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SHORT COMMUNICATION

New records of rare lichenicolous and lichen-forming fungi from volcanic rocks in SW Poland

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* Email: katarzyna.szczepanska@up.wroc.pl**Abstract**

Records of two lichenicolous and nine lichen-forming fungi found in the southwestern part of Poland are presented. All of the reported species are very rare and they have only a few scattered localities in the country. One of them, *Lecanora pannonica*, is reported for the second time from Poland. Additionally, the new, contemporary records of *Cercidospora macrospora*, *Rhizocarpon disporum*, *R. viridiatrum* and *Stereocaulon pileatum* in Lower Silesia were noted. These species were known only from historical collections in the study area. Furthermore, *Lecidea fuscoatra* has been found a new host for *Sagediopsis barbara*. All of the localities of recorded species were found on natural outcrops of basalt rocks.

Keywords

Ascomycota; biodiversity; distribution; basalt rocks

This issue of Acta Mycologica is dedicated to Professor Maria Lisiewska and Professor Anna Bujakiewicz on the occasion of their 80th and 75th birthday, respectively.

Introduction

The southwestern part of the Poland has the biggest number of basalt rock formations in the country. The rocks in the region are a part of a large Central European petrographic province reaching from Moravian Ostrava and Opavan Silesia, through Opole Silesia, the Sudetes, Upper Lusatia, Saxony and Bohemian Central Uplands to the Rhine Valley and the borders of the Netherlands [1]. Within Polish borders the biggest clusters of the rocks are located near Lubań, Zgorzelec, between Lwówek Śląski and Jawor, and between Gryfów Śląski and Świeradów. These clusters are relics of old volcanic fields, of which every group could have had up to a hundred of small volcanoes [2]. Basalt volcanism is connected with the youngest tectonic movements (in the Cenozoic Era) in the Sudetes and their vicinity, which were mostly vertical movements. Rocks created in this way exist today mostly as various forms of lava veins – volcanic plugs, flood basalt, volcanic cones and calderas [1]. Basalts (volcanic rocks made of plagioclase, pyroxene and olivine) are very hard volcanic rocks with absorptivity and, therefore, they are resistant to repeated processes of freezing and thawing. Because of that they often form denudation monadnocks – inselbergs [3]. It

is estimated that there are about 300 various basalt rock formations in Lower Silesia [2], most of which were in the past centuries used for mining. Many of these formations are extremely valuable for scientific, didactic, aesthetic and natural reasons and are often protected as landmarks [4]. When the rocks decompose due to environmental factors they create fertile soil and decomposed rocks rich in mineral compounds. For that reason many rare plants and plant communities can be found in their vicinity [5–9]. Volcanic rocks, including basalt rocks, often foster rare species lichens and lichenicolous fungi because of unique habitat conditions [10–16].

The current paper includes data on 11 species of lichens and lichenicolous fungi occurring in SW Poland. These species are mostly known from historical collections in the study area and they are currently very rare in the country. All of the presented species are saxicolous and had been discovered on natural outcrops of volcanic rock formations. Additionally, their ecology and distribution in Poland and in Central Europe are briefly characterized.

Material and methods

Material included in the present paper was collected by the author in 2012–2014, on some natural outcrops of volcanic rocks, especially on basalt rocks occurring in SW Poland.

Material was determined using standard methods. Identification of sterile, crustose specimens was supported by TLC analyses of secondary metabolites, according to the methods of Orange et al. [17]. The distribution of the taxa examined are given in the ATPOL grid square system [18], modified by Cieśliński and Fałtynowicz [19]. The herbarium material is housed in the private herbarium of the author (Hb. Szczepańska). In the text the asterisk (“*”) indicates a lichenicolous fungus.

Results and discussion

Buellia badia (Fr.) A. Massal.

This species is characterized by subsquamulose to squamulose, brown thallus. It is considered as a saxicolous, however it often grows as a parasite over various lichens, such as *Melanelia* and *Xanthoparmelia* species [20]. In Poland it is known from the Pojezierza Bałtyckie Lakelands, Nizina Środkowopolska Lowland and Wysoczyzna Podlaska Height [21]. In SW Poland it was noted only on the few localities in the Sudety Mts [22–24]. On the new location, some of the young thalli of *B. badia*, were growing on the thallus of *Xanthoparmelia loxodes* (Nyl.) O. Blanco et al.

