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SHORT COMMUNICATION

New and noteworthy species of lichens from the Augustów Forest (northeastern Poland)

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* Email: matwiej@uwb.edu.pl**Abstract**

The Augustów Forest is one of the biggest forest complex in Poland. In this paper, 13 rare species of lichens from Augustów Forest are presented. Four of these species are new to Augustów Forest: *Bacidina egenula*, *Lecanora persimilis*, *Rhizocarpon reductum*, *Scoliosporum pruinosum* and one species, *Rhizocarpon hochstetteri*, is new to northeastern Poland. Short notes on their features and distributions are provided.

Keywords

biodiversity; lichenized fungi; new records; distribution

Introduction

One of the largest forest complexes in Poland is the Augustów Forest, situated in northeastern part of the country, in the Podlaskie Province (Fig. 1). Along with the part of Forest in Lithuania and Belarus, which are its immediate neighbors, the Augustów Forest covers the area over 1600 km² and thus constitutes one of the largest dense forest complex in Europe. The Polish part of the Augustów Forest covers around 1100 km². In 1989, the northern part of the Augustów Forest has been appointed Wigry National Park [1].

In terms of weather condition, the Augustów Forest is characterized by distinct features of the continental climate. The main stand types of the Augustów Forest are: fresh coniferous forest, the fresh mixed coniferous forest, and fresh mixed forest, which occupy 39.3%, 27.2%, and 10.3%, respectively, of the area of Augustów Forest. The main forest-forming species in the Augustów Forest is Sots pine (*Pinus sylvestris*) [1,2].

The Augustów Forest is characterized by a high diversity of lichen species. Currently, in Augustów Forest (including the Wigry National Park) there are 365 known lichens taxa [1–3].

In the last decade, intensity of research on the distribution of lichens in Poland increased noticeably, using new methods and technologies. As a result, many new stands of different lichen species have been described [4–20], including new stands from Augustów Forest.

The aim of this study was to provide further data on rare and otherwise noteworthy lichen species from the Augustów Forest.

Material and methods

The specimens for this study were collected during field survey in the Augustów Forest in 2015 and 2016.

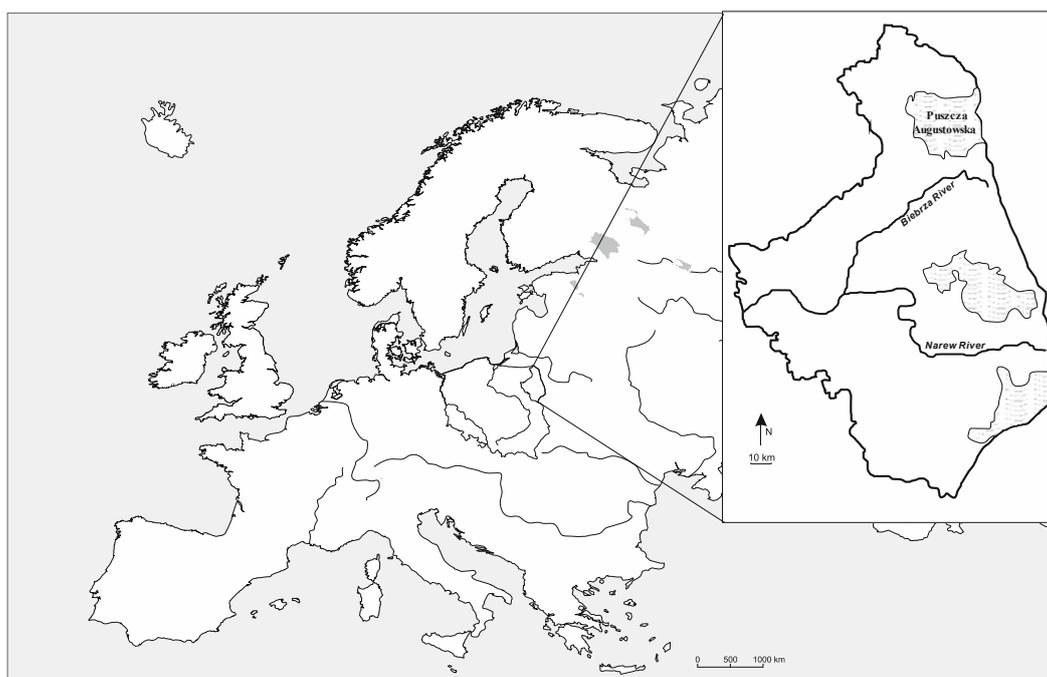


Fig. 1 Location of the Augustów Forest.

