

Monographiae Botanicae **107**

Anetta Wieczorek

The lichen genus *Opegrapha* s. l. in
Poland: morphological variability,
ecology, and distribution

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Abstract

This monograph presents the results of research on the morphological and anatomical variability, ecology, and distribution of *Opegrapha* s. l. in Poland. The study is based on roughly 1,400 specimens from Polish and some European herbaria. Out of the 18 species of the genus *Opegrapha* s. l. recorded from Poland, seven species belong to the genus *Opegrapha* Ach., four species now belong to the genus *Alyxoria* Ach. ex Gray, two species each are found in the genera *Arthonia* Ach. and *Zwackhia* Körb., and one species belongs to each of the genera *Gyroglyphis* Ertz & Tehler, *Phacographa* Hafellner, and *Pseudoschismatomma* Ertz & Tehler. One of the species, *Zwackhia soređiifera*, has been reported from Poland for the first time. Among the 18 species of the genus *Opegrapha* s. l., 10 are epiphytic, five epilithic, and two lichenicolous. The first modern identification key for the species of *Opegrapha* s. l. in Poland is presented. Numerous new regional records are provided that complement our knowledge of the geographic distribution of some poorly known taxa, such as *Alyxoria culmigena*, *A. mougeotii*, *A. ochrocheila*, *Arthonia calcarea*, *Opegrapha dolomitica*, *O. geographicola*, *O. lithyrgea*, and *Phacographa glaucomaria*. All species are characterized and discussed, and their diagnostic characters illustrated. Geographic ranges of each species in Poland are presented on maps based on revised herbarium materials.

Keywords

lichenized Ascomycota; Arthoniales; Opegraphaceae; Roccellaceae; species variability; distribution maps; Poland

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Competing interests

No competing interests have been declared.

1. Introduction

Opegrapha s. l. is a species-rich genus of crustose lichens. Individuals are typically found on the bark of various tree species or on rocks, decaying wood, and thalli of other lichens. They are distributed in all climatic zones across the planet. Although it is difficult to assess the number of species of this genus, the Index Fungorum contains about 600 species in the genus, including all synonyms.

For most of the last century, a taxonomic concept was used for this genus in Europe, which followed Redinger's [1] monograph. However, individual species concepts in that monograph did not deviate substantially from those presented previously by Acharius [2,3], Stizenberger [4], or Nylander [5]. The widespread use of molecular methods resulted in a major change for the systematics of this group. For example, Ertz et al. [6] drew attention to its polyphyly. Moreover, molecular studies resulted in the introduction of a new family, the Lecanographaceae, which included the genera *Alyxoria*, *Lecanographa*, and *Zwackhia* [7,8]. In 2015, several new genera, including *Gyrographa* and *Pseudoschismatomma*, were described in an additional study by Ertz et al. [9].

In Poland, the genus *Opegrapha* has been studied in detail only by Nowak [10], whose methods followed Redinger's monograph [1]. In 1983, Nowak [10] recognized 35 species and numerous intraspecific taxa on the basis of original observations. In 2003, Fałtynowicz accepted 14 *Opegrapha* species (with three synonyms) in his lichen checklist of Poland [11]. In Poland, genus *Opegrapha* has recently been well recognized by Bielczyk [12] and Bielczyk et al. [13] in the Carpathians.

The major objectives of this study were to: (i) determine the range of intraspecific variation for selected morphological and anatomical characters using light microscopy (LM) and scanning electron microscopy (SEM); (ii) estimate taxonomic diversity of the genus *Opegrapha* s. l. in Poland, with special emphasis on the *O. vulgata* group; (iii) construct a key for species identification use in Poland; (iv) present distribution ranges for all species recorded from Poland; and (v) analyze habitat preferences of individual species.

2. Research history of the genus

The genus *Opegrapha* first was described by Humboldt in 1793 [14] in the family Graphidaceae. The original description contained three species, but these currently are regarded as synonyms of *Graphis scripta* [15]. The first valid description of the genus *Opegrapha* was provided by Acharius [16] in 1809. This generic name derived from his earlier work published in 1803 [17], where he first used the name *Opegrapha vulgata* (Ach.) Ach. The binomial name *Lichen vulgatus*, from which he took this specific name, came from an earlier publication in 1798 [18]. On the basis of apothecium structure, Acharius [2] divided the genus *Opegrapha* into three

genera: *Arthonia*, *Graphis*, and *Opegrapha*. In total, the newly described genus *Opegrapha* included 24 species [17], with five more species added in 1810 [2]. Santesson [15] suggested that the name given by Acharius could be preserved, as it was also used by Massalongo [19], Leighton [20], Körber [21,22], and Nylander [23,24]. Stizenberger's [4] work, *Über die Steinbewohnenden Opegrapha-Arten*, took into account these earlier works and available materials from contemporary researchers, and attempted to summarize the state of the taxonomy of the group. In his treatment, Stizenberger included 15 species with numerous varieties and forms. It is noteworthy that he was the first author to suggest the creation of the new family Opegraphaceae [4]. However, his suggestion was not widely accepted by other botanists. In 1907, as a result of changes proposed by Zahlbruckner [25], the genus *Opegrapha* was placed in the family Graphidaceae, a family that contained other systematically distinct genera, including *Graphis*, *Xylographa*, and *Encephalographa*. That classification, with slight modifications, was accepted by most lichenologists [1,26]. Redinger [1] then presented a critical work that provided the first detailed concept for the genus *Opegrapha*, which remained valid until the 1970s. Redinger assigned 62 species to this genus that were divided into two sections: *Euopegrapha* with 58 species, and *Pleurothecium* with four species.

For nearly 180 years, the genus *Opegrapha* was included in the family Graphidaceae. In 1970, Ozenda and Clauzade [27] argued that the family Opegraphaceae should be established, because of differences in the structure of the paraphyses. Important modifications were proposed by Poelt [28], with his classification based primarily on the types of asci, paraphyses, and shapes of the ascospores, which allowed him to restore the family Opegraphaceae with the genus *Opegrapha* and placed in the order Arthoniales. In 1986, Eriksson and Hawksworth [29] suggested that the families Opegraphaceae and Roccellaceae should be moved to the order Opegraphales in the class Ascomycetes. The family Opegraphaceae, as defined by Eriksson and Hawksworth [29], was composed of 14 genera, including the genus *Opegrapha*. Nearly 10 years later, Hawksworth et al. [30] modified the classification of the genus *Opegrapha*, excluding it from the family Opegraphaceae. The genus *Opegrapha* then was moved to the family Roccellaceae in the order Arthoniales, and this decision was accepted by lichenologists [31–33].

In the late 1980s, Torrente and Egea [34] published results of their research on the family Opegraphaceae in the Iberian Peninsula, and paid attention to the structure of some anatomical parts that were not considered previously as diagnostic at the genus level within this group. These primarily included ascus structure, with the apical apparatus and ascospore type. In 1998, Grube [33] reviewed the literature on the position and separation of genera within the Arthoniales. Since then, the taxonomic concept for this group of lichens has been continuing to change. In the early twenty-first century, Ertz [35] published the first monograph of the genus *Opegrapha* in the Palaeotropics. He characterized 45 species, including nine new species. Among them, six species have a broad, pancontinental range and are found in Europe as well.

Recently, Ertz et al. [6] used molecular sequence data to reveal that some genera of crustose lichens, such as *Enterographa* and *Opegrapha*, were polyphyletic. Two species previously belonging to the genus *Opegrapha* and occurring in Poland (*O. calcarea* and *O. atra*) were thus placed in the family Arthoniaceae. However, Ertz and Tehler [7] once again restored the family Opegraphaceae, and placed it in the order Arthoniales along with the families Chrysothrixaceae (with the genus *Chrysothrix*), Arthoniaceae (*Arthonia*, *Arthothelium*, *Cryptothecia*, and *Reichlingia*), the newly created family Roccellographaceae (*Dimidiographa*,

Fulvophyton, and *Roccellographa*), and Roccellaceae (*Chiodecton*, *Dendrographa*, *Dirina*, *Enterographa*, *Erythrodictyon*, *Lecanactis*, *Roccella*, *Roccellina*, *Schismatomma*, *Sigridea*, and *Syncesia*). In addition to the genus *Opegrapha*, the family Opegraphaceae also included the genera *Combea*, *Dictyographa*, *Dolichocarpus*, *Ingaderia*, *Paralecanographa*, *Paraingaderia*, *Paraschismatomma*, *Pentagenella*, *Schizopelte*, and *Sparria*. Moreover, the authors created a new family, the Lecanographaceae, that contained the new genus *Alyxoria* (including among other species classified earlier as *Opegrapha culmigena*, *O. mougeotii*, *O. ochrolechia*, *O. varia*; see Diederich et al. [36]), the genus *Zwackhia* (with species classified earlier as *Opegrapha viridis* and *O. sorediifera* and several others), and the numerously represented genus *Lecanographa*. However, they noted that the systematic position of the family remained unclear.

In 2015, Ertz et al. [9] suggested that the new genera *Gyrographa* and *Pseudoschismatomma* should be included with *Dendrographa*, *Syncesia*, *Roccellina*, *Schismatomma*, *Lecanactis*, *Roccella*, *Dirina*, *Sigridea*, and *Enterographa* in the family Roccellaceae. Many of the species included earlier in the family Roccellaceae are now part of the Opegraphaceae, Roccellographaceae, and Lecanographaceae.

Tab. 1 summarizes the history of changes in systematic classification of the genus *Opegrapha* s. l. representatives occurring in Poland.

3. Material and methods

This study is based on specimens from herbaria located in Poland (BDPA, KRA, KRAM, KRAB, KTC, LBL, LOD, OLTC, POZ, TRN, UGDA, WA, WRSL) [37], the Institute of Biology, University of Białystok, and abroad [KPABGI, OHHI, RSU (according to Index Herbariorum Rossicum), BILAS, GSU, NNSU, and WI (according to Index Herbariorum)]. Materials from private collections (herb. A. Flakus, herb. M. Kossowska, herb. M. Kukwa, herb. L. Lipnicki, herb. E. Muchnik, herb. K. Szczepańska, herb. U. Schiefelbein, herb. M. Seaward), and specimens collected during my field research from 1997 to 2014 were also included. My field collections are housed in the Herbarium Stetinensis (SZUB). In total, nearly 1,400 specimens (1,206 from Poland) were examined. The Polish material originated from all parts of the country. Detailed data for each examined specimen were recorded. The analyzed morphological and anatomical characters (Tab. 2, Fig. 1) were selected on the basis of the original observations and published resources.

To analyze in detail some of the more subtle structures, such as paraphyses, asci, and spores, material from ascomata cross sections was squashed and stained in a drop of water containing a solution of iodine in potassium iodide (IKI). To observe the color reaction of the walls and apical structures of asci, 10% KOH and Lugol's solution (KOH/IKI) were used. To observe paraphyses, 10% KOH alone was used. Lactophenol cotton blue allowed for visualization of the apical nasse (the dome zone) in asci and ascospore cell walls. The color reaction in thalli was examined using KOH (30% aqueous solution) (K), sodium hypochlorite (C), and paraphenylenediamine (solution in 95% ethyl alcohol) (PD).

Tab. 1 History of systematic changes in the genus *Opegrapha* s. l. for the representatives that occur in Poland.

Author	Family	Current genus name
Humboldt 1793	Graphidaceae	<i>Opegrapha</i>
Stizenberg 1862	Opegraphaceae	<i>Opegrapha</i>
Zahlbruckner 1907	Graphidaceae	<i>Opegrapha</i>
Poelt 1973	Opegraphaceae	<i>Opegrapha</i>
Eriksson and Hawksworth 1986	Opegraphaceae	<i>Opegrapha</i>
Hawksworth et al. 1995	Roccellaceae	<i>Opegrapha</i>
Hafellner 2009	Roccellaceae	<i>Phacographa</i>
Ertz and Tehler 2011	Opegraphaceae	<i>Opegrapha</i>
	Arthoniaceae	<i>Arthonia</i>
	Lecanographaceae	<i>Alyxoria</i> , <i>Zwackhia</i>
Ertz et al. 2015	Roccellaceae	<i>Gyroglypha</i> , <i>Pseudoschismatomma</i>

Tab. 2 Analyzed morphological and anatomical characters.

Thallus	Ascomata	Asci	Ascospores	Pycnidia	Conidia
White	Ascoma naked	<i>Calcarea</i> -type	Straight	Present (1)/	Straight
Grey	Ascoma circular	<i>Varia</i> -type	Curved	absent (0)	Curved
White-grey	Ascoma elliptic	<i>Vulgata</i> -type	Ellipsoid	Sessile	Length
Brownish	Ascoma elongate	Length	Spindle-shaped	Convex	Width
	Ascoma unbranched	Width	Needle-shaped	Few (<10)	
	Ascoma branched		Central cell enlarged	Numerous (10–20)	
	Ascoma convex		Cells uniform	Very numerous (>20)	
	Ascoma sunken		Length	Black	
	Ascoma flat		Width with perispore	Pruinose	
	ascoma length		Number of septa		
	Ascoma width		Perispore thickness		
	Disc convex (a) disc flat (b)				
	Disc concave (c)				
	Disc width				
	Excipulum type a				
	Excipulum type b				
	Excipulum type c				
	Excipulum type d				
	Excipulum type e				
	Excipulum continuous at the base				
	Excipulum discontinuous at the base				
	Excipulum edge thickness				
	Excipulum base thickness				
	Hypothecium height				
	Hymenium height				
	Pseudoepithecium height				

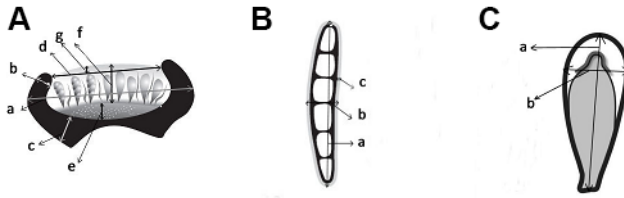


Fig. 1 Measurements of selected parts of the ascoma in *Opegrapha* s. l. (A) Ascoma cross section: a – width; b – excipulum edge thickness; c – excipulum base thickness; d – disc width; e – hypothecium height; f – hymenium height; g – pseudoepithecium height. (B) Ascospore: a – length; b – width; c – perispore thickness. (C) Ascus: a – length; b – width.



Fig. 2 Excipulum types in *Opegrapha* s. l.

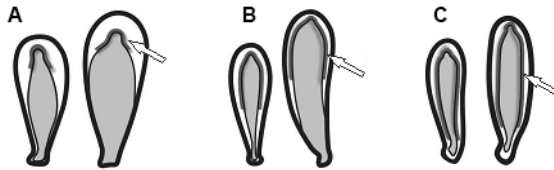


Fig. 3 Three grades of color reaction change for the inner membrane and types of asci in *Opegrapha* s. l.

In this study, five types of excipulum were characterized, depending on their shape in cross sections (see excipulum types in Fig. 2). In addition, I characterized three types of discs, depending on their surface shape (Fig. 3): concave (A), flat (B), or convex (C). On the basis of color reactions of the inner membrane, several types of asci were distinguished, following Torrente and Egea [34].

The various structures of the ascomata were observed and measured under a light microscope (Nikon Eclipse E600 and Zeiss Stereo Lumar v12) (LM), and images were captured with AioVision SE64Rel. 4.8 software. Additionally, a high-quality confocal laser scanning microscope (CLSM) and scanning electron microscope (Quanta 200 SEM) (SEM) were used.

Names of species used throughout the text are in accordance with valid taxonomic classifications [7,9,36]. Nomenclature and author citations follow Index Fungorum. Only basionyms and synonyms used by the authors of the collections are listed under the species. Descriptions and discussions of species are based only on the material examined during the course of this study.

Geographic elements were classified according to Wirth [38], Wirth et al. [39], Purvis et al. [40], and Smith et al. [41].

Ecological characteristics of species of the genus *Opegrapha* s. l. are based on information from labels of herbarium specimens and original field research.

The geographic distribution of individual taxa in Poland was mapped on the ATPOL grid square system [42]. All records marked on the maps were confirmed by relevant herbarium materials. Localities of the studied specimens are listed alphabetically by the ATPOL grid squares and named according to the regional division of Poland [43].

For each species, apart from the distribution map, the following data are given: (i) number of localities (L); (ii) number of squares (10 × 10 km; S); (iii) diagram of the number of records on particular substrate type, where the following abbreviations are used: Ab – *Abies alba* (fir); Ac – *Acer* spp. (maple); Ae – *Aesculus hippocastanum* (horse chestnut); Al – *Alnus* spp. (alder); Ap – *Acer pseudoplatanus* (sycamore); B – *Betula* spp. (birch); Cb – *Carpinus betulus* (hornbeam); Co – *Corylus avellana* (hazel); Fa – *Fagus sylvatica* (beech); Fr – *Fraxinus excelsior* (ash); l – limestone; Ma – *Malus domestica* (apple); Pa – *Picea abies* (spruce); Ps – *Pinus* spp. (pine); Po – *Populus* spp. (poplar, etc.); Q – *Quercus* spp. (oak); r – rock; Rp – *Robinia pseudacacia* (false acacia); Sa – *Salix* spp. (willow, etc.); s – sandstone; So – *Sorbus* spp. (mountain ash, etc.); T – *Tilia* spp. (linden); U – *Ulmus* spp. (elm); w – decaying wood.

4. Results and discussion

4.1. Numerical analysis of the examined material

On the basis of material from Poland obtained from 14 lichen herbaria and six private collections, 18 species were identified. According to the latest classifications [7,9,36], the species belong to seven genera. Seven of these species are in the genus *Opegrapha*, two in the genus *Arthonia*, four in the genus *Alyxoria*, two in the genus *Zwackhia*, and one species each in the genera *Gyrographa*, *Pseudoschismatomma*, and *Phacographa*. This is the first time that the species *Zwackhia sorediifera* has been reported from Poland. Two species represent nonlichenized lichenicolous fungi: *Opegrapha geographicola* and *Phacographa glaucomaria*. The largest number of the studied specimens (322) originated from the Herbarium of Jan Kochanowski at the University in Kielce, and slightly fewer (266) came from the lichen herbarium of the W. Szafer Institute of Botany, Polish Academy of Sciences in Cracow (Fig. 4).

Among nearly 1,206 specimens studied from Poland, fewer than 7% were collected before 1945. In contrast, nearly 510 were collected between 1945 and 1980, and over 666 were collected since 1981 (Fig. 5).

The great majority of the examined specimens were from four species: *Alyxoria varia* (334), *Opegrapha vulgata* (230), *Zwackhia viridis* (204), and *Pseudoschismatomma rufescens* (180). Between 12 and 77 specimens were examined for six other species: *O. niveoatra* (77), *O. vermicellifera* (52), *Gyrographa gyrocarpa* (47), *Arthonia atra* (34), *O. dolomitica* (24), and *Alyxoria mougeotii* (12). The smallest number of specimens came from *Alyxoria culmigena* and *Zwackhia sorediifera* (Fig. 6).

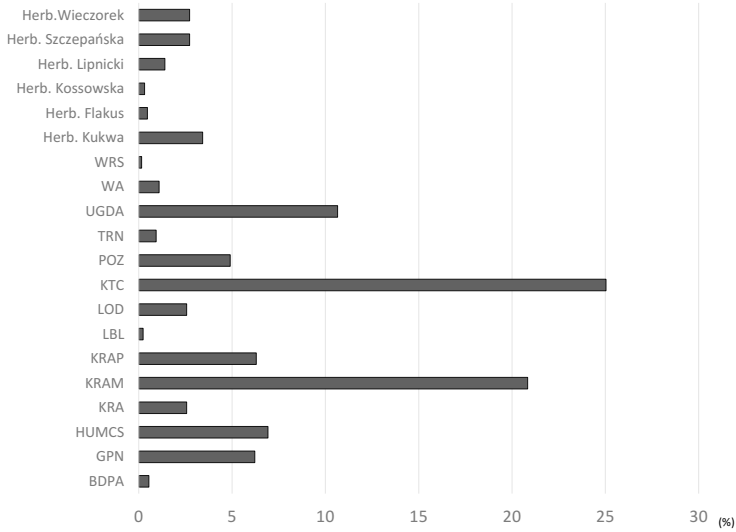


Fig. 4 Percent contribution of examined specimens from various herbaria.

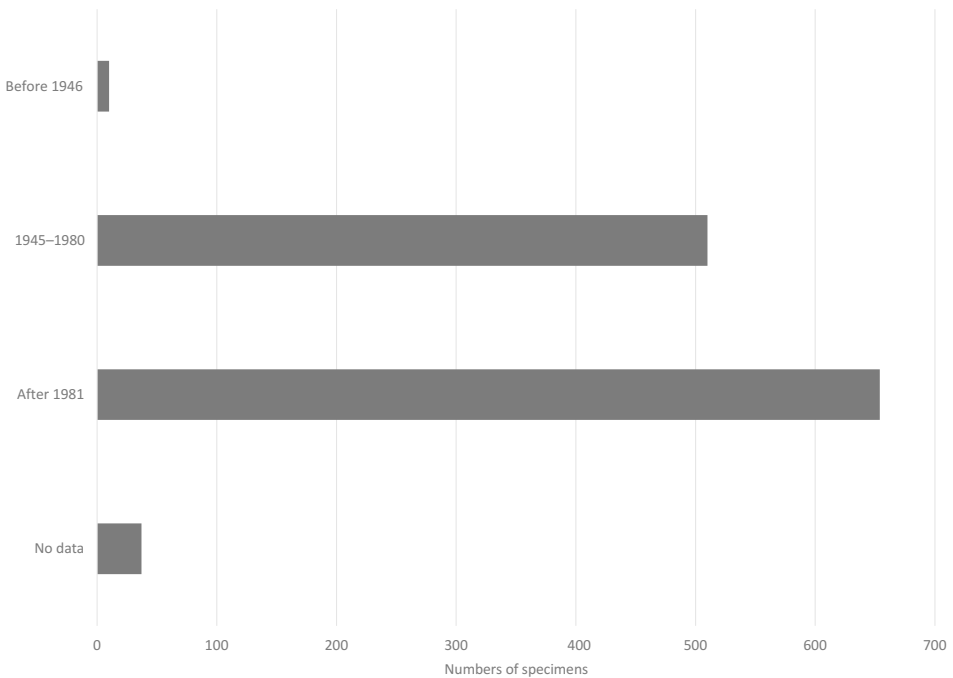


Fig. 5 Number of specimens collected before 1946, between 1945 and 1980, and since 1981.

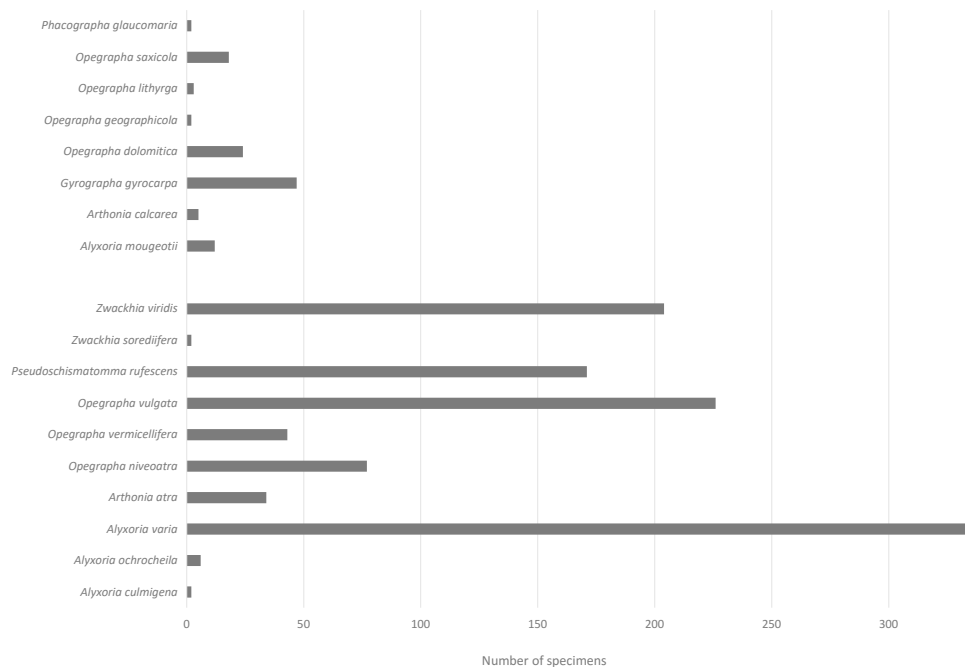


Fig. 6 Number of specimens of individual species of the genus *Opegrapha* s. l. in Poland.

4.2. Morphological features

4.2.1. Thallus

Members of the genus *Opegrapha* s. l. usually are uniformly crustose (Fig. 7) and are found on the bark of various tree species, rocks, plant debris, and the thalli of other lichens. The thallus of lichenized species in the genus *Opegrapha* s. l. is heterogeneous. Thalli of saxicolous species in this genus may be epilithic (growing on the rock surface) or endolithic (penetrating the rock, with a very thin outer layer), whereas epiphytic species always are epiphloeodal. Thallus morphology varies widely. It can be uniform or composed of small aggregated nodules, sometimes powdery-granular. Areolate thallus (i.e., subdivided into segments, areoles) usually is found near ascomata or in depressions of the substrate. In *Gyrographa gyrocarpa*, it develops yellowish soralia that often are connected and form larger aggregations of soredia. Sometimes, thalli are covered by delicate crevices or torn into pieces due to cracks in the substrate, such as in a tree bark.

Thallus color is highly variable, consisting of various hues of gray, white, brown, and green, which form lighter patches, clearly distinguished from the substrate, or only slightly different from it (Fig. 8). In some species, thalli are bordered with a conspicuous prothallus of various thickness.

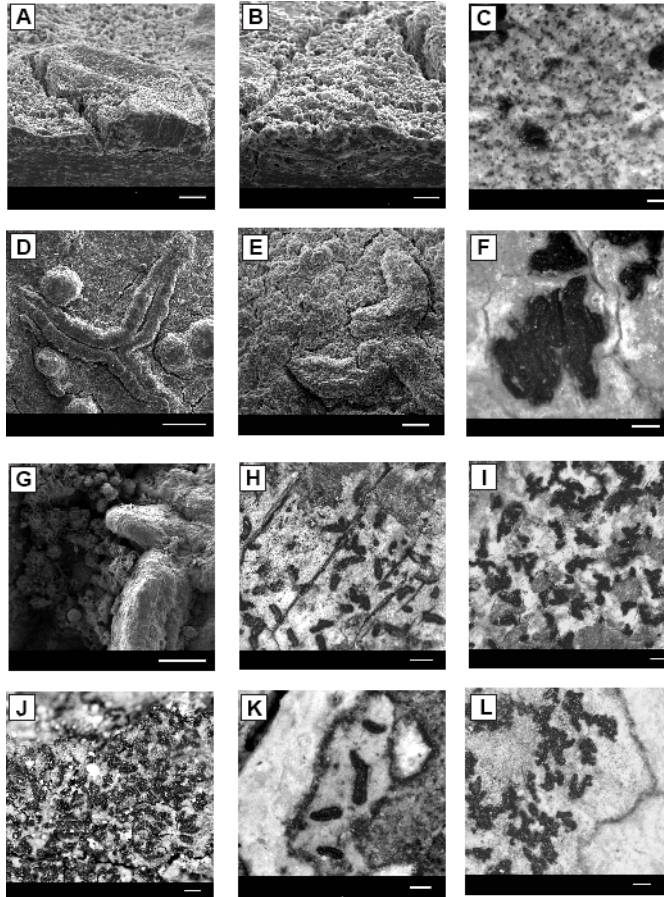


Fig. 7 Thallus: (A) *Opegrapha vermicellifera* – thallus, SEM (leg. W. Fałtynowicz, UGDA-L 2469); (B,C) *O. dolomitica* – endolithic thallus, SEM (leg. J. Nowak, KRAM-L 12273); (D) *O. vermicellifera* – thallus smooth, continuous, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (E) *O. vulgata* – thallus composed of small aggregated nodules, SEM (leg. J. Nowak, KRAM-L 7289); (F) *Arthonia atra* – thallus crevices, LM (leg. L. Lipnicki, 1989, herb. Lipnicki); (G) *Gyrographa gyrocarpa* – soredia, SEM (leg. P. Czarnota, GPN 2145); (H) *O. niveoatra* – thallus divided by bark cracks, LM (leg. S. Cieśliński & Z. Tobolewski, 1983, KTC); (I) *A. atra* – thallus pale, LM (leg. A. Wieczorek, 2002, herb. Wieczorek); (J) *O. niveoatra* – thallus dark, LM (leg. W. Fałtynowicz, UGDA-L 3435); (K,L) *Zwackhia viridis* – prothallus, LM (leg. A. Wieczorek, 1998, herb. Wieczorek). Scale bars: (A,B) 30 μ m; (C,F,K,L) 1 mm; (D) 200 μ m; (E) 0.5 μ m; (G) 150 μ m; (H) 1.5 mm; (I,J) 2 mm.

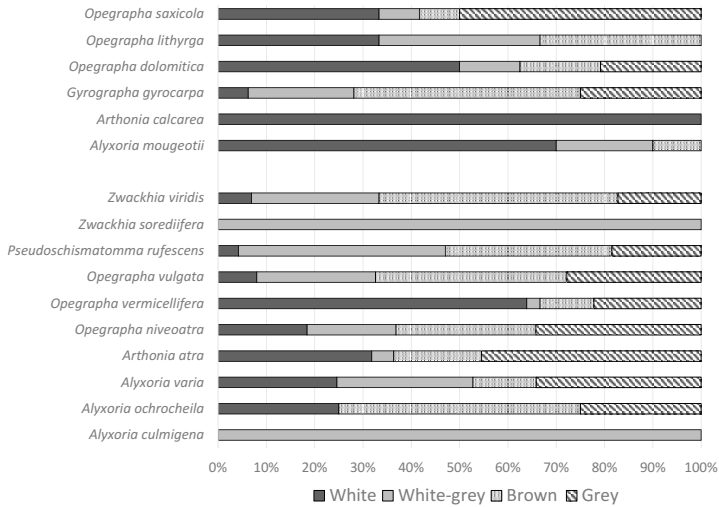


Fig. 8 Variation in thallus color in selected species of the genus *Opegrapha* s. l. in Poland.

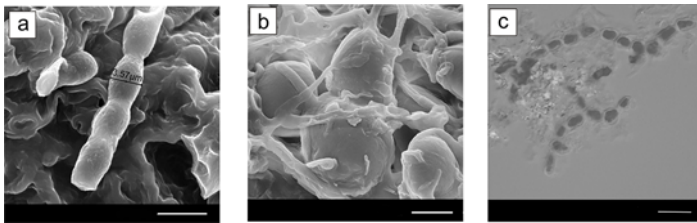


Fig. 9 Algae of the genus *Trentepohlia* in the thalli of *Opegrapha* s. l.: (A) short filament in a hydrated thallus, SEM (leg. A. Wieczorek, 1998, herb. Wieczorek); (B) single algal cells, SEM (leg. S. Ciesliński, 1990, KTC); (C) short filament, LM (leg. A. Wieczorek, 1998, herb. Wieczorek). Scale bars: (A) 5 µm; (B) 4 µm; (C) 10 µm.

4.2.2. Algae

Thalli of lichenized species of the genus *Opegrapha* s. l. contain algae of the genus *Trentepohlia* (Fig. 9). The algae form short filaments composed of several cells each that are linked together loosely, particularly in the terminal parts. However, their shape can change depending on water content of the thalli. The algal cells are orange because of a pigment that is a derivative of β carotene and usually masks the green chlorophyll. Each algal cell contains one or several chromatophores.

4.2.3. Ascomata

Species of the genus *Opegrapha* s. l. produce black ascomata classified as hysterothecia, varying in length from 0.1 mm to 2 mm. The ascomata do not (or very rarely) contain a slightly

whitish or yellowish pruinose. In most cases, ascomata are numerous, but rarely, thalli bear only a few or no ascomata. In *O. vermicellifera*, ascomata are rare, but characteristic pycnidia always are developed. An example of sterile, but easily identified species, is *Gyrographa gyrocarpa* (due to the characteristic soralia, stained red with iodine). The other species are unidentifiable when missing ascomata. The ascomata often are distributed evenly on the thallus, but they may also form groups. They usually protrude above the thallus surface and only rarely are they sessile or sunken.

The shape of the ascomata is highly variable and often differs within individual species. They usually are circular, ellipsoid or elongate, more or less branched, rarely vermiform. They are often fused. Only few species are characterized by low intraspecific variability in ascomata shape, such as *Arthonia calcarea*. In the past, many taxonomists regarded the shape of the ascomata as an important diagnostic feature. However, this feature is greatly modified under the influence of changing environmental conditions and is of little importance for taxonomic diagnosis in this genus (Fig. 10).

The ascomata disc is black, and rarely pruinose. Disc shape highly depends on the shape of the ascomata: it may be narrow or wide, often depending on the ascomata's maturity stage. Usually well-developed discs are found in mature specimens, but they are sometimes difficult to distinguish in young specimens. The disc in the genus *Opegrapha* s. l. usually is the widest in the central part of the ascomata and gradually tapers toward the apical parts. Most species are concave or flat, very rarely convex, and the degree of convexity or concavity is highly variable (Fig. 11). Disc's area in SEM images is usually slightly granular. Its structure is shaped by growing apically dilated paraphyzes.

The anatomical structure of the apothecia is an important diagnostic feature in the taxonomy of this genus. The ascomata of *Opegrapha* spp. are open (Fig. 12A) and composed of four layers of various thickness: excipulum, hypothecium, hymenium, and pseudoepithecium (Fig. 12B).

The excipulum (also known as the exciple) is the outermost layer of the ascomata (Fig. 13A). In the genus *Opegrapha* s. l., the excipulum is mature throughout the period of the ascomata development. The excipulum is brown-black to black; in some species, the color is continuous at the base of ascoma (Fig. 13B), while in others it is discontinuous (Fig. 13C). The excipulum's edge is well developed, the thickness of the edges in the upper part of the ascomata varies and changes as the ascomata mature. In most cases during early ascomata maturation, the excipulum forms strongly curved upward facing lips (Type A; Fig. 2). However, when the ascomata grow, the excipulum is open (Types B, C, D, and E; Fig. 2). Most species of the genus *Opegrapha* s. l. have the ascomata of Types B and C (Fig. 2), but in a few species (e.g., *Alyxoria varia*), widely opened apothecia develop (Types D and E) (Fig. 14). In these cases, the edge and disc of the excipulum are black.

The hypothecium is the inner part of the ascomata that is located near the excipulum (Fig. 15). It is formed by excipulum hyphae, which grow perpendicularly to the ascomata. The hypothecium consists of lower parts of ascogenous hyphae. In species of the genus *Opegrapha* s. l., this part of the ascomata is well defined because of the slightly darker color of the adhering hymenium. Like hymenium, the hypothecium can be stained with iodine, though sometimes the reaction is barely visible.

The hymenium is the part of the ascomata that contains asci and paraphyzes (Fig. 16A,B). In species of the genus *Opegrapha* s. l., the hymenium is well developed, surrounded by the excipulum, and adheres to the hypothecium. The hymenium is composed of crowded parallel

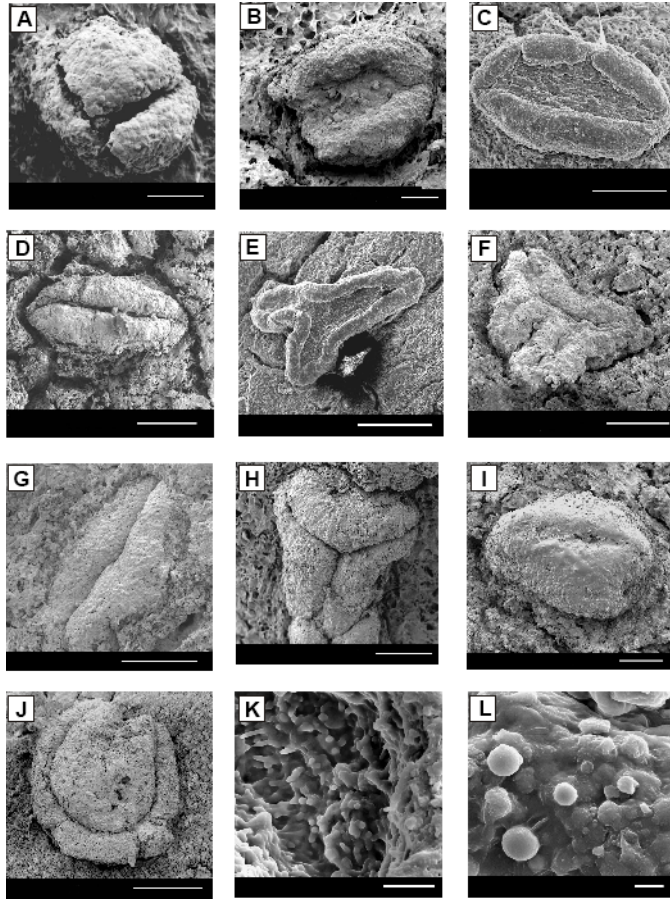


Fig. 10 Morphology of ascomata in *Opegrapha* s. l., SEM: (A) circular, convex, with a very narrow and concave disc (*Arthonia atra*, leg. Z. Tobolewski & S. Cieśliński, 1985, KTC); (B) circular, convex, with a wide and concave disc (*Alyxoria varia*, leg. P. Czarnota, GPN 2875); (C) elongate, convex, with a wide and flat disc (*A. atra*, leg. Z. Tobolewski, 1951, POZ); (D) elliptic, convex, with a very narrow and concave disc (*A. varia*, leg. P. Czarnota, GPN 2875); (E) branched, convex, with a narrow and flat disc (*Gyroglypha gyrocarpa*, leg. Z. Tobolewski, 1954, POZ); (F) branched, convex, with a very narrow and convex disc (*G. gyrocarpa*, leg. Z. Tobolewski, 1954, POZ); (G) elliptic, sessile, with a very narrow and concave disc (*Pseudoschismatomma rufescens*, leg. Z. Tobolewski, 1955, POZ); (H) branched, convex, with a very narrow and concave disc (*Opegrapha vulgata*, leg. J. Nowak, KRAM-L 13952); (I) young, elliptic, convex, with a poorly developed, slightly concave disc (*Alyxoria mougeotii*, leg. Z. Tobolewski, 1957, POZ); (J) circular, convex, with a very wide and convex disc (*Opegrapha dolomitica*, leg. K. Taborowicz, 1975, KTC); (K,L) disc surface (*A. varia*, leg. P. Czarnota, GPN 2875). Scale bars: (A,B) 50 μ m; (C,E,G) 1 mm; (D) 0.5 mm; (F,H) 100 μ m; (J) 200 μ m; (K) 10 μ m; (L) 4 μ m.

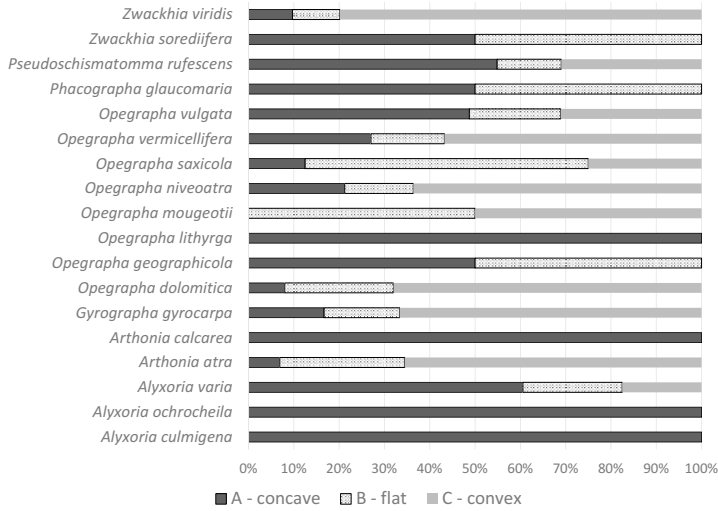


Fig. 11 Various types of discs in species of the genus *Opegrapha* s. l.

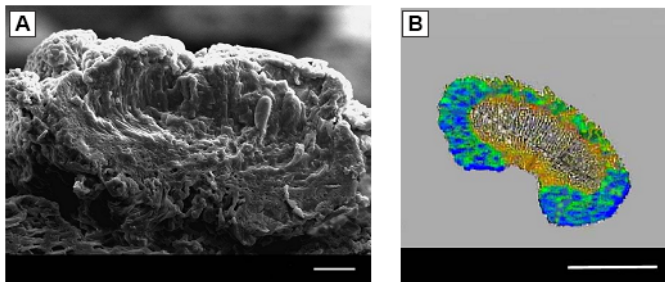


Fig. 12 Ascocoma cross section: (A) *Opegrapha vulgata*, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (B) *Pseudoschismatomma rufescens*, LM (leg. S. Cieśliński, 1990, KTC). Scale bars: (A) 20 μ m; (B) 100 μ m.