In Central Europe, *B. badia* has been found in Austria [25], the Czech Republic [26] and Germany [27].

Specimen examined. Eb-40: Pogórze Zachodniosudeckie Foothills, Pogórze Kaczawskie Foothills, Ostrzyca Proboszczowicka Mt, alt. 450 m, on basalt rocks, 26 September 2012, leg. K. Szczepańska 929 (Hb. Szczepańska).

Caloplaca subpallida H. Magn.

This species belongs to the *Caloplaca ferruginea* group [28] which includes taxa characterized by whitish to blackish thalli and ferrugineous apothecia. It was reported for the first time, as a new to Poland, in the Sudety Mts, including Przedgórze Sudeckie Foreland and Pogórze Zachodniosudeckie Foothills [16]. It grows only on mineral-rich, siliceous rocky substrata, especially on the basic and altered ultrabasic rocks, i.e., basalt, greenstone and serpentinite.

In Central Europe, *C. subpallida* has been found in Austria [25], the Czech Republic [26] and Germany [27].

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Krzyżowa Mt, alt. 360 m, on basalt rocks, 25 May 2013, leg. K. Szczepańska 949 (Hb. Szczepańska).

**Cercidospora macrospora* (Uloth) Hafellner & Nav.-Ros.

A rare lichenicolous fungus in Poland, reported from only a few localities till now. It was noted in the Pomorze Gdańskie Pomerania and in the XIX century in the Sudety Mts [29]. *Cercidospora macrospora* was recorded in Poland exclusively on the thallus of the *Lecanora muralis* (Schreb.) Rabenh., however this taxon is also known as growing on different *Lecanora* species, occurring on siliceous, as well as on calcareous rocks [30]. In contrary to other, known from Poland, species – *C. epipolytropa* (Muss) Arnold, *C. macrospora* does not show a preference to develop the ascomata in the apothecial discs and they are equally frequent in host thallus and apothecia [31].

In Central Europe, *C. macrospora* has been found in Austria [31], the Czech Republic [32], Germany and Slovakia [31].

Host: *Lecanora muralis* (Schreb.) Rabenh. (apothecia and thallus).

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Krzyżowa Mt, alt. 360 m, on *Lecanora muralis* growing on basalt rocks, 19 May 2013, leg. K. Szczepańska 982 (Hb. Szczepańska).

Lecanora subaurea Zahlbr.

Lecanora subaurea is listed on the *Red list of the lichens in Poland* [33], in DD category (data deficient). As a habitat it prefers heavy metal rich lime-free silicate rocks, including iron-rich basalts [27]. Due to similar, bright yellow color of the thallus, as well as secondary chemistry and habitat, *L. subaurea* can be confused with *L. epanora* (Ach.) Ach. However, in contrary to *L. epanora*, soredia of *L. subaurea* arising on the margins of areoles, not on their upper surface. In the country this species has been noted mainly in the southern part of the country, in the Karpaty Zachodnie Mts [21,34]. Additionally it has two localities in the Sudety Mts, in Karkonosze Mts [35,36] and Rudawy Janowickie Mts [37]. Some of the specimens noted on the Słupiec rock were growing as a parasite, on the *Aspicilia simoënsis* Räsänen thallus. The specimens examined by TLC method contained typical substances mentioned in literature [27,38], i.e., pannarin (major), rhizocarpic acid (major) and zeorin (major).

In Central Europe, *L. subaurea* has been found in Austria [25], the Czech Republic [26] and Germany [27].

Specimens examined. Ea-56: Pogórze Izerskie Foothills, Ciasnota Mt, Stożek Perkuna rock near Grabiszycze village, alt. 401 m, on basalt rock, 21 June 2014, leg. K. Szczepańska 1001 (Hb. Szczepańska). **Ea-57:** Pogórze Izerskie Foothills, Słupiec rock near Giebułtów village, alt. 746 m, on basalt rock, 22 June 2013, leg. K. Szczepańska 962, 984 (Hb. Szczepańska).

