common on the bark of deciduous and coniferous trees in forest communities, rarer in open areas in gardens, country parks, or on roadside trees.

The species is known mainly from southern Poland and has some dispersed localities in the north (Ossowska, 2021). In the central part of the country, it is known only from the historical localities of the Wysoczyzna Bełchatowska Plateau and the Pasma Przedborsko-Małogoskie Range (Czyżewska, 2020). In the Wyżyna Kielecka Upland, it was found in 1989 in the Świnia Góra nature reserve by Toborowicz (Ossowska, 2021). It is considered an extinct species in the Góry Świętokrzyskie Mountains region (Cieśliński & Łubek, 2003). In 2023, during another exploration in the nature reserve, we found *P. submontana* on fallen branches of *Populus tremula*. This species is under strict protection in Poland (Dz.U. z 2014 r. Poz. 1408).

Species examined. Ee-55 – Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Świnia Góra nature reserve, 51.0582°N, 20.7124°E, wet *Abies alba* forest, on fallen branches of *Populus tremula*, June 2023, leg., det. R. Szymczyk (KTC); Ee-91 – Niecka Nidziańska Basin, Płaskowyż Jędrzejowski Plateau, Gaj nature reserve, 50.6691°N, 20.2694°E, deciduous forest, on bark of *Padus avium*, June 2023, det. R. Szymczyk (field observation and photographic documentation).

3.12. *Peltigera malacea* (Ach.) Funck

This lichen species reaches up to 15 cm in diam., and frequently produces marginal apothecia. It is well distinguished from the other *Peltigera* species by the lack of veins and very sparse rhizines on the lower surface of the thallus, as well as a characteristic blue-green color in the moisture state (Smith et al., 2009).

In Poland, it grows on soil, especially in open and partially shaded habitats, on sandy soils in xeric conditions, in psammophilous grasslands, on dirt road edges, and in young pine plantations (i.e., Cieśliński, 2003; Czyżewska, 1986; Zielińska, 1967). In the 20th century, it was considered widespread (Czyżewska, 1986; Faliński et al., 1993; Halicz & Godlewski, 1968; Zielińska, 1967) however, it vanished nowadays, i.e., in the vicinity of Siemianówka reservoir (Matwiejuk, 2016), and was not confirmed in the areas of Kampinos National Park and Równina Kurpiowska Plain (field observations). The species was recorded in the vicinity of the presented site in the 20th century (Faliński et al., 1993). It is listed in the category of VU (Vulnerable) on the red list of lichens in Poland (Cieśliński et al., 2006), but this threat category probably should be increased nowadays. It is also under strict species protection in Poland (Dz.U. z 2014 r. Poz. 1408).

Specimens examined. Cg-27 (*GC7253) – Równina Bielska Plain, north of Kleszczel town, 52.58952°N, 23.33414°E, on soil on the edge of a sandy dirt road and xeric Scots-pine forest, 22 Apr. 2021, det. P. Zaniewski (field observation).

3.13. *Trapelia involuta* (Taylor) Hertel

The species is characterized by pale grey to brownish grey, slightly glossy to matt thallus, built from single and radially growing areoles. When mature, thallus forms aggregations of thick primary areoles and crust cracked of secondary areoles (Orange, 2018). Apothecia are often sparse, with pinkish-brown to black discs, with grey-brown or white-pruinose margins. It contains two secondary metabolites – 5-O-methylhiascic acid as a major component and gyrophoric acid as a trace (Orange, 2018).

T. involuta was previously synonymous with *T. glebulosa*. However, the latest research reconfirmed them as a separate species (Orange, 2018). In this context, correct and verified field data of those taxa are important. *T. involuta* was previously known from the Karpaty Mountains (Fałtynowicz et al., 2024). At Wyżyna Kielecka Upland, this species has been recorded in 1991 by Cieśliński (Cieśliński, 1991) from stone at Świętokrzyski National Park area. *T. involuta* grows on siliceous rock, small stones, or brick in varying habitats as a colonist of recently exposed surfaces (Orange, 2018).

Specimens examined. Ee-55 – Wyżyna Kielecka Upland, Płaskowyż Suchedniowski Plateau, Suchedniowsko-Oblęgorzki Landscape Park, Skalki Piekło Dalejowskie Rocks nature monument, 51.0800°N, 20.7600°E, upland fir mixed forest, on acidic stone, Oct. 2021, leg., det. A. Łubek (KTC).

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