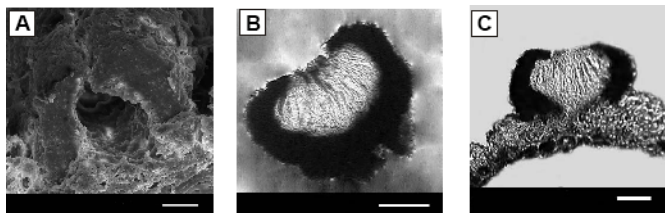


Fig. 13 Excipulum: (A) SEM image (*Opegrapha vermicellifera*, leg. S. Cieśliński, 1992, KTC); (B) continuous at the base of ascocoma, LM (*O. niveoatra*, leg. W. Fałtynowicz, UGDA-L 3435); (C) discontinuous at the base of ascocoma, LM (*Alyxoria varia*, leg. L. Lipnicki, 1989, herb. Lipnicki). Scale bars: (A) 20 μ m; (B) 100 μ m; (C) 50 μ m.

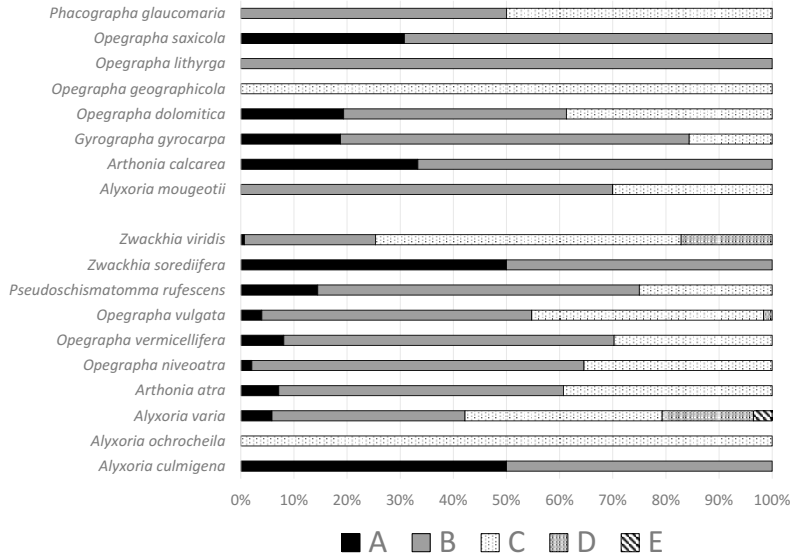


Fig. 14 Percent contribution of various excipulum types in individual species of the genus *Opegrapha* s. l.

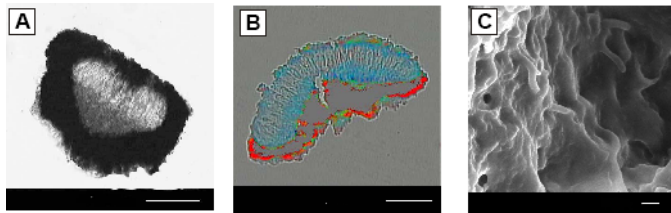


Fig. 15 Hypothecium: (A,B) *Alyxoria varia*, LM (leg. L. Lipnicki, 1989, herb. Lipnicki); (C) ascogenous hyphae growing from the hypothecium, SEM (*Opegrapha vermicellifera*, leg. S. Cieřliński, 1992, KTC). Scale bars: (A,B) 100 μ m; (C) 2 μ m.

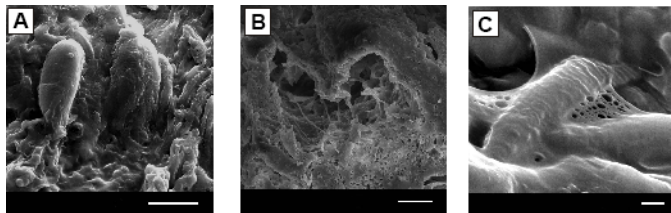


Fig. 16 Hymenium, SEM: (A) asci (*Opegrapha vulgata*, KRAM-L 14823); (B) paraphyses (*O. vulgata*, KRAM-L 14823); (C) hyaline interhyphal substance (*O. vulgata*, leg. D. Kubiak, 2001, OLTC). Scale bars: (A) 10 μ m; (B) 20 μ m; (C) 3 μ m.

hyphae, which in the upper layer, near the excipulum, form lips curved toward the hymenium center [34]. In species of the genus *Opegrapha* s. l., the hymenium is yellowish in color.

Paraphyses are formed by sterile hyphae on the hypothecium. In the genus *Opegrapha* s. l., paraphyses are persistent throughout the life span of the ascomata. At the first stages of the ascomatal development, paraphyses are connected to the lower part of the hypothecium. The paraphyses grow perpendicularly to the hypothecium, are crowded and are usually united with asci by means of an interhyphal, hyaline substance (Fig. 16C). In mature ascomata, paraphyses are branched and distally clavate (club-shaped). Usually, they are branched above the asci.

The asci in the genus *Opegrapha* s. l. are cylindrical-clavate and clavate (Fig. 17A,B), usually with a broader base. They are bitunicate, composed of an outer and inner membrane known as the eoascus and endoascus, respectively (Fig. 17C). The eoascus is thin, covers the ascus, and sometimes is amyloid and can be stained with KOH/IKI (Fig. 17D). The endoascus is composed of two layers (inner and outer), which are distinguishable based on their different sensitivity to double treatment with KOH/IKI. The inner layer can be stained blue more intensely, while the outer layer remains unchanged or is stained only slightly. The staining of the inner layer of the endoascus may be limited to the dome zone, be extended to half the ascus height (Fig. 17E), or may extend to the whole length of the ascus. The variation in staining and the structure of the apical apparatus are features that allowed Torrente and Egea [34] to distinguish three types of ascus in the genus *Opegrapha* s. l. The first type, known as the *calcareo* (Fig. 3), is characterized by a short stipe, with the inner layer of the endoascus amyloid only in apical nasse, and a reduced ring with a large locular chamber. The *varia*-type refers to clavate asci with the inner layer of the endoascus amyloid in the upper half or slightly lower, with a short but wide chamber and no apical nasse. The *vulgata*-type has cylindrical-clavate asci, with the inner layer of the endoascus amyloid nearly alongside its whole length, with a small chamber and no apical nasse. At the apex of the ascus, the apical apparatus is located (Fig. 17F,G).

Usually, the asci contain eight spores. During the course of spore growth, the outer membrane is damaged and the inner membrane expands until the ascus walls are destroyed and the spores are released.

Ascospores in the genus *Opegrapha* s. l. are hyaline (besides pale brown in *O. geographicola*) and multicellular, with 4–15-septa. Their shape is variable, from elliptic to more or less spindle-shaped (Fig. 18A–E), straight, or slightly curved. Ascospores vary in length from 11 μm to 61 μm , while they are 2 μm to 14 μm wide (including the outer covering, in the widest part of the ascospore) in the hydrated state. Following dehydration, their width can be reduced by up to 2 μm (Fig. 18F). The ascospores have one–two coverings: an inner one known as the episporium, and the outer perisporium, the presence or absence of the latter one is an important diagnostic feature (Fig. 18G). The wall of the ascospore is hyaline, but after long periods in a herbarium, it may turn light gray. The length and shape of the ascospores, as well as the number of septa, have been used for species identification since Massalongo [44]. Ascospores in the genus *Opegrapha* s. l. are autofluorescent [45] (Fig. 18H,I).

The pseudoepithecium is the upper most layer of the ascomata and is located above the hymenium. This layer has been given various names. Korf [46] used the term pseudoepithecium to describe the undifferentiated material located above the hymenium. Muthappa [47] believed that the epithecium is a layer composed of remnants of the hymenium, usually consisting of damaged apical parts of paraphyses. Eriksson [48] suggested using the term pseudoepithecium for the layer present in all species having paraphyses. Similarly, Hawksworth

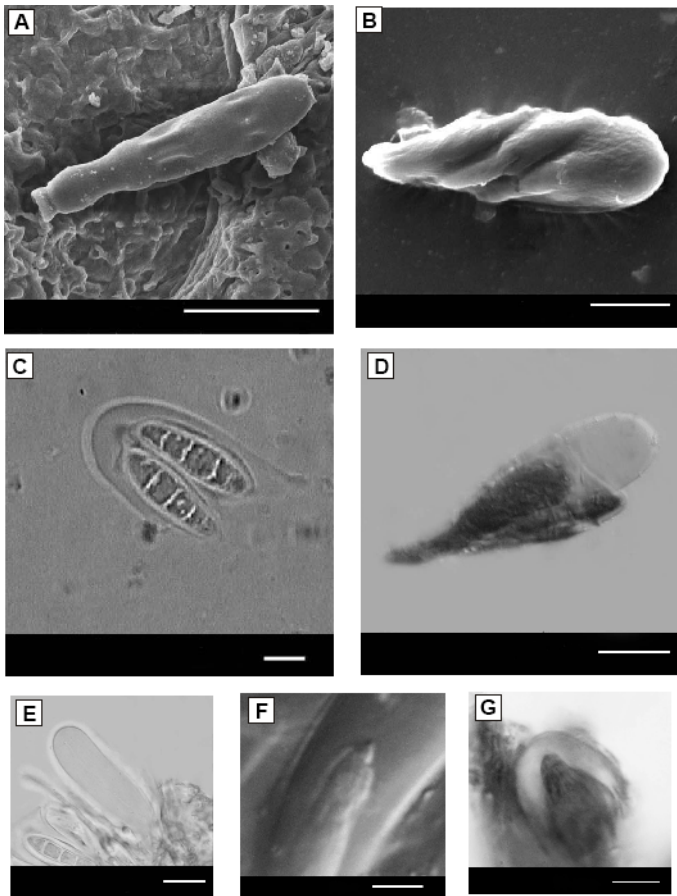


Fig. 17 Asci: (A) cylindrical-clavate, SEM (*Zwackhia viridis*, leg. A. Wieczorek, 1996, herb. Wieczorek); (B) clavate with mature ascospores, SEM (*Pseudochismatomma rufescens*, leg. Z. Tobolewski, 1955, POZ); (C) two layers of the endoascus, LM (*Opegrapha vulgata*, leg. J. Nowak, KRAM-L 16223); (D) amyloid outer layer, LM (*Arthonia calcarea*, KRAM-L 26972); (E) outer layer of the endoascus stained to half its length, LM (*Alyxoria varia*, leg. W. Fałtynowicz & Z. Tobolewski, KRAM-L 34074); (F) apical apparatus, SEM (*Arthonia calcarea*, KRAM-L 26972); (G) apical nasse, LM (*A. calcarea*, KRAM-L 26972). Scale bars: (A) 30 μ m; (B–E,G) 10 μ m; (F) 5 μ m.

[49] recommended the term pseudoepithecium, defining it as a shapeless granular covering, which embeds the apical parts of paraphyzes. Considering the developmental forms of the paraphyzes, and in light of the SEM observations in this study, it seems that there is no true epithecium in the genus *Opegrapha* s. l. [34], and thus the use of the term pseudoepithecium appears justified.

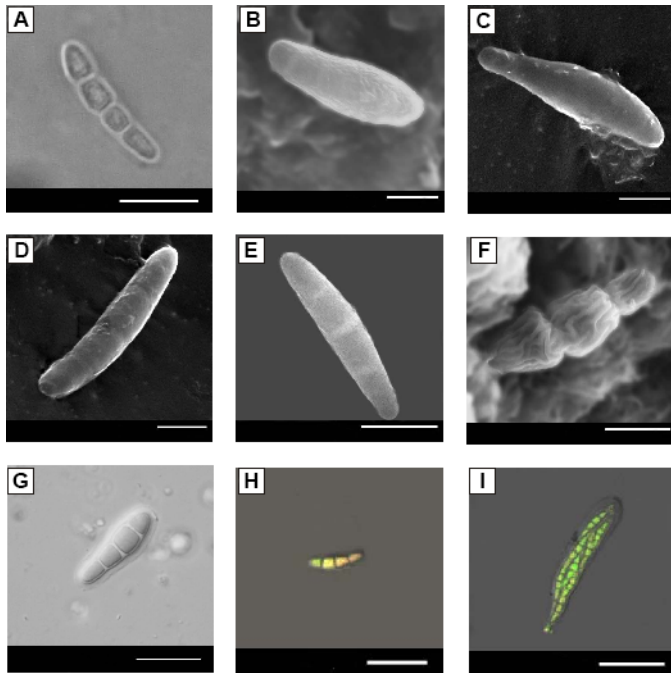


Fig. 18 Ascospores: (A) *Opegrapha dolomitica*, LM (leg. J. Nowak, KRAM-L 12349); (B) *Alyxoria culmigena*, SEM (leg. L. Lipnicki, 1989, herb. Lipnicki); (C) *Arthonia atra*, SEM (leg. Z. Tobolewski, 1951, POZ); (D) *Pseudoschismatomma rufescens*, SEM (leg. S. Cieśliński, 1989, KTC); (E) *Gyrographa gyrocarpa*, SEM (leg. J. Nowak, KRAM-L 17040); (F) dry, young ascospore of *A. atra*, SEM (leg. P. Czarnota, GPN 231); (G) perispore and episporium of *O. dolomitica*, LM (leg. J. Nowak, KRAM-L 12349); (H,I) autofluorescence of *O. dolomitica* spores, CLSM (leg. J. Nowak, KRAM-L 12349). Scale bars: (A,C,E,G) 10 μm ; (B,D,F) 5 μm ; (H) 20 μm ; (I) 25 μm .

4.2.4. Pycnidia

The pycnidia in the genus *Opegrapha* are described in detail in my previous publication [50]. It is noteworthy that in species of this genus, the pycnidia are unilocular, i.e., characterized by only by one locule [51] (Fig. 19A,B). The pycnidia are highly variable in shape and size, even within species. Most of the analyzed specimens only had one ostiole (Fig. 19C–E), although some pycnidia had two ostioles at the apex (Fig. 19F). The ostiole is nearly always apical, but it also can develop along any part of the pycnidium. Ostioles usually are circular, but sometimes they can be elongate or irregular. Ostiole size is also highly variable. The pycnidia of the studied species are scattered on thalli or form clusters of various sizes. Most of the analyzed species had prominent pycnidia (Fig. 19G–I, Fig. 20). For example, on one specimen of a given species, some pycnidia were convex, while others were sunken in the thallus. The pycnidia of the epilithic species occurred in more variable locations on the thallus than those of species growing on the bark of trees.

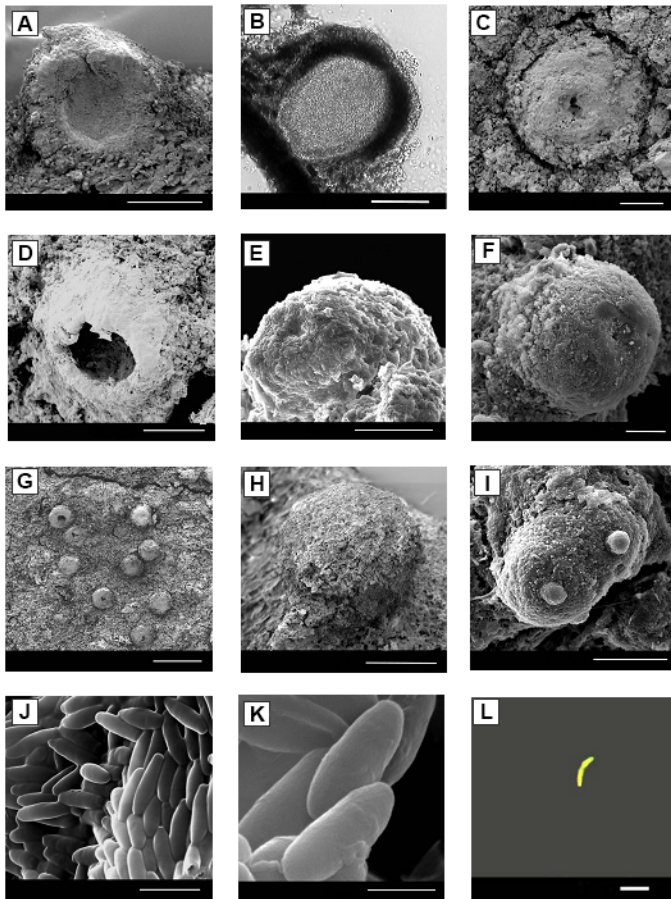


Fig. 19 Pycnidia and conidia of the species of the genus *Opegrapha* s. l.: (A) *O. vulgata*, SEM (leg. J. Nowak, KRAM-L 10343); (B) *O. vermicellifera*, LM (leg. W. Fałtynowicz, UGDA-L 2785); (C) *O. dolomitica*, SEM (leg. J. Nowak, KRAM-L 29981); (D) *O. saxicola*, SEM (leg. K. Szczepańska, 2004, herb. Szczepańska); (E) *Pseudoschismatomma rufescens*, SEM (leg. Z. Tobolewski, 1953, POZ); (F) *Alyxoria varia*, SEM (leg. Z. Tobolewski, 1959, POZ); (G) *O. vermicellifera*, SEM (leg. S. Cieśliński, 1989, KTC); (H) *O. niveoatra*, SEM (leg. W. Fałtynowicz & J. Miądlukowska, UGDA-L 3673); (I) *Alyxoria varia*, LM (leg. S. Cieśliński, 1993, KTC); (J) *O. vulgata*, SEM (leg. K. Czyżewska, LOD-L 520); (K) *O. vermicellifera*, SEM (leg. U. Bielczyk, KRAM-L 44575); (L) *O. vulgata*, CLSM (leg. K. Glanc, KRAM-L 39101). Scale bars: (A) 500 µm; (B,C,E,I) 100 µm; (D,F-H) 50 µm; (J,L) 5 µm; (K) 2 µm.

The conidia produced by species of the genus *Opegrapha* s. l. are usually cylindrical or clavate (Fig. 19J,K). The length of the conidia in the material that I analyzed varied between species, even though length is one of the most important taxonomic characters. LM revealed smooth and hyaline conidia, while under a scanning electron microscope, their delicate granular ornamentation could be observed. Similar to ascospores, conidia in the genus *Opegrapha* s. l. are autofluorescent [45] (Fig. 19L).

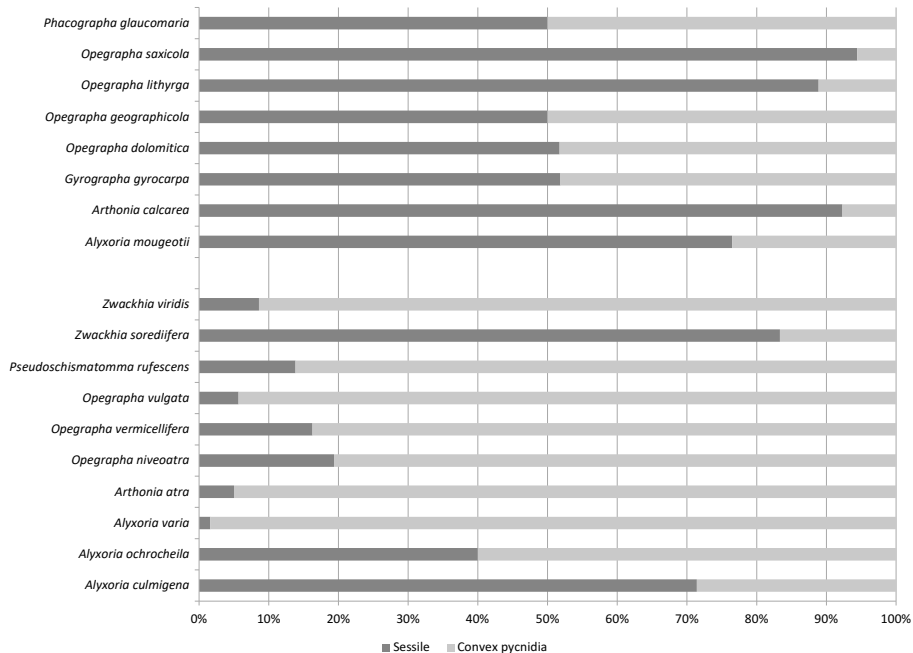


Fig. 20 Percentage of the contribution of sessile and convex pycnidia in the studied material.

4.3. Ecology

Species of the genus *Opegrapha* s. l. in Poland were shown to primarily colonize the bark of various tree species (86% of records), but they also occur on rocks (10%), decaying wood (1%) (Fig. 21), and sporadically on lichen thalli. The species composition of epiphytes and epilithes is presented in Fig. 22. Unfortunately, labels of the analyzed herbarium specimens did not always contain complete information on habitat. Therefore, there generally was insufficient information to estimate ecological requirements of individual species.

The analyzed taxa were recorded on the bark of 20 genera of trees. Most of them were deciduous phorophytes, except for the conifers, such as *Abies alba*, *Picea abies*, and *Pinus* spp. Representatives of *Opegrapha* s. l. are most frequently found on the smooth bark of *Fagus sylvatica* and the cracked bark of *Fraxinus excelsior*, whilst they are found less frequently on the bark of *Carpinus betulus*, *Acer pseudoplatanus* and other *Acer* spp., *Alnus glutinosa*, and other phorophytes (Fig. 23).

The bark of *Fagus sylvatica* was most often colonized by *Opegrapha niveoatra* and *O. vulgata*, while the bark of *Fraxinus excelsior* was colonized by *Pseudoschismatomma rufescens*, and the bark of *Carpinus betulus* by *O. niveoatra*.

Nearly all of the epiphytic species are moderately acidophilic. They prefer slightly acid to neutral sites, with a range of pH from 4.9 to 7.0 [38]. They grow on the bark of various tree species, usually in open woodlands and on moderately moist sites, including oak-linden-hornbeam forest, acidophilus and eutrophic beech forests, acidophilus and thermophilous

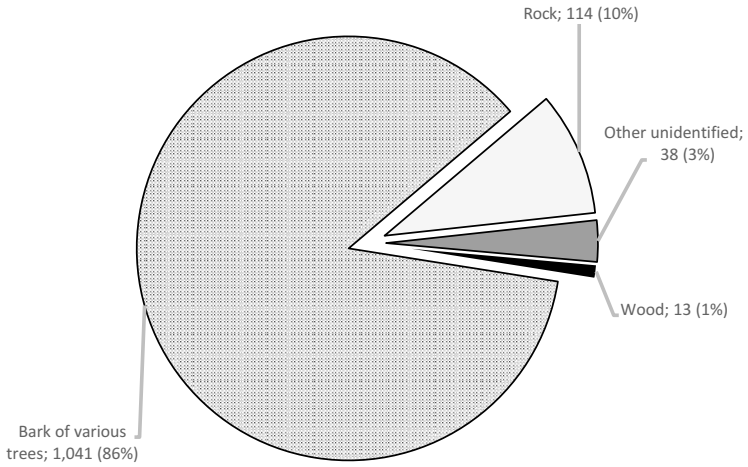


Fig. 21 Numeric and percentage of the contribution of ecological groups in the genus *Opegrapha* s. l.

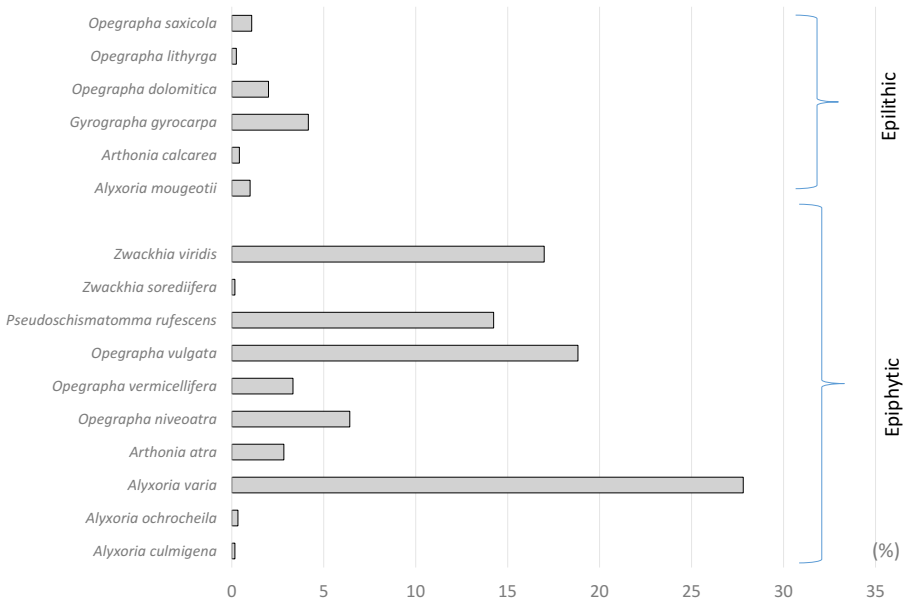


Fig. 22 Percentage contribution of specimens of epiphytic and epilithic species.

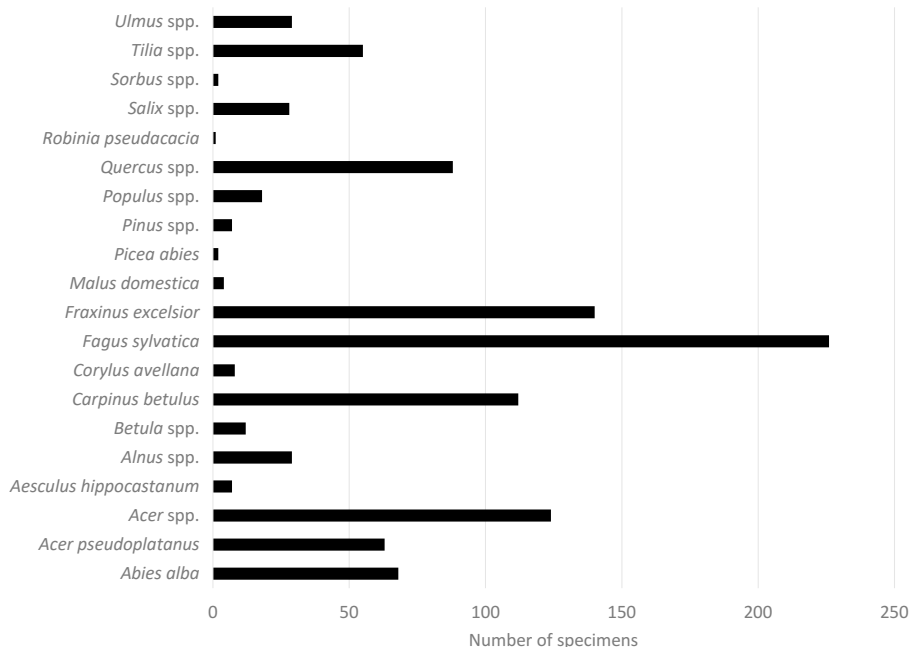


Fig. 23 Number of specimens of epiphytic species of *Opegrapha* s. l. on various phorophytes.

oak forests, streamside alder-ash forest, and black alder bog forest. They are found in plant communities of the *Opegraphetum rufescentis* Almb. 1948 ex Klem. 1955 and *Opegraphetum vermicelliferae* Almborn 1948 [38] association.

The most frequently recorded epiphytic species from Poland include *Alyxoria varia* (311 herbarium specimens), *Opegrapha vulgata* (226), and *Pseudoschismatomma rufescens* (164). More research is needed on rare species (*Alyxoria culmigena*, *O. niveoatra*, or *O. vermicellifera*) to determine their distribution and ecological preferences.

All of the recorded epiphytic lichen species, except for *Alyxoria culmigena* and *A. ochrocheila* (extremely rare species), are on the “Red list of threatened lichens in Poland” [52]. One of them, *O. vermicellifera*, is regarded as an indicator of lowland primeval forests [53].

There are six epilithic lichens of the genus *Opegrapha* s. l. found in Poland: *Alyxoria mougeotii*, *Arthonia calcarea*, *Gyrographa gyrocarpa*, *Opegrapha dolomitica*, *O. lithyrgea*, and *O. saxicola*. They occur primarily in uplands and mountains, and grow mostly on limestones, but occasionally also on sandstones and other rocks (Fig. 24), shaded and moist sites, or sunlit and moderately dry sites. Species found on natural limestones are highly specific (e.g., *A. calcarea*, *O. dolomitica*, and *O. saxicola*). In contrast, *Gyrographa gyrocarpa* prefers sandstones. The other species, *O. mougeotii* and *O. lithyrgea*, are as frequent on both limestone and sandstone. As epilithic lichens, they usually are major components of epilithic moss-lichen communities. For example, Wirth et al. [39] listed *O. gyrocarpa* and *O. lithyrgea* as components of mountain lichen grasslands of the alliance *Enterographetum zonatae* (Fegel 1939) Wirth 1972.

The most frequently recorded epilithic species are *Gyrographa gyrocarpa* (both sterile and fertile specimens were noted) and *Opegrapha dolomitica*.

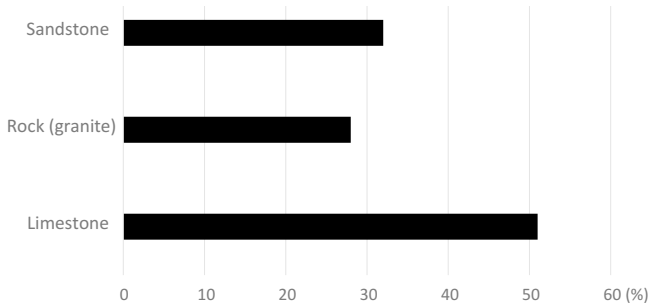


Fig. 24 Percentage contribution of epilithic species on various rocks types.

Three of the epilithic lichen species of this group recorded from Poland (*Arthonia calcarea*, *Gyroglypha gyrocarpa*, and *Opegrapha dolomitica*) are threatened in Poland [52]. One of them, *Alyxoria mougeotii*, is on the red list of the Beskid Sądecki Mountains [54].

4.4. Geographic distribution

Opegrapha s. l. is a genus with a wide, pancontinental distribution, as it is known from all continents except Antarctica. Most of the species recorded from Poland are widespread in the country.

Epilithic species are distributed mostly in the southern part of Poland (Fig. 25A). All of them are typical mountain species, found in both the subalpine and montane zones. The

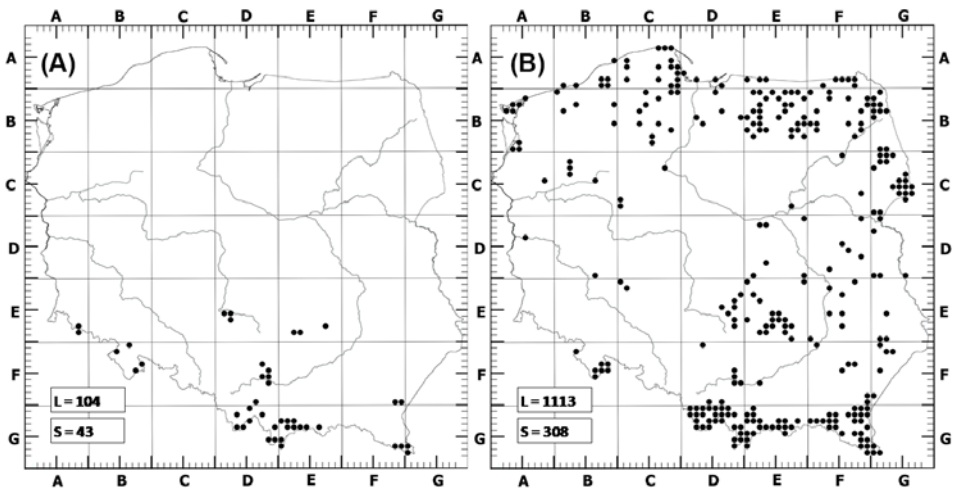


Fig. 25 Distribution of (A) epilithic and (B) epiphytic species of *Opegrapha* s. l. in Poland.

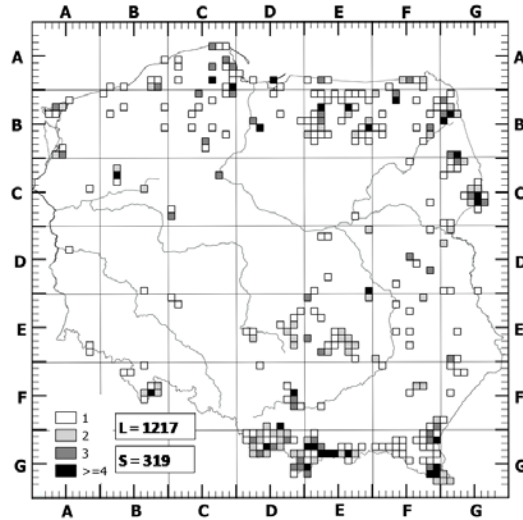


Fig. 26 The number of species of the genus *Opegrapha* s. l. recorded in individual 10 × 10-km grids, which are based on the ATPOL grid square system in Poland.

distribution of epiphytic species is associated with extensive natural woodlands. They were recorded both in lowlands and in mountains (Fig. 25B).

The highest species diversity was recorded in southern Poland, in the West Beskids, Tatras, and Bieszczady Mountains. In the north, high diversity occurs in the Pojezierze Mazurskie (Masurian Lake District) and Nizina Północnopodlaska (North Podlachian Lowland) (Fig. 26). The higher number of species in these regions results from the presence of the old, well-preserved forests and more favorable ecological conditions [55,56], but this may be a consequence of more intensive lichen surveys conducted in the area.

4.5. Key to the species of *Opegrapha* s. l. found in Poland

- 1 Ascospores up to three-septate.....2
- 1* Ascospores 4–15-septate.....11
- 2 On rock.....3
- 2* On tree bark, wood, plant debris.....8
- 3 Growing directly on rock.....4
- 3* Lichenicolous.....7
- 4 Thallus C–, KC–.....5
- 4* Thallus C+ reddish, KC+ reddish.....*Gyroglypha gyrocarpa* (4.6.7)
- 5 Asci *calcareae*-type.....*Arthonia calcarea* (4.6.6)
- 5* Asci *varia*-type.....6
- 6 Ascospores length <22 μm.....*O. saxicola* (4.6.12)

6*	Ascospores length >22 µm.....	<i>O. dolomitica</i> (4.6.8)
7	Hypothecium pale.....	<i>O. geographicola</i> (4.6.9)
7*	Hypothecium dark, grey to grey-brown.....	<i>Phacographa glaucomarina</i> (4.6.15)
8	Asci <i>calcareo</i> -type.....	<i>Arthonia atra</i> (4.6.5)
8*	Asci <i>varia</i> -type.....	9
9	Conidia 12–19 µm long, two–three-septate.....	<i>Alyxoria ochrocheila</i> (4.6.3)
9*	Conidia 4–7 µm long.....	10
10	Ascospores 3–4 µm wide, perispore absent.....	<i>Pseudoschismatomma rufescens</i> (4.6.16)
10*	Ascospores 4–7 µm wide, perispore present.....	<i>Alyxoria culmigena</i> (4.6.1)
11	On rock.....	12
11*	On tree bark, wood, plant debris.....	13
12	Ascospore cells of similar size, asci <i>vulgata</i> -type.....	<i>O. lithyriga</i> (4.6.10)
12*	Middle cell of ascospore enlarged, asci <i>varia</i> -type.....	<i>Alyxoria mougeotii</i> (4.6.2)
13	Ascospores four–six-septate.....	16
13*	Ascospores 6–15-septate, fusiform.....	19
16	Middle cell of ascospore enlarged.....	<i>Alyxoria varia</i> (4.6.4)
16*	Ascospore cells of similar size.....	17
17	Conidia straight, pycnidia whitish pruinose.....	<i>O. vermicellifera</i> (4.6.13)
17*	Conidia straight or curved, pycnidia epruinose.....	18
18	Conidia 4–9 µm long.....	<i>O. niveoatra</i> (4.6.11)
18*	Conidia 9–15 µm long.....	<i>O. vulgata</i> (4.6.14)
19	Perispore 1.5–2.0 µm thick.....	<i>Zwackhia viridis</i> (4.6.18)
19*	Perispore 0.5–0.9 µm thick.....	<i>Zwackhia sorediifera</i> (4.6.17)

4.6. Species characteristics

4.6.1. *Alyxoria culmigena* (Lib.) Ertz

in Diederich, Ertz, Eichler, Cezanne, Boom, Fischer, Killmann, van den Broeck & Sérusiau, Bull. Soc. Nat. luemb. 113: 105 (2012).

≡ *Opegrapha culmigena* Lib., Pl. crypt. Arduenna, fasc. (Liège) 1: No. 15 (1830).

= *Opegrapha betulina* Sm., in Smith & Sowerby, English Botany. 32: Tab. 2281 (1811).

= *Opegrapha herbarum* Mont., in Guillemin, Arch. Bot. (Forli) 2: 302 (1833).

Thallus thin, smooth or delicately wrinkled, grey-whitish, sometimes with yellow-green tint. Ascوماتa numerous, solitary or in small groups, short or elongate, unbranched, rarely branched, 0.3–2 × 0.1–0.3 mm. Discs narrow, concave, black, not pruinose. Excipulum thick, elevated, permanent, black, dark brown, K–, continuous below the hypothecium, 35–45 µm thick laterally and 50–90 µm at the base. Hypothecium 40–60 µm high, I+ slightly stained blue. Hymenium 50–70 µm high, hyaline, I+ reddish. Pseudoepithecium up to 25 µm high, I+ pale blue. Asci elongate, cylindrical or elongate-ellipsoid, 40–60 × 15–18 µm, *varia*-type. Ascospores hyaline, spindle-shaped, with blunt ends, three-septate, 18–26 × (4)5–7 µm, with perispore of 0.7–1.2 µm thick. Pycnidia scattered, sunken, visible as very small, blackish dots. Conidia straight, 4–7 × 0.5–1 µm (Fig. 27). Chemistry: thalli K–, C–, PD–.

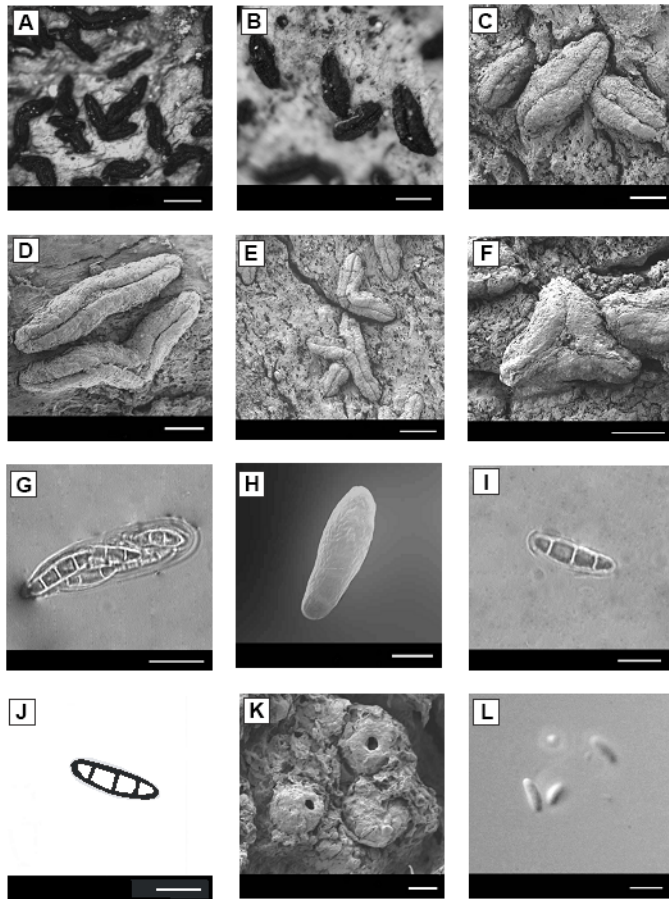


Fig. 27 *Alyxoria culmigena* (Lib.) Ertz: (A,B) thallus and ascomata, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (C-F) thallus and ascomata, SEM (leg. L. Lipnicki, 1989, herb. Lipnicki); (G) ascus with ascospores, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (H) ascospore, SEM (leg. L. Lipnicki, 1989, herb. Lipnicki); (I,J) ascospores, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (K) pycnidia, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (L) conidia, LM (leg. A. Wieczorek, 1997, herb. Wieczorek). Scale bars: (A) 1 mm; (B-D,K) 100 μ m; (E,F) 250 μ m; (G) 20 μ m; (H,J) 10 μ m; (L) 5 μ m.

Discussion. According to Nowak [10], *Alyxoria culmigena* (= *O. herbarum*) is very closely related to *Arthonia atra*, and sometimes they can be difficult to distinguish. My observations show that *Alyxoria culmigena* has slightly longer and straighter ascospores and conidia. Nowak [10] also reported that this species, in comparison to *Arthonia atra*, has wider ascospores, but I could not confirm that report. Other similar of epiphytic taxa with three-septate ascospores are *Alyxoria ochrocheila* and *Pseudoschismatomma rufescens*. *Alyxoria culmigena* differs from *A. ochrocheila* by much shorter, unicellular conidia and a lack of pruina, and it differs from *P. rufescens* by having wider ascospores and the presence of a perispore.