Lecanora pannonica Szatala

This species was reported only once from northern Poland, in the Pojezierze Iławskie Lackeland and Nizina Staropruska Lowland [39], from three localities. *Lecanora pannonica* usually grows on anthropogenic substrates [38] and all of its previously known records from Poland, come from old brick made buildings. The new locality of this species in country, for the first time was recorded on natural rocky substrata. This species was observed on vertical surfaces of well lighted basalt rocks, however there were found only sterile thalli. *Lecanora pannonica* can be confused with *Tephromela grumosa* (Pers.) Hafellner & Cl. Roux, which is also usually sterile lichen, produce blue-grey, K+ yellow soredia. The features which allow to distinguish *L. pannonica* from *T. grumosa*, are distinctly bullate-areolate thallus, discrete, rounded and

not confluent soralia as well as chemistry. The specimens were analyzed using TLC method. The thallus contains atranorin (major), roccellic acid (major) and gangaleoidin (trace).

In Central Europe, *L. pannonica* has been found in Austria [25], Germany [27] and Slovakia [40].

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Krzyżowa Mt, alt. 360 m, on basalt rocks, 19 May 2013, leg. K. Szczepańska 955 (Hb. Szczepańska).

Lecidella scabra (Taylor) Hertel & Leuckert

A lichen species listed on the *Red list of the lichens in Poland* [33], in NT category (near threatened). Due to similar C+ orange reaction of soredia, *L. scabra* may be confused with *Rinodina aspersa* (Borrer) J.R. Laundon. However, *R. aspersa* differs from *L. scabra* in secondary chemistry and because of possessing clearly areolate thallus with discrete, not confluent, circular soralia. *Lecidella scabra* has scattered localities in Poland, situated in the Pojezierza Bałtyckie Lakelands, Wysoczyzna Podlaska Height, Wyżyna Środkowomłopolska Upland and Karpaty Zachodnie Mts [21,34]. In SW Poland, *L. scabra* was noted only in the Sudety Mts [41]. Most of the specimens found on the new locality were sterile and in order to proper identification of the specimens, TLC analysis was performed. Thallus of the species contains atranorin (major) and xanthonones: thuringione (minor) and arthothelin (major). Additionally there was found some unidentified substance (Rf class in solvent C – 35, spot color after acid and heating – colorless, UV after heating – bright yellowish-green).

In Central Europe, *L. scabra* has been found in Austria [25], the Czech Republic [26], Germany [27] and Hungary [42].

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Św. Jerzego Mt, alt. 360 m, on basalt rocks, 25 May 2013, leg. K. Szczepańska 954 (Hb. Szczepańska).

Rhizocarpon disporum (Nägeli ex Hepp) Müll. Arg.

This species has only a few scattered localities in Poland. It has been noted mainly in the mountain areas in the southern part of the country [21,34] and additionally in the Pojezierze Bałtyckie Lakelands [43]. In SW part of the country it was observed only in XIX century in the Sudety Mts [22,23,44–46]. *Rhizocarpon disporum* is characterized by the 1-spored asci, containing very large (40–70 × 18–30 µm), dark and strongly muriform ascospore [27].

In Central Europe, *R. disporum* was noted in Austria [25], the Czech Republic [26], Germany [27] and Hungary [42].

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Krzyżowa Mt, alt. 360 m, on basalt rocks, 4 October 2013, leg. K. Szczepańska 971 (Hb. Szczepańska).

Rhizocarpon viridiatrum (Wulfen) Körb.

Rhizocarpon viridiatrum is considered as a rare species in Poland and is listed on the *Red list of the lichens in Poland* [33], in VU category (vulnerable). It was recorded in the Pojezierza Bałtyckie Lakelands and Karpaty Zachodnie Mts [21,34]. In SW Poland *R. viridiatrum* was noted only in historical papers, in the Sudety Mts [22,23,45,46]. Young thalli of this species are known as initially parasitic on other saxicolous, crustose lichens, especially on *Aspicilia caesiocinerea* (Malbr.) Arnold [38]. On the new locality it was found growing on the *Aspicilia cinerea* (L.) Körb. thallus, in light, exposed but rather warm places.

In Central Europe, *R. viridiatrum* has been found in Austria [25], the Czech Republic [26], Germany [27] and Hungary [42].

Specimen examined. Eb-64: Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Świętego Jerzego Mt, alt. 354 m, on *Aspicilia cinerea* on basalt rocks, 19 May 2013, leg. K. Szczepańska 957 (Hb. Szczepańska).

Stereocaulon pileatum Ach.