Morphological characters (thickness, structure, and color of thallus and prothallus, color, shape, and size of soralia and apothecia) were examined using stereomicroscope Leica EZ4. Examination of anatomical features, i.e., thickness and color of hypothecium, hymenium, excipulum proprium, number of spores in asci, size and shape of ascospores were done with light microscope Leica DM500.

The chemical analyses were carried out using thin layer chromatography (TLC) according to Orange et al. [21]. The lichen species nomenclature follows Fałtynowicz and Kossowska [22].

All recorded sites are located in the ATPOL grid square system [2]. The geographical coordinates of study sites of the Augustów Forest were recorded by GPS using the WGS84 datum.

The collected specimens are deposited in the Herbarium of Institute of Biology, University of Białystok for future reference.

Lichens were collected in five sites in Augustów Forest:

- Bg-20, Augustów Plain mesoregion, Augustów Forest, the Augustów Canal, Swoboda Lock, 53°52'00.2" N / 23°08'41.6" E
- Bg-30, Augustów Plain mesoregion, Augustów Forest, the Augustów Canal, Czarny Bród, 53°52'49.7" N / 23°12'20.0" E
- Bg-40, Biebrza Plain mesoregion, Augustów Forest, Augustów Forest District, Kozi Rynek Reserve, forest section 53°48' N / 23°13' E
- Bg-21, Augustów Plain mesoregion, Augustów Forest, Frącki, 53°58'47" N / 23°18'05" E
- Bg-31, Augustów Plain mesoregion, Augustów Forest, the Augustów Canal, Perkuć Lock, 53°53'56.76" N / 23°19'07.81" E.

List of recorded species

Anisomeridium polypori (M. B. Ellis & Everh.) M. E. Barr

In Augustów Forest, it was previously recorded only by Czyżewska et al. [6]. *Anisomeridium polypori* is a nearly cosmopolitan species with a broad ecological amplitude [23].

Specimens examined. Bg-20, on bark of *Salix alba*, leg. A. Matwiejuk.

Arthonia muscigena Th. Fr.

The second record in the Augustów Forest. It is a suboceanic species [6]. *Arthonia muscigena* is specialized to grow on mosses.

Specimens examined. Bg-40, on epiphytic mosses on bark of *Alnus glutinosa*, 2015, 2016, leg. A. Matwiejuk.

Bacidina egenula (Nyl.) Vězda

New to the Augustów Forest. The species was reported for the first time from Polish lowland from the Białowieża Forest [19]. So far, the species has been reported only from the southern part of the country (see Fałtynowicz [24]). *Bacidia egenula* is a species often recorded on anthropogenic (concrete) and siliceous substrates (pebbles, stones).

Specimens examined. Bg-20, concrete, 2015, leg. A. Matwiejuk.

Lecanora albella (Pers.) Ach.

So far, it has been recorded from the Augustów Forest, only from Starożyn Nature Reserve [3]. The species is widespread in temperate to boreal regions of the Holarctic, including Africa, Asia, Europe, and North America. It commonly grows on the smooth bark of trees, on which the thallus forms roundish patches [2].

Specimens examined. Bg-20, on bark of *Alnus glutinosa*, *Salix alba*, 2015, leg. A. Matwiejuk.

Lecanora persimilis (Th. Fr.) Nyl.

The species is new to the Augustów Forest. It has been overlooked for a long time in Poland, and was only recently rediscovered after ca. 40 years [19,24–27]. *Lecanora persimilis* is perhaps a boreal to mainly temperate element [27]. It grows on twigs and small branches of neutral-barked deciduous shrubs and trees, especially ash *Fraxinus*, oak *Quercus* [2]. The taxon is endangered in Poland, in data deficient category (DD) [28].