Because of the small number of specimens, it is difficult to assess variability within this species. Nowak [10] distinguished two varieties: var. *herbarum* known from France, Germany, and Belgium, and var. *betulina* (Oliv.) J. Nowak reported from Poland. The latter is supposed to have two forms: for. *betulina* and for. *conferta* (Erichs.) J. Nowak. The specimens that I examined produced mostly unbranched (or occasionally branched) ascomata making it difficult to distinguish among the different forms. The population from the Puszcza Barlinecka (Barlinecka Forest) had some features of for. *betulina* that typically has unbranched ascomata, but branched ascomata also were found on the thallus.

According to the latter cited authors, these features justify the creation of a separate genus. Separating the genus *Alyxoria* also was confirmed by results of molecular studies [7] and in my anatomical research.

Nomenclatural notes. This species is one of the first taxa recognized in the genus *Opegrapha*. It was described by Smith in 1811 [57] as *O. betulina*. Under the name *O. herbarum*, it was reported by Montagne in 1833 [58]. Both names (*O. betulina* and *O. herbarum*) of this species have been widely accepted by lichenologists [59,60]. The species was included in the genus *Opegrapha* until recently. Currently, with *O. ochrocheila*, *O. varia*, *O. subelevata* Nyl., and *O. bicolor* R. C. Harris & Lendemer, it is placed in the genus *Alyxoria*. This generic name was first used by Gray [61] to describe *A. diaphora* Gray and *A. notha* (Ach.) Gray, and it was based on the generic name *Alyxorina*, which first was used by Acharius [2]. That name, however, was not accepted, and contemporary lichenologists returned its initial generic name, *Opegrapha* [62–64]. In all *Alyxoria* species, *varia*-type asci are produced, which are characterized by a short, wide ocular chamber without an apical nasse, and staining to about half of the inner layer of the endoascus [34]. According to the cited authors [34], these features justify the creation of a separate genus. Separating the genus *Alyxoria* was also confirmed by results of molecular studies [7] and in my anatomical research.

Distribution outside Europe. Species with a wide geographic range, found in Africa (Morocco: [65]), South and North America (Canada [66] and Alaska [67]), Asia (Korea [68] and Taiwan [69]), and in Australia [70].

Habitat and distribution in Europe. *Alyxoria culmigena* is found on smooth bark of these deciduous trees: *Carpinus betulus*, *Fagus sylvatica*, *Acer* spp., *Fraxinus excelsior*, and *Quercus* spp. Occasionally in Belarus, it was recorded from the bark of *Pinus* spp., but rarely from decaying wood or bark of tree trunks.

In Europe it is known from, e.g., Austria [71], Estonia [72], Ireland [73], Italy [74], Portugal (Madeira [75]), and Slovenia [76].

Habitat and distribution in Poland. In Poland, it grows on the bark of *Populus* spp. and *Fagus sylvatica*, where it is probably the rarest species of the genus *Opegrapha* s. l., first reported by Ohlert [77] and Lettau [78]. It was later reported from the Pobreże Kaszubskie (Kashubian Coastland) [79], Pobreże Szczecińskie (Szczecin Coastland) [80], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foothills) [81], Pojezierze Ełckie (Ełk Lakeland) [82], Pojezierze Kaszubskie (Kashubian Lake District) [83], Pomorze Gdańskie (Gdańsk Pomerania) [84], Równina Drawska (Drawno Plain) [85], Równina Słupska (Słupsk Plain) [86], and Wyżyna Lubelska (Lublin Upland) [87].

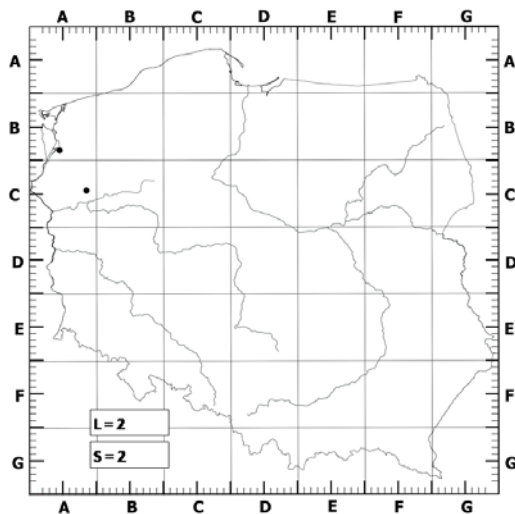


Fig. 28 Distribution of *Alyxoria culmigena* in Poland.

Only two herbarium specimens were available to study from two localities in northwestern Poland (Fig. 28). The records are published here for the first time.

4.6.2. *Alyxoria mougeotii* (A. Massal.) Ertz, Frisch & G. Thor

in Frisch, Thor, Ertz & Grube, *Taxon* 63(4): 727–744 (2014).

≡ *Opegrapha mougeotii* A. Massal., *Memor. Lich.*: 103 (1853).

Thallus very thin, poorly developed, continuous or cracked, granulose, whitish, sometimes with grey-brown tint. Ascromata numerous, solitary or in small groups, unbranched or branched, 0.5–2.5 × 0.2–0.4 mm. Discs narrow, very rarely slightly widened, concave or flat, black, not pruinose. Excipulum well defined, permanent, black, naked, dull or sparsely dotted with granules of thallus, continuous below the hypothecium, 30–50 μm thick laterally and 40–70 μm at the base. Hypothecium 20–40 μm high. Hymenium 45–70 μm high, I+ reddish. Pseudoepithecium 1.2–1.5 μm high. Asci club-shaped, mature 55–70 × 15–20 μm, young 40–55 × 13–15 μm, inner layer of endoascus amyloid in upper part, ring visible around a small ocular chamber (*varia*-type). Ascospores hyaline, spindle-shaped, straight or slightly curved, five–eight-septate, 19–30 × 4–8 μm, with enlarged middle cell, pointed distal cells, and with perispore of 0.8–2 μm thick. Pycnidia sunken in thallus, conidia straight, 4–6 × 1 μm (Fig. 29). Chemistry: thalli K–, C–, PD–.

Discussion. *Alyxoria mougeotii* sometimes resembles *O. saxicola* in the ascromata shape and thallus habit, but these two species differ in ascospore size and structure. The major distinguishing feature between the species is that *A. mougeotii* has an enlarged middle cell in the ascospore.

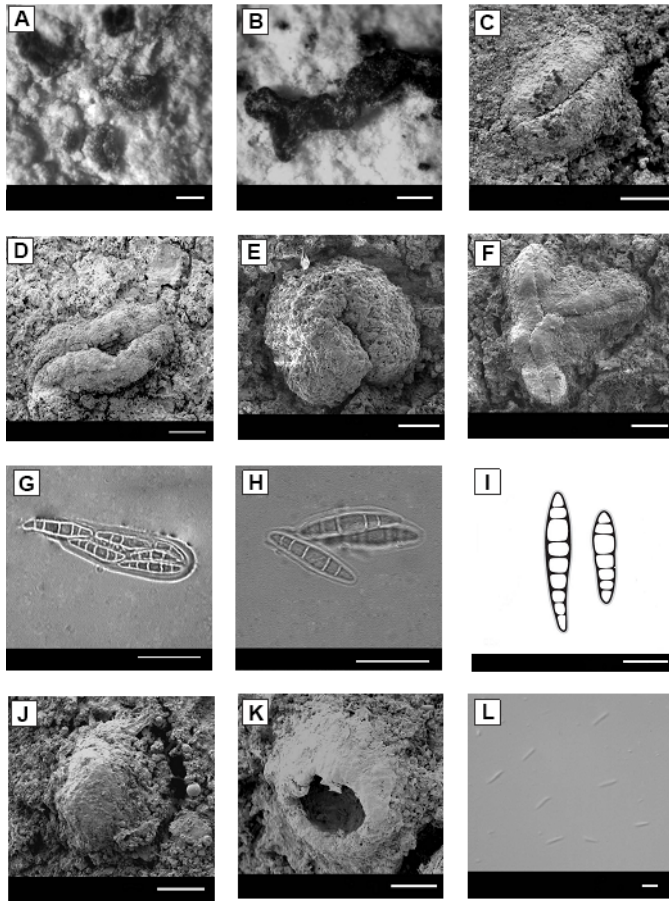


Fig. 29 *Alyxoria mougeotii* (A. Massal.) Ertz, Frisch & G. Thor: (A,B) thallus and ascomata, LM (leg. Z. Tobolewski, 1954, POZ); (C-F) thallus and ascomata, SEM [(C,D) leg. J. Nowak, KRAM-L 4132; (E,F) leg. J. Nowak, KRAM-L 4128)]; (G) ascus with ascospores, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (H,I) ascospores, LM (leg. A. Wieczorek, 1985, herb. Wieczorek); (J,K) pycnidium, SEM (leg. Z. Tobolewski, 1954 Aug 6, POZ); (L) conidia, LM (leg. Z. Tobolewski, 1954, POZ). Scale bars: (A) 200 μm ; (B–D,F,K) 100 μm ; (E,J) 50 μm ; (G–I) 10 μm ; (L) 5 μm .

Alyxoria mougeotii has highly variable sizes and shapes of the ascomata, depending on environmental conditions. Their ascomata usually are ellipsoid [var. *lutescens* (Ach.) Redgr.], rarely circular, or strongly elongate and branched (var. *mougeotii*) [10]. In most of the examined ascomata, the disc was narrow and flat or slightly convex. They generally had an excipulum of type B, but only occasionally type C. The white thallus was sessile, and convex pycnidia were observed (Fig. 30).

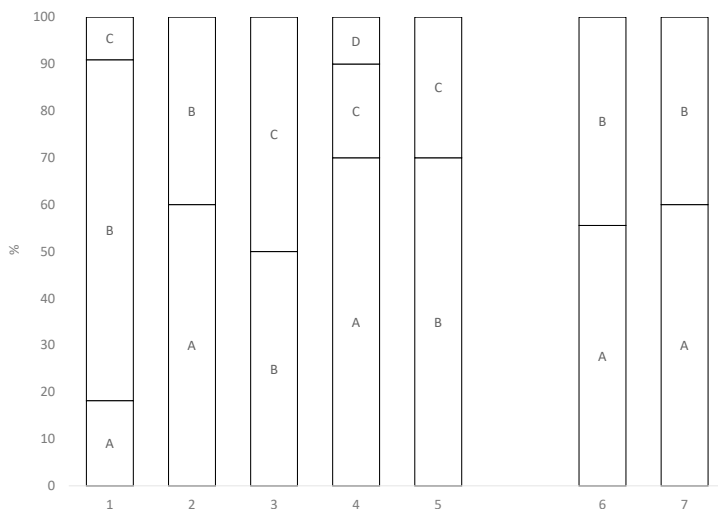


Fig. 30 Variation in selected morphological and anatomical features of *Alxyoria mougeotii*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Distribution outside Europe. *Alxyoria mougeotii* is known only from a few localities outside of Europe, including Morocco [65] and Tunisia [88] in North Africa.

Habitat and distribution in Europe. Epilithic types are found typically growing on limestone, rarely on sandstone, and in shaded and moist sites. Its distribution has been studied insufficiently. Reported from Austria [71], Estonia [89], Germany [90,91], Great Britain [92], Hungary [93], Ireland [94], Malta [95], the Netherlands [96], Norway [97], Portugal (Madeira, Azores [75,98]), Spain [99], Sweden [97], and Ukraine [100].

Habitat and distribution in Poland. Like other parts of Europe, in Poland *Alxyoria mougeotii* grows on limestone, but less often on sandstone or slate. It grows primarily on vertical or hanging sites that dry and shaded, and occasionally in slightly moist sites. Sometimes, it can be found in partly sunny sites.

Its first records were from the Wąwóz Szopczański [Sobczański] (Szopczański Gorge) (in the Pieniny Mountains) [101]. Later, it was reported from several other localities in the southern part of the country, including the Beskid Sądecki mountain range [102,103], Dolina Dolnego Sanu (Lower San River Valley) [104], Świętokrzyskie Mountains [105], Łańcuch Tatrzański macroregion [106,107], Niecka Włoszczowska (Włoszczowa Basin) [108], Pagóry Jaworznickie (Jaworzno Hills) [109], Pieniny Mountains [110,111], and Pogórze Przemyskie (Przemysł Foothills) [112].

The species is rare in Poland (Fig. 31), as it is known only from 13 localities in the Central Beskids or a few more localities in the Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Kielecka (Kielce Upland), and Pogórze Przemyskie.

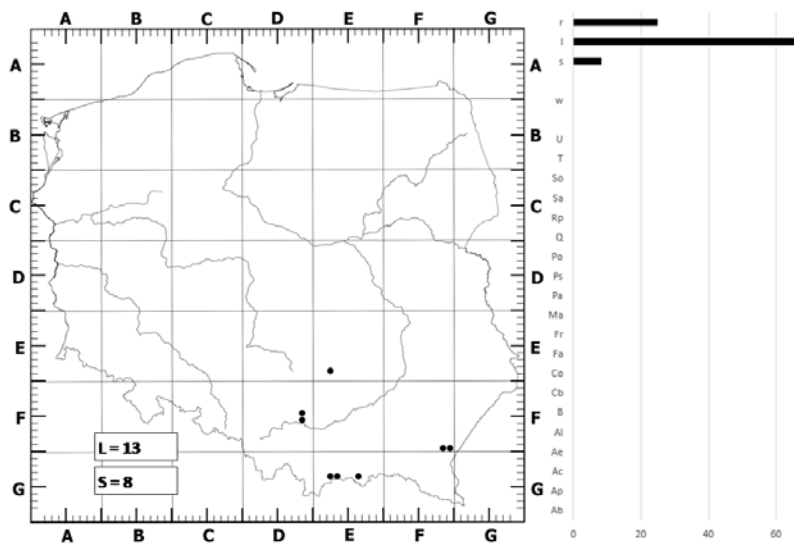


Fig. 31 Distribution and substrate preference of *Alyxoria mougeotii* in Poland.

4.6.3. *Alyxoria ochrocheila* (Nyl.) Ertz & Tehler

Fungal Diversity 49(1): 50 (2011).

≡ *Opegrapha ochrocheila* Nyl., Flora (Regensburg) 48: 212 (1865).

= *Opegrapha rubescens* Sandst., Abh. Naturw. Ver. Bremen 21: 50 (1919).

Thallus thin, continuous, white or grey, covered by orange pruina. Ascomata numerous, solitary or in groups, unbranched or branched, black, $0.5\text{--}2.0 \times 0.2\text{--}0.4$ mm. Discs narrow, sometimes slightly wider in central part, pruinose with rusty-orange pruina. Excipulum relatively thick, elevated, black, pruinose similarly to disc, continuous below the hypothecium, $20\text{--}30$ μm thick laterally and $40\text{--}50$ μm at the base. Hypothecium pale brown, $20\text{--}35$ μm high. Hymenium $50\text{--}65$ μm high, I+ partly blue-green. Pseudoepithecium poorly developed, reddish-brown, $10\text{--}15$ μm high. Asci club-shaped, $45\text{--}60 \times 13\text{--}15$ μm , inner layer of endoascus amyloid in upper part (*varia*-type). Ascospores hyaline, ellipsoid, three-septate, $14\text{--}18 \times 4\text{--}5$ μm , with very narrow, hardly visible perispore of $0.4\text{--}0.7$ μm thick. Pycnidia numerous, small, black. Conidia straight, two–three-septate, $12\text{--}19 \times 1\text{--}2$ μm (Fig. 32). Chemistry: thalli K–, C– PD–.

Discussion. The major microscopic feature that unambiguously distinguishes *A. ochrocheila* from other epiphytic species are the two–three-septate conidia that are $12\text{--}19$ μm long. Some specimens that did not produce conidia were reported in the literature [35], but in Poland no such materials were observed. *Alyxoria ochrocheila* is easy to distinguish with the use of a magnifying glass due to the characteristic rusty-orange pruina on the ascomata. Pentecost and James [59] and Ertz [35] described specimens with a nonpruinose ascomata, but all of the specimens from Poland had scattered pruinose ascomata. With respect to asci and ascospores, *A. ochrocheila* has slightly wider ascospores than *Pseudoschismatomma rufescens*, shorter ascospores than *Alyxoria culmigena*, and when compared to *Arthonia atra*, *A. ochrocheila* has no amyloid layer in the ascus and a short chamber without apical nasse.

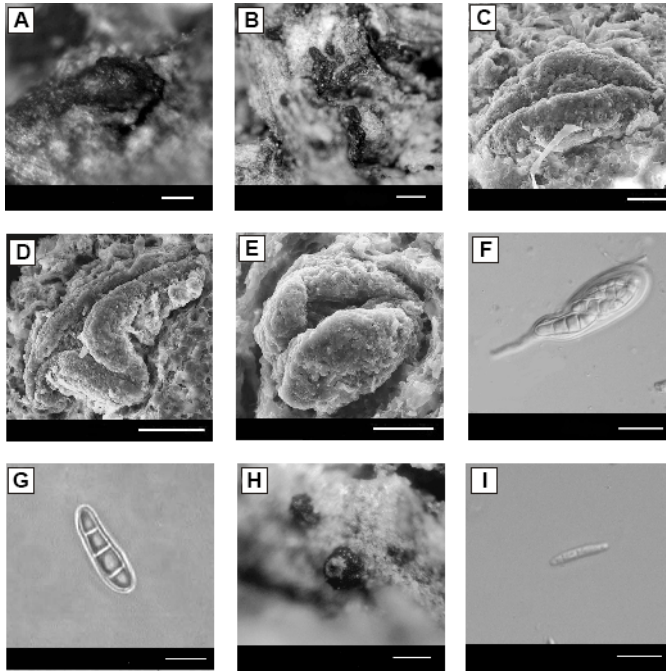


Fig. 32 *Alyxoria ochrocheila* (Nyl.) Ertz & Tehler: (A,B) thallus and apothecia, LM; (C–E) apothecia, SEM; (F) ascus with mature spores, LM; (G) ascospore, LM; (H) pycnidia, LM; (I) conidium, LM (leg. J. Kiszka & J. Nowak, KRAM-L 17736). Scale bars: (A,B) 1 mm; (C,D) 100 μ m; (E) 50 μ m; (F,G) 10 μ m; (H) 500 μ m; (I) 20 μ m.

The five voucher specimens examined were insufficient to assess intraspecific variation. However, the studied specimens produced mostly solitary, unbranched ascomata, with narrow, exclusively concave discs that were widened sporadically in the central region. Few ascomata were branched. All specimens had relatively numerous, convex pycnidia.

Nomenclatural notes. The species was described in 1865 by Nylander [113], who gave it the binomial *Opegrapha ochrocheila*. Leighton [114] considered it as a form of *O. atra*, which was accepted by Bouly de Lesdain [115] and Smith [116]. However, this treatment was rejected by other researchers, who treated it as a separate species [1,34,38,117–119].

Distribution outside Europe. It is known from North America (e.g., from Canada [66]) and Asia (Armenia [120] and Yemen [121]).

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], *A. ochrocheila* occurs in Central Europe, Mediterranean, and sub-Atlantic regions. It usually grows on the smooth bark of *Fagus sylvatica* and *Carpinus betulus* and usually is found in moist forest communities where the substrate is moderately acidic to neutral: pH 5.7–7.0 [38].

Known from Europe, e.g., from Austria [71], Denmark [122], Estonia [123], Germany [90,124–126], Great Britain [92], Greece [127], Ireland [94], Italy [74], the Netherlands

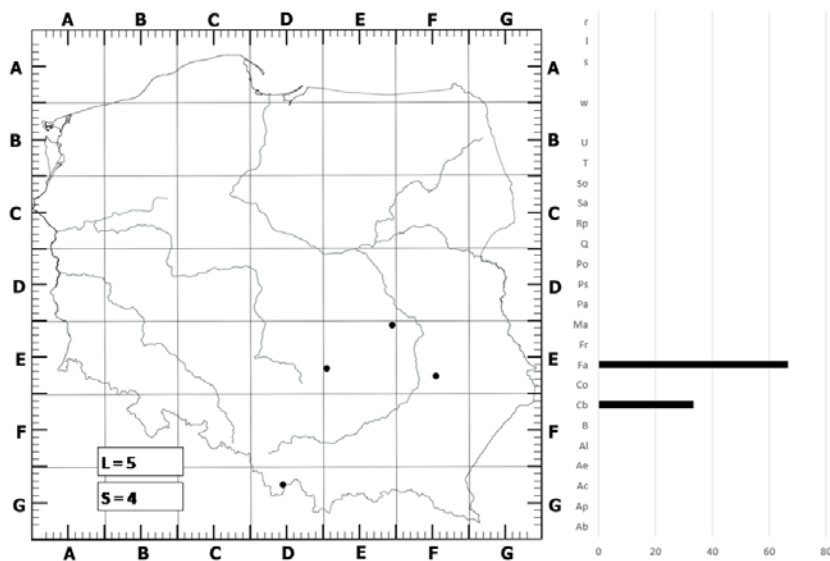


Fig. 33 Distribution and substrate preference of *Alyxoria ochrocheila* in Poland.

[96], Norway [97,128], Portugal (Azores [98]), Slovenia [76], Spain [99], Sweden [128], and Switzerland [129].

Habitat and distribution in Poland. Two of the analyzed specimens grew on the bark of *Fagus sylvatica*, while the third one grew on *Carpinus betulus*. The species was first reported by Migula [130] in northern Poland, and it also was found in the Beskid Sądecki Mountains [103], Beskid Żywiecki Mountains [131], Dolny Śląsk (Lower Silesia Province) [132], Pieniny Mountains [110], Równina Kozienicka (Kozienice Plain) [133], Wzgórza Łopuszańskie (Łopuszańskie Hills) [134].

Based on the available herbarium material, the species occurs in central and southern Poland (Fig. 33).

4.6.4. *Alyxoria varia* (Pers.) Ertz & Tehler

Fungal Diversity 49(1): 53 (2011).

= *Opegrapha varia* Pers., Ann. Bot. (Usteri) 1: 30 (1794).

= *Opegrapha diaphora* Ach., Meth. Lich.: 19 (1803).

= *Opegrapha lichenoides* Pers., Ann. Bot. (Usteri) 7: 30 (1794).

= *Opegrapha pulicaris* (Hoffm.) Schrad., in Acharius, Lichenogr. Univ.: 251 (1810).

= *Opegrapha variiformis* Anzi Comm. Soc. crittog. Ital. 1 (fasc. 3): 160 (1862).

Thallus thin, smooth or cracked, from white to grey, white-grey and brownish. Ascomata numerous, variable in size and shape, solitary or in small groups, unbranched or branched, 0.3–2.0 × 0.2–0.8 mm. Discs concave, flat or convex, wide, in younger specimens sometimes narrow, usually not, but sometimes pruinose with whitish or yellow pruina. Excipulum black,

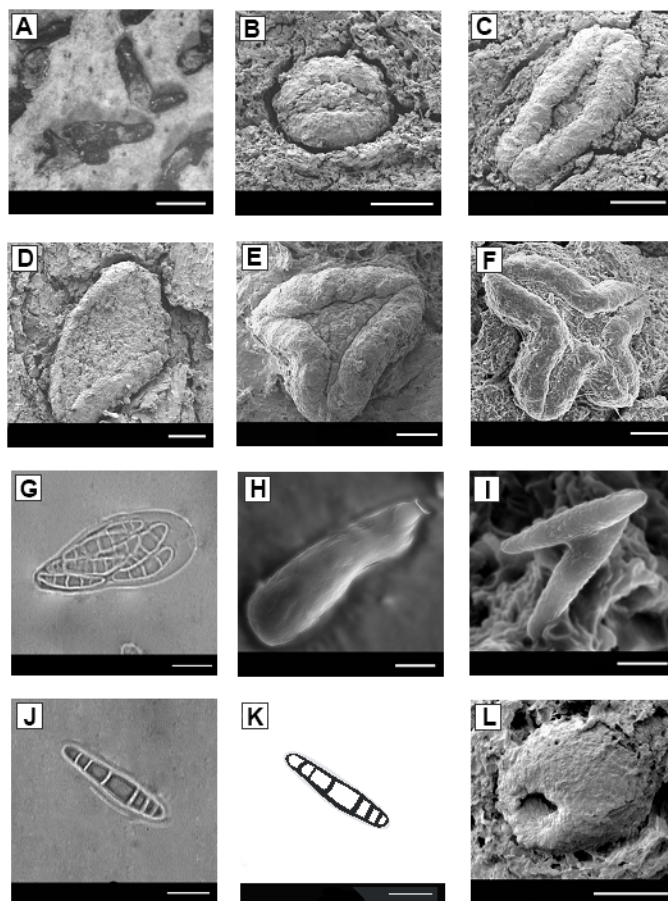


Fig. 34 *Alyxoria varia* (Pers.) Ertz & Tehler: (A) thallus and ascomata, LM (leg. J. Nowak, KRAM-L 14551); (B–F) thallus and ascomata, SEM [(B,D) leg. S. Cieśliński, 1993, KTC; (C) leg. J. Nowak, KRAM-L 14551; (E,F) leg. S. Cieśliński, 1988, KTC]; (G) ascus with ascospores, LM (leg. J. Nowak, KRAM-L 14551); (H) ascus, SEM (leg. S. Cieśliński, 1990, KTC); (I) ascospores, SEM (leg. K. Toborowicz, 1976, KTC); (J,K) ascospores, LM (leg. S. Cieśliński, 1990, KTC); (L) pycnidium, SEM (leg. K. Glanc, KRAM-L 39086). Scale bars: (A) 500 μ m; (B–G) 100 μ m; (H–J) 10 μ m; (K) 20 μ m; (L) 50 μ m.

well defined, permanent, edge thick, lips strongly curved towards hymenium, continuous, rarely discontinuous below the hypothecium, 20–45 μ m thick laterally and 30–60 μ m at the base. Hypothecium 15–50 μ m high, K–. Hymenium hyaline or pale yellowish, 40–80(90) μ m high, I+ red-yellow. Pseudoepithecium grey-brown, 10–25 μ m high, K–. Asci club-shaped, 30–70 \times 12–18(20) μ m, inner layer of endoascus amyloid to half of its length (*varia*-type). Ascospores hyaline, spindle-shaped, straight, four–six-septate, 15–30 \times 4–7(8) μ m, with enlarged middle cell, and with visible perispore of 0.6–1.5 μ m thick. Pycnidia scattered, sunken. Conidia straight or slightly curved, 3–4 \times 1–1.5 μ m (Fig. 34). Chemistry: thalli K–, C–, PD–.

Discussion. *Alyxoria varia* is easy to distinguish from other epiphytic species. Its diagnostic features are: the enlarged middle cell of ascospores, and the amyloid upper half of the inner layer of the endoascus.

Alyxoria varia is highly variable with respect to thallus color, morphology, and anatomy of the ascomata. Individual populations in Poland and other parts of Europe differ remarkably, not only in thallus color and size and shape of ascomata, but also in ascospore size. These features resulted in a taxonomic description of many varieties and forms of this species, including *O. lichenoides* for. *populina* (Mong.) A. Zahlbr., for. *confluens* (Massal.) A. Zahlbr., for. *cerebrina* (Erichs.) J. Nowak, for. *juglandis* (Massal.) A. Zahlbr., var. *nigrocaesia* Chev., var. *chlorina* (Pers.) Redgr., *O. pulicaris* for. *lignicola* (Harm.) A. Zahlbr., for. *minuta* (Chev.) Oliv., for. *incrustedata* (God.) Oliv., for. *pollinii* (Massal.) Redgr., for. *phaea* (Ach.) Oliv., *O. diaphora* var. *diaphora*, for. *signata* (Ach.) J. Nowak, for. *tigrine* (Ach.) J. Nowak, for. *saprophila* (Nyl.) Oliv., var. *tridens* (Ach.) Oliv., var. *spurcata* (Ach.) Ach., for. *subgregaria* Harm., *O. rimalis* Pers. [10]. Its most frequent phenotype in Poland produces numerous circular to elliptic ascomata, with a conspicuous disc and thin excipulum edge. The disc shapes also are variable. Apothecia with flat, convex, and concave discs were observed. Moreover, in the examined material, convex discs were found to have wide and narrow ascomata. The number and types of pycnidia (Fig. 35) also were extremely variable. Similarly, the shape, length, and number of septa vary widely, but their variation is continuous and fits within the range of variability circumscribed for this species. Thus, attempts to identify a relationship between particular phenotypes and distinct taxa at lower ranks were unsuccessful.

Nomenclatural notes. The extreme morphological and anatomical variation of *Alyxoria varia* is due to its extensive geographic range. The variability resulted in a diverse circumscription of the species throughout its history. Considering its complicated taxonomic history, as well as the large numbers of varieties and forms of this species, it is challenging to identify correctly.

Difficulties with its classification probably result from different methods of taxonomic analysis and concepts used by different researchers. The taxon was regarded for a long time as a species aggregate, which could be divided into *Opegrapha lichenoides* (var. *nigrocaesia*, and *chlorina*), *O. pulicaris*, *O. rimalis*, *O. subrimalis*, and *O. diaphora* (var. *diaphora*, *tridens*, *spurcata*, and *angustata* Bouly de Lesd. [1]). For three nomenclatural synonyms (*O. lichenoides*, *O. pulicaris*, and *O. diaphora*), Nowak [10] compiled a list of as many as 22 heterotypic names of intraspecific taxa. Hawksworth et al. [62] excluded *O. pulicaris* from this group, as it was considered an allied fungus growing on lichens. Pentecost and Coppins [119] included only two names in the aggregate species: *O. lichenoides* and *O. varia* (synonyms: *O. diaphora* and *O. rimalis*). Clauzade and Roux [64] maintained that *O. varia* was a collective species. Torrente and Egea [34] attempted to clarify the classification of this group, but failed to find any relationships that determined limits of the taxonomic variation. Because of the discrepancies in systematic classification of this species, I used the concept of Santesson [63], such that all examined material was regarded as *A. varia*.

Distribution outside Europe. Widespread in North America [135–139]. Occasionally recorded from South America, Africa, and Asia. Reported from, e.g., Algeria [140], Argentina [141], the Bahamas [142], Brasil [143], Canada [66], China [144], Costa Rica [145], Hong Kong [146], India [147], Israel [148], Japan [149], Maldives [150], Morocco [65], in eastern Russia [151], Syria [152], Tunisia [88], Turkey [153–155], Uruguay [156,157], and the USA [135–139].

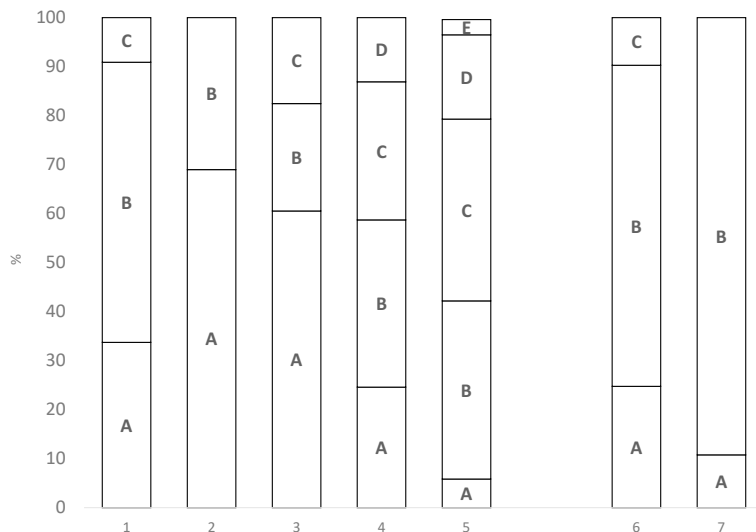


Fig. 35 Variation in selected morphological and anatomical features *Alyxoria varia*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], *A. varia* has a Central European-Mediterranean and Atlantic distribution. In most European countries, it is usually found on the bark of deciduous trees, including *Carpinus betulus*, *Acer* spp., *Fagus sylvatica*, and *Fraxinus excelsior*. It was the least recorded from the bark of *Quercus* spp, and occasionally it was found on conifers. Like most of the species of the group, *Alyxoria varia* prefers moderately acidic to neutral substrates: pH 4.9–7.0 [38,39].

Widely distributed in Europe, reported, e.g., from Albania [158,159], Austria [71,160], Bulgaria [161], Cyprus [162], Denmark [163], Estonia [123,164], Finland [165], France [166,167], Germany [168–170], Greece [127], Hungary [93], Italy [171], Latvia [172], Lithuania [173–175], Malta [95], Montenegro [176], Norway [97], Portugal (Madeira [75,177]), Romania [178,179], Slovenia [76], Spain [99], Switzerland [129], and Ukraine [100,180,181].

Habitat and distribution in Poland. *Alyxoria varia* grows on the bark of various deciduous tree species in Poland, including old, well-preserved forests and moderately sunny sites. Most frequently, it can be found on *Fagus sylvatica*, *Acer* spp., *Fraxinus excelsior*, *Carpinus betulus*, and *Quercus* spp., but it is less frequently found on *Acer pseudoplatanus*, *Ulmus* spp., *Betula* spp., *Tilia* spp., and *Populus* spp. It is found also along streams and rivers (*Salix* spp.) and on roadside trees (*Acer* spp., *Aesculus hippocastanum*, etc.). Occasionally, it can be found on decaying wood, the bark of coniferous trees, and in sandstone.

In the nineteenth century, *Alyxoria varia* was described by Körber [21] and Stein [182], although they did not provide detailed localities. It also was reported without localities by Ohlert [77] and Lettau [78] from Prussia and Galicia [183–185]. During the last 100 years,

there have been a large number of reports of *A. varia* published in the Polish lichenological literature, but many of them are undocumented in the Polish herbaria.

The species was reported from: the Beskid Makowski Mountains [186], Beskid Mały Mountains [187], Beskid Niski Mountains [188], Beskid Śląski Mountains [189,190], Beskidy Lesiste Mountains [191], Bieszczady Mountains [192,193], Bory Tucholskie (Tuchola Forest) [194,195], Dolina Dolnego Sanu (Lower San River Valley) [104], Dolina Konińska (Konin Valley) [196], Dolny Śląsk (Lower Silesia Province) [132], Gorce Mountains [197], Stołowe Mountains [198], Świętokrzyskie Mountains [105,199–201], Karkonosze Mountains [202], Carpathians [203,204], Kotlina Biebrzańska (Biebrza Basin) [205], Kotlina Toruńska (Toruń Basin) [206], Kotlina Żywiecka (Żywiec Basin) [207], Łańcuch Tatrzański macroregion [107,208–211], Małopolski Przełom Wisły (Lesser Poland Gorge of the Vistula) [212], Masyw Ślęży (Ślęża Massif) [213,214], Mierzeja Wiślana (Vistula Spit) [215], Niecka Włoszczowska (Włoszczowa Basin) [216], Nizina Mazowiecka (Mazovian Lowland) [217], northeastern Poland [218], Pieniny Mountains [111,219], Płaskowyż Nałęczowski (Nałęczów Plateau) [220], Pobrzeże Kaszubskie (Kashubian Coastland) [79,221], Pobrzeże Szczecińskie (Szczecin Coastland) [222], Podgórze Rzeszowskie (Rzeszów Foothills) [223], Podhale [224], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foothills) [81], Pogórze Spiskie (Spisz Foothills) [225], Pojezierze Choszczeńskie (Choszczno Lake District) [226], Pojezierze Gnieźnieńskie (Gniezno Lake District) [227–229], Pojezierze Iławskie (Iława Lake District) [230,231], Pojezierze Kaszubskie (Kashubian Lake District) [232], Pojezierze Krajeńskie (Krajna Lake District) [233], Pojezierze Mrągowskie (Mrągowo Lake District) [234], Pojezierze Olsztyńskie (Olsztyn Lake District) [235,236], Pradolina Wieprza (Wieprz River Urstromtal) [237], Pradolina Wrocławska (Wrocław Urstromtal) [238], Równina Augustowska (Augustów Plain) [239–242], Równina Bielska (Bielsk Plain) [55,243], Równina Drawska (Drawno Plain) [244], Równina Kozińska (Kozienice Plain) [245,246], Równina Łęczyńsko-Włodawska (Łęczna-Włodawa Plain) [247,248], Równina Łowicko-Błońska (Łowicz-Błonie Plain) [249], Równina Łukowska (Łuków Plain) [250,251], Równina Piotrkowska (Piotrków Plain) [252,253], Równina Słupska (Słupsk Plain) [86], Roztocze [254–258], Sudetes [259–261], Śląsk Opolski (Opole Silesia) [262], West Beskids [131,190,191], Western Pomerania [56,263,264], Wybrzeże Słowińskie (Slovincian Coast) [265,266], Wysoczyzna Bełchatowska (Bełchatów Highland) [267,268], Wysoczyzna Białostocka (Białystok Highland) [269–272], Wysoczyzna Elbląska (Elbląg Highland) [273], Wysoczyzna Kaliska (Kalisz Highland) [274,275], Wysoczyzna Łaska (Łask Highland) [276], Wysoczyzna Siedlecka (Siedlce Highland) [277], Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland) [278], Wyżyna Sandomierska (Sandomierz Upland) [279], Wyżyna Wieluńska (Wieluń Upland) [280], Wzgórze Radomszczańskie (Radomsko Hills) [216], Wzniesienia Mławskie (Mława Hills) [281], and Zakłęsłość Sosnowicka (Sosnowica Depression) [282].

Throughout Poland, 334 specimens were located in the lowlands and mountains (Fig. 36). A majority of its known localities are in the West Carpathians and East Beskids. It has been reported from the Western Tatras by Tobolewski at 1,150 m in altitude [209]. In the Sudetes, it is known from a few localities. Outside the mountainous regions, it is frequent in the East Baltic-Belorussian Lowlands on phorophytes in extensive, dense woodlands. In northern Poland, it was scattered in the Pojezierze Południowobałtyckie (South Baltic Lakeland) and Pobrzeże Południowobałtyckie (South Baltic Coastland). In other parts of the country, it was observed more often in the eastern Nizina Środkowopolska (Central Poland Lowland). In the western part of the country, it was recorded only occasionally.

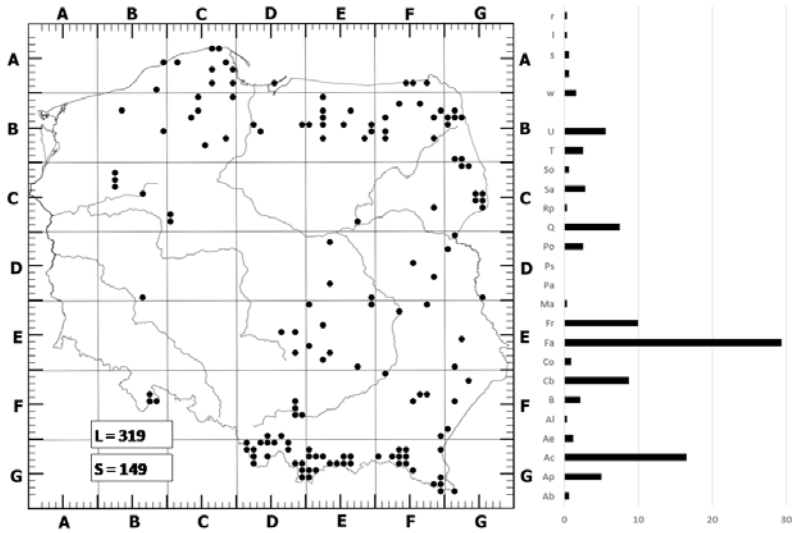


Fig. 36 Distribution and substrate preference of *Alyxoria varia* in Poland.

4.6.5. *Arthonia atra* (Pers.) A. Schneid.

Guide Study Lich.: 131 (1898).

≡ *Opegrapha atra* Pers., Ann. Bot. (Usteri) 7: 30 (1794).

Thallus thin, external, smooth or cracked, ranging in color from white and white-grey to brown. Ascromata numerous, solitary or clustered, unbranched or branched, sometimes forming large and continuous patches, fused terminally, 0.1–0.8 mm long and 0.1–0.3 mm wide. Discs concave (groove-like), flat or, more often, convex, central part rarely ± wider (trough-like), black, not pruinose, 13–133 µm wide. Excipulum relatively thick, elevated, permanent, black, naked, continuous below the hypothecium, rarely discontinuous, 20–40 µm thick laterally and 30–60 µm at the base. Hypothecium 12–25(30) µm high, K–. Hymenium hyaline, 30–60 µm high, I+ blue. Pseudoepithecium brownish, 6–14 µm high, K–. Asci 30–50 × 10–15 µm, *calcareo*-type. Ascospores hyaline, ellipsoid, three-septate, 13–17(20) × 4–6 µm, with perispore of 0.4–0.6 µm thick. Pycnidia frequent, black, usually convex, 17–68 µm in diameter. Conidia straight or curved, 3.5–5 × 0.5–1.5 µm (Fig. 37). Chemistry: thalli K–, C–, PD–.