This is a mountain species, listed on the *Red list of the lichens in Poland* [33], in EN category (endangered). It was noted only in the southern part of the country, on the few localities, in the Karpaty Zachodnie Mts [21,34] and Sudety Mts [23,45,47,48]. This species is characterized by wart-like phyllocladia and distinctly globose soralia, located at the ends of small pseudopodetia. The appearance and position of soralia distinguishes this species from the other taxon with small thallus – *S. nanodes* Tuck. Till now, *S. pileatum* has been known as growing only on sandstone and granite rocks and this is the first record of this species noted on the basalts.

In Central Europe, *S. pileatum* has been found in Austria [25], the Czech Republic [26] and Germany [27].

Specimens examined. Ea-56: Pogórze Izerskie Foothills, Ciasnota Mt, Stożek Perkuna rock near Grabiszycze village, alt. 401 m, on basalt rock, 21 June 2014, leg. K. Szczepańska 1000 (Hb. Szczepańska). **Ea-57:** Pogórze Izerskie Foothills, Słupiec rock near Giebułtów village, alt. 746 m, on basalt rock, 22 June 2013, leg. K. Szczepańska 958 (Hb. Szczepańska).

**Sagediopsis barbara* (Th. Fr.) R. Sant. & Triebel

A rare lichenicolous fungus in Poland, reported only from the Sudety Mts [29]. It is known as a parasite restricted to *Porpidia rugosa* (Taylor) Coppins & Fryday [49], however, some other lichens, like *Lecanora* and *Lecidea* genera, are mentioned as hosts of this taxon [50]. On the new localities *S. barbara* was noted on the thallus of the *Lecidea fuscoatra* (L.) Ach. This species differs from similar *S. aquatica* (Stein) Triebel mainly in the larger size of perithecia and ascospores.

Characteristics of specimens: ascomata perithecioid, 380–450 µm diam., globose, black, partly immersed in the host thallus, ascomata wall dark brown to black, perithecium wall distinctly delimited from the host tissue, interascal filaments visible usually only in early stages in development, asci 8-spored, ascospores hyaline, narrowly fusiform with rounded ends and with only transverse septa, spores (25.5–)30.0–38.0(–41.0) × (2.0–)3.0–3.5(–4.0) µm.

In Central Europe, *S. barbara* has been found in Austria [51] and the Czech Republic [32].

Host: *Lecidea fuscoatra* (L.) Ach. (thallus).

Specimens examined. Ea-56: Pogórze Izerskie Foothills, Ciasnota Mt, Stożek Perkuna rock near Grabiszycze village, alt. 401 m, on *Lecidea fuscoatra* growing on basalt rock, 21 June 2014, leg. K. Szczepańska 1010 (Hb. Szczepańska). **Ea-57:** Pogórze Izerskie Foothills, Słupiec rock near Giebułtów village, alt. 746 m, on *Lecidea fuscoatra* growing on basalt rock, 22 June 2013, leg. K. Szczepańska 1011 (Hb. Szczepańska).

Tephromela grumosa (Pers.) Hafellner & Cl. Roux

This species is not very frequent in Poland, especially in the SW part of the country. It is known from the Pojezierza Bałtyckie Lakelands, Wysoczyzna Podlaska Height, Wyżyna Środkowomałopolska Upland [21] and Sudety Mts [22,23,41,52,53]. At the new localities only sterile thalli of this species were found. *Tephromela grumosa* can be confused with other saxicolous and usually sterile taxa – *Lecanora pannonica* (see

comments on *L. pannonica*). Secondary metabolites detected by TLC in analyzed specimens were atranorin (major) and protolichesterinic acid (major). There were not find α -collatolic acid, which is sometimes mentioned as a substance present in *T. grumosa* thallus [27].

In Central Europe, *T. grumosa* has been found in Austria [25], the Czech Republic [26] and Germany [27].

Specimens examined. **Eb-40:** Pogórze Zachodniosudeckie Foothills, Pogórze Kaczawskie Foothills, Ostrzyca Proboszczowicka Mt, alt. 450 m, on basalt rocks, 26 September 2012, leg. K. Szczepańska 934 (Hb. Szczepańska). **Ea-57:** Pogórze Izerskie Foothills, Słupiec rock near Giebułtów village, alt. 746 m, on basalt rocks, 22 June 2013, leg. K. Szczepańska (Hb. Szczepańska). **Eb-64:** Przedgórze Sudeckie Foreland, Wzgórza Strzegomskie Hills, Góra Krzyżowa Mt, alt. 360 m, on basalt rocks, 25 May 2013, leg. K. Szczepańska (Hb. Szczepańska).

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