Specimens examined. Bg-20, on fallen branches of *Quercus robur*, 2015, leg. A. Matwiejuk.

Lichenomphalia umbellifera (L.) Redhead & al.

The second record in the Augustów Forest [6]. The species is one of few lichens in Poland in which mycobiont is Basidiomycota. So far, it has been recorded from northeastern Poland from several localities [6]. The species occurs on old, decaying logs and on moss-covered soil [2]. *Lichenomphalia umbellifera* is a near threatened species (NT) in Poland [28].

Specimens examined. Bg-40, on decaying wood, 2016, leg. A. Matwiejuk.

Lobaria pulmonaria (L.) Hoffm.

In the Augustów Forest, this lichen was reported from several localities [2,3,7,10,29], including Wigry National Park [1,30–32]. The species was reported first time in Kozi Rynek Reserve. *Lobaria pulmonaria* is widely used as an indicator species of undisturbed old-growth forests [2]. It is an endangered species (EN) in Poland [28].

Specimens examined. Bg-40, on bark of *Fraxinus excelsior*, 2016, leg. A. Matwiejuk.

Melanohalea olivacea (L.) O. Blanco & al.

So far, it has been recorded from the Augustów Forest only from Starożyn Nature Reserve [3]. *Melanohalea olivacea* is perhaps a circumboreal-montane species, most often found on the barks of *Betula* [3]. *Melanohalea olivacea* is a critically endangered species (CR) in Poland [28].

Specimens examined. Bg-30, on bark of *Betula pendula*, 2016, leg. A. Matwiejuk.

Menegazzia terebrata (Hoffm.) Körb.

So far, this species has been reported from only few localities [2,3,29]. In the Kozi Rynek Nature Reserve, it was reported only by Cieśliński and Tobolewski [29] and Cieśliński [2]. *Menegazzia terebrata* is an indicator species for old and biologically rich forests in Poland [2]. The species occurs in damp shady woods on barks of trees such as *Alnus*, *Betula*, *Fraxinus*, *Quercus*. *Menegazzia terebrata* is a critically endangered species (CR) in Poland [28].

Specimens examined. Bg-40, on bark of *Fraxinus excelsior*, 2016, leg. A. Matwiejuk.

Rhizocarpon hochstetteri (Körb.) Vain.

This species is characterized by crustose thallus, thin, areolate, concentrated, grey to brown (Fig. 2). Areoles – 0.8 mm in diameter. Prothallus black. Apothecia up to 1.3 mm in diameter, insignificantly outstanding over thallus, black, matt. Disc nude, flat to easily convex, smooth. Margin enough thick or thin, persistent or dying out. Epihymenium brown. Hymenium 100–110 μm high, hyaline. Hypothecium dark brown (Fig. 3). Asci eight-spored. Ascospores 1-septate, hyaline, 10–28 \times 6–9 μm .

New to the northeastern Poland and the Augustów Forest. In Poland, it was reported from only few localities, mainly from the southern part of Poland (see Fałtynowicz [24]). The species is known from Belarus, Grodno region [33]. *Rhizocarpon hochstetteri* has a circumboreal/Arctic distribution [34]. It grows on either acid or calcareous rocks, stones. *Rhizocarpon hochstetteri* is an endangered species (EN) in Poland [28].

Specimens examined. Bg-21, on stone, 2015, leg. A. Matwiejuk.

Rhizocarpon reductum Th. Fr.

New to the Augustów Forest. This saxicolous lichen is quite common in Poland [35]. The species grows on stones and pebbles.

The distinction of *R. reductum* is related to the changes in the taxonomy of *Rhizocarpon obscuratum* (Ach.) Massal. complex, with hyaline and muriform ascospores [35–37]. Examination of the specimens upon which *R. obscuratum* is based revealed that they are mostly referable to the species currently known as *R. lavatum*. According to Fryday [36], *R. reductum* is resurrected for specimens with small ascospores and a thallus containing stictic acid formerly placed there, whereas specimens with larger ascospores and a thallus lacking lichen substances are more referred to *R. lavatum* [35,37].