Discussion. *Arthonia atra* is characterized by short ascospores (up to 17 µm), a thin perispore (0.4–0.6 µm), *calcareo*-type asci, and a short conidium (3.5–5 µm). According to Nowak [10], this species is most similar to *Alyxoria culmigena* (= *O. herbarum*) and *Pseudoschmatomma rufescens* (= *O. rufescens*). However, its ascospores are shorter than in *A. culmigena*, slightly wider than in *P. rufescens*, and have a conspicuous but thin perispore. Moreover, in contrast to the *vulgata*-type asci in *P. rufescens* and the *varia*-type asci in *A. culmigena*, *A. atra* produces *calcareo*-type asci. Another species that can be confused with *A. atra* is *Alyxoria ochrocheila*. Both species have ascospores of similar size and with perispores, but *A. ochrocheila* has conidia that are much longer and two–three-septate.

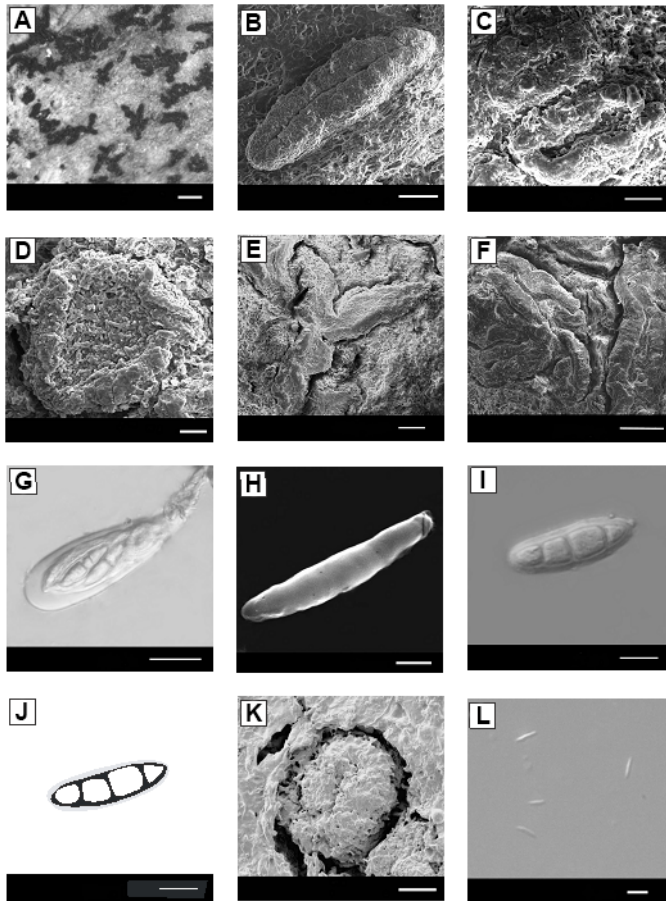


Fig. 37 *Arthonia atra* (Pers.) A. Schneid.: (A) thallus and ascomata, LM (leg. S. Cieśliński, 1993, KTC); (B–F) thallus and ascomata, SEM [(B,D,E) leg. S. Cieśliński, 1985, KTC; (C) leg. S. Cieśliński, 1993, KTC]; (G) ascus with ascospores, LM (leg. A. Wieczorek, 2002, herb. Wieczorek); (H) ascospore, SEM (leg. S. Cieśliński, 1985, KTC); (I, J) ascospores, LM (leg. A. Wieczorek, 2002, herb. Wieczorek); (K) pycnidium, SEM (leg. Z. Tobolewski, 1951, POZ); (L) conidia, LM (leg. A. Wieczorek, 1996, herb. Wieczorek). Scale bars: (A) 2 mm; (B,C,E,F) 100 μ m; (D) 50 μ m; (G, J) 10 μ m; (H) 2 μ m; (I) 5 μ m; (K) 250 μ m; (L) 3 μ m.

Arthonia atra is phenotypic plastic among individuals, depending on changing environmental conditions. In total, 24 intraspecific taxa have been described within *A. atra*, and their names are regarded as synonyms. Based on the shape of their ascomata, Nowak [10] distinguished 11 forms of *O. atra* [for. *atra* – *O. cerasi* Chev., for. *fabricola* B. de Lesd., for. *reticulata* (DC.) J. Nowak, for. *rimosa* (DC.) J. Nowak, for. *denigrata* (Ach.) Leight., for. *stenocarpa* (Ach.) – *O. stenocarpa* Ach., for. *arthonioidea* (Leight.) Leight., for. *nigrita* Leight., for. *platanoides* Nyl., for. *stellulata* Mereschk., for. *orbicularis* B. de Lesd.], including two new ones described from Poland (for. *reticulata* and for. *rimosa*). However, these forms do not appear to deserve separate taxonomic rankings, as the character variation is continuous throughout all examined

material, with many specimens having intermediate features and parameters. In the analyzed material, the ascomata usually were elliptic or elongate, and circular ascomata were very rare (Fig. 38). The ascomata length ranged from 154 μm to 797 μm . Their distribution was scattered or clumped (with similar frequency). The examined specimens had flat or slightly convex discs, rarely concave. In addition to the size and shape of their ascomata, the color of the thalli also varied. They usually contain abundant, convex pycnidia, but the shape of conidia was variable. They usually were slightly curved, but sometimes the same specimen showed both straight and curved conidia.

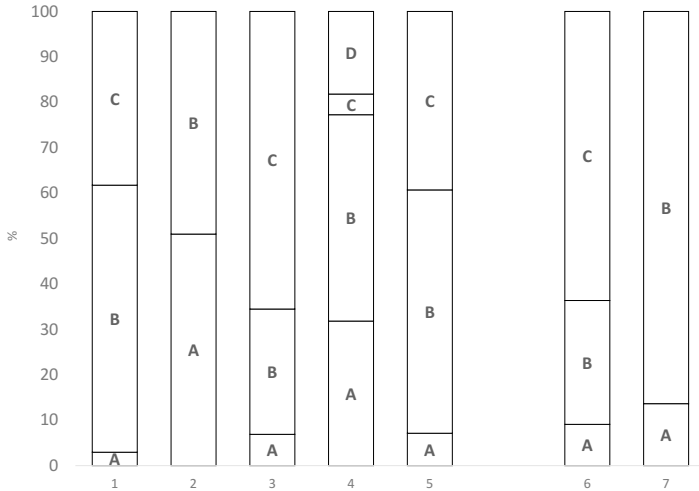


Fig. 38 Variation in selected morphological and anatomical features *Arthonia atra*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types: A – few, B – numerous, C – very numerous; 6 – number of pycnidia: A – sessile, B – convex.

Nomenclatural notes. The taxon was first described by Persoon in 1794 [283], who named it *Opegrapha atra*. It is noteworthy that Schneider in 1898 [284] was the first to call it *Arthonia atra*, but this name was not commonly used. However, according to the latest taxonomic classification [6], the genus *Arthonia* in the order Arthoniales is confirmed. Previously, *O. calcarea* was included in *Arthonia* as well [6] due to the different structure of their asci [34]. This conclusion is confirmed by the present study. The genus *Arthonia* is a heterogeneous group of lichens [33,285] that now contains about 400 species, the largest genus in the order Arthoniales [286].

Distribution outside Europe. Species with a wide geographic range. Recorded from North America (Canada [66], Alabama [287], the Bahamas [142], Florida [139], Louisiana [138], New York [288], South Carolina [289], Wisconsin [290]), Bermudas [291]), in South America (Argentina [141]), in Africa (Lebanon [292], Morocco [65], Tunisia [88]), and in Oceania [293].

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], *Arthonia atra* is a boreal-Mediterranean, sub-Atlantic species. It grows on the bark of various deciduous tree species, but is less often found on conifers. It is most frequently found on *Carpinus betulus*, *Fagus sylvatica*, *Quercus* spp., and *Acer* spp., but less frequently on the bark of *Fraxinus excelsior*, *Abies* spp., and *Picea* spp. Only occasionally is it found on *Pinus* spp. This species usually colonizes moderately acidic substrates, with pH 4.9–5.6 [38].

In Europe, it is known from numerous localities, reported, e.g., from Albania [294], Austria [71], the Czech Republic [295], Denmark [122,163], Estonia [123], Finland [165], France [166], Germany [124,168,170,296–300], Great Britain [92], Greece [127], Hungary [93], Ireland [94], Italy [74,171], Latvia [172], Lithuania [173], Macedonia [301], Malta [95], the Netherlands [96], Norway [97], Portugal (Madeira [75]), Romania [302], Slovenia [76], Spain [99], Sweden [97], Switzerland [129], Turkey [153–155], and Ukraine [100].

Habitat and distribution in Poland. In Poland, *Arthonia atra* grows commonly on the bark of deciduous trees, including *Fagus sylvatica*, *Quercus* spp., *Fraxinus excelsior*, *Acer pseudoplatanus*. It can be found less often on *Acer* spp., *Carpinus betulus*, or *Salix* spp, and very rarely on *Betula* spp., *Corylus avellana*, *Populus* spp., and *Ulmus* spp. Nowak [10] reported it on coniferous trees, including twigs of *Myrica gale*, and on decaying wood.

Most *A. atra* localities are found in northern Poland, while several isolated specimens can occur in central Poland. Additionally, the species was recorded from the Sudetes and Carpathians (Fig. 39).

The first record of *A. atra* was published by Körber [21]. It was also reported by Ohlert [77], Stein [182], Eitner [303], Lettau [78], Boberski [183–185]. Later, the species was many times reported in the Polish lichenological literature from: the Beskid Sądecki Mountains [103], Beskidy Lesiste Mountains [191], Bory Tucholskie (Tuchola Forest) [194,195], Dolny

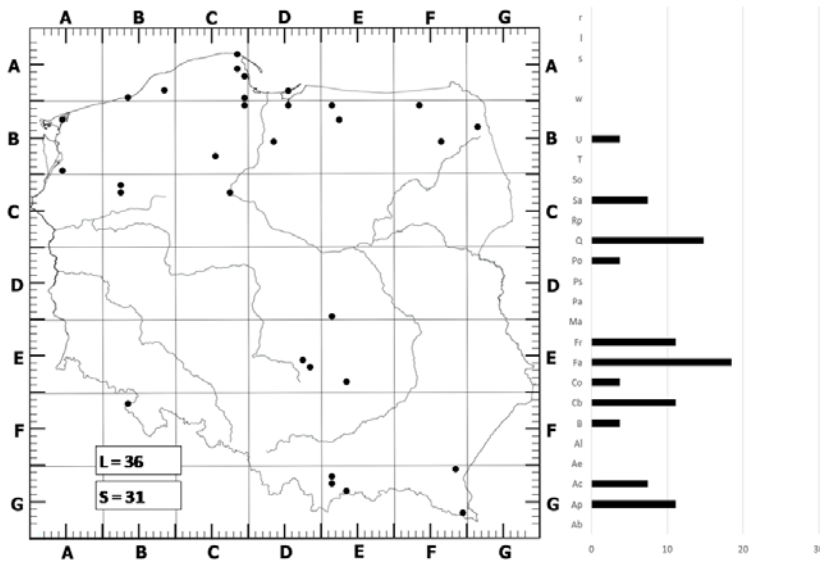


Fig. 39 Distribution and substrate preference of *Arthonia atra* in Poland.

Śląsk (Lower Silesia Province) [132], Gorce Mountains [197], Stołowe Mountains [198], Świętokrzyskie Mountains [105,199–201], Kotlina Biebrzańska (Biebrza Basin) [205], Kotlina Toruńska (Toruń Basin) [206], Łańcuch Tatrzański macroregion [107,208], Małopolski Przełom Wisły (Lesser Poland Gorge of the Vistula) [212], Masyw Ślęży massif [213,214], Niecka Włoszczowska basin [216], Pieniny Mountains [111,219], Płaskowyż Nałęczowski (Nałęczów Plateau) [220], Pobrzeże Kaszubskie (Kashubian Coastland) [79,221,304], Pobrzeże Szczecińskie (Szczecin Coastland) [80,222], Podgórze Rzeszowskie (Rzeszów Foothills) [223], Pogórze Przemyskie (Przemyśl Foothills) [112], Pojezierze Elckie (Elk Lakeland) [305], Pojezierze Gnieźnieńskie (Gniezno Lake District) [227], Pojezierze Iławskie (Iława Lake District) [230], Pojezierze Kaszubskie (Kashubian Lake District) [83,232], Pojezierze Krajeńskie (Krajna Lake District) [233], Pojezierze Mrągowskie (Mrągowo Lake District) [234], Pradolina Wieprza (Wieprz River Urstromtal) [237], Pradolina Wrocławska (Wrocław Urstromtal) [238], Równina Augustowska (Augustów Plain) [240–242,306,307], Równina Bielska (Bielsk Plain) [55], Równina Biłgorajska (Biłgorajska Plain) [308], Równina Drawska (Drawno Plain) [85,244], Równina Łęczyńsko-Włodawska (Łęczna-Włodawa Plain) [247,248], Równina Łukowska (Łuków Plain) [250,251], Równina Piotrowska (Piotrków Plain) [252,253], Roztocze [254–258], Sudetes [260,261], Śląsk Opolski (Opole Silesia) [262], West Beskids [190,191], West Bieszczady Mountains [309], Western Pomerania [56,263,264], Wzgórze Radomszczańskie (Radomsko Hills) [216], Wybrzeże Słowińskie (Slovincian Coast) [266], Wysoczyzna Białostocka (Białystok Highland) [269–272], Wysoczyzna Elbląska (Elbląg Highland) [273], Wysoczyzna Kaliska (Kalisz Highland) [274], Wysoczyzna Łaska (Łask Highland) [276], Wysoczyzna Siedlecka (Siedlce Highland) [277], Wyżyna Lubelska (Lublin Upland) [87], and Zakłęśłość Sosnowicka (Sosnowica Depression) [282].

Most of *A. atra* localities are placed in northern Poland, while several isolated ones are in central Poland. Additionally, the species was recorded from the Sudetes and Carpathians (Fig. 39).

4.6.6. *Arthonia calcarea* (Turner ex Sm.) Ertz & Diederich

in Ertz, Miądlikowska, Lutzoni, Dessein, Raspe, Vigneron, Hofstetter & Deiderich, Mycol. Res. 113(1): 146 (2009).

≡ *Opegrapha calcarea* Turner ex Sm., in Smith & Sowerby, Engl. Bot. 25: Tab. 1790 (1807).

= *Opegrapha chevallieri* Leight., Ann. Mag. Nat. Hist., Ser. 213: 90 (1854).

Thallus thin, white. Ascومات black, not pruinose, elevated, solitary or in small groups, unbranched or branched, $0.3\text{--}1.2 \times 0.15\text{--}0.3$ mm. Discs narrow, reduced to a crevice, concave, $15\text{--}35$ μm wide. Excipulum thick, elevated, permanent, black, naked, continuous below the hypothecium, $20\text{--}35$ μm thick laterally and $30\text{--}45$ μm at the base. Hypothecium grey-brown, $15\text{--}25$ μm high. Hymenium $40\text{--}70$ μm high, I+ blue. Pseudoepithecium hardly visible. Asci club-shaped, $35\text{--}50 \times 15\text{--}20$ μm , inner layer of endoascus slightly amyloid, limited to the dome zone (*calcarea*-type). Ascospores hyaline, ellipsoid, three-septate, $(13)15\text{--}18 \times 4\text{--}6$ μm , with perispore of 0.5 μm thick, sometimes hardly visible. Pycnidia sunken in thallus, rarely convex, conidia straight $5\text{--}8 \times 0.8\text{--}1(1.2)$ μm (Fig. 40). Chemistry: thalli K⁻, C⁻, PD⁻.

Discussion. *Arthonia calcarea* can be distinguished from other epilithic taxa found in Poland primarily by its longer conidia, the presence of an amyloid layer around the ascus, and based on

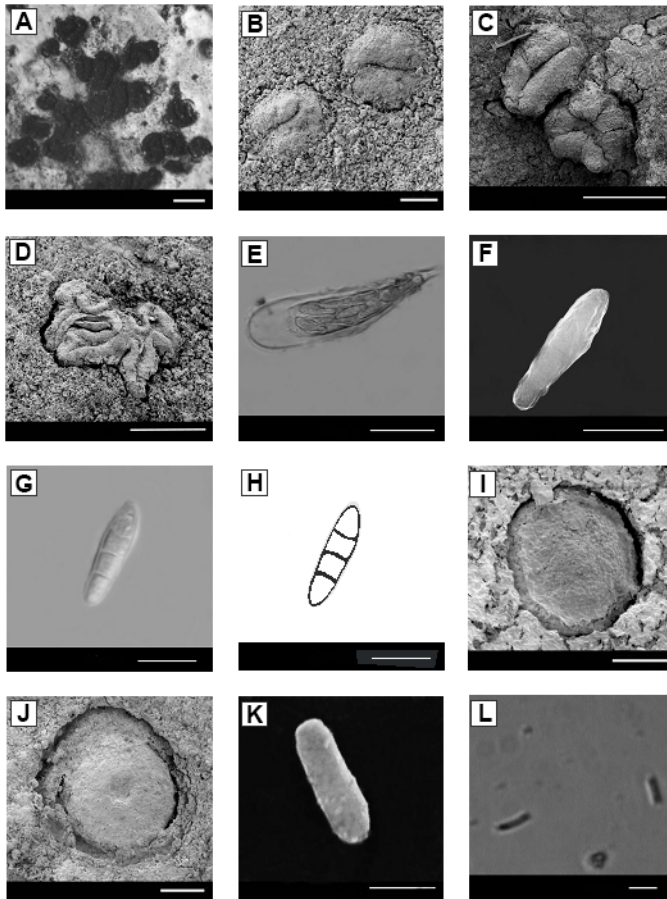


Fig. 40 *Arthonia calcarea* (Turner ex Sm.) Ertz & Diederich: (A) thallus and ascomata, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (B–D) thallus and ascomata, SEM [(B) leg. A. Wieczorek, July 20, 1997, herb. Wieczorek; (C) s. coll., KRAM-L 27263; (D) s. coll., KRAM-L 26972]; (E) ascus with ascospores, LM (s. coll., KRAM-L 27263); (F) ascospores, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (G,H) ascospores, LM (s. coll., KRAM-L 27263); (I,J) pycnidium, SEM (s. coll., KRAM-L 27263); (K) conidium, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (L) conidia, LM (leg. A. Wieczorek, 1997, herb. Wieczorek). Scale bars: (A,B) 200 μm ; (C,D) 300 μm ; (E) 20 μm ; (F–H) 10 μm ; (J) 50 μm ; (K) 3 μm ; (L) 5 μm .

the structure of the apical apparatus. Identification on the basis of other anatomical structures can be difficult. Ascospore size and shape are similar to those in *Opegrapha saxicola* Ach, particularly for individuals that develop a visible perispore. However, perispore's thickness in *A. calcarea* does not exceed 1 μm , but mature, well-developed spores of *O. saxicola* contain thicker perispores. *Arthonia calcarea* differs from *O. dolomitica* by having ascospores shorter than 20 μm .

Since *Arthonia calcarea* is rare in Poland and there are few herbarium specimens, it is difficult to assess its intraspecific variability. Most populations vary primarily in shape of the ascomata. In some individuals, the ascomata are circular, solitary, unbranched, and resemble those in *Opegrapha dolomitica*. Occasionally, the ascomata are ellipsoid to elongate. Only concave discs were observed in the studied specimens. The ascomata with two types of excipulum were observed: Types A and B. Usually, there are few pycnidia, both sessile and convex (Fig. 41). Perispore thickness also is variable in ascospores. In some individuals, it is reduced and poorly developed, whilst in others, it is narrow but well defined.

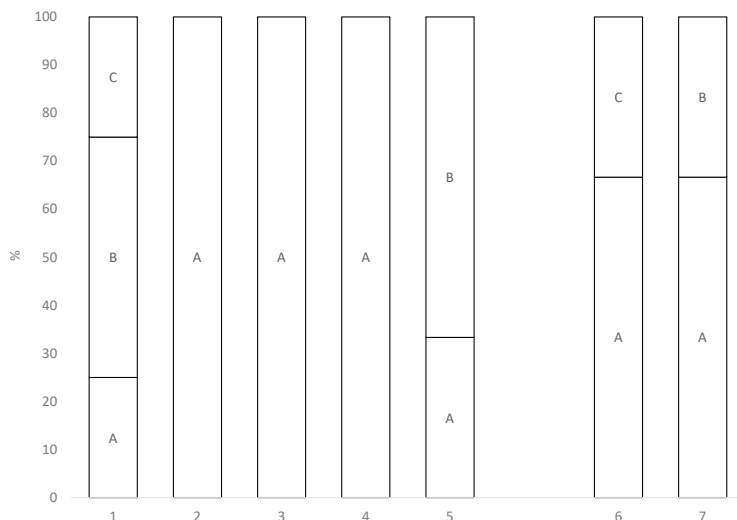


Fig. 41 Variation in selected morphological and anatomical features of *Arthonia calcarea*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Nomenclatural notes. *Opegrapha calcarea* was described by Smith and Sowerby [310]. The name was taken from Turner’s manuscripts, who described the species from “the mortar of old walls in Norfolk and Suffolk”. The name was accepted by Acharius [2,3]. Stizenberger [4] proposed a different approach and regarded this species, with other epilithic lichens (*O. trifurcata* Hepp and *O. chevallieri*), as synonymous with *O. atra*, on the basis of similar ascospore shape and size. His approach, however, was not accepted by a majority of lichenologists, who continued using the name *O. calcarea* [1,116,311–313].

Considering ascospore dimensions, Pentecost and Coppins [119] as well as Purvis et al. [40] treated *A. calcarea* as an ecotype of *Opegrapha saxatilis*. However, according to Clauzade and Roux [64], *O. saxatilis* has a discontinuous excipulum below the hypothecium, therefore the species cannot be treated as synonyms.

Detailed studies on this species were conducted by Torrente and Egea [34], who compared three similar, closely related species (*O. calcarea*, *O. chevallieri*, and *O. trifurcata*). They pointed out that the three species are conspecific and represent *O. calcarea*. Smith et al. [41] deviated from their earlier classification by assuming that *O. saxatilis* was a synonym of *O. calcarea*, and they took into account other morphotypes of this taxon, including *O. conferta* and *O. chevallieri*.

The treatment of *Arthonia calcarea* as a separate species is justified by the characteristic ascus type and the continuous excipulum below the hypothecium. This was confirmed by Clauzade and Roux [64], Torrente and Egea [34], and by the results of my research.

Distribution outside Europe. It was recorded from North America (Canada [66], the Bahamas [142]), in Asia (Taiwan [69], Armenia [120]), and in North Africa (Morocco [65] and Tunisia [88]). Moreover, it has been reported from the Canary Islands [314].

Habitat and distribution in Europe. According to Smith et al. [41], the species distribution is Central European-Mediterranean and sub-Atlantic. In Europe, it is found on calcareous rocks and occasionally sandstone. According to Torrente and Egea [34], they are observed in Western Europe mostly in coastal zones, but they are known also from a few localities in Central Europe, including Styria in Austria [160].

The species was reported, e.g., from Austria [71], Cyprus [162], Denmark [122,163], Germany [91,168,298,299], Greece [315], Hungary [93], Italy [74], Montenegro [316], Norway [97], Portugal (Madeira [75]), Slovenia [76], Spain [99], and Ukraine [100].

Habitat and distribution in Poland. Like most of the epilithic species, *Arthonia calcarea* grows on rocks of various types (limestone and dolomite, rarely sandstone), usually on dry, sunny, vertical sites. The various local climates and microclimates associated with the varied relief of mountainous terrain, likely provide favorable conditions for this species. *Arthonia calcarea* was reported for the first time by Eitner [303] in the Sudetes. It was later reported from the Łańcuch Tatrzański macroregion [106,107], Sudetes [260], and Dolny Śląsk (Lower Silesia Province) [132].

Only two contemporary collections were available to study and they both originated from the Carpathians (Fig. 42). However, the KRAM herbarium includes three specimens (one dating back to 1847), with no location or author given.

4.6.7. *Gyrographa gyrocarpa* (Flot.) Ertz & Tehler

in Ertz, Tehler, Irestedt, Frisch, Thor & van den Boom, Fungal Diversity 70: 42 (2015).

≡ *Opegrapha gyrocarpa* Flot., Flora, (Regensburg) 8: 345 (1825).

Thallus with very characteristic, yellowish soralia, poorly developed, often forming larger aggregations. Ascomata rare, if present, usually circular to ellipsoid, solitary or in groups, very rarely branched, 0.5–2.0 mm in diameter. Discs strongly wrinkled, sometimes limited from the center with a roundish ridge or irregularly twisted, black, not pruinose. Excipulum thick, permanent, undulated or convoluted, black, naked, dull or slightly shiny, brittle, continuous below the hypothecium, up to 500 µm thick at the base, K+ olive-green. Hypothecium pale to nearly hyaline, 20–25 µm high. Hymenium hyaline, ca. 100 µm high, I+ reddish. Pseudoepithecium

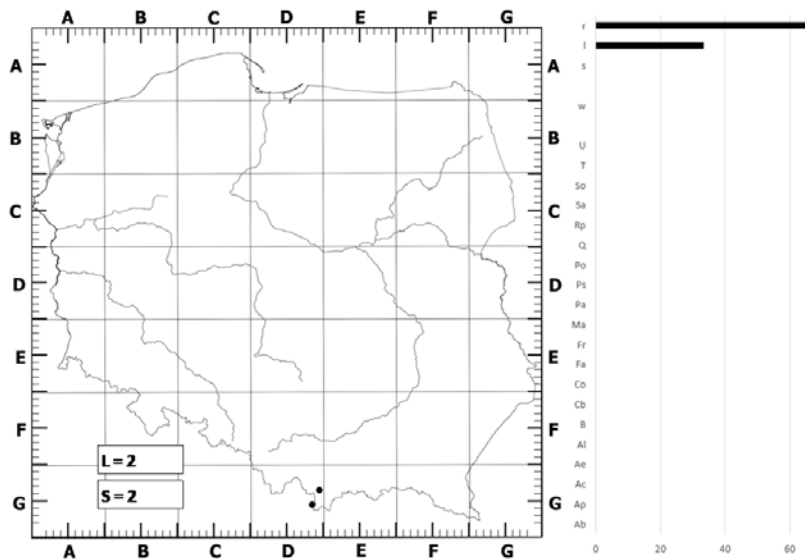


Fig. 42 Distribution of *Arthonia calcarea* in Poland.

inconspicuous. Asci club-shaped or cylindrical, $80\text{--}90 \times 12\text{--}15 \mu\text{m}$. Ascospores hyaline, narrowly spindle-shaped, three-septate, $20\text{--}26 \times 3\text{--}5 \mu\text{m}$, without perispore. Pycnidia scattered, sunken, visible as very small, blackish dots. Conidia straight, $5\text{--}6 \times 0.3\text{--}0.5 \mu\text{m}$ (Fig. 43). Thallus K⁻, C⁺ reddish, KC⁺ reddish (mainly the inner part and soralia are stained), PD⁻. Three chemotypes were described by Tønsberg [317].

Discussion. In Poland, *Gyrographa gyrocarpa* is the most distinctive species among the epilithic representatives of the group. It rarely is confused with other species. Due to the characteristic soredia, it easily can be identified, even when sterile. In addition to the color reaction of the soredia, it differs from other species in the following characteristics: (i) large (but not always present), nearly circular or irregular ascomata and (ii) three-septate ascospores without perispore.

The species is usually sterile. In the sterile form, it is similar to *Enterographa zonata*, but it differs in the color reaction of the medulla and soredia (C⁺ and KC⁺ reddish). In some localities (e.g., in the Sudetes), *G. gyrocarpa* produces numerous ascomata. Like in other taxa of the genus *Opegrapha* s. l., the ascomata are variable, usually elliptic or circular, very rarely elongate. They usually are solitary, producing various types of discs from concave to flat or convex. The species is variable in thallus color and in the abundance of pycnidia (Fig. 44).

Nomenclatural notes. *Gyrographa gyrocarpa* was described in 1825 as *Opegrapha gyrocarpa* [318]. Previously, two varieties were distinguished: var. *arenaria* Körber [319] and var. *schisticola* (Eitn.) Migula [313]. The genus *Gyrographa* was described by Ertz et al. [9]. In the earlier literature, polymorphic characters were noted by Tønsberg [317], and it was even suggested that the species should be moved to the related genus *Lecanactis* [57].

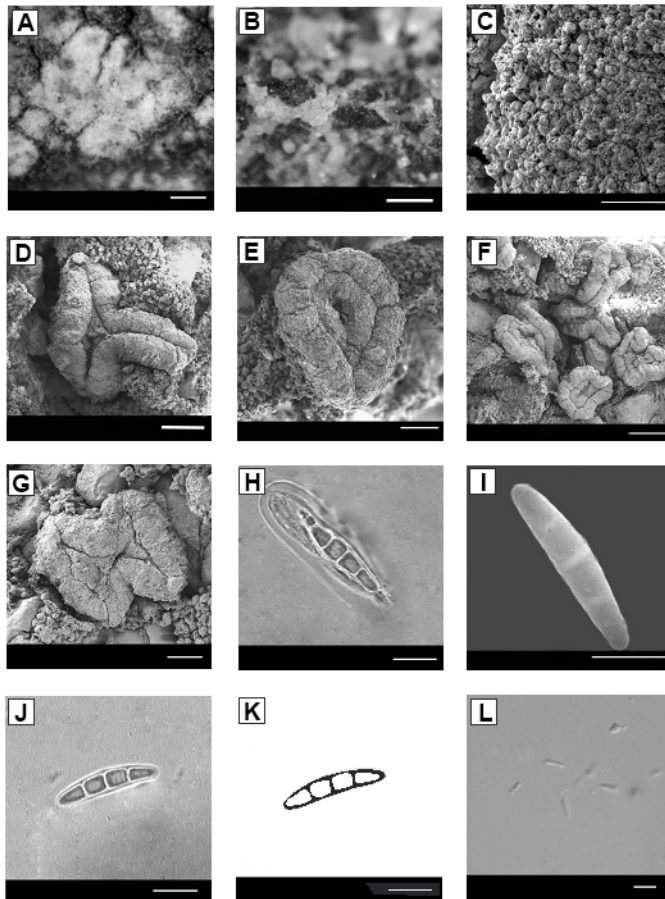


Fig. 43 *Gyrographa gyrocarpa* (Flot.) Ertz & Tehler: (A,B) thallus and ascomata, LM (leg. M. Kossowska, 2008, herb. Kossowska); (C–G) thallus and ascomata, SEM [(C–E) leg. K. Szczepańska, 2003, herb. Szczepańska; (F,G) leg. P. Czarnota, GPN 2145]; (H) ascus with ascospores, LM (leg. Z. Tobolewski, 1960, POZ); (I) ascospore, SEM (leg. K. Szczepańska, 2003, herb. Szczepańska); (J,K) ascospores, LM (leg. A. Wieczorek, 1989, herb. Wieczorek); (L) conidia, LM (leg. A. Wieczorek, 1989, herb. Wieczorek). Scale bars: (A,C,E,G) 100 µm; (B) 500 µm; (D) 200 µm; (F) 250 µm; (H–K) 10 µm; (L) 5 µm.

Distribution outside Europe. Species with a wide geographic range, including North America, e.g., Canada [66], and part of Asia, e.g., Japan [149].

Habitat and distribution in Europe. According to Wirth [38], Wirth et al. [39], and Purvis et al. [40], the species distribution is boreal–Central European and sub-Atlantic. It is most frequently found on sandstone and granite.

In Europe it is known, e.g., from Austria [71,160], the Czech Republic [295], Finland [165], Germany [124–126,168,170,320], Great Britain [92], Italy [74], the Netherlands [96],

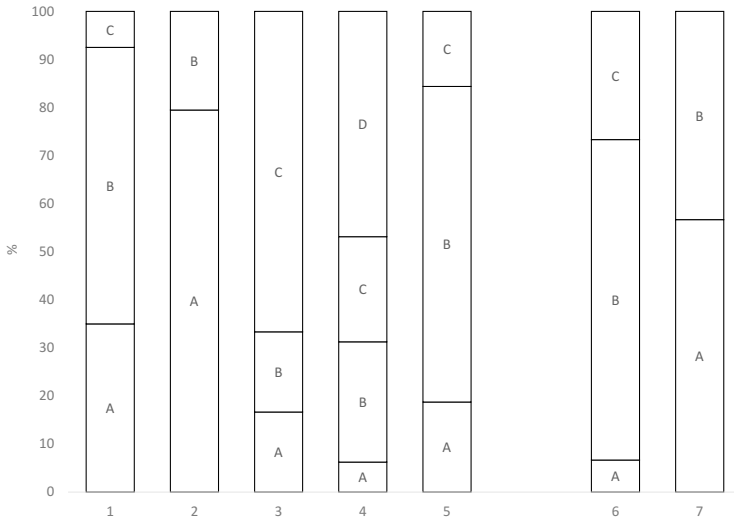


Fig. 44 Variation in selected morphological and anatomical features *Gyrographa gyrocarpa*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Norway [97], Portugal (Madeira, Azores [75,98]), Romania [302], Slovenia [76], Spain [99], and Sweden [97].

Habitat and distribution in Poland. *Gyrographa gyrocarpa* can be found on rocks of woodlands located in valleys and gorges, and on vertical or hanging rocks that are dry or moist, with north or northeastern exposure. They are less often found in open or sunny habitats.

The first record of *Gyrographa gyrocarpa* was published by Körber [21]. It was also recorded by Stein [182] and Eitner [303], but it was erroneously reported from calcareous rocks in some southern parts of Poland.

It was later reported in the Polish lichenological literature from the Beskid Mały Mountains [321], Beskid Niski Mountains [322], Beskid Sądecki Mountains [102,103,323], Beskid Śląski Mountains [190], Beskidy Lesiste (Wooded Beskids) [191], Gorce Mountains [324], Stołowe Mountains [198], Sowie Mountains [325], Karkonosze Mountains [326,327], Łańcuch Tatrzański macroregion [107,210], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foot-hills) [81], Sudetes [261,328], West Beskids [329], West Bieszczady Mountains [309].

Gyrographa gyrocarpa was recorded exclusively from the southern part of Poland (Fig. 45), with a center of distribution in the Polish Carpathians. It can also be found in the West Beskids and Beskidy Lesiste. It is more rare to find it in the Sudetes, Karkonosze Mountains, and Stołowe Mountains.

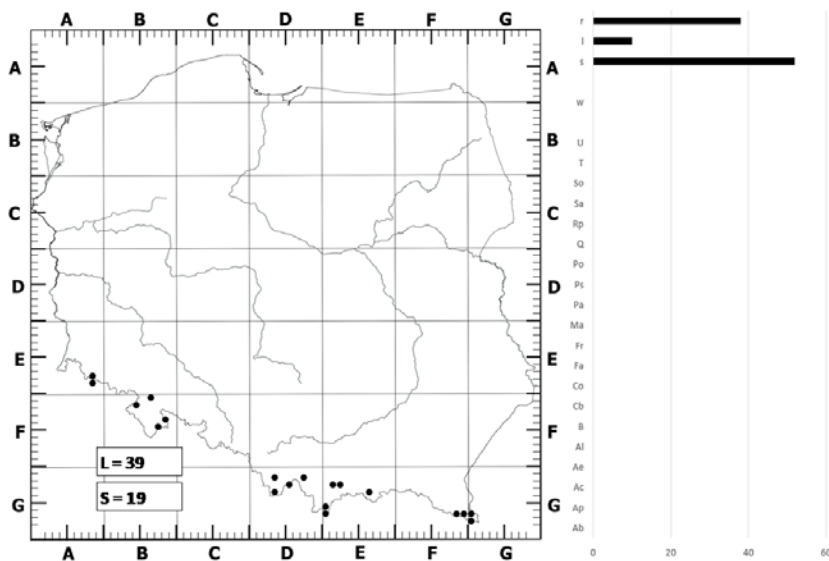


Fig. 45 Distribution and substrate preference of *Gyrographa gyrocarpa* in Poland.

4.6.8. *Opegrapha dolomitica* (Arnold) Clauzade & Cl. Roux ex Torrente & Egea

Bibliotheca Lichenol. 32: 146 (1989).

≡ *Opegrapha rupestris* var. *dolomitica* Arnold, Flora (Regensburg) 43: 78 (1860).

≡ *Opegrapha saxicola* var. *dolomitica* (Arnold) V. Wirth, Flechtenflora (Stuttgart): 531 (1980).

Thallus grey to grey-white, sometimes with black prothallus. Ascomata elliptic, sometimes curved and branched in maturity, $0.2\text{--}0.8 \times 0.4\text{--}0.8$ mm, solitary or in groups of various size; surface not pruinose, protrude above the thallus, very rarely sunken. Discs black, narrow, rarely broad. Excipulum thick, permanent, black, naked, continuous below the hypothecium, $40\text{--}60$ μm thick laterally and $80\text{--}150$ μm at the base. Hypothecium grey to grey-brown, dark, $20\text{--}25$ μm high. Hymenium $50\text{--}70$ μm high, I+ reddish. Pseudoepithecium brown, K-. Asci broadly club-shaped, mature $60\text{--}70 \times 19\text{--}22$ μm , young $45\text{--}57 \times 16$ μm , inner layer of endoascus amyloid in upper part, ring and ocular chamber reduced (*varia*-type). Ascospores hyaline, ellipsoid, three-septate, $(18)22\text{--}29 \times 5\text{--}6$ μm , with perispore of $0.5\text{--}0.7(1.0)$ μm thick. Pycnidia elevated or sessile, black. Conidia straight, $4\text{--}6 \times 0.5\text{--}1$ μm (Fig. 46). Chemistry: thalli K-, C-, PD-.

Discussion. *Opegrapha dolomitica* can be distinguished from the similar *Opegrapha saxicola* by its markedly longer ascospores, which are more than 22 μm long, with a thin hyaline perispore. *Opegrapha dolomitica* differs from *Gyrographa gyrocarpa* by the presence of a perispore and the lack of a color reaction on the thallus.

Most populations of *O. dolomitica* vary in size and shape of the ascomata. In some specimens, all of the ascomata were elliptic, unbranched, and elevated. In others, the ascomata were branched and meandering. However, in some specimens, a broad range of shape variation was observed. For this reason, like in other *Opegrapha* species, the shape and size of the ascomata

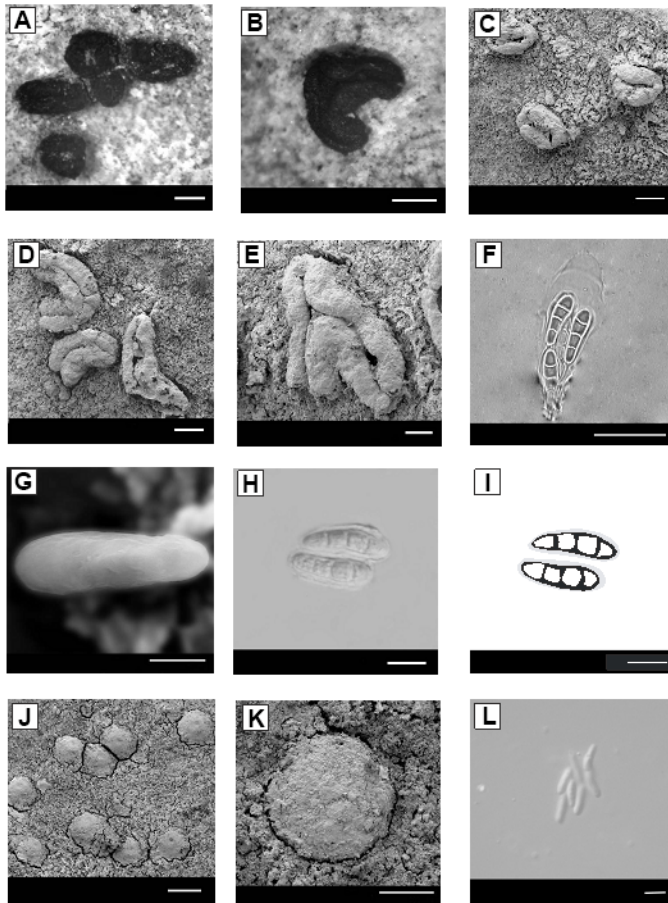


Fig. 46 *Opegrapha dolomitica* (Arnold) Clauzade & Cl. Roux ex Torrente & Egea: (A,B) thallus and ascomata, LM [(A) leg. J. Nowak, KRAM-L 12158; (B) leg. J. Nowak, KRAM-L 9661]; (C–E) thallus and ascomata, SEM [(C,E) leg. J. Nowak, KRAM-L 30447; (D) leg. J. Nowak, KRAM-L 12158]; (F) ascus with ascospores, LM (leg. J. Nowak, KRAM-L 30447); (G) ascospore, SEM (leg. J. Nowak, KRAM-L 30447); (H,I) ascospores, LM (leg. J. Nowak, KRAM-L 30447); (J,K) pycnidia, SEM (leg. J. Nowak, KRAM-L 30447); (L) conidia, LM (leg. J. Nowak, KRAM-L 30447). Scale bars: (A,B,D,E,K) 100 μ m; (C) 150 μ m; (E,G) 25 μ m; (H,I) 10 μ m; (J) 250 μ m; (L) 5 μ m.

cannot be regarded as a good diagnostic feature. Disc type also is variable within populations and on individual specimens. They have an excipulum of Type C, but A or B may be found occasionally. The pycnidia are numerous, sessile, and convex (Fig. 47).

Nomenclatural notes. *Opegrapha dolomitica* is one of the newest species of this genus to be distinguished at the species rank [34]. Stizenberger [4] wrote “a frequently noticeable form of this species (*O. saxicola*) is *dolomitica* Arn., but I do not attempt to establish its

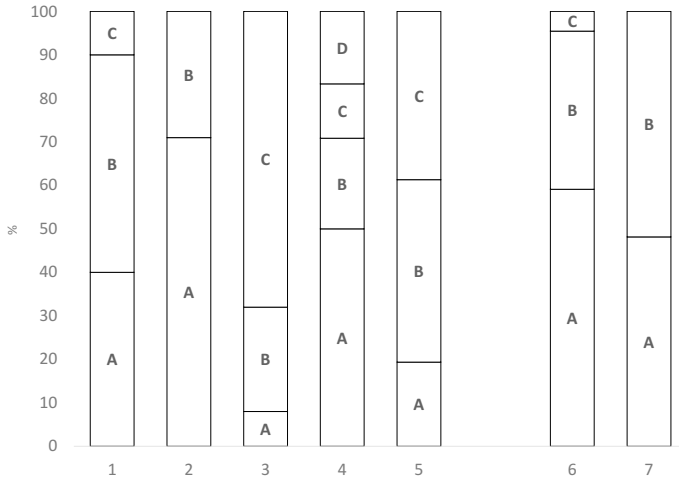


Fig. 47 Variation in selected morphological and anatomical features *Opegrapha dolomitica*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – cross section of a typical ascoma; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

systematic position”. Most often it was regarded as a variety or subspecies of *O. rupestris* or *O. saxicola* [*O. rupestris* var. *dolomitica* Arnold [330], *O. saxicola* subsp. *dolomitica* (Arnold) Roux [331]].

Nowak [10] discussed the species under the name *O. saxicola* for. *dolomitica* (Arnold) Arnold.

Distribution outside Europe. *Opegrapha dolomitica* has a Holarctic distribution, covering the whole Europe and North America (the Bahamas [142], Canada [332]). Recorded also from Africa (Morocco) [65].

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], this species distribution is boreal Mediterranean. In Europe, it grows on limestone or dolomitic rocks.

Reported, e.g., from Austria [71], the Czech Republic [295], Denmark [122,163], Great Britain [92], Italy [74], Norway [97], Romania [178,302], Russia (Dagestan [333]), Spain [99], Sweden [97], and Ukraine [334].

Habitat and distribution in Poland. In Poland, *Opegrapha dolomitica* occurs less frequently on limestone than on other rocks, such as sandstones. It occurs typically on vertical and smooth rock walls. The first record of *O. dolomitica* was published by Körber [21]. It was also reported by Stein [182], Eitner [303], Migula [130], and a few times in the Polish lichenological literature from Dolny Śląsk (Lower Silesia Province) [132], Łańcuch Tatrzański macroregion [106,107], Pieniny Mountains [110,111], Sudetes [260], and West Beskids [131].

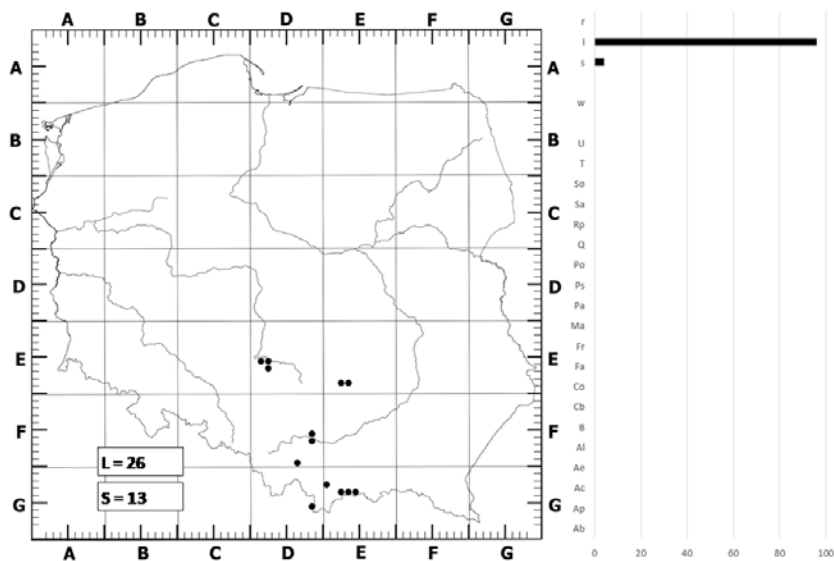


Fig. 48 Distribution and substrate preference of *Opegrapha dolomitica* in Poland.

Like most of the epilithic species of the studied genera, *O. dolomitica* is found in the southern part of the country, with a few scattered localities in the western part of the Polish Carpathians and uplands (Fig. 48).

4.6.9. **Opegrapha geographicola* (Arnold) Hafellner

Herzogia 10: 12 (1994).

≡ *Phaeospora geographicola* Arnold, Verh. Zool.-Bot. Ges. Wien 46: 140 (1896).

It is a lichenicolous nonlichenized fungus. It is parasitic on the host lichen thallus (*Rhizocarpon badioatrum*). Ascumata black, roundish, not pruinose, usually elevated above the host thalli. Discs black, narrow, rarely broad. Excipulum permanent, thick, black, continuous below the hypothecium. Hypothecium 10–15 μm high. Hymenium 45–80 μm high, I+ reddish. Pseudoepithecium inconspicuous. Asci broadly club-shaped, mature 55–70 \times 15–20 μm . Ascospores pale brown, ellipsoid, two–three-septate, 18–29 \times 7–9 μm , darkening in herbarium specimens, with perispore of 0.8–1.4 μm thick. Wall of ascospores I+ blue. Pycnidia elevated or sessile, black. Conidia straight, 4–6 \times 1 μm (Fig. 49).

Discussion. This species is morphologically similar to *Opegrapha dolomitica* and *Phacographa glaucomaria*, especially to the individuals that develop ascospores of the same size. It differs from the above taxa primarily due to its pale brown ascospores, as well as the color reaction of the transverse walls of the ascospores (I+ blue). Additionally, *O. geographicola* produces both three-septate and two-septate ascospores. It is difficult to understand the variability of this species, because only few herbarium specimens are available.

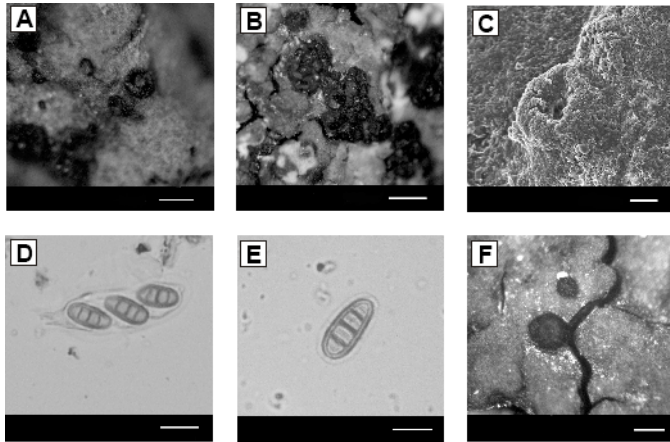


Fig. 49 *Opegrapha geographicola* (Arnold) Hafellner: (A,B) host thallus of *Rhizocarpon badioatrum* and apothecia, LM; (B) apothecium, LM; (D) ascus with ascospores, LM; (E) ascospore, LM; (F) pycnidia, LM (leg. A. Flakus, 2740/1, KRAM). Scale bars: (A,F) 1 mm; (B) 2 mm; (C,D) 30 μ m; (E) 20 μ m.

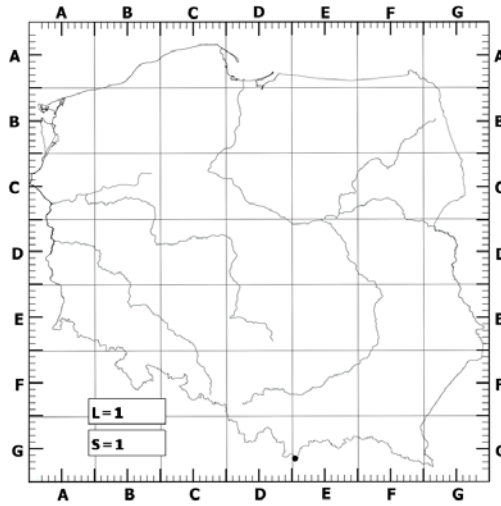


Fig. 50 Distribution of *Opegrapha geographicola* in Poland.

General distribution. Recorded from Alaska [67]. Known also from a few localities in Europe, e.g., from Austria [335] and Spain [99].

Habitat and distribution in Poland. This is a lichenicolous fungus that grows on *Rhizocarpon badioatrum* and is known only from one locality in the Western Tatras [336] (Fig. 50).

4.6.10. *Opegrapha lithyrge* Ach.

Lichenogr. Univers.: 247 (1810).

Thallus poorly developed, thin, smooth or granular, greyish. Ascomata solitary or in small groups, unbranched, rarely branched, straight or curved, $0.2\text{--}1 \times 0.15\text{--}0.25$ mm. Discs narrow, concave, not pruinose. Excipulum thick, permanent, black, naked, continuous below the hypothecium, $13\text{--}18$ μm thick laterally and $40\text{--}60$ μm at the base. Hypothecium grey-brown, $15\text{--}25$ μm high. Hymenium hyaline, $60\text{--}70$ μm high, I+ reddish. Pseudoepithecium insignificant, very narrow. Asci cylindrical-clavate, mature $40\text{--}60 \times 15\text{--}18$ μm , inner layer of the endoascus amyloid along its whole length, ring hardly visible (*vulgata*-type). Ascospores hyaline, spindle-shaped, straight or slightly curved, five–seven-septate, $21\text{--}35 \times 3\text{--}5$ μm , with perispore of $1\text{--}1.5$ μm thick. Pycnidia numerous, black, very small, sunken in thallus. Conidia straight, $3\text{--}5 \times 1\text{--}1.5$ μm (Fig. 51). Chemistry: thalli K–, C–, PD–.

Discussion. The species is morphologically similar to *Arthonia calcarea* and *Alyxoria mougeotii*, especially the individuals that develop solitary, unbranched ascomata. The differences between the species primarily concern the structure of the apical apparatus and the color reaction of the inner layer of the endoascus: *calcarea*-type in *A. calcarea*, *varia*-type in *A. mougeotii*, and *vulgata*-type in *O. lithyrge*. Moreover, *O. lithyrge* differs from *A. calcarea* by five–seven-septate ascospores, and from *A. mougeotii* by narrower ascospores, with all cells of similar size.

Opegrapha lithyrge is closely related to *O. vulgata* [7]. However, the former is epilithic, while the latter is epiphytic. Moreover, *O. lithyrge* has much larger, mature asci, slightly wider ascospores, and shorter conidia. Undoubtedly, the species evolved by adapting to its substrate, which was confirmed by recent molecular analyses [7] that support their species status in spite of the close relationship.

Opegrapha lithyrge varies remarkably in size and shape of their ascomata. Nowak [10] distinguished three varieties with two forms (var. *lithyrge*, for. *lithyrge*, [for.] b. *steriza* Ach., [var.] β . *ochracea* Körb., var. *vestita* Redgr.) to reflect this variation.

This species has elliptic and elongate ascomata, with narrow concave or flat discs, and one excipulum type. Some specimens only have short and straight conidia (e.g., a specimen from WA herbarium), while others have long and curved conidia (Fig. 52). *Opegrapha lithyrge* is a well described species that is easy to distinguish from other epilithic species. Its spore size is uniform, $23\text{--}24 \times 3\text{--}3.5$ μm , and its perispore is well developed. All of the analyzed specimens had single and unbranched ascomata, with narrow and concave discs. They mostly represent the typical var. *lithyrge* described by Acharius [2].

Nomenclatural notes. The species was described by Acharius [2], who gave it the binomial name that is still in usage. Its similarity to *O. vulgata* was noted by Stizenberger [4], who classified it as *O. vulgata* var. *lithyrge*. *Opegrapha lithyrge* was listed in many works published in the nineteenth century as *O. lithyrge* [2,3,25], as *O. vulgata* for. *lithyrge*, [285], as *O. lithyr-giza* [5], or as synonymous with *O. vulgata* [4]. In the early twentieth century, it was treated as the distinct species *O. lithyrge* (e.g., [60]). Redinger [1] distinguished two varieties: var. *grisea* Körb. and var. *ochracea* Redgr., whereas Nowak [10] discussed three varieties: var. *lithyrge*, var. *ochracea*, and var. *vestita* (see above). Both authors distinguished them on the basis of morphological variation of the thalli. The lack of synonyms indicates that this taxon is interpreted rather unambiguously.

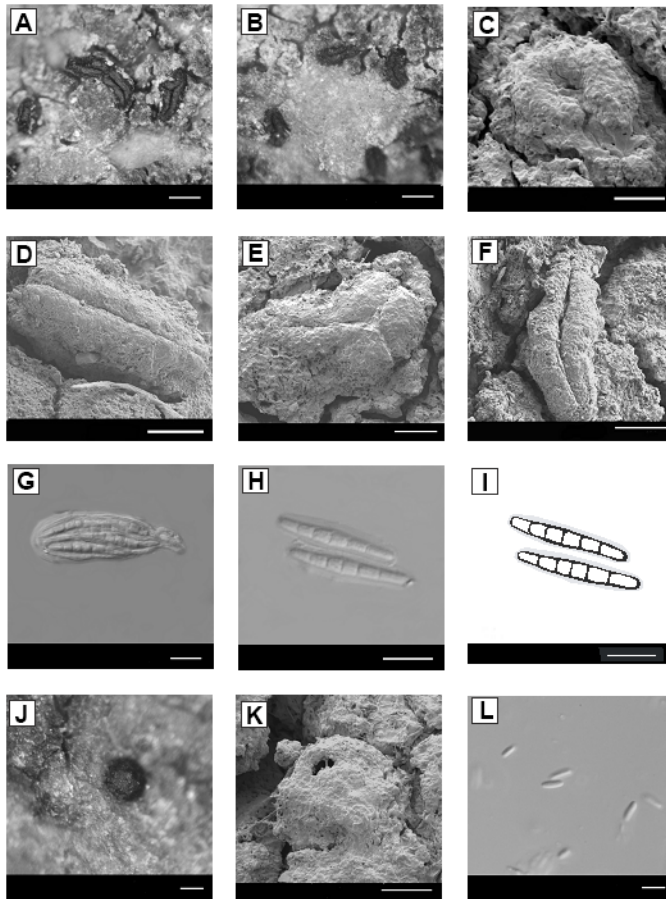


Fig. 51 *Opegrapha lithyrga* Ach.: (A,B) thallus and ascomata, LM [(A) leg. J. Nowak, KRAM-L 13909; (B) leg. J. Nowak, KRAM-L 5059]; (C–F) thallus and ascomata, SEM [(C,E) leg. J. Nowak, KRAM-L 5059; (D,F) leg. J. Nowak, KRAM-L 13909]; (G) ascus with ascospores, LM (leg. J. Nowak, KRAM-L 5557); (H,I) ascospores, LM (leg. J. Nowak, KRAM-L 5557); (J) pycnidium, LM (leg. J. Nowak, KRAM-L 13909); (K) pycnidium, SEM (leg. J. Nowak, KRAM-L 13909); (L) conidia, LM (leg. J. Nowak, KRAM-L 5557). Scale bars: (A,B,D,E,F) 100 μ m; (C,E,K) 50 μ m; (G,I) 10 μ m; (L) 5 μ m.

Distribution outside Europe. They are distributed in North America in mountainous regions, such as the high altitudes in Canada.

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], it is a Central European and Mediterranean species. In Europe, it is found on acidic shale/slate, granite, gneiss, and quartzite. It prefers smooth and vertical or hanging surfaces, in shaded habitats, usually with northern exposure that are dry or at least periodically slightly moist [10]. It probably spread from the south of Sweden and Norway to the Alps and southwestern

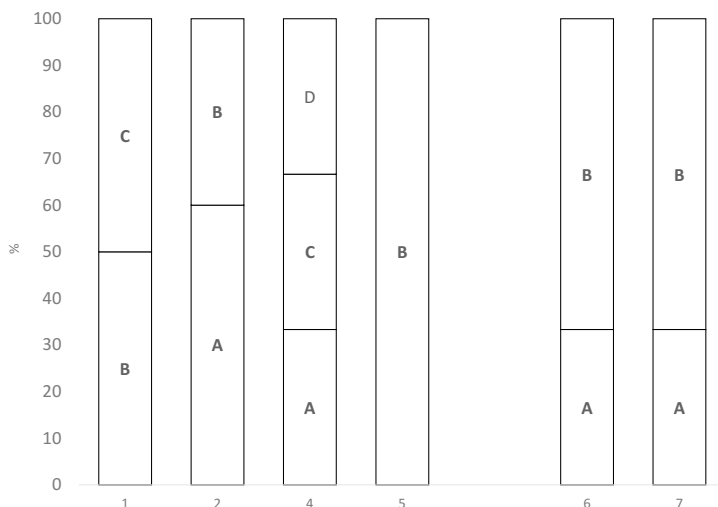


Fig. 52 *Opegrapha lithyrge*, variability of selected morphological-anatomical features. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Europe [34]. In Central Europe, it grows together with *Enterographa zonata* (Körb.) Källsten, *E. hutchinsiae* (Leight.) A. Massal. [38], whereas on the Atlantic coast of the Iberian Peninsula, it grows with *O. gyrocarpa* and *O. saxigena* Taylor [34].

In Europe, known, e.g., from Austria [71,160], Denmark [122,163], France [167], Germany [124–126,170,320,337], Great Britain [92], Ireland [94], Italy [74], Malta [95], Portugal (Madeira, Azores [75,98]), Spain [99], Turkey [153,154], and Ukraine [100].

Habitat and distribution in Poland. It grows on sandstone, but less commonly on other rock types. It is a very rare species. The first record of *O. lithyrge* was published by Nowak [187]. It has been reported from the Beskid Makowski Mountains [186], Beskid Mały Mountains [187], Beskid Sądecki Mountains [102], Beskid Śląski Mountains [189], Łąncuch Tatrzański macroregion [210], Podhale [224], and Wyżyna Wieluńska (Wieluń Upland) [280].

Only three voucher specimens support records of this species in the western part of the Polish Carpathians (Fig. 53).

4.6.11. *Opegrapha niveoatra* (Borrer) J. R. Laundon

Lichenologist 2(2): 138 (1963).

≡ *Verrucaria niveoatra* Borrer, in Hooker, Engl. Bot., Supplement. 1: Tab. 2637 (1831).

= *Opegrapha vulgata* var. *subsiderella* Nyl., Lich. Scand. (Helsinki): 255 (1861).

= *Opegrapha subsiderella* (Nyl.) Arnold, Flora (Regensburg) 67: 656 (1884).

Thallus thin, continuous, sometimes in the form of spots, whitish or greyish, sometimes with green tint, with dark prothallus. Ascomata numerous, solitary or in groups, unbranched or

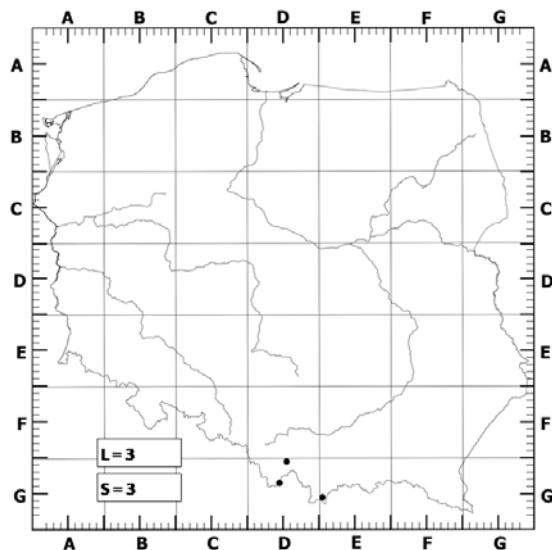


Fig. 53 Distribution of *Opegrapha lithyriga* in Poland.

more often branched, $0.3\text{--}1.5 \times 3\text{--}5$ mm. Discs narrow or delicately widened, concave, black, not pruinose. Excipulum of various thickness, elevated, permanent, black, naked, continuous below the hypothecium, $25\text{--}30$ μm thick laterally and $40\text{--}50$ μm at the base. Hymenium $50\text{--}60$ μm high, I+ reddish. Hypothecium $10\text{--}20$ μm high. Pseudoepithecium very poorly developed, ca. $5\text{--}10$ μm high. Asci cylindrical-clavate, mature $45\text{--}55 \times 10\text{--}13$ μm , inner layer of endoascus amyloid along its whole length, small ring around ocular chamber (*vulgata*-type). Ascospores hyaline, spindle-shaped, straight or slightly curved, four–five(six)-septate, $20\text{--}25 \times 2.5\text{--}3.5$ μm , with inconspicuous perispore of $0.5\text{--}0.7$ μm thick. Pycnidia numerous, small, black. Conidia highly variable, straight or slightly or very strongly curved, $4\text{--}9 \times 0.9\text{--}1.5$ μm (Fig. 54). Chemistry: thalli K–, C–, PD–.

Discussion. An exceptional feature that differentiates *O. niveoatra* from the other *Opegrapha* species is the length of its conidia. In its typical form, *O. niveoatra* produces conidia that are $4\text{--}8(9)$ μm long. However, specimens without mature pycnidia are impossible to be distinguished from the closely related *O. vulgata*.

Morphological and anatomical variability of *O. niveoatra* (as in case of other species of the genus) is driven by the environmental factors. Nowak [10] distinguished three forms within the species [for. *niveoatra*, for. *intermedia* (B. de Lesd.) J. Nowak, and for. *olivaceonigra* (B. de Lesd.) J. Nowak] that differ in size and shape of their ascomata. However, it should be noted that the species was misinterpreted by the author (see “Nomenclatural notes”).

My observations show that conidial size and shape differ markedly between and within populations of *O. niveoatra*. Specimens from Southern Europe are characterized by straight conidia up to 9 μm long [34]. By contrast, in material from Poland, both straight and slightly curved conidia are observed, sometimes on the same individual. Their length ranges from 4 μm to 8 μm , regardless of the curve angle (Fig. 55).

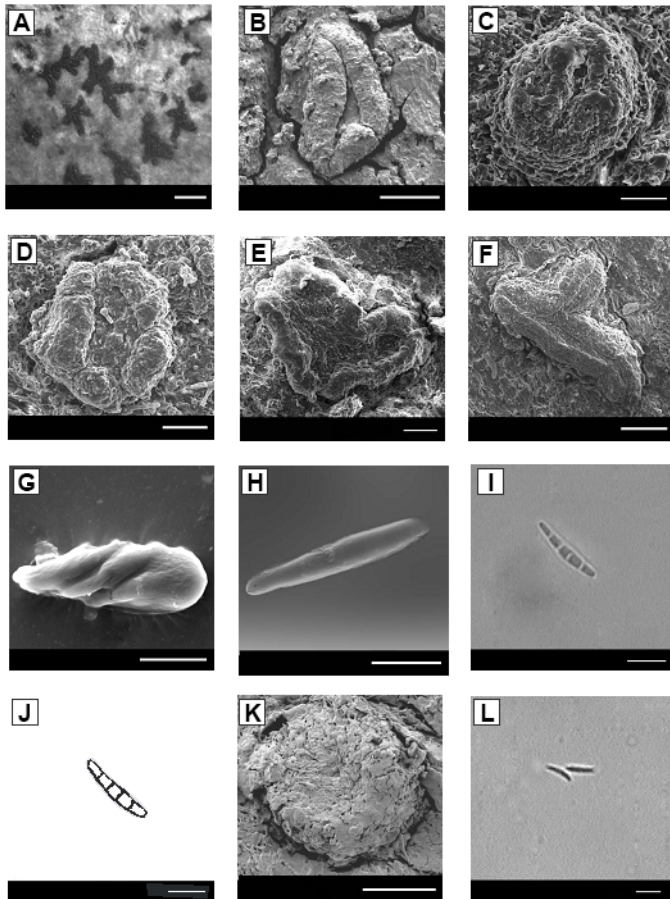


Fig. 54 *Opegrapha niveoatra* (Borrer) J. R. Laundon: (A) thallus and ascomata, LM (leg. W. Fałtynowicz, UGDA-L 3435); (B–F) thallus and ascomata, SEM [(B,C) leg. S. Cieśliński & Z. Tobolewski, 1984, KTC; (D) leg. W. Fałtynowicz, UGDA-L 3435; (E,F) leg. W. Fałtynowicz, UGDA-L 3435]; (G) ascus with ascospore, SEM (leg. W. Fałtynowicz, UGDA-L 3435); (H,I) ascospore, SEM (leg. S. Cieśliński & Z. Tobolewski, 1983, KTC); (J) ascospore, LM (leg. S. Cieśliński & Z. Tobolewski, 1983, KTC); (K) pycnidium, SEM (leg. W. Fałtynowicz, UGDA-L 3435); (L) conidia, LM (leg. W. Fałtynowicz, UGDA-L 3435). Scale bars: (A) 200 μm ; (B–F) 100 μm ; (G) 25 μm ; (H–J) 10 μm ; (K) 50 μm ; (L) 5 μm .

Nomenclatural notes. Until the twentieth century, the taxon was named *Opegrapha vulgata* var. *subsiderella* [338], and then it was named *Opegrapha subsiderella* [339]. The names appeared, however, synonymously with *O. niveoatra* [340]. During the revision of voucher specimens, I found some Polish collections that were misidentified following Nowak [10]. In the treatment, Nowak described *O. niveoatra* that was characterized by a conidium length of 12–18 μm . This was misleading, as this size range of conidia is characteristic for *O. vulgata*.

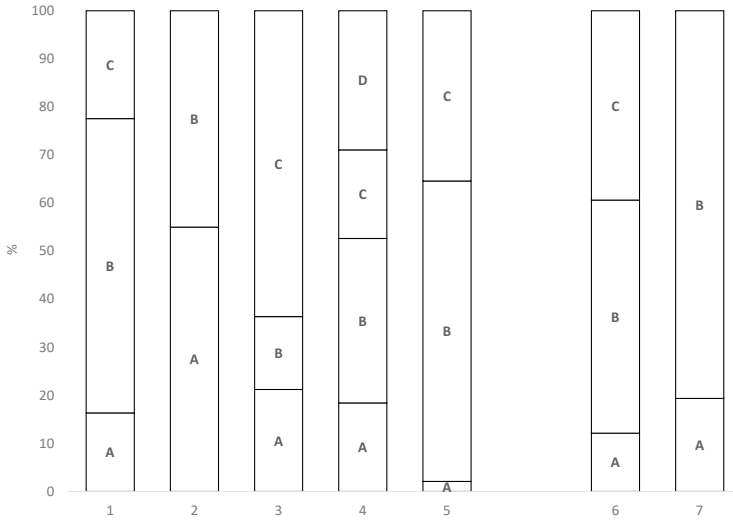


Fig. 55 *Opegrapha niveoatra*, variability of selected morphological-anatomical features. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

This mistake was due to the fact that Nowak [10] accepted Redinger’s concept of this species [1]. The latter author treated *O. niveoatra* under the name *O. cinerea* Chevall. This contradicts the currently valid classifications, where *O. cinerea* is a synonym of *O. vulgata*, which is characterized by curved conidia of such length [34,119,122]. However, according to Torrente and Egea [34], *O. niveoatra* is characterized by straight conidia that are 4–8 μm long. This is confirmed by the results of my study (Fig. 56). As a result of the revision of material in Polish herbaria, *O. niveoatra* was renamed and included under *O. vulgata*.

Distribution outside Europe. This species is distributed in North Africa (Morocco [65], Algeria [140]) and in a few localities in North America (Canada [66], USA [341]).

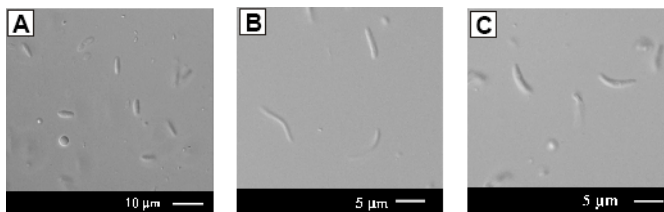


Fig. 56 Conidia of *Opegrapha niveoatra*, LM. (A) leg. Z. Tobolewski & S. Cieśliński, 1987, KTC; (B,C) leg. S. Cieśliński & Z. Tobolewski, 1983, KTC.

Habitat and distribution in Europe. *Opegrapha niveoatra* is a very rare sub-Atlantic species [38]. It grows in Central Europe on the bark of deciduous trees, especially in open sites. It is most frequently found on *Fagus sylvatica*, *Fraxinus excelsior*, and *Quercus* spp. Sometimes it grows together with *O. vulgata*, *O. ochrocheila*, and *Pertusaria leioplaca*.

According to Torrente and Egea [34], this species is known from Central and northwestern Europe. It is reported from, e.g., Austria [71], Denmark [122,163], Estonia [164], Finland [128], France [166,167], Germany [168,300], Great Britain [92], Ireland [73], Italy [74], Latvia [342], Lithuania [173], the Netherlands [96], Portugal (Madeira, Azores [75,98]), Romania [179], Russia [343–345], Spain [99], Sweden [97].

Habitat and distribution in Poland. In Poland, *O. niveoatra* grows in open and sparsely wooded habitats, on the smooth bark of these deciduous trees: *Fagus sylvatica*, *Quercus* spp., *Acer pseudoplatanus*, *Carpinus betulus*. Less often, it is found on other *Acer* spp., *Ulmus* spp., and *Fraxinus excelsior*. In mountains, it is found frequently on the bark of *Abies alba*.

Its first record was published by Grummann [346]. It also was reported by Eitner [303,347] and Migula [130]. The species also was reported from the Beskid Makowski Mountains [186], Beskid Niski Mountains [322], Beskid Sądecki Mountains [102,323,348], Beskid Śląski Mountains [189,190], Gorce Mountains [349], Karkonosze Mountains [350], Łączęch Tatrzański macroregion [107,210,211,351], Mierzeja Wiślana (Vistula Spit) [215], northeastern Poland [218], Pieniny Mountains [110], Pogórze Przemyskie (Przemysł Foothills) [112], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foothills) [81], Pogórze Spiskie (Spisz Foothills) [225], Pojezierze Ełckie (Ełk Lakeland) [82,305], Pojezierze Kaszubskie (Kashubian Lake District) [83], Pojezierze Olsztyńskie (Olsztyn Lake District) [235,352,353], Równina Augustowska (Augustów Plain) [306], Równina Bielska (Bielsk Plain) [55,243], Równina Drawska (Drawno Plain) [244], Równina Kozienicka (Kozienice Plain) [245,246], Równina Piotrkowska (Piotrków Plain) [252], Roztocze [255,258], Sudetes [260], Uznam and Wolin islands [354], West Beskids [131,190,191], West Bieszczady Mountains [309,355], Western Pomerania [56], Wysoczyzna Białostocka (Białystok Highland) [271,356], Wysoczyzna Elbląska (Elbląg Highland) [273], and Wzgórze Radomszczańskie (Radomsko Hills) [216].

The species occurs in the mountains, where it is quite frequent in the western part of the Polish Carpathians and in the Bieszczady Mountains, and in northern Poland where it is scattered along the Pobrzeże Koszalińskie (Koszalin Coastland), Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Mazurskie (Masurian Lake District), and Nizina Północnopodlaska (North Podlachian Lowland). In addition, it is reported from the Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Świętokrzyskie Mountains, and Równina Kozienicka (Fig. 57).

4.6.12. *Opegrapha saxicola* Ach.

Syn. Meth. Lich. (Lund): 71 (1814).

= *Opegrapha persoonii* Ach., Methodus, Sectio prior: 17 (1803).

= *Opegrapha rupestris* auct. polon. (non Pers.).

Thallus epilithic, thin, smooth or delicately wrinkled, dull, usually composed of small granules, sometimes powdery-granular, whitish, light grey. Ascospores not numerous, solitary or in groups, elevated, 0.4–1 × 0.1–0.2 mm, variable in shape. Discs narrow or wide, not pruinose,

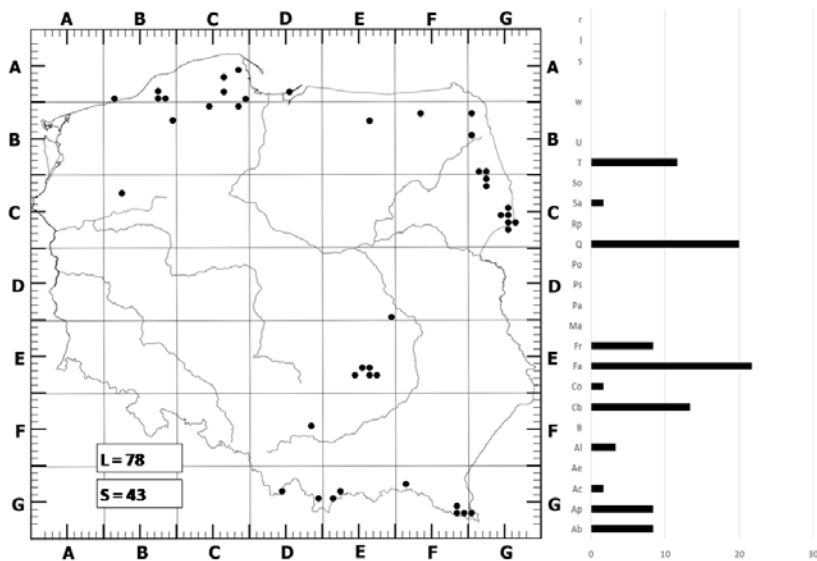


Fig. 57 Distribution and substrate preference of *Opegrapha niveoatra* in Poland.

dull. Excipulum relatively thick, elevated, permanent, black, naked, continuous below the hypothecium, 40–50 μm thick laterally and up to 90 μm at the base. Hypothecium from pale brownish-yellowish to nearly hyaline, 20–40 μm high. Hymenium hyaline, 60–80 μm high, I+ blue. Pseudoepthecium poorly developed, 10–15 μm high. Asci club-shaped, 55–65 \times 15–20 μm , inner layer of endoascus amyloid in upper half (*varia*-type). Ascospores hyaline, spindle-shaped, three-septate, 18–22(24) \times 5–7 μm , with perispore of 1.0–1.2 μm thick. Pycnidia numerous, small, black. Conidia straight, 4–6 \times 0.5–1 μm , cylindrical (Fig. 58). Chemistry: thalli K–, C–, PD–.

Discussion. *Opegrapha saxicola* differs from the otherwise similar *Arthonia calcarea* by the *varia*-type ascus, ascospores longer than 18 μm , and shorter conidia that are up to 6 μm long in *Opegrapha saxicola* and up to 8 μm long in *Arthonia calcarea*.

The species is not highly variable, as pointed out by Nowak [10]. This taxon is easy to recognize due to its relatively thin thallus that usually is whitish and gray, and its narrow, slender, elliptic, elongate, unbranched, or branched ascomata. It produces the ascomata with relatively narrow discs (Fig. 59).

Nomenclatural notes. Throughout the nineteenth century, *Opegrapha saxicola* was treated under various names, and the group of species has a complicated taxonomy. In 1989, Egea and Torrente [34] treated *O. saxicola* with *O. saxatilis*, and *O. persoonii* was a synonym of *O. rupestris*. A different concept was adopted by Purvis et al. [40], who accepted three species in this group based on ascospore length: *O. saxicola*, *O. saxatilis*, and *O. parasitica* (= *O. persoonii*). The authors' concept later was modified to distinguish: *O. dolomitica* (= *O. saxicola* auct., non Ach.) and *O. rupestris* (= *O. persoonii*), with the latter species as a strictly lichenicolous, parasitic species growing on crustose Verrucariaceae, especially *V. baldensis*

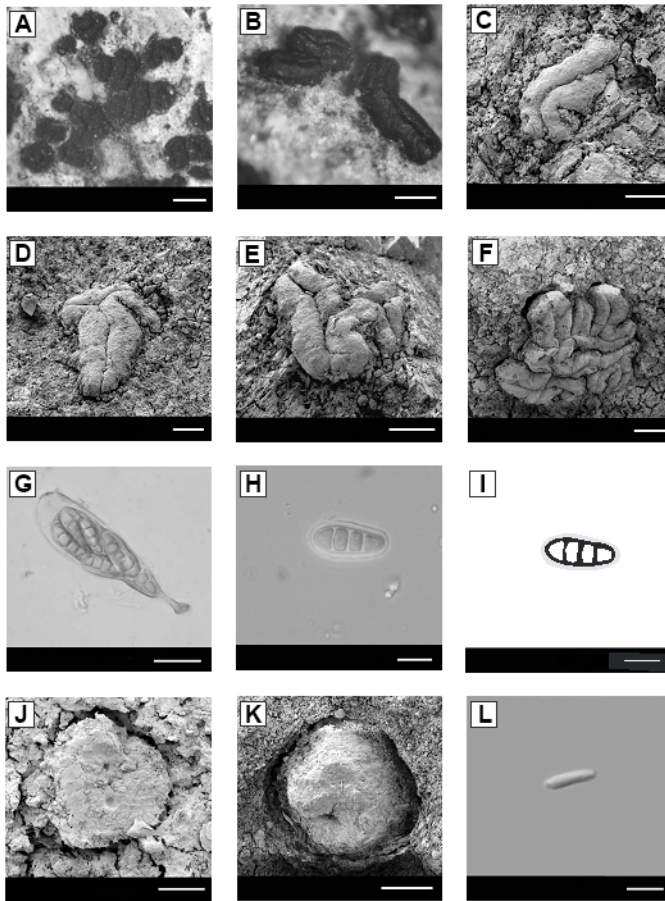


Fig. 58 *Opegrapha saxicola* Ach.: (A–F) thallus and ascomata, LM [(A,B) leg. J. Nowak, KRAM-L 12277]; (C–F) thallus and ascomata, SEM [(C,D) leg. J. Nowak, KRAM-L 12277; (E,F) leg. K. Toborowicz, 1975, KTC]; (G) ascus with ascospores, LM (leg. J. Nowak, KRAM-L 12277); (H,I) ascospores, LM (leg. U. Bielczyk, KRAM-L 44572); (J,K) pycnidium, SEM (leg. J. Nowak, KRAM-L12277); (L) conidium, LM (leg. J. Nowak, KRAM-L 12277). Scale bars: (A,B,E,K) 100 μ m; (C,D,F) 200 μ m; (G) 20 μ m; (H,I) 10 μ m; (J) 50 μ m; (L) 5 μ m.

[41]. In the Polish material, the two species *O. dolomitica* and *O. saxicola* were distinguished based on length of the ascospores. However, *O. rupestris*, as described by Smith et al. [41], was not found in the material.

Distribution outside Europe. Known from a few localities in North Africa, e.g., in Morocco [357].

Habitat and distribution in Europe. According to Purvis et al. [40], *Opegrapha saxicola* is a Central European and Mediterranean species. It is found on limestone or calcareous schist,

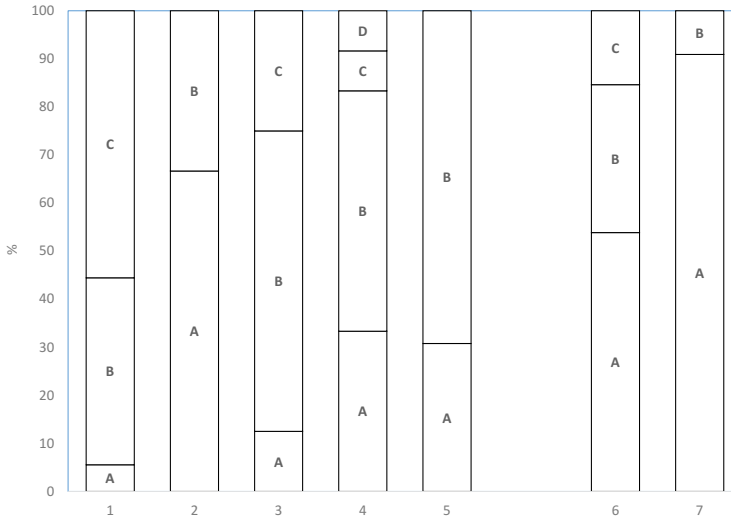


Fig. 59 Variation in selected morphological and anatomical features *Opegrapha saxicola*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

and rarely on sandstone or shale/slate. It is known from Central, Southern, and Eastern Europe, and has been recorded from Austria [358] and Bosnia and Herzegovina [359].