Specimens examined. Bg-20, on stone, 2015, leg. A. Matwiejuk.

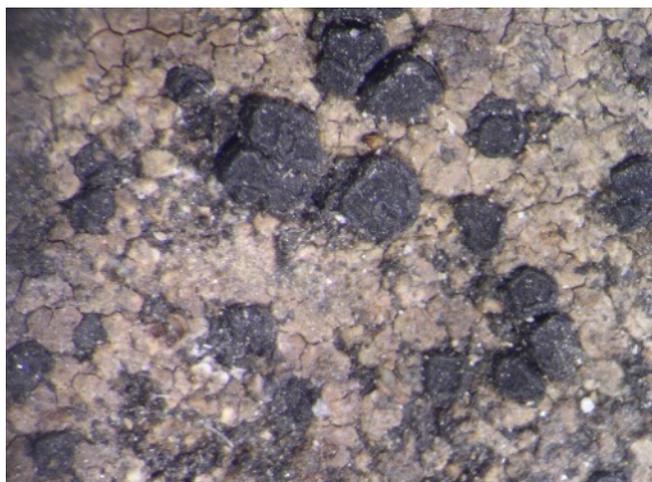


Fig. 2 *Rhizocarpon hochstetteri*, thallus and apothecia, photo by A. Matwiejuk.

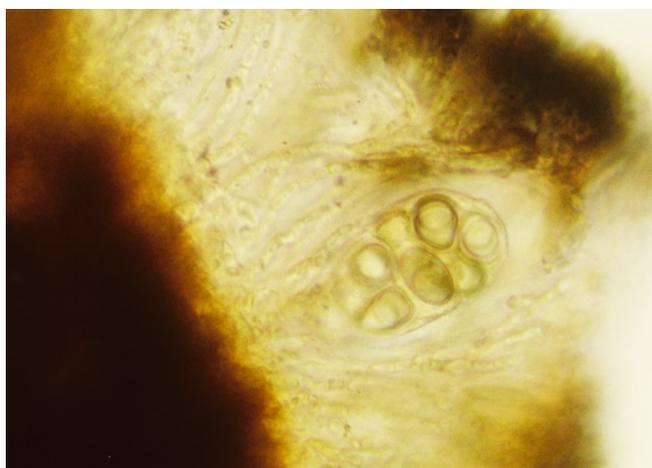


Fig. 3 Cross section through the apothecium of *Rhizocarpon hochstetteri*. Photo by A. Matwiejuk.

***Scoliciosporum pruinosum* (P. James) Vězda**

New to the Augustów Forest. In Poland, it was reported only from few localities, in old deciduous forests (see Fałtynowicz [24]). It is a mild-temperature species, grown on barks of deciduous trees. *Scoliciosporum pruinosum* is an endangered in Poland, in data deficient category (DD) [28].

Specimens examined. Bg-40, on bark of *Alnus glutinosa*, 2016, leg. A. Matwiejuk.

***Thelotrema lepadinum* (Ach.) Ach.**

In the Augustów Forest, it was reported from only few localities – Starożyn, Perkuć, Kozi Rynek nature reserves [2,3,6,29]. This is an indicator species for old and biologically rich forests in Poland [2]. It commonly grows on sheltered, smooth-barked, deciduous trees. *Thelotrema lepadinum* is an endangered species (EN) in Poland [28].

Specimens examined. Bg-40, on barks of *Alnus glutinosa*, *Fraxinus excelsior*, *Quercus robur*, 2016, leg. A. Matwiejuk.

In conclusion, four species of lichens, namely *Bacidina egenula*, *Lecanora persimilis*, *Rhizocarpon reductum*, *Scoliciosporum pruinosum*, presented in this paper are new species for the Augustów Forest, whereas *Rhizocarpon hochstetteri* is new to northeastern Poland.

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