Habitat and distribution in Poland. *Opegrapha saxicola* is found in southern Poland, on limestone or occasionally on other rocks. Its first record was published by Błoński (as *O. rupestris* [360]). It was reported from the Beskid Mały Mountains [187], Stołowe Mountains [198], Świętokrzyskie Mountains [105,201,361], Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin) [362], Łańcuch Tatrzański macroregion [363–365], Pieniny Mountains [110,366], Pradolina Wrocławska (Wrocław Urstromtal) [238], Eastern Sudetes [367], Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland) [278], Wysoczyzna Bełchatowska (Bełchatów Highland) [268] and Wyżyna Wieluńska (Wieluń Upland) [280].

The species occurs in the western part of the Polish Carpathians and in the Wyżyna Krakowska upland. It also is recorded from the Sudety Mountains (Fig. 60).

4.6.13. *Opegrapha vermicellifera* (Kunze) J. R. Laundon

Lichenologist 2(2): 139 (1963).

≡ *Pyrenotheca vermicellifera* Kunze, in Reichenbach. & Schubert, Lich. Exsicc. No. 60 (1823).

Thallus thin, well developed, white-grey to dark grey, usually sterile. Ascomata very rare, unbranched or branched, usually sessile, 115–118 × 76–375 μm. Discs of ascomata narrow or wider, often concave, not pruinose, 11–264 μm wide. Excipulum black, slightly elevated,

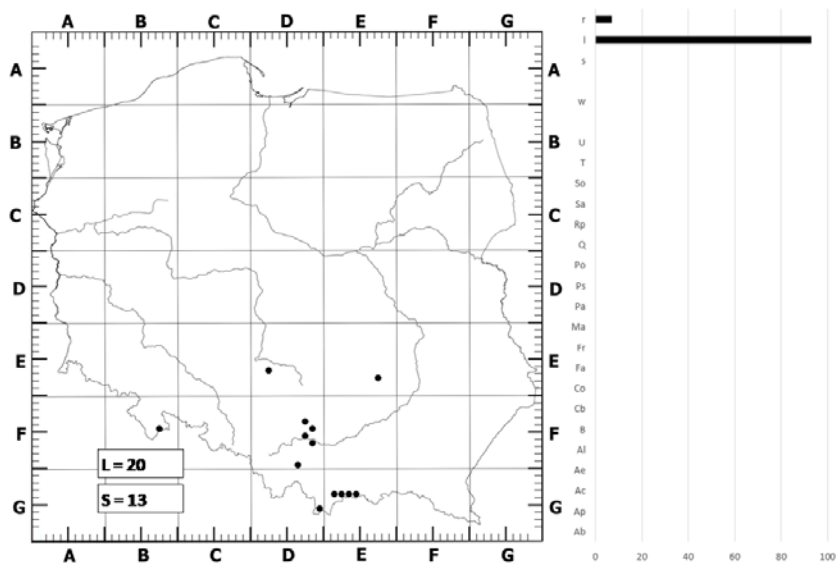


Fig. 60 Distribution and substrate preference of *Opegrapha saxicola* in Poland.

continuous below the hypothecium, 29–40 μm thick laterally and 40–50 μm at the base. Hypothecium brownish, 10–15 μm high. Hymenium hyaline, ca. 60 μm high. Pseudoepithecium very poorly developed. Asci club-shaped, 40–50 \times 12–15 μm , inner layer of endoascus amyloid nearly along its whole length (*vulgata*-type). Ascospores hyaline, straight, spindle-shaped, five–six-septate, 16–24 \times 3–5 μm , with perispore of 0.8–1.0 μm thick. Pycnidia numerous, very characteristic whitish pruinose. Conidia straight, widened in the middle part, 3–4 \times 1 μm (Fig. 61). Chemistry: thalli K–, C–, PD–.

Discussion. *Opegrapha vermicellifera* is a very characteristic, epiphytic species that has a large, whitish pruinose and nearly spherical pycnidia. The pycnidia help to distinguish it from the closely related species (*O. vulgata*, *O. niveoatra*, and *O. lithyriga*). This diagnostic feature is particularly useful for species identification in its sterile form and in material mixed with other taxa. Additionally, *O. vermicellifera* differs from the above mentioned *Opegrapha* spp. due to the presence of conidia that are widened in the middle part and only sometimes elongate.

The species varies remarkably in size and shape of ascomata. Nowak [10] accepted five forms of this species: for *vermicellifera*, for *discrepans* (Erichs) J. Nowak, for *deplanata* (Erichs) J. Nowak, for *subpulvaris* (Erichs) J. Nowak, and for *spermogonifera* (Arnold?). The species is found usually in sterile form (for *spermogonifera*) with numerous, convex, whitish pruinose pycnidia (Fig. 62). Specimens producing the ascomata are infrequent, and ascomata are elliptic, elongate, unbranched, and branched with a convex or rarely concave or flat disc.

Nomenclatural notes. This species was described in 1823 as *Pyrenotheca vermicellifera* [368], and Laundon referred to it as *Opegrapha vermicellifera* in 1963 [369].

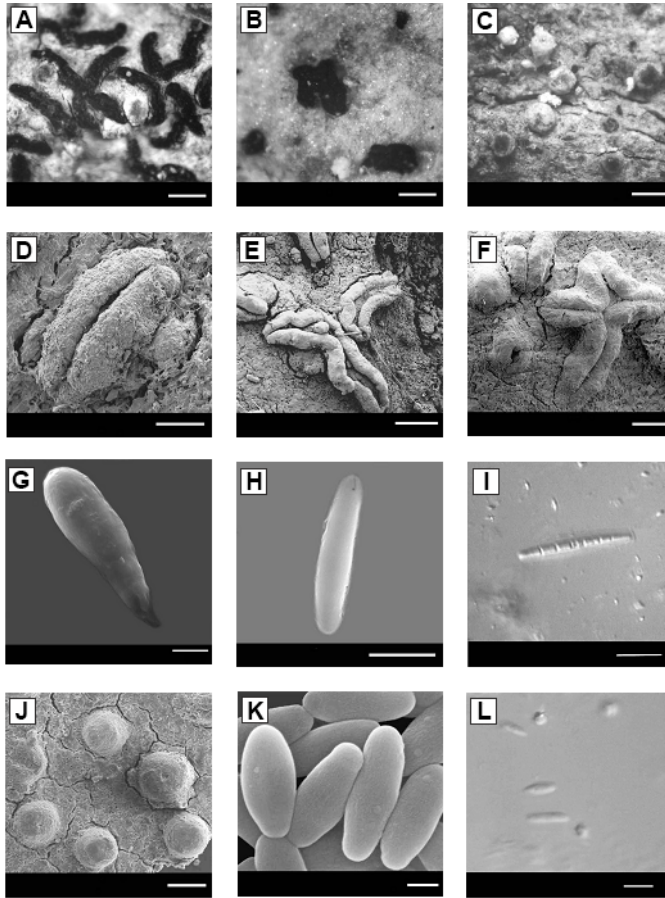


Fig. 61 *Opegrapha vermicellifera* (Kunze) J. R. Laundon: (A–C) thallus and ascomata, LM [(A) leg. A. Wieczorek, 2001, herb. Wieczorek; (B) leg. J. Nowak, KRAM-L 19963; (C) leg. A. Wieczorek, 1995, herb. Wieczorek]; (D–F) thallus and ascomata, SEM [(D,F) leg. A. Wieczorek, 2001, herb. Wieczorek; (E) leg. A. Wieczorek, 1997, herb. Wieczorek]; (G) ascus, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (H) ascospore, SEM (leg. A. Wieczorek, 1997, herb. Wieczorek); (I) six-septate ascospore, LM (leg. A. Wieczorek, 2001, herb. Wieczorek); (J) pycnidia, SEM (leg. P. Czarnota, GPN 2946); (K) conidia, SEM (leg. P. Czarnota, GPN 2946); (L) conidia, LM (leg. P. Czarnota, GPN 2946). Scale bars: (A) 300 μ m; (B) 400 μ m; (C,J) 200 μ m; (D,F) 100 μ m; (E) 250 μ m; (G–J) 10 μ m; (K) 1 μ m; (L) 5 μ m.

Distribution outside Europe. The species is recorded primarily from Europe but also from Africa (Morocco) [65].

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], this species is found in Central European, Mediterranean, and sub-Atlantic regions. It is found on the bark of deciduous trees, including *Carpinus betulus*, *Quercus* sp., and *Fraxinus excelsior*. It is less often found on conifers. As late as the 1980s, it has not been reported from Southern Europe [10].

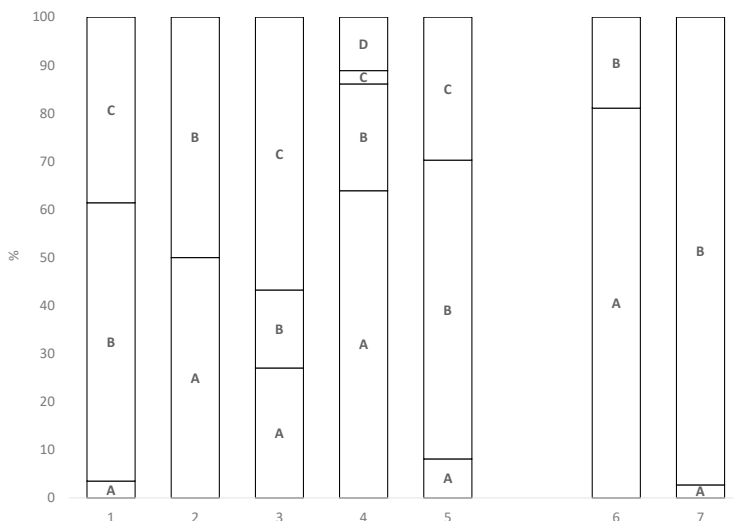


Fig. 62 Variation in selected morphological and anatomical features *Opegrapha vermicellifera*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Currently it is known from, e.g., Austria [71], the Czech Republic [295], Denmark [122,163], France [166], Germany [90,91,124–126,168,337], Great Britain [92], Ireland [94], Italy [74], Latvia [172], Lithuania [173], the Netherlands [96], Norway and Sweden [128], Portugal (Azores [98]), Slovenia [76], Spain [99], Switzerland [129], and Ukraine [100].

Habitat and distribution in Poland. *Opegrapha vermicellifera* clearly prefers extensive woodlands. It is found on the bark of deciduous trees, most often on *Fagus sylvatica* and *Ulmus* spp. However, it is less often found on *Quercus* spp., *Fraxinus excelsior*, *Acer* spp., *Carpinus betulus*, and occasionally it can be found on *Aesculus hippocastanum*, *Populus* spp., *Pyrus* sp., and *Robinia pseudacacia* [369]. Its preferred habitats are moderately acidic (pH 4.9–5.6) to neutral (pH 5.7–7.0) [38]. It is a typical skiophyte, hence it needs shaded conditions for proper development, which is similar to *O. atra* or *Zwackhia viridis* [38].

The first record of *O. vermicellifera* was published by Eitner [370] and Migula [130]. The species was reported from: Dolny Śląsk (Lower Silesia Province) [132], Świętokrzyskie Mountains [199–201], Karkonosze Mountains [202], Mierzeja Wiślana (Vistula Spit) [215], Niecka Włoszczowska (Włoszczowa Basin) [216], northeastern Poland [218], Pobrzeże Szczecińskie (Szczecin Coastland) [80], Pojezierze Ełckie (Ełk Lakeland) [305], Pojezierze Olsztyńskie (Olsztyn Lake District) [235,236], Pogórze Przemyskie (Przemysł Foothills) [112], Równina Bielska (Bielsk Plain) [55,243], Równina Drawska (Drawno Plain) [244], Równina Kozienicka (Kozienice Plain) [245,246,371,372], Śląsk Opolski (Opole Silesia) [262], Uznam and Wolin islands [354], West Bieszczady Mountains [373–376], West Carpathians [12], Western Pomerania [56,377], Wybrzeże Słowińskie (Slovincian Coast) [378], Wysoczyzna

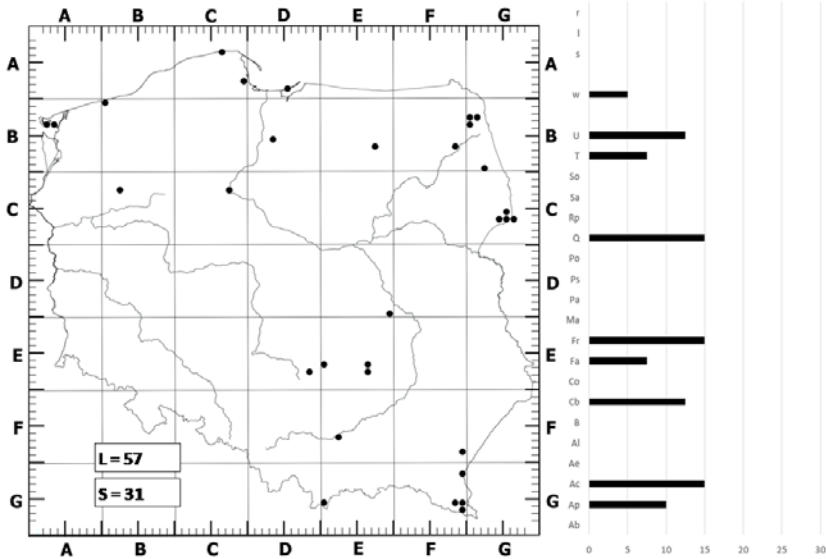


Fig. 63 Distribution and substrate preference of *Opegrapha vermicellifera* in Poland.

Białostocka (Białystok Highland) [356], and Wzgorza Radomszczańskie (Radomsko Hills) [216]. According to Nowak [10], this species was often misidentified and overlooked during field research because of its usually sterile thalli.

The species is scattered in the lowlands, and it is rare in the uplands and mountains (Fig. 63). In the mountains, it has been recorded only from the West Bieszczady Mountains and from a few localities in the Western Tatras.

4.6.14. *Opegrapha vulgata* (Ach.) Ach.

Meth. Lich.: 20 (1803).

≡ *Lichen vulgatus* Ach., Lichenogr. Suec. Prodr. 21 (1799) [1798].

= *Opegrapha cinerea* Chevall., J. Phys. Chim. Hist. Nat. Arts 94: 41 (1822).

= *Opegrapha devulgata* Nyl., Flora (Regensburg) 62: 358 (1879).

= *Opegrapha niveoatra* auct. polon. (according to Nowak 1983) [non (Borrer) J. R. Laundon].

Thallus thin, continuous or cracked, smooth or granular, white-grey to green-brown. Ascospores numerous, solitary or in small groups, straight or curved, rarely branched, 0.5–1.5 × 0.15–0.25 mm. Discs narrow, very rarely widened, sunken, black, not pruinose. Excipulum permanent, elevated, black, naked, continuous below the hypothecium, 20–45 μm thick laterally and 30–70 μm at the base. Hypothecium dirty yellowish, 15–35 μm high. Hymenium hyaline, 40–60 μm high, I+ reddish. Pseudoepithecium poorly developed. Asci cylindrical-clavate, mature 40–50 × 11–18 μm, young 30–40 × 10–13 μm, inner layer of endoascus amyloid along its whole length, ring around small ocular chamber (*vulgata*-type). Ascospores hyaline, spindle-shaped, usually straight or slightly curved, five–six-septate, 19–28 × 3–5 μm, with thin perispore of 1 μm, sometimes inconspicuous. Pycnidia numerous, sunken, small, black.

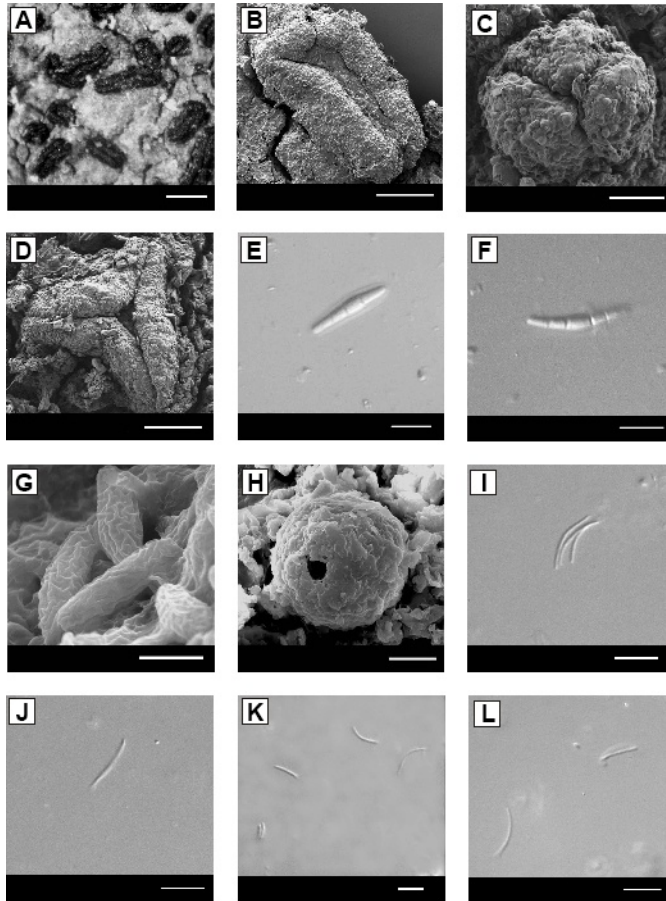


Fig. 64 *Opegrapha vulgata* (Ach.) Ach.: (A) thallus and ascomata, LM (leg. J. Nowak, KRAM-L 16211); (B–D) thallus and ascomata, SEM (leg. J. Nowak, KRAM-L 16211); (E) three-septate ascospore, LM (leg. J. Nowak, KRAM-L 7288); (F) six-septate ascospore, LM (leg. J. Nowak, KRAM-L 10012); (G) ascospores, SEM (leg. J. Nowak, KRAM-L 7252); (H) pycnidium, SEM (leg. J. Nowak, KRAM-L 16211); (I–L) conidia, LM (leg. J. Nowak, KRAM-L 7252). Scale bars: (A) 200 μm ; (B,D) 100 μm ; (C) 50 μm ; (E–G,I–L) 10 μm ; (H) 30 μm .

Conidia highly variable, straight, or slightly or strongly curved, $9\text{--}15 \times 0.9\text{--}1.5 \mu\text{m}$ (Fig. 64). Chemistry: thalli K–, C–, PD–.

Discussion. *Opegrapha vulgata* is closely related to *O. vermicellifera* and *O. niveoatra* [7]. Its long conidia and small, hardly visible, but not pruinose pycnidia help to separate it from the two morphologically similar species.

In *Opegrapha vulgata*, inter- and intrapopulation variation is observed in size and shape of the ascomata (Fig. 65). The variation is associated with diverse habitat conditions. The conidia size and shape also are highly variable. In general, the species has long and strongly

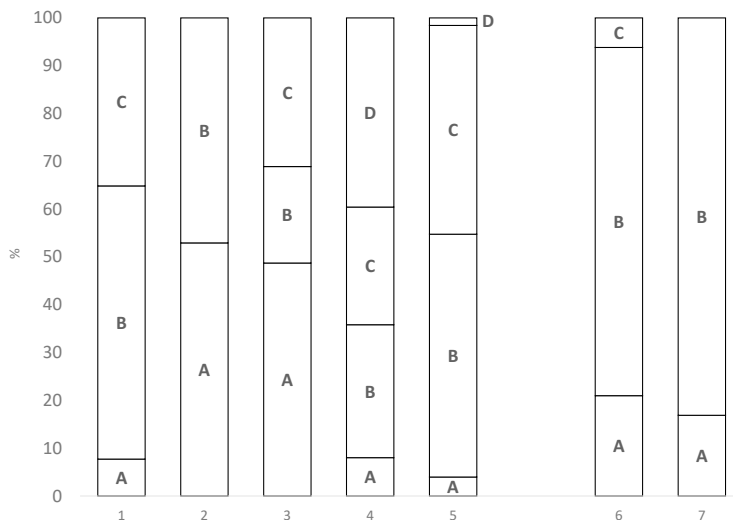


Fig. 65 Variation in selected morphological and anatomical features *Opegrapha vulgata*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

curved conidia. However, sometimes highly variable conidia can be observed within the same population: from straight to slightly or strongly curved. This also was noted by Purvis et al. [40], who distinguished three types of conidia on the basis of their size and shape. In this study, shape and size of conidia were used as the most reliable diagnostic features for this species.

Nomenclatural notes. The species was described by Acharius [18] as *Lichen vulgatus*, and it was moved to *Opegrapha* later by the some author [17]. In the eighteenth and nineteenth century, the taxon was treated under various names (*O. cinerea*, *O. confluens*, *O. devulgata*) because of the high variation in size and shape of the ascomata, ascospores, and conidia (e.g., [1]). To show this morphological variation, 22 heterotypic names of intraspecific taxa also were introduced [1]. Nowak [10] accepted two species: *O. devulgata* and *O. vulgata*.

Distribution outside Europe. This species has a wide geographic range. It can be found in the USA [135,136,138,139,379], the Republic of Khakassia in Asia [380], and Australia [381]. The taxon is frequent in oceanic climates in the Euro-Siberian and Mediterranean regions, e.g., in Israel [148], Iran [382], and Morocco [65]. It rarely occurs in dry habitats [34].

Habitat and distribution in Europe. Wirth [38] and Wirth et al. [39] defined it as having a Central European distribution where it can be found in lowland forests, in shaded habitats on slightly acidic bark. Reported, e.g., from Austria [71], the Czech Republic [295], Denmark

[122,163,383], Estonia [123], Finland [165], France [166], Germany [124,168,297], Great Britain [92], Greece [384], Hungary [93], Ireland [73], Italy [74,171], Latvia [172], Lithuania [173,174], Montenegro [176], the Netherlands [96], Norway [97], Portugal (Madeira, Azores [75,177]), Romania [179], Slovenia [76,385], Spain [99], Sweden [97], Switzerland [129], Turkey [153,154], and Ukraine [100].

Habitat and distribution in Poland. *Opegrapha vulgata* is found on the bark of both deciduous and coniferous trees in Poland. In the lowlands, it has been found on *Carpinus betulus*, *Fagus sylvatica*, *Quercus* spp., and *Acer* spp.; in the mountains, it is found on the bark of coniferous trees: *Abies alba*, *Picea abies*, and *Pinus* spp. It grows on slightly acidic substrates, with pH 4.1–4.8 [38]. The first records of *O. vulgata* were published by Körber [21], Ohlert [77], Stein [182], Eitner [303], and Lettau [78]. Later it was reported from the Beskid Makowski Mountains [186], Beskid Mały Mountains [187,321], Beskid Niski Mountains [188], Beskid Sądecki Mountains [102,103,323], Beskid Śląski Mountains [189], Bory Tucholskie (Tuchola Forest) [194], Dolny Śląsk (Lower Silesia Province) [132], Gorce Mountains [349], Świętokrzyskie Mountains [105,201,361], Kotlina Biebrzańska (Biebrza Basin) [205], Łańcuch Tatrzański macroregion [107,365], northeastern Poland [218], Pieniny Mountains [111,366], Płaskowyż Nałęczowski (Nałęczów Plateau) [220], Pobrzeże Szczecińskie (Szczecin Coastland) [80], Pogórze Spiskie (Spisz Foothills) [225], Pojezierze Ełckie (Ełk Lakeland) [305], Pojezierze Kaszubskie (Kashubian Lake District) [232], Pojezierze Olsztyńskie (Olsztyn Lake District) [235,353], Pradolina Wrocławska (Wrocław Urstromtal) [238], Roztocze [258,386], Równina Augustowska (Augustów Plain) [239], Równina Drawska (Drawno Plain) [244], Równina Kozienicka (Kozienice Plain) [246], Równina Piotrkowska (Piotrków Plain) [252,253], Równina Słupska (Słupsk Plain) [86], Sudetes [260,367], Śląsk Opolski (Opole Silesia) [262], Uznam and Wolin islands [354], West Beskids [131], West Bieszczady Mountains [309], Western Pomerania [56,84], Wybrzeże Słowińskie (Slovincian Coast) [378], Wysoczyzna Białostocka (Białystok Highland) [356], Wyżyna Wieluńska (Wieluń Upland) [280], Wyżyna Lubelska (Lublin Upland) [87], and Wzgórze Radomszczańskie (Radomsko Hills) [216].

The species is frequent in various areas of Poland (Fig. 66). In the south, it is known in the western part of the Polish Carpathians (mostly the Beskid Wysoki Mountains, Beskid Średni Mountains, Tatras, and also East Beskids) and Kotlina Kłodzka (Kłodzko Basin). Outside of the mountains, it is frequent in the lowlands [mostly in the Pojezierze Kaszubskie, Warmia and Masuria, and Nizina Podlaska (Podlachian Lowland)]. It also is scattered in the northern part of the Wyżyna Małopolska (Lesser Poland Upland).

4.6.15. **Phacographa glaucomaria* (Nyl.) Hafellner

Bibliotheca Lichenol. 100: 102 (2009).

≡ *Lecidea glaucomaria* Nyl., Bot. Notiser: 177 (1852).

≡ *Opegrapha glaucomaria* (Nyl.) Källsten ex Hafellner, Bull. Soc. Linn. Provence 45: 227 (1994).

It is a lichenicolous nonlichenized fungus. It is parasitic on the host lichen thallus (*Protoparmelia badia*). Ascumata black, roundish, naked, usually elevated above host thalli, very rarely. Discs black, narrow, rarely broad. Excipulum permanent, thick, black, continuous below the hypothecium. Hypothecium grey to grey-brown, dark, 10–14 µm high, upper part of hypothecium K+ yellowish. Hymenium 50–75 µm high, I+ reddish. Pseudoepithecium very

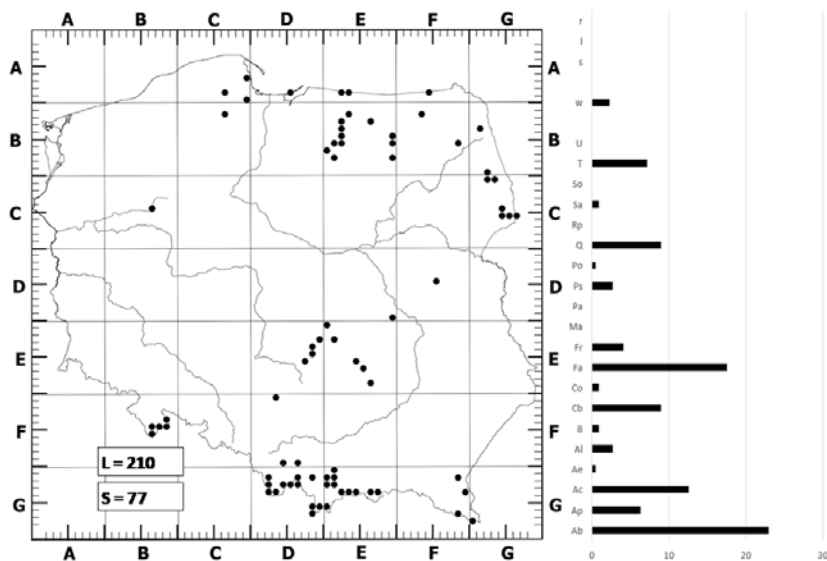


Fig. 66 Distribution and substrate preference of *Opegrapha vulgata* in Poland.

poorly developed, brown. Asci broadly club-shaped, mature $60\text{--}75 \times 18\text{--}30 \mu\text{m}$. Ascospores hyaline, ellipsoid, two–three-septate, $18\text{--}29 \times 7\text{--}9 \mu\text{m}$, darkening in herbarium specimens, with perispore of $0.6\text{--}1.4 \mu\text{m}$ thick. Pycnidia elevated or sessile, black. Conidia straight, $4\text{--}6 \times 1 \mu\text{m}$ (Fig. 67).

Discussion. *Phacographa glaucomaria* is characterized by its epruinose ascromata, with exposed discs. It differs from *Opegrapha dolomitica* in its color reaction in the upper part of the hypothecium (K+ yellowish) and its slightly wider ascospores. It differs from *Arthonia calcarea* due to its much longer and wider ascospores, and the presence of a well-developed perispore. It is difficult to assess its intraspecific variability due to too few herbarium specimens available. The two specimens studied were morphologically similar. Small differences were noted in ascospore size, but they are typical for this taxon. This species was not treated by Nowak [10].

Nomenclatural notes. The species was described by Nylander [387] as *Lecidea glaucomaria*. It was moved to *Opegrapha* in 1994, and recently to *Phacographa* [388].

General distribution. It has been reported from Canada [66], Austria [335], Portugal (Madeira [75]), and Spain [99].

Habitat and distribution in Poland. In Poland, this parasitic fungus grows on the thalli of *Protoparmelia badia*. It was recorded only from the High Tatras at the Mięguszowiecka Przełęcz Wyżnia (Mięguszowiecka Wyżnia Pass) and from Mięguszowiecki Szczyt Czarny (Mięguszowiecki Black Peak) [336] (Fig. 68).

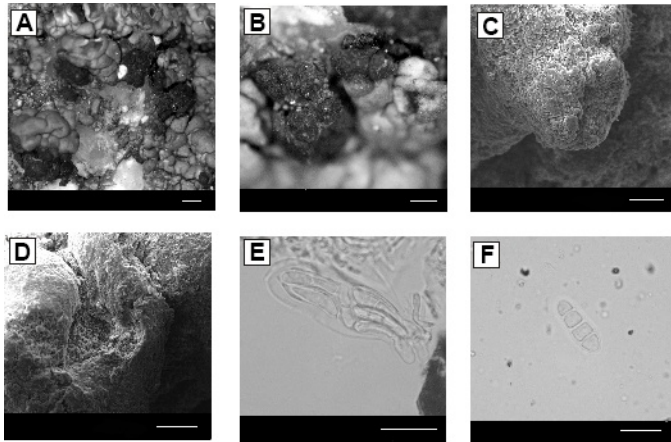


Fig. 67 *Phacographa glaucomaria* (Nyl.) Hafellner: (A,B) thallus and ascomata, LM (leg. Arnold, July 21, 1887, herb. Seaward); (C,D) thallus and ascomata, SEM; (E) ascus with ascospores, LM; (F) ascospore, LM (leg. A. Flakus, KRAM-L 52516). Scale bars: (A,B) 1 mm; (C) 50 μ m; (D) 150 μ m; (E) 40 μ m; (F) 15 μ m.

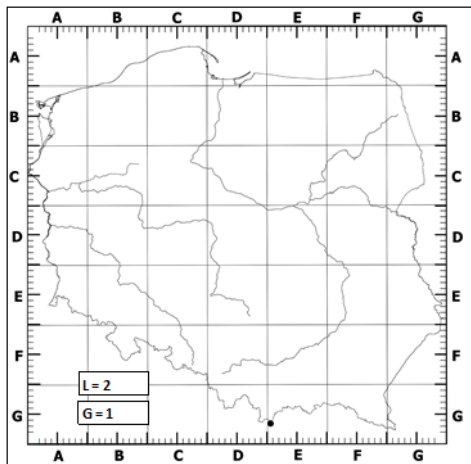


Fig. 68 Distribution of *Phacographa glaucomaria* in Poland.

4.6.16. *Pseudoschmatomma rufescens* (Pers.) Ertz & Tehler

in Ertz, Tehler, Irestedt, Frisch, Thor & Boom, Fungal Diversity 70: 42 (2015) [2014].

\equiv *Opegrapha rufescens* Pers., Ann. Bot. (Usteri) 1: 29 (1794).

= *Opegrapha herpetica* (Ach.) Ach., Meth. Lich. 23 (1803).

Thallus thin, often with dark prothallus, smooth or granular-nodular, uniform or delicately wrinkled, from grey-whitish to brownish-grey to dark brown. Ascomata numerous, more or less evenly distributed, solitary or in small groups, unbranched or branched, sunken, rarely

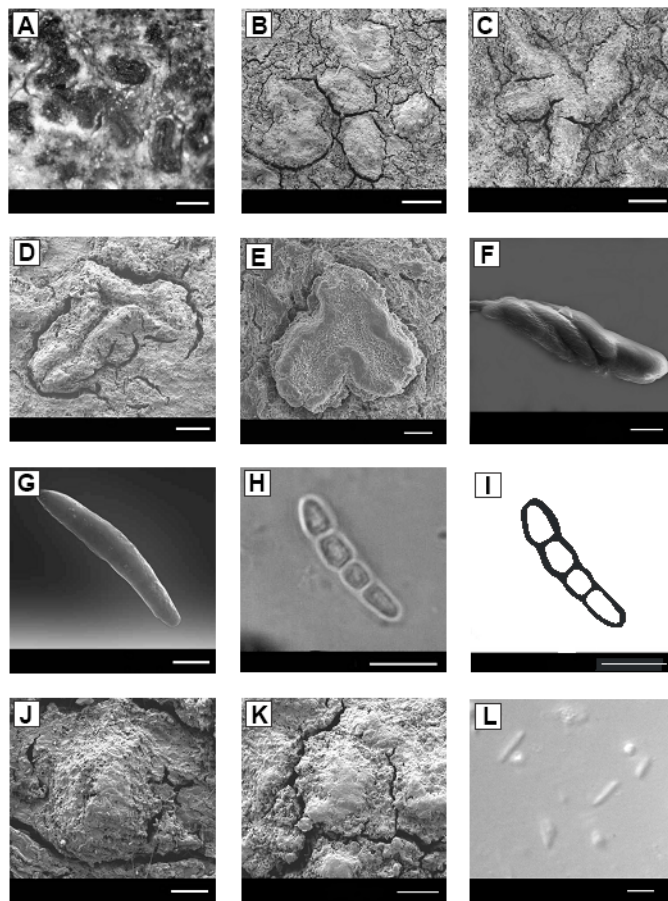


Fig. 69 *Pseudoschismatomma rufescens* (Pers.) Ertz Tehler: (A) thallus and ascomata, LM (leg. W. Fałtynowicz, UGDA-L 2568); (B–E) thallus and ascomata, SEM [(B) leg. W. Fałtynowicz, UGDA-L 2568; (C,D) leg. J. Nowak, KRAM-L 2051; (E) leg. S. Cieśliński, 1989, KTC]; (F) ascus with ascospore, SEM (leg. S. Cieśliński, 1989, KTC); (G) ascospore, SEM (leg. D. Kubiak, 2003, OLT); (H,I) ascospores, LM (leg. P. Czarnota, GPN 1181/94); (J,K) pycnidium, SEM (leg. J. Kiszka, 1968, KRAP); (L) conidium, LM (leg. P. Czarnota, GPN 1181/94). Scale bars: (A) 500 μ m; (B,C) 200 μ m; (D,K) 100 μ m; (E,H,I) 10 μ m; (F,G,L) 5 μ m.

convex, 0.4–1.2 \times 0.1–0.3 mm. Discs narrow, rarely widened, sunken, black, not pruinose. Excipulum permanent, thick, elevated, black, naked, continuous below the hypothecium, 20–40 μ m thick laterally and 30–60 μ m at the base. Hypothecium 10–25 μ m high, I+ blue. Hymenium ca. 35–70 μ m high, I+ reddish. Asci club-shaped, mature 40–60 \times 10–12 μ m, young 30–40 \times 10–11 μ m, inner layer of endoascus amyloid nearly along its whole length (*vulgata*-type). Ascospores hyaline, spindle-shaped, straight or slightly curved, three-septate, 15–25 \times 3–4 μ m, without perispore. Pycnidia numerous, small, black. Conidia straight or slightly curved, 4–7 \times 0.8–2 μ m (Fig. 69). Chemistry: thalli K–, C–, PD–.

Discussion. *Pseudoschismatomma rufescens* differs from the otherwise similar *Arthonia atra*, *Alyxoria culmigena*, and *A. ochrocheila* due to its narrower ascospores and the lack of a perispore. The primary diagnostic features of *Pseudoschismatomma rufescens* are: (i) the ascomata are relatively short and usually sunken or surrounded by the thallus, (ii) there is a lack of a perispore, and (iii) it has narrow ascospores.

Pseudoschismatomma rufescens is morphologically variable. Two varieties were described: var. *rufescens* (Pers.) Mudd and var. *subocellata* Ach., with a total of 10 forms [var. *rufescens* for. *rufescens*, for. *disparate* (Ach.) Grumm., for. *rubella* (Pers.) Grumm., for. *elegans* (Borr.) Grumm., for. *arthonioidea* (Schaer), for. *herpetica* (Ach.), for. *fuscata* (Turn. Ach.), for. *stellaris* (Müll. Arg.), var. δ . *subocellata* (Ach.) Schaer., for. *subocellata*, for. *albicans* (Chev.) Grumm.], which seem to be of little taxonomic value [10]. There is intraspecific variation in thallus color, and size and shape of the ascomata (Fig. 70). The characters are of little diagnostic value, as they change considerably with environmental factors. The size and shape of the conidia are quite variable as well, with either straight or mixed conidia (straight and slightly curved) occurring occasionally in the same population or on the same thallus.

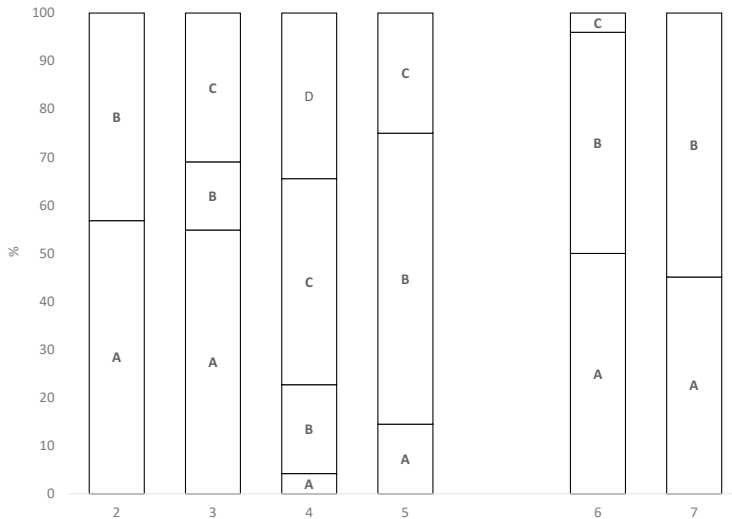


Fig. 70 Variation in selected morphological and anatomical features of *Pseudoschismatomma rufescens*. 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Nomenclatural notes. The species was described by Persoon [283] as *Opegrapha rufescens*. Ertz et al. [6] placed it in *Pseudoschismatomma* and noted its close morphological and anatomical similarity to species of the family Roccellaceae, including the genera *Lecanactis* and *Schismatomma*. This similarity was mentioned by Diederich et al. [36], who pointed out the lack of a perispore in ascospores of the taxa.

Distribution outside Europe. This species has a wide geographic range, being distributed in China [144], Morocco [65], Mongolia [389], the USA [138,288,390], and Canada [66].

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], this species occurs in boreal Mediterranean and sub-Atlantic regions. *Pseudoschismatomma rufescens* grows on the bark of *Carpinus betulus*, *Fagus sylvatica*, *Fraxinus excelsior*, and *Quercus* spp., and occasionally on *Abies* spp. and *Picea* spp. It usually is found in natural broad-leaved forest stands, where it is sometimes seen on trees growing along rivers and streams. It prefers moderately acidic to neutral substrates, with pH 4.9–7.0 [38].

This species has been reported from Austria [71,160], the Czech Republic [295], Denmark [122,163], Estonia [123], Finland [165], France [166,167], Germany [124,170,297], Great Britain [92], Greece [127], Hungary [93], Ireland [94], Italy [74], Latvia [172], Lithuania [173,174], Malta [95], Montenegro [316], the Netherlands [96], Norway [97], Portugal (Madeira, Azores) [75,98], Romania [178], Russia (Dagestan) [333], Slovenia [76], Spain [99], Sweden [97], Switzerland [129], and Ukraine [100,180,181].

Habitat and distribution in Poland. *Pseudoschismatomma rufescens* occurs primarily in extensive natural woodlands and sometimes on isolated trees. It prefers shaded and slightly moist habitats. It is widespread (in some places common) in the lowlands and mountains to the lower montane zone of Poland. It grows on the bark of deciduous trees (*Carpinus betulus*, *Fagus sylvatica*, *Fraxinus excelsior*, *Quercus* spp., less often on *Salix* spp.), occasionally on *Abies alba*, exceptionally on *Picea abies*.

The first records of *Pseudoschismatomma rufescens* were published by Körber [21], Ohlert [77], Stein [182], Eitner [303,347], and Lettau [78]. It was reported from Galicia [391], the Beskid Makowski Mountains [186], Beskid Mały Mountains [321], Beskid Niski Mountains [188,322], Beskid Sądecki Mountains [103,323], Beskid Śląski Mountains [189,190], Beskidy Lesiste Mountains [191], Bieszczady Mountains [193,376], Bory Tucholskie (Tuchola Forest) [194], Dolina Dolnego Sanu (Lower San River Valley) [104,392], Dolina Konińska (Konin Valley) [196], Dolina Wisły (Vistula Valley) [393,394], Dolny Śląsk (Lower Silesia Province) [132], Gorce Mountains [349], Stołowe Mountains [198], Świętokrzyskie Mountains [199–201], Kotlina Gorzowska (Gorzów Basin) [395], Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin) [362], Kotlina Sandomierska (Sandomierz Basin) [396,397], Kotlina Żywiecka (Żywiec Basin) [207], Łańcuch Tatrzański macroregion [210,211], Masyw Ślęży (Ślęża Massif) [213], Nizina Mazowiecka (Mazovian Lowland) [217], Padół Zamojski (Zamość Depression) [223], Pieniny Mountains [110,111,398], Płaskowyż Nałęczowski (Nałęczów Plateau) [220], Pobrzeże Kaszubskie (Kashubian Coastland) [79,221], Pobrzeże Szczecińskie (Szczecin Coastland) [80,222], Podgórze Rzeszowskie (Rzeszów Foothills) [223], Pogórze Przemyskie (Przemysł Foothills) [112], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foothills) [81], Pogórze Spiskie (Spisz Foothills) [225], Pojezierze Ełckie (Ełk Lakeland) [305,399], Pojezierze Gnieźnieńskie (Gniezno Lake District) [229], Pojezierze Kaszubskie (Kashubian Lake District) [232], Pojezierze Krajeńskie (Krajna Lake District) [233], Pojezierze Olsztyńskie (Olsztyn Lake District) [235], northeastern Poland [218], Pradolina Wieprza (Wieprz River Urstromtal) [237], Równina Drawska (Drawno Plain) [85,244], Roztocze [255,256,258], Równina Augustowska (Augustów Plain) [239,241,307], Równina Bielska (Bielsk Plain) [55,243], Równina Biłgorajska (Biłgorajska Plain) [308], Równina Drawska, Równina Kozienicka (Kozienice Plain) [245,373,400], Równina Łęczyńsko-Włodawska

(Łęczna-Włodawa Plain) [247], Równina Łukowska (Łuków Plain) [251], Równina Słupska (Słupsk Plain) [86,401], Sudetes [260,261,367], Śląsk Opolski (Opole Silesia) [262], West Beskids [131,190,191], Western Pomerania [264,402], Wybrzeże Słowińskie (Slovincian Coast) [378], Wysoczyzna Białostocka (Białystok Highland) [272], Wysoczyzna Elbląska (Elbląg Highland) [273], Wysoczyzna Kaliska (Kalisz Highland) [274,275], Wysoczyzna Łaska (Łask Highland) [276], Wyżyna Lubelska (Lublin Upland) [87], Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland) [278], Wyżyna Sandomierska (Sandomierz Upland) [279], and Zakłęsłość Sosnowicka (Sosnowica Depression) [282].

In comparison to other species of the genus *Opegrapha* s. l., *P. rufescens* is most widespread in the Polish lowlands, with a majority of its known localities in the northern and eastern parts of the country, mostly in Warmia, Masuria, the Nizina Podlaska (Podlachian Lowland), and Wyżyna Lubelska. In southern Poland, it is found in the western part of the Polish Carpathians and in the East Beskids (Fig. 71).

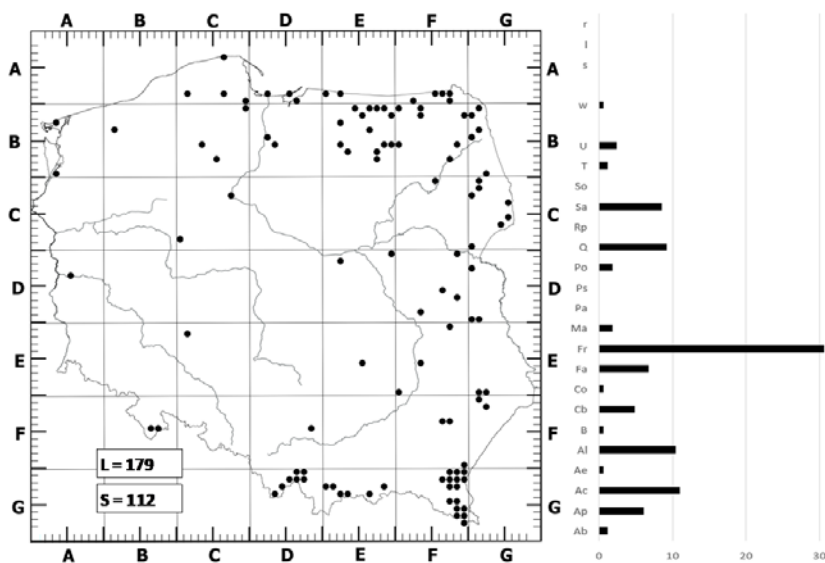


Fig. 71 Distribution and substrate preference of *Pseudoschismatomma rufescens* in Poland.

4.6.17. *Zwackhia soreidiifera* (P. James) Ertz

in Diederich, Ertz, Eichler, Cezanne, Boom, Fischer, Killmann, van den Broeck & Sérusiau, Bull. Soc. Nat. Luemb. 113: 106 (2012).

≡ *Opegrapha soreidiifera* P. James, Lichenologist 2: 86 (1962).

Thallus thin, partly sunken, with characteristic orange soralia. Ascomata black, unbranched, 0.2–0.7 × 0.1–0.3 mm, not pruinose, elevated, very rarely sunken. Discs black, narrow, rarely broad. Excipulum continuous below the hypothecium, 80–100 μm thick at the base, K+ olive-green. Hypothecium grey to grey-brown, dark, 10–15 μm high. Hymenium pale, 80–110 μm high, I+ reddish. Asci club-shaped, 60–100 × 16–21 μm. Ascospores hyaline, spindle-shaped,

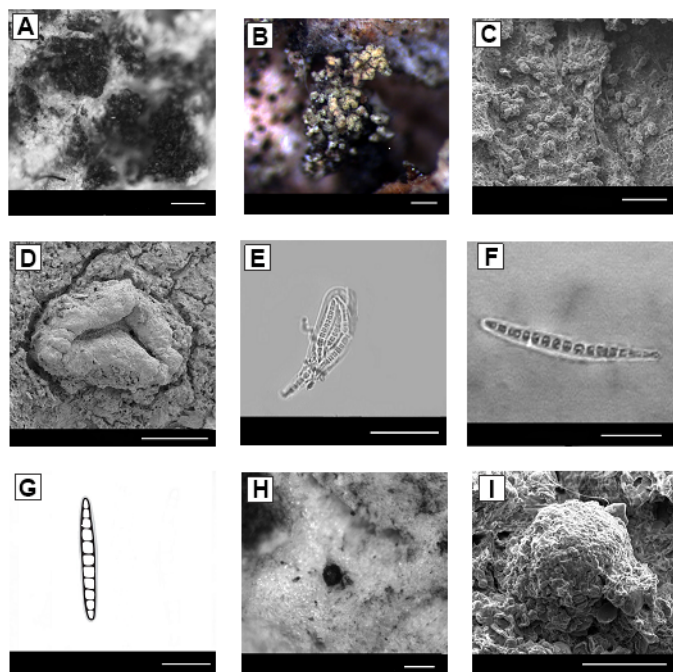


Fig. 72 *Zwackhia soredivifera* (P. James) Ertz: (A,B) thallus with soredia, LM (leg. A. Wieczorek, 2014, herb. Wieczorek); (C) thallus with soredia, SEM (leg. A. Wieczorek, 2014, Sept. 22, herb. Wieczorek); (D) apothecia, SEM (leg. A. Wieczorek, 2014, herb. Wieczorek); (E) ascus with ascospore, LM (leg. A. Wieczorek, 2014, herb. Wieczorek); (F,G) ascospore, LM (leg. A. Wieczorek, 2014, herb. Wieczorek); (H) pycnidium, LM (leg. A. Wieczorek, 2014, herb. Wieczorek); (I) pycnidium, SEM (leg. A. Wieczorek, 2014, herb. Wieczorek). Scale bars: (A,B,G) 2 mm; (C) 200 μ m; (D) 30 μ m; (E) 15 μ m; (F) 10 μ m; (H) 40 μ m; (I) 200 μ m.

30–45 \times 4–5 μ m, 10–14-septate, with well-developed perispore of 0.5–0.9 μ m thick. Pycnidia elevated or sessile, black. Conidia straight, 4–6 \times 0.5–0.8 μ m (Fig. 72). Soredia K–, C– or + reddish, PD–.

Discussion. *Zwackhia soredivifera* is often mistaken with *Z. viridis*. Although both species grow together in mixed populations, they are relatively easy to distinguish. *Zwackhia soredivifera* can be recognized due to its characteristic orange soralia, multicellular ascospores, and markedly thinner perispore. The minor diagnostic features of *Z. soredivifera* are the shorter and slightly wider ascospores compared to *Z. viridis*. Because of its rarity in Poland, intraspecific variability cannot be assessed.

Nomenclatural notes. *Opegrapha soredivifera* was described by James [403] based on specimens collected near Middleton in Ireland. In Europe, this taxon had been overlooked until recently. According to the latest taxonomic treatment, the species is now placed in the genus *Zwackhia* [29]. Both species in this genus, *Z. soredivifera* and *Z. viridis*, differ from other species in the genus *Opegrapha* s. l. by their multicellular spindle-shaped ascospores and *vulgata*-type asci,

which are characterized by an inner layer of endoascus amyloid along most of its length and a conspicuous ring with no apical nasse.

Distribution outside Europe. This species is known from North America, recorded, e.g., from Canada [66].

Habitat and distribution in Europe. *Zwackhia soreidiifera* was reported, e.g., from the Azores [404], Denmark [163], Estonia [123], France [405], Great Britain [92], Lithuania [173,174], and Norway and Sweden [97].

Habitat and distribution in Poland. This is the first record of *Z. soreidiifera* reported from Poland. The species was found on the bark of *Fraxinus excelsior* and *Carpinus betulus* in extensive woodlands, in the northwestern part of the country (Fig. 73).

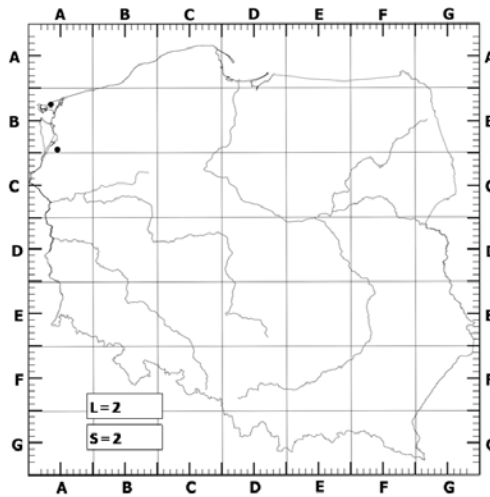


Fig. 73 Distribution of *Zwackhia soreidiifera* in Poland.

4.6.18. *Zwackhia viridis* (Ach.) Poetsch & Schied.

System. Aufzähl. Samenlos. Pflanzen (Krypt.): 186 (1872).

≡ *Opegrapha rubella* var. *viridis* Ach., Methodus, Sectio prior Stockholmia: 22 (1803).

= *Opegrapha viridis* (Ach.) Behlen & Desberger, Naturgesch. und Beschreib. Deutsch Forst.-Kryptog.: 110 (1835).

Thallus thin, often with lines of dark prothallus, smooth or delicately cracked in some parts, grey-brown. Ascomata numerous, solitary or in large groups, usually evenly distributed, unbranched or branched, 0.4–5.0 × 0.1–0.4 mm. Discs flat or convex, black and not pruinose, at early stages of development very narrow, but during maturation some of them widened. Excipulum edge thick, permanent, elevated, black, naked, continuous below the hypothecium,

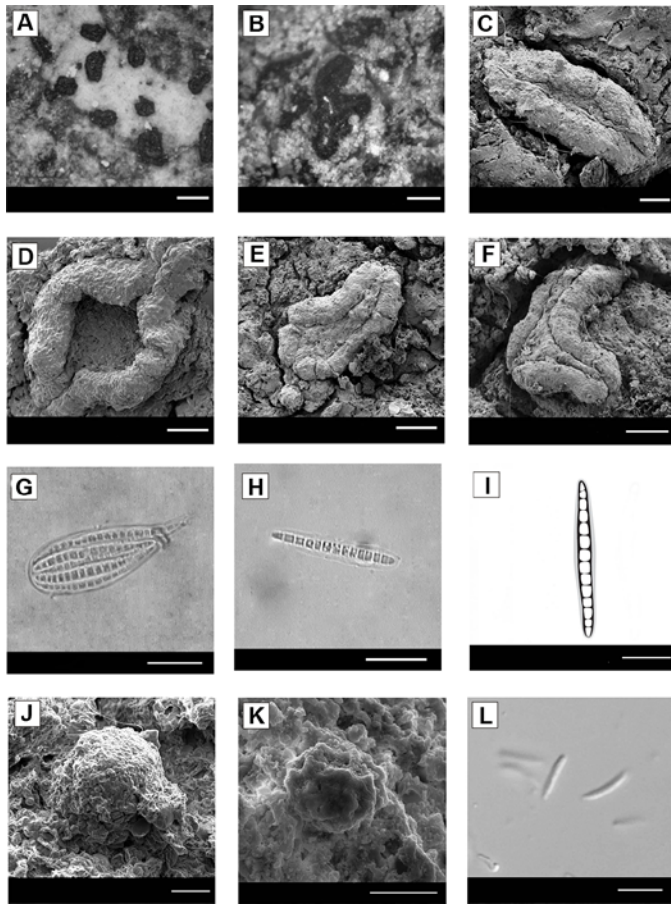


Fig. 74 *Zwackhia viridis* (Ach.) Poetsch & Schied.: (A,B) thallus and ascomata, LM [(A) leg. A. Wieczorek, 1997, herb. Wieczorek; (B) leg. W. Fałtynowicz & J. Miądlikowska UGDA-L 3496]; (C-F) thallus and ascomata, SEM [(C,E) leg. A. Wieczorek, July 12, 1997, herb. Wieczorek; (D,F) leg. W. Fałtynowicz & J. Miądlikowska UGDA-L 3496]; (G) ascus with ascospores, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (H,I) ascospores, LM (leg. A. Wieczorek, 1997, herb. Wieczorek); (J,K) pycnidium, SEM (leg. W. Fałtynowicz & J. Miądlikowska, UGDA-L 3496); (L) conidia, LM (leg. W. Fałtynowicz & J. Miądlikowska, UGDA-L 3496). Scale bars: (A,B) 200 (C-F) 200 μm ; (G) 30 μm ; (H,I) 20 μm ; (J,K) 100 μm ; (L) 10 μm .

20–60 μm thick laterally and 30–80 μm at the base. Hypothecium brownish, 10–35 μm high. Hymenium hyaline, ca. 40–85 μm high, I+ reddish-yellow. Pseudoepithecium poorly developed. Asci club-shaped, mature 50–90 \times 15–25 μm , young 30–50 \times 10–15 μm – inner layer of endoascus amyloid nearly along its whole length, chamber small, with no apical nasse (*vulgata*-type). Ascospores hyaline, narrowly spindle-shaped, straight or slightly curved, (5)6–15-septate, 20–60 \times 3–10 μm , with well-developed perispore of 1.5–2.0 μm thick. Pycnidia numerous, small, black. Conidia straight or slightly curved, 6–11 \times 0.8–2 μm (Fig. 74). Chemistry: thalli K \pm dark rusty-brownish, C–, PD–.

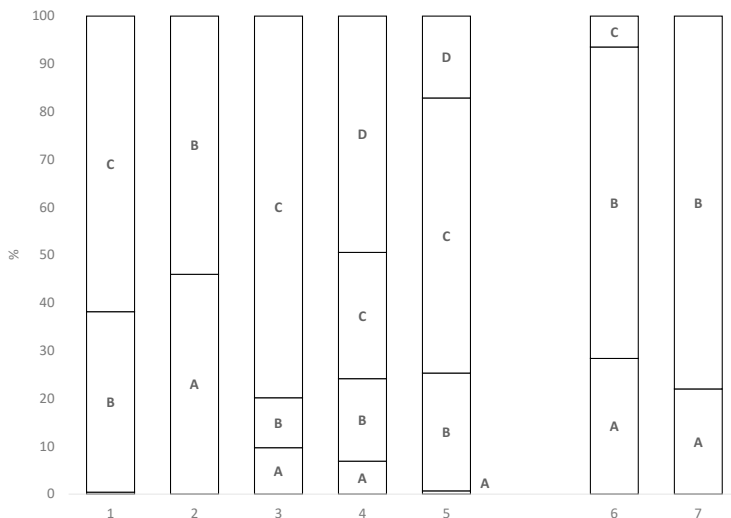


Fig. 75 Variation in selected morphological and anatomical features *Zwackhia viridis* 1 – ascomata shape: A – circular, B – elliptic, C – elongate; 2 – ascomata: A – unbranched, B – branched; 3 – disc type: A – concave, B – flat, C – convex; 4 – thallus color: A – white, B – grey, C – white-grey, D – brownish; 5 – excipulum types; 6 – number of pycnidia: A – few, B – numerous, C – very numerous; 7 – type of pycnidia: A – sessile, B – convex.

Discussion. *Zwackhia viridis* is easy to recognize due to its very long and narrow, multicellular ascospores and its well-developed hyaline perispore. Its thallus habit and ascomata shape sometimes resemble *Opegrapha vulgata* and *O. niveoatra*, but the ascospore size and structure generally differ in the latter species.

Similar to other species with wide geographic ranges, *Zwackhia viridis* shows high phenotypic variability. Nowak [10] distinguished five forms of the species: for. *viridis*, for. *albicans* Kremp. ex Redgr., for. *perminuta* Erichs. ex Redgr. in herb., for. *subatra* Erichs. ex Redgr. in herb., and for. *ferruginea* (Kremp.) A. Zahlbr. The size and shape of ascomata are highly variable in this species (Fig. 75), as is ascospore length (with a range from 20 µm to 60 µm), and the number of cells in ascospores. The majority of specimens (76) have 10-septate ascospores, followed by 47 specimens with 11-septate ascospores and 20 specimens with 12-septate ascospores. The remaining specimens have 13–15-septate ascospores [34].

A recent study on the genetic diversity of seven populations of *Z. viridis* revealed high intraspecific genetic variability in different regions of eastern Poland [406].

Nomenclatural notes. *Zwackhia viridis* was described by Acharius [17] in 1803, under the name *Opegrapha rubella* var. *viridis*. In 1814, the species name *O. viridis* began being used widely [3]. An old synonym for the species is *Lecanactis involuta* (Wallr.) A. Massal. [407]. In 1869, *O. viridis* was transferred to *Graphis* by Branth and Rostrup [408]. The species was treated by Poetsch and Schiedermayr [409], who due to its specific features, called it *Zwackhia viridis*, adopting the generic epithet from Körber [21]. Research by Ertz and Tehler [7] confirmed the genotypic differentiation of this taxon, and the genus *Zwackhia* was reinstated by the authors, who considered the morphological and anatomical structure of its representatives.

Distribution outside Europe. *Zwackhia viridis* has a wide geographic range, comprising Africa, North America, and Asia. It has been recorded, e.g., from China [144], Hong Kong [146], Korea [68], Taiwan [69], Morocco [65], Canada [66], and the USA [135,138,139,410].

Habitat and distribution in Europe. According to Wirth [38] and Wirth et al. [39], *Zwackhia viridis* occurs in Central European, Mediterranean, and sub-Atlantic regions. In Europe, it grows on the bark of deciduous trees, most often on *Quercus* spp., *Fraxinus excelsior*, *Fagus sylvatica*, and *Carpinus betulus*. Occasionally it can be found on coniferous trees.

It has been recorded, e.g., from Austria [71], the Czech Republic [295], Denmark [122,163], Estonia [411], Germany [168,412], Great Britain [92], Hungary [93], Latvia [172], Lithuania [175,413], Romania [178,179], Sweden and Norway [128], Switzerland [129], and Ukraine [100].

Habitat and distribution in Poland. *Zwackhia viridis* grows mostly on the bark of *Fagus sylvatica*, *Carpinus betulus*, and *Fraxinus excelsior*, in well-preserved forests of Poland. It is found less frequently on isolated trees or in open forests, such as on *Betula* spp., *Acer* spp., *Quercus* spp., or *Populus* spp. Occasionally, it is found on *Abies alba* [367]. *Zwackhia viridis* grows on trees whose bark is moderately acidic to neutral, with pH 4.9–7.0. It grows in the shade, preferring moist habitats [38].

The first records of *Zwackhia viridis* were published by Körber [21], Ohlert [77], Stein [182], Eitner [303,347], and Lettau [78]. It was reported from Galicia [185], the Beskid Mały Mountains [321], Beskid Niski Mountains [188,322], Beskid Sądecki Mountains [102,323], Beskid Śląski Mountains [189,190], Beskidy Lesiste Mountains [191], Bory Tucholskie (Tuchola Forest) [194,195], Dolina Dolnego Sanu (Lower San River Valley) [104,397], Dolina Konińska (Konin Valley) [194], Dolina Wisły (Vistula Valley) [394], Dolny Śląsk (Lower Silesia Province) [132], Gorce Mountains [349,414], Stołowe Mountains [198], Świętokrzyskie Mountains [199–201], Kotlina Gorzowska (Gorzów Basin) [395], Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin) [362], Kotlina Żywiecka (Żywiec Basin) [207], Łańcuch Tatrzański macroregion [210,211], Masyw Ślęży (Ślęża Massif) [213], Mierzeja Wiślana (Vistula Spit) [215], Niecka Włoszczowska (Włoszczowa Basin) [216]. Nizina Mazowiecka (Mazovian Lowland) [217], Padół Zamojski (Zamość Depression) [223], Pieniny Mountains [110,111,219], Płaskowyż Nałęczowski (Nałęczów Plateau) [220], Pobrzeże Kaszubskie (Kashubian Coastland) [83,221], Pobrzeże Szczecińskie (Szczecin Coastland) [80,222], Podgórze Rzeszowskie (Rzeszów Foothills) [223], Pogórze Przemyskie (Przemysł Foothills) [112], Pogórze Rożnowsko-Ciężkowickie (Rożnowsko-Ciężkowickie Foothills) [81], Pogórze Spiskie (Spisz Foothills) [225], Pojezierze Ełckie (Ełk Lakeland) [82,305,399], Pojezierze Gnieźnieńskie (Gniezno Lake District) [227–229], Pojezierze Iławskie (Iława Lake District) [231], Pojezierze Kaszubskie (Kashubian Lake District) [232], Pojezierze Krajeńskie (Krajna Lake District) [233], Pojezierze Olsztyńskie (Olsztyn Lake District) [235,353], northeastern Poland [218], Pradolina Wieprza (Wieprz River Urstromtal) [237], Równina Łukowska (Łuków Plain) [251], Roztocze [255,256,258], Równina Augustowska (Augustów Plain) [239,241,242,307], Równina Bielska (Bielsk Plain) [55,243], Równina Biłgorajska (Biłgorajska Plain) [308], Równina Drawska (Drawno Plain) [85,244], Równina Kozienicka (Kozienice Plain) [245,372,400], Równina Łęczyńsko-Włodawska (Łęczna-Włodawa Plain) [247], Równina Łowicko-Błońska (Łowicz-Błonie Plain) [249], Równina Piotrkowska (Piotrków Plain) [252,253], Równina Słupska (Słupsk Plain) [86], Sudetes [259–261,367],

Śląsk Opolski (Opole Silesia) [262], West Beskids [131,190,191], West Bieszczady Mountains [309,355,376], Western Pomerania [84,264,402], Wybrzeże Słowińskie (Slovincian Coast) [378], Wysoczyzna Białostocka (Białystok Highland) [271,272,356], Wysoczyzna Elbląska (Elbląg Highland) [273], Wysoczyzna Kaliska (Kalisz Highland) [274,275], Wysoczyzna Łaska (Łask Highland) [276], Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland) [278], Wyżyna Lubelska (Lublin Upland) [87], Wyżyna Sandomierska (Sandomierz Upland) [279], and Zakłęśłość Sosnowicka (Sosnowica Depression) [282].

Zwackhia viridis is one of the most frequent epiphytic species in Poland, and it is distributed in both lowlands and uplands [e.g., the Pojezierze Pomorskie (Pomeranian Lake District), Warmia and Masuria, Wyżyna Małopolska (Lesser Poland Upland), and Wyżyna Lubelska] as well as in the mountains (Tatras, Beskids, and Bieszczady Mountains) (Fig. 76). Herbarium specimen labels indicate that in the Tatras, it is frequent in both the lower and upper montane belts, but it reaches the subalpine belt (altitudes of up to about 1,700 m).

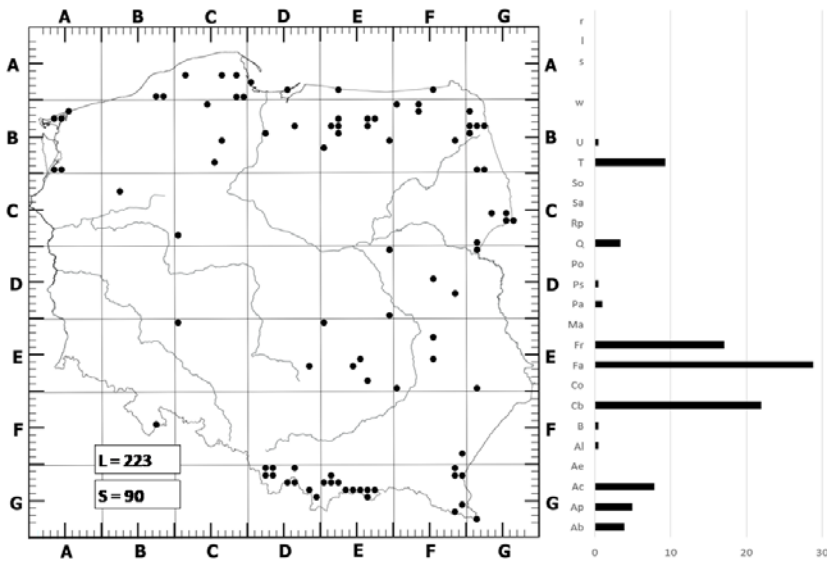


Fig. 76 Distribution and substrate preference of *Zwackhia viridis* in Poland.

5. Summary of results and conclusions

- About 1,400 specimens of the genus *Opegrapha* s. l. were examined from the Polish herbaria (BDPA, KRA, KRAM, KRAP, KTC, LBL, LOD, OLTC, POZ, TRN, UGDA, WA, WRSL), from private collections, and obtained during the author's field research. Reference material from several European herbaria also was studied (e.g., BILAS, GSU, NNSU, OHHI, WI).

- In total, 18 species of the genus *Opegrapha* s. l. were found to occur in Poland, including, eight of the genus *Opegrapha* s.s., four of the genus *Alyxoria*, two of the genus *Arthonia*, two of the genus *Zwackhia*, one of the genus *Gyrographa*, one of the genus *Phacographa*, and one of the genus *Pseudoschismatomma*.
- *Zwackhia soređiifera* is reported from Poland for the first time.
- An identification key for the species of the genus *Opegrapha* s. l. found in Poland was compiled based on morphological and anatomical characters.
- Most of the species in the genus *Opegrapha* s. l. in Poland are simple to identify. The only exception is *Arthonia calcarea*, as its ascospores are of similar size and shape to those of *O. saxicola*. However, *A. calcarea* differs from *O. saxicola* by having a narrow perispore and different ascus structure.
- Within the genus *Alyxoria*, the shape of the hymenial disc and ascomata varied widely, so the characters do not seem to be good diagnostic features.
- In the genus *Opegrapha*, conidia size and shape are the most reliable diagnostic characters at the species level.
- All species of genus *Opegrapha* s. l. grow on natural substrates in Poland.
- Out of the 18 species, 10 are epiphytes that grow on the bark of various tree species, including: *Alyxoria culmigena*, *A. ochrocheila*, *A. varia*, *Arthonia atra*, *Opegrapha niveoatra*, *O. vermicellifera*, *O. vulgata*, *Pseudoschismatomma rufescens*, *Zwackhia soređiifera*, and *Z. viridis*.
- The epilithic species of the genus *Opegrapha* s. l. are *Alyxoria mougeotii*, *Arthonia calcarea*, *Gyrographa gyrocara*, *Opegrapha dolomitica*, *O. lithyrge*, and *O. saxicola*, and they occur predominantly in the south of the country.
- New regional records for the number of species extended our knowledge of their distribution in Poland.
- Several species are rare in Poland and are known only from a few localities. These include *Alyxoria culmigena*, *A. mougeotii*, *A. ochrocheila*, *Arthonia calcarea*, *Opegrapha dolomitica*, *O. geographicola*, *O. lithyrge*, *Phacographa glaucomaria*, and *Zwackhia soređiifera*.
- A large number of the examined specimens originated from the northeastern and southern parts of Poland, likely a consequence of the more intensive collecting activity there compared to other areas.

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1. Appendix: list of examined herbarium specimens, literature records, and list of surveyed localities

Alyxoria culmigena (Lib.) Ertz

Specimens examined. **AB-84** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Szczecin Landscape Park, Puszcza Bukowa (Beech Forest), *Fagus sylvatica*, forest section No. 240, July 1997, leg. A. Wieczorek (herb. Wieczorek). **AC-48** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Gorzowska (Gorzów Plain): Puszcza Barlinecka (Barlinek Forest), Wilanów Nature Reserve, *Populus* spp., December 3, 1989, leg. L. Lipnicki (herb. Lipnicki).

Additional material examined. **BELARUS:** Gomel Region, Gomel District, Pribor forest, 52°22' N, 30°45' E, *Vaccinium myrtillus*-type old-growth pine forest, *Pinus* sp., October 10, 2012, leg. A. Tsurykau 01382 (GSU); Kalinino forest, 52°15' N, 30°59' E, *Pleurozium schreberi*-type pine forest, *Pinus* sp., October 2, 2012, leg. A. Tsurykau 01383 (GSU); Kalinino forest, 52°15' N, 30°59' E, *Pleurozium schreberi*-type pine forest, *Pinus* sp., August 3, 2011, leg. A. Tsurykau, 01439 (GSU); Kalinino forest, 52°15' N, 30°58' E, *Pteridium aquilinum*-type pine forest, *Pinus* sp., August 3, 2011, leg. A. Tsurykau 01440 (GSU). **FRANCE:** forêt de Hardelet, *Quercus* sp., August 29, 1954, leg. J. Barkman. **RUSSIA:** Orel region, T. 204, Khotynetsky distr., Orlovskoye Polesie National Park, Lgovskoye Forest Division, dried wood, 53°17.249' N, 35°20.544' E, alt. 239 m, June 9, 2012, leg. E. E. Muchnik 9635 (OHHI).

Alyxoria mougeotii (A. Massal.) Ertz, Frisch & G. Thor

Specimens examined. **DF-48** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Ojców village, Dolina Sąspowska (Sąspowska Valley), limestone, May 1, 1956, leg. J. Nowak (KRAM-L 4128). **DF-58** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Kochanów village near Rudawa village, limestone, August 6, 1956, leg. J. Nowak (KRAM-L 4132); Ojców National Park, Dolina Prądnika (Prądnik River Valley), rock, May 3, 2005, leg. J. Kiszka (KRAP); Dolina Sąspowska (Sąspowska Valley), Jarki Gorge, rock, September 29, 2005, leg. J. Kiszka (KRAP). **EE-82** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Polichno village, limestone, April 10, 1977, leg. Sepski (KTC). **EG-32** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: rocks in Czorsztyń village, limestone, October 11, 1993, leg. J. Kiszka (KRAP); Zielone Skalki, on N from Falsztyn village, limestone, August 18, 1995, leg. J. Kiszka (KRAM-L 60008). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Wąwóz Szopczański [Sobczański] (Szopczański Gorge), limestone, September 11, 1957, leg. K. Glanc (KRAM-L 39372); Wąwóz Szopczański [Sobczański] (Szopczański Gorge), alt. 560 m, limestone, September 18, 1957, leg. Z. Tobolewski (POZ); limestone, August 6, 1954, leg. Z. Tobolewski (POZ). **EG-36** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny Krynickiej (Jaworzyna Krynicka Range), sandstone, August 23, 1985, leg. A. Wieczorek (herb. Wieczorek).

FF-98 – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): Krzeczkowa village, rock, stones, May 22, 1986, leg. J. Piórecki (BDPA).

FF-99 – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): Przemysł City, on the way to Kruhel Wielki village, No. 127, concrete wall, October 16, 1996, leg. J. Kiszka (KRAM-L 60007).

Additional material examined. GREAT BRITAIN: Chudleigh cave, S Devon, on basic rock in deep shade, August 15, 1975, leg. C. J. B. Hitch (herb. Seaward).

***Alyxoria ochrocheila* (Nyl.) Ertz & Tehler**

Specimens examined. DG-24 – West Beskids, Beskid Żywiecki Mountains: Rysianka Mount, *Fagus sylvatica*, July 3, 1978, leg. J. Kiszka & J. Nowak (KRAM-L 17736); Hala Rysianka, *Fagus sylvatica*, September 7, 1964, leg. J. Nowak (KRAM-L 17579). **EE-09** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Jedlnia Nature Reserve, *Quercus* sp., September 1, 2003, leg. S. Cieśliński (KTC). **EE-60** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Łopuszańskie (Łopuszańskie Hills), Oleszno Nature Reserve, forest section No. 53, *Acer pseudoplatanus*, February 2008, leg. A. Donica (KTC). **FE-75** – Wyżyna Lubelska (Lublin Upland), Wzniesienia Urzędowskie (Urzędów Hills): Trzydnik village near Kraśnik village, *Carpinus betulus*, 1975, leg. Z. Flisińska (LBL).

Additional material examined. DENMARK: Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek). **GERMANY:** Schleswig-Holstein, Ostholstein, Fehmarn, Staberhuk, Staber Holz, *Sambucus nigra*, October 30, 2010, leg. U. Schiefelbein 2468 (herb. Schiefelbein); Mecklenburg-Vorpommern, Landkreis Mecklenburg-Strelitz, Schlosspark, Mirow, concrete, November 2, 2002, leg. U. Schiefelbein 1213 (herb. Schiefelbein); Vorpommern-Rügen, Isle of Rügen, forest Goor, ca. 1 km E of Badehaus, alt. 15 m, *Carpinus betulus*, October 24, 2014, leg. U. Schiefelbein 3732 (herb. Schiefelbein); Niedersachsen, Landkreis Cloppenburg, NSG Urwald Baumweg, *Carpinus betulus*, October 25, 2004, leg. U. Schiefelbein 1887 (herb. Schiefelbein).

***Alyxoria varia* (Pers.) Ertz & Tehler**

Specimens examined. BA-59 – Pobrzeże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Slovincian Coast): Orzechowo village near Ustka town, *Fagus sylvatica*, July 17, 1986, leg. W. Fałtynowicz (UGDA-L 2824) as *O. variaeformis*. **BA-98** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Chomicz village near Janiewice village, *Fagus sylvatica*, August 27, 1987, leg. W. Fałtynowicz & J. Miądlkowska (UGDA-L 3893) as *O. variaeformis*. **BB-23** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Białogardzka (Białogard Plain): Krępa village near Białogard town, *Acer* sp., October 17, 1987, leg. W. Fałtynowicz (KRAM-L 21815, UGDA-L 3602) as *O. variaeformis*. **BB-59** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Dolina Gwdy (Gwda River Valley): Cisy w Czarnem Nature Reserve, beech forest, *Fagus sylvatica*, November 13, 2004, leg. M. Kukwa 3709 (UGDA-L 12641). **BC-12** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy

(Drawa National Park), Tragankowe Urwisko Nature Reserve, E slopes of Drawa River, ca. 2 km NE of Zatom village, *Fagus sylvatica*, May 6, 2010, leg. U. Schiefelbein 2617, 2625 (herb. Schiefelbein). **BC-22** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Ostrowiec Lake, Okrzei Island, *Fagus sylvatica*, August 17, 1989, September 18, 1989, leg. L. Lipnicki (herb. Lipnicki); decaying wood, May 27, 1989, leg. L. Lipnicki (herb. Lipnicki); Województwo lubuskie (Lubusz Province), *Acer pseudoplatanus*, May 7, 2010, leg. U. Schiefelbein 2670 (herb. Schiefelbein); Dąbrowa village, ca. 2 km E of Moczele, *Populus tremula*, May 7, 2010, leg. U. Schiefelbein 2642 (herb. Schiefelbein); Wydrzy Głaz Nature Reserve, ca. 3 km N of Moczele village, *Fagus sylvatica*, May 8, 2010, leg. U. Schiefelbein 2721 (herb. Schiefelbein). **BC-32** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), by Płociczna River, forest section No. 253, *Carpinus betulus*, August 17, 1989, leg. L. Lipnicki (herb. Lipnicki). **BC-46** – Pradolina Toruńsko-Eberswaldzka (Toruń-Eberswalder Urstromtal), Kotlina Gorzowska (Gorzów Basin): Noteć region, near Czarnków town, *Ulmus laevis*, March 12, 1967, leg. K. Glanc (KRAM-L 39090). **BD-96** – Obniżenie Milicko-Głogowskie (Milicz-Głogów Depression), Kotlina Żmigrodzka (Żmigród Basin): Kowalowo village, *Populus* sp., May 21, 1969, leg. K. Glanc (KRAM-L 39069). **BF-37** – Eastern Sudetes, Góry Złote (Golden Mountains): Łądek Zdrój town, decaying wood, July 23, 1997, leg. E. Kozioł (WRSŁ). **BF-47** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Białskie Mountains, Dolina Kleśnicy (valley of Kleśnica Stream), *Acer* sp., June 30, 2001, leg. K. Szczepańska (herb. Szczepańska); Puszcza Jaworowa Nature Reserve, *Fagus sylvatica*, July 8, 2003, leg. K. Szczepańska (herb. Szczepańska); *Acer* sp., July 8, 2003, leg. K. Szczepańska (herb. Szczepańska). **BF-48** – Eastern Sudetes, Góry Złote (Golden Mountains): Nowa Morawa village, roadside trees, September 18, 1992, leg. E. Kozioł (WRSŁ); above Bielice village, old tree, September 20, 1991, leg. E. Kozioł (WRSŁ). **CA-36** – Pobrzeże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Słowincian Coast): Białogóra village, forest section No. 25Z, *Fagus sylvatica*, July 29, 1982, leg. W. Fałtynowicz (UGDA-L 4236) as *O. variaeformis*. **CA-37** – Pobrzeże Koszalińskie (Koszalin Coastland), Pradolina Redy-Łeby (Reda-Łeba Urstromtal): ca. 2 km of Wejherowo town, near road to Krokowa village, *Acer* sp., April 16, 1983, leg. A. Zalewska (UGDA-L 2880) as *O. variaeformis*. **CA-51** – Pobrzeże Koszalińskie (Koszalin Coastland), Wysoczyzna Damnicka (Damnica Highland): Smoładzino village, March 19, 1995, leg. W. Fałtynowicz (herb. Seaward). **CA-58** – Pobrzeże Koszalińskie (Koszalin Coastland), Pradolina Redy-Łeby (Reda-Łeba Urstromtal): ca. 4 km N of Wejherowo town, *Ulmus* sp., July 15, 1983, leg. A. Zalewska (UGDA-L 2869). **CA-66** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): 1.5 km S of Porzecze village, *Carpinus betulus*, July 11, 1985, leg. W. Fałtynowicz (UGDA-L 2871) as *O. variaeformis*. **CA-69** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): between Rumia and Zagórze towns, *Quercus* sp., March 28, 1987, leg. W. Fałtynowicz (UGDA-L 3241) as *O. variaeformis*. **CA-86** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): near Staniszewskie Błota Nature Reserve, *Acer* sp., April 23, 1977, leg. W. Fałtynowicz (UGDA-L 1849, 1861); *Fagus sylvatica*, August 7, 1984, leg. W. Fałtynowicz (UGDA-L 2563) as *O. variaeformis*; May 9, 2013, leg. M. Kukwa 12175, A. Kowalewska (UGDA-L 19348). **CA-89** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Gdańsk Oliwa City, Dolina Radości (Valley of Joy), *Fagus sylvatica*,

June 7, 1963, leg. W. Fałtynowicz (UGDA-L 3384) as *O. variaeformis*. **CB-04** – Pojezierze Zachodniopomorskie (West Pomeranian Lake District), Pojezierze Bytowskie (Bytowskie Lake District): Glinowo Forest District, SW edge of Matusz Lake, *Fagus sylvatica*, April 3, 1986, leg. W. Fałtynowicz (UGDA-L 3418). **CB-09** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Gdańsk City, Zaskoczyn near Kościerzyna town, *Aesculus hippocastanum*, April 5, 1986, leg. W. Fałtynowicz & Z. Tobolewski (KRAM-L 34074, UGDA-L 3014) as *O. variaeformis*. **CB-24** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Charzykowska (Charzykowy Plain): Bory Tucholskie (Tuchola Forest), Przymuszewo Forest District, *Acer* sp., July 28, 1976, leg. W. Fałtynowicz (UGDA-L 248); Parzyn village, *Acer* sp., June 17, 1975, leg. W. Fałtynowicz (UGDA-L 605). **CB-33** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Charzykowska (Charzykowy Plain): Bory Tucholskie (Tuchola Forest), Laska village, *Aesculus hippocastanum*, August 2, 1983, leg. L. Lipnicki (TRN); July 6, 1985, leg. L. Lipnicki (herb. Lipnicki); Laska Forest District, forest section No. 766, *Acer* sp., March 27, 1976, leg. W. Fałtynowicz (UGDA-L 621). **CB-68** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Bory Tucholskie (Tuchola Forest): stream below Cieściernicka meadow, open place in oak-hornbeam forest, *Quercus* sp., June 14, 2004, leg. M. Kukwa 3325 (UGDA-L 11802). **CB-75** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Charzykowska (Charzykowy Plain): Bory Tucholskie (Tuchola Forest), Tuchola Landscape Park, Brda River Valley Nature Reserve, *Quercus* sp., March 30, 1985, leg. L. Lipnicki (herb. Lipnicki, TRN); Brda River valley, *Carpinus betulus*, August 11, 1989, leg. L. Lipnicki (herb. Lipnicki); *Corylus avellana*, August 11, 1989, leg. L. Lipnicki (herb. Lipnicki). **CC-70** – Pojezierze Wielkopolskie (Wielkopolska Lake District), Pojezierze Gnieźnieńskie (Gniezno Lake District): Zielonka Forest District near Poznań City, forest section No. 8, *Carpinus betulus*, October 3, 1960, leg. K. Glanc (KRAM-L 39089); forest section No. 8g, *Quercus* sp., August 11, 1963, leg. K. Glanc (KRAM-L 39093); *Acer pseudoplatanus*, August 11, 1963, leg. K. Glanc (KRAM-L 39099). **CC-80** – Pojezierze Wielkopolskie (Wielkopolska Lake District), Pojezierze Gnieźnieńskie (Gniezno Lake District): Zielonka Forest District near Poznań City, forest section No. 27c, *Quercus* sp., September 18, 1961, leg. K. Glanc (KRAM-L 39071); forest section No. 72c, *Quercus* sp., October 24, 1960, leg. K. Glanc (KRAM-L 39072); forest section No. 73, *Acer* sp., September 15, 1961, leg. K. Glanc (KRAM-L 39094); *Tilia* sp., June 17, 1971, leg. K. Glanc (KRAM-L 39098); *Ulmus* sp., October 31, 1962, leg. K. Glanc (KRAM-L 39100); *Quercus* sp., August 16, 1963, leg. K. Glanc (KRAM-L 39095); forest section No. 73, *Acer* sp., June 17, 1961, leg. K. Glanc (KRAM-L 39097); forest section No. 110f, *Ulmus laevis*, November 9, 1962, leg. K. Glanc (KRAM-L 39096); *Ulmus* sp., September 9, 1962, leg. K. Glanc (UGDA-L 5078) as *O. variaeformis*. **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit): Przebrno village, forest section No. 128, *Betula* sp., June 21, 1981, leg. E. Budzbon (UGDA-L 2189). **DB-42** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Iławskie (Iława Lake District): Kwidzyń Forest District, *Populus tremula*, April 10, 2004, leg. M. Kukwa 3026 (UGDA-L 10685). **DB-49** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 1.5 km S of Kotkowo village, *Acer* sp., August 22, 1993, leg. S. Cieśliński (KTC); ca. 2 km S of Kot village, *Acer* sp., May 8, 1990, leg. S. Cieśliński (KTC). **DB-53** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Iławskie (Iława Lake District): Liwa River, *Ulmus* sp., April 12, 2004, leg. M. Kukwa 3056 (UGDA-L 10267). **DE-46** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Radomszczańskie (Radomsko

Hills): Fryszerka village by Widawka River, *Ulmus* sp., October 28, 1969, leg. K. Czyżewska (LOD). **DE-48** – Wyzyna Przedborska (Przedborska Upland), Wzgórza Radomszczańskie (Radomsko Hills): Masłowice village, in a former manor house park, *Ulmus* sp., November 12, 1971, leg. K. Czyżewska (LOD). **DE-78** – Wyzyna Przedborska (Przedborska Upland), Niecka Włoszczowska (Włoszczowa Basin): Dębowiec Nature Reserve, forest section No. 161, Silniczka Forest District, *Acer platanoides*, June 15, 1972, leg. K. Czyżewska (LOD); forest section No. 162, *Ulmus glabra*, September 30, 1969, leg. K. Czyżewska (LOD). **DF-48** – Wyzyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyzyna Olkuska (Olkusz Upland): southern part, Ojców village, in Dolina Sąspowska (Sąspowska Valley), *Carpinus betulus*, May 1, 1956, leg. J. Nowak (KRAM-L 4123). **DF-58** – Wyzyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyzyna Olkuska (Olkusz Upland): Dolina Prądnika (Prądnik River Valley), rock, May 3, 2005, leg. J. Kiszka (KRAP). **DF-68** – Wyzyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Garb Tenczyński (Tenczynek Ridge): Brzoskwinia village near Mników village, limestone, June 17, 1956, leg. J. Nowak (KRAM-L 4127). **DF-69** – Brama Krakowska, Pomost Krakowski: Kraków City, November 4, 1800, leg. A. Rehmann (KRAM-L 10316); Kraków City, *Salix* sp., leg. A. Rehman (KRAM-L 3194). **DF-94** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: valley stream on S slope of Wielki Cisownik Mount, *Fagus sylvatica*, April 13, 1961, leg. J. Nowak (KRAM-L 7291); Zwalisko Mount, S slope, alt. 700 m, *Fagus sylvatica*, May 11, 1960, leg. J. Nowak (KRAM-L 6222). **DF-96** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: Targoszów village, 12 km to Sucha Beskidzka town, *Fagus sylvatica*, May 11, 1960, leg. J. Nowak (KRAM-L 6223). **DG-01** – West Beskids, Beskid Śląski Mountains: in stream valley under Lipowski Wierch Mountain, *Populus* sp., August 3, 1964, leg. J. Kiszka (KRAP). **DG-03** – West Beskids, Beskid Śląski Mountains: Skrzyczne Mount, *Fagus sylvatica*, September 1, 1964, leg. J. Kiszka (KRAP). **DG-04** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: Dolina Roztoki (Roztoka Stream Valley), near Czernichowa village, *Populus* sp., August 24, 1960, leg. J. Nowak (KRAM-L 6225); Kocierz Moszczanicki village, *Fraxinus excelsior*, August 8, 1960, leg. J. Nowak (KRAM-L 7290). **DG-05** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Makowski Mountains: Pasma Pewelskie (Pewelskie Range), Kapałów Stream, *Abies alba*, July 25, 1965, leg. J. Nowak (KRAM-L 15231). **DG-07** – West Beskids, Beskid Żywiecki Mountains: Przysłop Wielki Mount, *Fagus sylvatica*, August 6, 1964, leg. J. Nowak (KRAM-L 14398); Beskid Makowski Mountains, Groń Mount, *Fagus sylvatica*, April 28, 1966, leg. J. Nowak (KRAM-L 17343). **DG-11** – West Beskids, Beskid Śląski Mountains: slope of Soszów Wielki Mount, *Fagus sylvatica*, July 13, 1963, leg. J. Kiszka (KRAP). **DG-12** – West Beskids, Beskid Śląski Mountains: Barania Góra (Ram Mountain), E slope, *Populus* sp., August 31, 1965, leg. J. Kiszka (KRAP); Biała Wisiełka Stream, *Fagus sylvatica*, September 2, 1966, leg. J. Kiszka (KRAP); *Fagus sylvatica*, July 24, 1965, leg. J. Kiszka (KRAP); Czarna Wisiełka Stream, *Fagus sylvatica*, June 24, 1965, leg. J. Kiszka (KRAP). **DG-17** – West Beskids, Beskid Żywiecki Mountains: Pasma Policy (Polica Range), Urwanica Mount, *Fagus sylvatica*, July 9, 1965, leg. J. Nowak (KRAM-L 15167); Okrąglica Mount, *Fagus sylvatica*, May 9, 1965, leg. J. Nowak (KRAM-L 15175); Sidzińskie Pasionki, *Fagus sylvatica*, May 8, 1964, leg. J. Nowak (KRAM-L 16204). **DG-22** – West Beskids, Beskid Śląski Mountains: Gańczorka Mount, *Fagus sylvatica*, August 3, 1962, leg. J. Kiszka (KRAP). **DG-24** – West Beskids, Beskid Żywiecki Mountains; Piłsko Massif, Hala Bacmańska, *Fagus sylvatica*, September 9, 1964, leg. J. Nowak (KRAM-L 16594); Piłsko Massif, Pod Rysianką Nature Reserve, *Fagus sylvatica*, September 7, 1964,

leg. J. Nowak, (KRAM-L 16384); October 12, 1967, leg. J. Kiszka (KRAP 10060, 10083, 10057). **DG-32** – West Beskids, Beskid Żywiecki Mountains: Wielka Racza Massif, Beskid Bednarów Mount, *Fagus sylvatica*, September 4, 1964, leg. J. Nowak (KRAM-L 14866, 14873); beech forest, on N slope of Orzeł Mount, *Fagus sylvatica*, August 9, 1964, leg. J. Nowak (KRAM-L 14550); Przysłop Wielki Mount, *Fagus sylvatica*, August 6, 1964, leg. J. Nowak (KRAM-L 14069); Wielka Racza Massif, Śrubita Nature Reserve, *Fagus sylvatica*, August 12, 1964, leg. J. Nowak, (KRAM-L 14004, 14005, 14449); Kikula Mount, *Fagus sylvatica*, June 5, 1976, leg. U. Bielczyk (KRAM-L 42067); Wielka Racza Massif, on N slope of Orzeł Mount, *Fagus sylvatica*, August 9, 1964, leg. J. Nowak (KRAM-L 14551). **DG-38** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin): by Piekielnik Stream, *Fagus sylvatica*, May 30, 1970, leg. J. Kiszka (KRAP 10816); *Fagus sylvatica*, June 20, 1970, leg. J. Kiszka (KRAP 10847). **DG-39** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pogórze Spisko-Gubałowskie (Spisz-Gubałówka Foothills): Skalice Nowotarskie, *Tilia cordata*, August 12, 1968, leg. J. Kiszka (KRAP 10529). **DG-49** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Rów Podtatrzański (Podtatrzański Trench): Ligasowski Potok (Ligasowski Stream), *Fraxinus excelsior*, September 20, 1964, leg. J. Kiszka (KRAP); by Cichy Potok (Cichy Stream), *Acer pseudoplatanus*, August 20, 1964, leg. J. Kiszka (KRAP). **DG-59** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Strążyska (Strążyska Valley), near trail to Wielka Rówień under Giewont Mount, *Acer pseudoplatanus*, August 18, 1959, leg. Z. Tobolewski (POZ). **EB-02** – Nizina Staropruska (Old Prussian Lowland), Wzniesienia Górowskie (Górowo Hills): NE of Stabunty village, *Ulmus* sp., August 28, 1993, leg. S. Cieśliński (KTC). **EB-22** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 3 km NNE of Smolajny village, near Łyna River, *Fraxinus excelsior*, August 23, 1993, leg. S. Cieśliński (KTC); ca. 1.5 km NNE of Smolajny village, *Fraxinus excelsior*, August 23, 1993, leg. S. Cieśliński (KTC). **EB-26** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): W edge of Legińskie Lake, SW of Leginy village, *Acer* sp., May 3, 1989, leg. S. Cieśliński (KTC). **EB-32** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2 km SSW of railway station in Cerkiewnik village, *Fraxinus excelsior*, September 14, 1989, leg. S. Cieśliński (KTC). **EB-40** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): near road between villages Pełnik and Wołowo, forest section No. 242, *Acer* sp., July 18, 1988, leg. S. Cieśliński (KTC). **EB-42** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Olsztyn City, Osiedle Redykejany, *Acer* sp., August 2000, leg. D. Kubiak (OLTC); Olsztyn City, city forest, *Acer* sp., August 9, 2000, leg. D. Kubiak (OLTC); *Malus* sp., April 2001, leg. D. Kubiak (OLTC). **EB-45** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 1 km S of Rzeck village, by road to Rasząg village, *Acer* sp., August 28, 1993, leg. S. Cieśliński (KTC). **EB-49** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): Puszcza Piska (Pisz Forest), ca. 1.5 km S of Lipowo village, *Quercus* sp., September 1, 1987, leg. S. Cieśliński (KTC). **EB-59** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich: Masurian Landscape Park, 2 km SE of Bobrówko village *Fraxinus excelsior*, November 9, 1999, leg. D. Kubiak (OLTC); ca. 1 km E of Krutyń village, *Acer* sp., September 2, 1987, leg. S. Cieśliński (KTC); Krutynia Nature Reserve, *Quercus robur*, August 31, 1987, leg. S. Cieśliński (KTC). **EB-62** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Las Warmiński Nature Reserve on Łyna River, *Fraxinus*

excelsior, May 28, 1994, leg. S. Cieśliński (KTC). **EB-68** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): Szklarnia Forest District, ca. 4 km SSE of Spychowo village, *Acer* sp., May 4, 1990, leg. S. Cieśliński (KTC). **EC-87** – Nizina Północnomazowiecka (North Mazovian Lowland), Dolina Dolnej Narwi (Lower Narew River Valley): Pogorzelec village, May 21, 1950, leg. S. Cieśliński (LBL). **ED-13** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Kotlina Warszawska (Warsaw Basin): Kampinos National Park, Dąbrowa Stara village, *Salix* sp., July 1958, leg. J. Zielińska (WA). **ED-73** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Wysoczyzna Rawska (Rawa Highland): Trębaczew Nature Reserve, forest section No. 92, *Carpinus betulus*, August 19, 1970, leg. K. Czyżewska (LOD, KRAM-L 29964). **ED-99** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Zagożdżon Nature Reserve, *Carpinus betulus*, August 12, 1998, leg. Gnat & S. Cieśliński (KTC). **EE-00** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Piotrkowska (Piotrków Plain): Puszcza Pilicka (Pilica Forest), Spała Nature Reserve, forest section No. 271, *Carpinus betulus*, August 23, 1970, leg. K. Czyżewska (LOD-L 521); forest section No. 287, *Quercus robur*, October 20, 1970, leg. K. Czyżewska (LOD-L 522); forest section No. 287, *Quercus robur*, November 10, 1970, leg. K. Czyżewska (LOD-L 524); Dolina Białobrzeska (Białobrzegi Valley): Puszcza Pilicka (Pilica Forest), near Sługocice village, forest section No. 205l, *Carpinus betulus*, May 16, 1974, leg. K. Czyżewska (LOD-L 4447). **EE-09** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), 1 km SW of Pionki village, 1978, leg. A. Anusiewicz & S. Cieśliński (KTC). **EE-32** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Opoczyńskie (Opoczno Hills): near Trzemoszna village, *Acer* sp., July 20, 1979, leg. Kurczyńska & K. Toborowicz (KTC). **EE-60** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Łopuszańskie (Łopuszańskie Hills): Oleszno Nature Reserve, forest section No. 53, *Acer platanoides*, June 19, 1974, leg. K. Czyżewska (LOD). **EE-73** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Zagórsko village near Kielce town, *Ulmus* sp., September 4, 1976, leg. K. Toborowicz (KTC). **EE-82** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Góra Czubatka Mount, *Fraxinus excelsior*, May 8, 1989, leg. S. Cieśliński (KTC). **EE-97** – Wyżyna Kielecka (Kielce Upland), Pogórze Szydłowskie (Szydłów Foothills): Przyjmy Forest District, forest section No. 113, 5 km E of Chańcza village, *Carpinus betulus*, July 1986, leg. K. Toborowicz (KTC). **EG-10** – West Beskids, Gorce Mountains: near church in Niedźwiedź village, *Tilia* sp., September 16, 1965, leg. K. Glanc (KRAM-L 39082); S of Niedźwiedź village, by Konina Stream, *Populus* sp., September 16, 1965, leg. K. Glanc (KRAM-L 39084, 39086); in former manor house park in Poręba Wielka village, November 23, 1993, leg. P. Czarnota (GPN 13); park near Poręba Wielka Forest District headquarters, *Fraxinus excelsior*, *Ulmus* sp., September 16, 1965, leg. K. Glanc (KRAM-L 39050). **EG-20** – West Beskids, Gorce Mountains: W of Turbacz Mount, by Lepietnica Stream, *Fagus sylvatica*, September 12, 1964, leg. K. Glanc (KRAM-L 39049); valley of Olszowy Potok (Olszowy Stream), *Fagus sylvatica*, May 6, 1993, leg. P. Czarnota (GPN 514); on E slope of Suhora Mount, *Fagus sylvatica*, July 4, 1994, leg. P. Czarnota (GPN 592); Suche Buczki Forest District, *Fagus sylvatica*, July 31, 1995, leg. P. Czarnota (GPN 1849). **EG-21** – West Beskids, Gorce Mountains: Turbacz Nature Reserve, above Turbaczyk Stream, *Fagus sylvatica*, September 6, 1959, leg. K. Glanc (KRAM-L 39067); Dolina Kamienicy (Kamienica River Valley), *Fagus sylvatica*, June 11, 1996, leg. P. Czarnota (GPN 1405); Turbacz Nature Reserve, *Fagus sylvatica*, February 5, 1993, leg. P. Czarnota (GPN 267); s. loc., May 23, 1996, leg.

P. Czarnota (GPN 12/95/94); Konina Stream Valley, *Acer* sp., January 9, 1994, leg. P. Czarnota (GPN 878); Ustępny Stream Valley, *Fagus sylvatica*, February 20, 1995, leg. P. Czarnota (GPN 251); Łopuszna Nature Reserve, *Fagus sylvatica*, May 5, 1995, leg. P. Czarnota (GPN 1041); near plot 329, *Fagus sylvatica*, February 20, 1995, leg. P. Czarnota (GPN); under ridge of Przysłopok Mount, in Konina Stream catchment area, *Fagus sylvatica*, January 4, 1996, leg. P. Czarnota (GPN 854); S slope of Mostownica Mount, *Fagus sylvatica*, April 3, 1954, leg. K. Glanc (KRAM-L 39066); near source of Lepietnica Stream, at the eit of Turbacz Mount, *Fagus sylvatica*, September 2, 1964, leg. K. Glanc (KRAM-L 39088); near blue tourist trail, by Kamienica Stream, near temporary building of Polish Academy of Sciences, *Fagus sylvatica*, June 11, 1996, leg. P. Czarnota (GPN 967); Turbacz Nature Reserve, Czoło Turbacza Mount, *Fagus sylvatica*, September 9, 1964, leg. K. Glanc (KRAM-L 39076); *Fagus sylvatica*, September 11, 1966, leg. K. Glanc (KRAM-L 39092); decaying wood, June 20, 1967, leg. K. Glanc (KRAM-L 39091); *Fagus sylvatica*, August 28, 1961, leg. K. Glanc (KRAM-L 39074); E slope of Kiczora Mount, Dolina Furcówki (Furcówka Stream Valley), decaying wood, August 27, 1968, leg. K. Glanc (KRAM-L 39080). **EG-22** – West Beskids, Gorce Mountains: S slope of Twarogi Mount, *Fraxinus excelsior*, July 8, 1966, leg. K. Glanc (KRAM-L 39085); N slope of Lubań Mount, in the valley of Kudowski Stream *Fagus sylvatica*, July 3, 1967, leg. K. Glanc (KRAM-L 39075); Ochotnica Dolna village, under Kasinka Mount, by the road to Ochotnica Górna village, *Salix* sp., August 7, 1966, leg. K. Glanc (KRAM-L 39057); N slope of Lubań Mount, SE of Skała Boginka, *Acer pseudoplatanus*, August 15, 1967, leg. K. Glanc (KRAM-L 39081); E slope of Lubań Mount, above Tylmanowa village, *Salix* sp., September 9, 1973, leg. K. Glanc (KRAM-L 39497); S slope of Lubań Mount, Dolina Kluszkowianki (Kluszkowianka Stream Valley), *Fagus sylvatica*, July 6, 1967, leg. K. Glanc (KRAM-L 39087); S slope of Lubań Mount, valley of Skalny Potok (Rocky Stream), decaying wood, May 10, 1959, leg. K. Glanc (KRAM-L 39070); Lubań Mount, NE slope, near route from Rzek to Biała Skała, *Fagus sylvatica*, August 4, 1968, leg. K. Glanc (KRAM-L 39083). **EG-25** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny (Jaworzyna Range), Barnowiec Nature Reserve, *Fagus sylvatica*, September 12, 1976, leg. U. Bielczyk (KRAM-L 42062). **EG-26** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny (Jaworzyna Range), Łabowiec Nature Reserve, *Fagus sylvatica*, June 13, 1991, leg. L. Śliwa (KRA). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: near road from Krościenko to Zawiasy villages by Dunajec River, *Salix* sp., August 12, 1954, leg. Z. Tobolewski (POZ); near road from Krościenko to Żlebie Żłobina villages, *Robinia pseudacacia*, June 10, 1956, leg. Z. Tobolewski (POZ); near trail from Polana Wyrobek to Zamkowa Góra (Zamkowa Mount), *Fagus sylvatica*, June 12, 1956, leg. Z. Tobolewski (POZ); roadside near Szlachtowa village, *Salix* sp., June 9, 1956, leg. Z. Tobolewski (POZ). **EG-34** – West Beskids, Beskid Sądecki Mountains: Pasma Radziejowej (Radziejowa Range), S slope of Dzwonkówka Mount, *Fagus sylvatica*, June 13, 1965, leg. M. Olech (KRA); by Potok Sopotnicki (Sopotnicki Stream), sandstone, June 13, 1965, leg. M. Olech (KRA); Szlachtowa village, *Fraxinus excelsior*, May 2, 1991, leg. L. Śliwa (KRA); Kłodzkie Nature Reserve, *Tilia cordata*, July 12, 1967, leg. M. Olech (KRA); *Carpinus betulus*, August 12, 1967, leg. M. Olech (KRA); Pasma Jaworzyny (Jaworzyna Range), at edge of Polana Bukowa, *Fagus sylvatica*, September 23, 1966, leg. M. Olech (KRA). **EG-35** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny (Jaworzyna Range), Potasznia Stream Valley, *Fagus sylvatica*, September 9, 1967, leg. M. Olech (KRA); sandstone, October 22, 1966, leg. M. Olech (KRA); *Fagus sylvatica*, July 28, 1967, leg. M. Olech (KRA). **EG-36** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny (Jaworzyna Range), Składniszczan Stream

Valley, *Fraxinus excelsior*, July 25, 1966, leg. M. Olech (KRA); Feleczyn Stream Valley, *Fagus sylvatica*, October 9, 1967, leg. M. Olech (KRA); Żebracze Nature Reserve, *Fagus sylvatica*, July 5, 2001, leg. P. Czarnota (GPN 2520); *Fagus sylvatica*, July 6, 2001, leg. P. Czarnota (GPN 2549). **EG-40** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pogórze Spisko-Gubałowskie (Spisz-Gubałówka Foothills); Pasma Bukowiny Tatrzańskiej, *Betula* sp., August 17, 1967, leg. J. Kiszka (KRAP). **EG-41** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pogórze Spisko-Gubałowskie (Spisz-Gubałówka Foothills): NW slope of Piastowy Wierch Mountain, *Fagus sylvatica*, June 20, 1970, leg. J. Kiszka (KRAP 10894). **EG-50** – Łańcuch Tatrzański Mountains, Eastern Tatras: Dolina Białego (Valley of the White), *Fagus sylvatica*, July 13, 1912, leg. Augustynowicz (KRAM-L 18076). **FA-84** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): near road from Jurkiszki to Szyliny villages, forest section No. 304, *Betula* sp., May 17, 1985, leg. Z. Tobolewski (KRAM-L 31851); s. loc., *Betula* sp., May 16, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 88, *Fraxinus excelsior*, May 16, 1985, leg. S. Cieśliński (KRAM-L 31864); 2 km N of Gołdap town, *Ulmus* sp., May 20, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); s. loc., leg. S. Cieśliński (KRAM-L 31912). **FA-85** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): Boczki Nature Reserve, forest section No. 86, *Tilia cordata*, May 16, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); 0.7 km SE of Pluszkiejmy village, E edge of Czarne Lake, *Salix* sp., May 19, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC). **FA-87** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): ca. 2.5 km SW of Żytkiejmy village, *Acer* sp., May 15, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Puszcza Borecka (Borki Forest), Walisko Lake, *Fraxinus excelsior*, May 13, 1958, leg. K. Glanc (KRAM-L 39052); Borki Nature Reserve, forest section No. 20, *Tilia cordata*, May 19, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC); *Acer* sp., May 19, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-16** – Pojezierze Litewskie (Lithuanian Lake District), Pojezierze Zachodniosuwalskie (West Suwałki Lake District): near road from Bakafarzewo village to Olecko town, *Acer* sp., May 16, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-29** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Monkinie Nature Reserve, *Corylus avellana*, August 4, 1993, leg. J. Bystrek & A. Matwiejuk (University of Białystok, Institute of Biology). **FB-31** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): ca. 2 km SE of Dąbrówka village, near road to Orzysz town, *Acer* sp., September 6, 1988, leg. S. Cieśliński (KTC). **FB-38** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Ełckie (Ełk Lakeland): Jezioroki village near road from Ełk to Augustów towns, *Alnus glutinosa*, May 23, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-51** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): S edge of Kocioł Lake, *Acer* sp., September 7, 1988, leg. S. Cieśliński (KTC). **FB-61** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): ca. 7 km NE of Pisż village, near Roś Lake, *Acer* sp., May 10, 1990, leg. S. Cieśliński (KTC). **FB-68** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Czerwone Bagno Nature Reserve, forest section No. 246, *Quercus robur*, September 24, 1986, leg. S. Cieśliński (KTC). **FC-68** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): ca. 5 km W of Szmurły village, *Quercus robur*, August 20, 1991, leg. S. Cieśliński (KTC). **FD-45** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Łukowska (Łuków Plain): Jata Nature Reserve near Łuków town, *Acer* sp., November

4, 1971, leg. M. Motyka-Zgłobicka (LBL); *Sorbus* sp., May 25, 1973, leg. M. Motyka-Zgłobicka (LBL). **FD-68** – Nizina Południowopodlaska (South Podlachian Lowland), Równina Łukowska (Łuków Plain): Omelno Nature Reserve near Radzyń Podlaski town, *Quercus* sp., August 3, 1972, leg. B. Ordyczyńska (LBL); *Acer* sp., August 3, 1972, leg. B. Ordyczyńska (LBL). **FE-07** – Nizina Południowopodlaska (South Podlachian Lowland), Wysoczyzna Lubartowska (Lubartów Highland): Kozłówka Forest District, Dąbrówka Forest District, Nowodwór Forest District, *Betula* sp., September 20, 1962, leg. L. Jędrzejewska (LBL); Nasutów Forest District, *Populus* sp., September 12, 1962, leg. L. Jędrzejewska (LBL). **FE-13** – Wyżyna Lubelska (Lublin Upland), Małopolski Przełom Wisły (Lesser Poland Gorge of the Vistula): Puławy town, *Quercus* sp., 1970, leg. H. Stasiak (LBL). **FF-01** – Kotlina Sandomierska (Sandomierz Basin), Równina Tarnobrzewska (Tarnobrzeg Plain): Tarnobrzeg town, *Quercus* sp., 1968, leg. J. Piórecki (LBL). **FF-36** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Kolbuszowski (Kolbuszowa Plateau): Brzoza Królewska Forest District, forest section No. 218, *Acer* sp., 1963, leg. B. Ordyczyńska (LBL); Jelana Forest District, *Fraxinus* sp., 1963, leg. B. Ordyczyńska (LBL); forest section No. 119, *Sorbus* sp., leg. B. Ordyczyńska (LBL). **FF-37** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Kolbuszowski (Kolbuszowa Plateau): Leżajsk County, Puszcza Sandomierska (Sandomierz Forest), Julin Forest District, forest section No. 253, *Quercus* sp., August 1960, leg. B. Ordyczyńska (LBL); forest section No. 271, *Fraxinus* sp., 1963, leg. B. Ordyczyńska (LBL). **FF-45** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Kolbuszowski (Kolbuszowa Plateau): Marynin Forest District, *Acer* sp., 1963, leg. B. Ordyczyńska (LBL). **FF-99** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): Korytniki village, *Morus* sp., October 13, 1983, leg. J. Kiszka & J. Piórecki (KRAM-L 30517). **FG-13** – Central Beskids, Beskid Niski Mountains: near Rymanów-Zdrój town, Wisłoczek Stream Valley, *Fraxinus excelsior*, August 20, 1974, leg. J. Nowak (KRAM-L 33137). **FG-14** – Central Beskids, Beskid Niski Mountains: Bukowica, grassland near Odrzechowa village, *Juglans regia*, October 10, 1974, leg. J. Nowak (KRAM-L 32416). **FG-19** – Beskidy Lesiste Mountains, Sanocko-Turczyńskie Mountains: Pasma Turnicy, under Arłamów village, *Acer pseudoplatanus*, May 22, 1986, leg. J. Piórecki (BDPA), leg. J. Kiszka & J. Piórecki (KRAM-L 60047). **FG-20** – Central Beskids, Beskid Niski Mountains: Nieznajowa near Świątkowa villages, Spelży forest, No. 600, *Abies alba*, October 4, 1979, leg. J. Nowak (KRAM-L 32441). **FG-22** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Puszcza Bukowa (Beech Forest), between Czerkownik and Szypowaty streams, *Fagus sylvatica*, August 22, 1957, leg. K. Glanc (KRAM-L 39061). **FG-23** – Central Beskids, Beskid Niski Mountains: valley stream, between Bania Mount and Daňová Mount, *Fagus sylvatica*, May 22, 1974, leg. M. Olech (KRA). **FG-24** – Central Beskids, Beskid Niski Mountains: near Huczkowa village, on a clearing in the forest No. 415, *Juglans regia*, September 4, 1977, leg. J. Nowak (KRAM-L 23014). **FG-33** – Central Beskids, Beskid Niski Mountains: near Jaśliska village, between Spalona and Stasiana farmsteads No. 410, *Acer platanoides*, September 11, 1974, leg. J. Nowak (KRAM-L 32287). **FG-34** – Central Beskids, Beskid Niski Mountains: Berdo village near Moszczaniec village, by the Wisłok River, *Fraxinus excelsior*, September 16, 1974, leg. J. Nowak (KRAM-L 32739). **FG-45** – Bieszczady Lesiste Mountains, West Bieszczady Mountains: S slope of Dział Mount, *Acer pseudoplatanus*, April 24, 1958, leg. K. Glanc (KRAM-L 39048). **FG-59** – Bieszczady Lesiste Mountains, West Bieszczady Mountains: Dwerniczek village, near road by San River, *Salix* sp., August 15, 1958, leg. Z. Tobolewski (POZ). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Puszcza Bukowa (Beech Forest), on S slope of Dział Mount, *Fagus sylvatica*, August 19, 1958, leg. K. Glanc (KRAM-L 39064); Puszcza

Bukowa (Beech Forest), *Fagus sylvatica*, August 22, 1957, leg. K. Glanc (KRAM-L 39058); above Beskidnik Stream, *Fagus sylvatica*, August 28, 1957, leg. K. Glanc (KRAM-L 39060); Lesko County, near Beskidnik Stream, *Acer* sp., August 28, 1957, leg. Z. Tobolewski (POZ); *Acer pseudoplatanus*, August 1956, leg. Z. Tobolewski (KTC); Dział Mount, below the top of the mountain, *Acer pseudoplatanus*, April 26, 1956, leg. K. Glanc (KRAM-L 39045); *Fagus sylvatica*, April 26, 1956, leg. K. Glanc (KRAM-L 39055); by Wielki Lutowy Stream, Puszcza Bukowa (Beech Forest), *Fagus sylvatica*, August 18, 1958, leg. K. Glanc (KRAM-L 39059); Puszcza Bukowa (Beech Forest), near Wetlina village, by Wielki Lutowy Stream, *Fagus sylvatica*, August 18, 1958, leg. Z. Tobolewski (POZ); slope on right bank of Wielki Lutowy Stream, *Fagus sylvatica*, August 23, 1957, leg. Z. Tobolewski (KTC). **FG-69** – Bieszczady Lesiste Mountains, West Bieszczady Mountains: Ustrzyki Górne village, by road to Bereżki village, *Ulmus montana*, August 5, 1959, leg. K. Glanc (KRAM-L 39053); Ustrzyki Górne village, above Wołosaty Stream, *Acer pseudoplatanus*, July 8, 1960, leg. J. Nowak (KRAM-L 8821) as *O. variaeformis*; Bereżki village, *Acer pseudoplatanus*, September 20, 1968, leg. K. Glanc (KRAM-L 39046); valley of Rzczyca Stream, near Ustrzyki Górne village, *Acer pseudoplatanus*, August 27, 1957, leg. K. Glanc (KRAM-L 39056); valley of Rzczyca Stream, above road from Berehy (now: Brzegi Górne) village to Ustrzyki Górne village, *Acer pseudoplatanus*, September 27, 1958, leg. K. Glanc (KRAM-L 39047); between Caryńskie and Bereżki villages, *Acer pseudoplatanus*, September 22, 1958, leg. K. Glanc (KRAM-L 39062); Bereżki village, road to Przełęcz Przysłup (Przysłup Pass), *Acer pseudoplatanus*, July 17, 2001, leg. J. Kiszka & R. Kościelniak (KRAP 1888). **FG-79** – Beskidy Lesiste Mountains, West Bieszczady Mountains: S slope of Tarnica Mount, above Wołosatka Stream Valley, *Acer pseudoplatanus*, June 1956, leg. K. Glanc (KRAM-L 39063). **GB-21** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Łoska Forest District, forest section No. 7, *Fraxinus excelsior*, November 1, 1958, leg. K. Glanc (KRAM-L 39051). **GB-30** – Pojezierze Wschodniosuwalskie (East Suwałki Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Płaska Forest District, forest section No. 23, *Quercus robur*, November 1, 1958, leg. K. Glanc (KRAM-L 39054); Płaska Forest District, *Acer platanoides*, November 1, 1958, leg. K. Glanc (KRAM-L 39079); *Quercus robur*, November 1, 1958, leg. K. Glanc (KRAM-L 39078); Żyliń village, *Salix* sp., November 3, 1958, leg. K. Glanc (KRAM-L 39073). **GB-31** – Pojezierze Wschodniosuwalskie (East Suwałki Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Starożyn Nature Reserve, *Acer platanoides*, September 17, 1986, leg. S. Cieśliński (KTC); *Acer* sp., July 18, 1965, leg. J. Zielińska (WA); Puszcza Augustowska (Augustów Primeval Forest), forest section No. 51/24, Łozy Forest District, *Fraxinus excelsior*, September 13, 1986, leg. S. Cieśliński (KTC); Puszcza Augustowska (Augustów Primeval Forest), forest section No. 442, *Salix* sp., September 12, 1986, leg. S. Cieśliński (KTC). **GB-32** – Pojezierze Wschodniosuwalskie (East Suwałki Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Kudrynki village near Rudawki village, *Acer platanoides*, September 16, 1986, leg. S. Cieśliński (KTC). **GB-40** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Puszcza Augustowska (Augustów Primeval Forest), forest section No. 153, ca. 1 km of Lebedzin village, *Fraxinus excelsior*, September 21, 1986, leg. S. Cieśliński (KRAM-L 31931). **GB-91** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), 1 km NWW of Machnacznaczn village, forest section No. 130, *Fraxinus excelsior*, September 1997, leg. M. Murati,

K. Glanc & Z. Tobolewski (KTC). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, *Carpinus betulus*, August 5, 1994, leg. S. Cieśliński (KTC); *Fraxinus excelsior*, August 5, 1994, leg. S. Cieśliński (KTC); *Acer platanoides*, May 13, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology). **GC-02** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): ca. 4 km SW of Sokołda village, forest section No. 120, *Fraxinus excelsior*, August 4, 1994, leg. S. Cieśliński (KTC); Knyszyn Forest Landscape Park, Czolnowo Nature Reserve, *Acer* sp., March 29, 1994, s. coll. (University of Białystok, Institute of Biology); *Carpinus betulus*, March 29, 1994, s. coll. (University of Białystok, Institute of Biology); *Quercus robur*, March 29, 1994, leg. K. Kolanko (University of Białystok, Institute of Biology). **GC-03** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Stare Biele Nature Reserve, s. d., s. coll. (University of Białystok, Institute of Biology). **GC-44** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Browsk Forest District, forest section No. 185c,d, *Fraxinus excelsior*, 1983, leg. Z. Tobolewski & S. Cieśliński (KTC); Browsk Forest District, *Ulmus* sp., August 21, 1962, leg. J. Rydzak (LBL); *Acer platanoides*, August 21, 1962, leg. J. Rydzak (LBL). **GC-45** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Narewka Forest District, *Fraxinus excelsior*, August 25, 1968, leg. J. Rydzak (LBL). **GC-54** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Zwierzyniec village, forest section No. 447b, *Quercus* sp., 1982, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 281d, *Fraxinus excelsior*, 1981, leg. Z. Tobolewski & S. Cieśliński (KTC); Zwierzyniec Forest District, *Ulmus* sp., August 24, 1965, leg. J. Rydzak (LBL); *Acer* sp., August 25, 1965, leg. J. Rydzak (LBL); forest section No. 220, *Fraxinus excelsior*, August 25, 1965, leg. J. Rydzak (LBL); *Acer platanoides*, August 26, 1965, leg. J. Rydzak (LBL); *Acer* sp., September 13, 1965, leg. J. Rydzak (LBL). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park, *Quercus robur*, August 12, 2002, leg. P. Czarnota (GPN 2949); forest section No. 283, S of Orłówka River, *Tilia cordata*, 1982, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 342b, *Carpinus betulus*, 1979, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 256, *Carpinus betulus*, 1998, leg. S. Cieśliński (KTC); forest section No. 256, *Carpinus betulus*, 1988, leg. K. Glanc (KTC); Pogorzelce village, *Quercus robur*, May 21, 1950, leg. S. Cieśliński (LBL); forest section No. 256, *Carpinus betulus*, August 2014, leg. M. Kukwa 12891, A. Łubek (UGDA-L 20440); May 2014, leg. M. Kukwa 12737, 12610, A. Łubek (UGDA-L 20334, 20246); forest section No. 256, *Acer platanoides*, August 2014, leg. M. Kukwa 13288, A. Łubek (UGDA-L 20734); May 2014, leg. M. Kukwa 12754, A. Łubek (UGDA-L 20345); on bark of snag (*Fraxinus excelsior*), October 2014, leg. M. Kukwa 13062, A. Łubek (UGDA-L 20572). **GC-65** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Białowieża Forest District, Białowieża Forest Division, forest section No. 609a,b, on Podcerkowka River, *Fraxinus excelsior*, 1983, leg. Z. Tobolewski & S. Cieśliński (KTC); *Fraxinus excelsior*, August 21, 1961, leg. J. Rydzak (LBL). **GD-01** – Wysoczyzna Podlasko-Białoruskie (Podlachian-Belarusian Highlands), Wysoczyzna Drohiczyńska (Drohiczyń Highland): forest between Adamów and Koterka villages, forest section No. 275, *Fraxinus excelsior*, May 11, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **GD-20** – Nizina

Południowopodlaska (South Podlachian Lowland), Równina Łukowska (Łuków Plain): Chmielne Nature Reserve, Leśna near Biała Podlaska town, *Ulmus* sp., May 18, 1962, leg. B. Ordyczyńska (LBL). **GD-95** – Polesie Zachodnie (Western Polesie), Polesie Brzeskie: Sobibór village near Włodawa town, *Quercus* sp. 1965, leg. J. Bystrek (LBL). **GE-52** – Wyżyna Lubelska (Lublin Upland), Działy Grabowieckie mountain ranges: Krupie near Krasnystaw villages, *Betula* sp., 1975, leg. J. Nowak (LBL). **GE-91** – Roztocze, Central Roztocze: Kosobudy Forest District, *Fagus sylvatica*, September 25, 1964, leg. B. Warmińska (LBL); Krzywe Forest District, Jarugi Forest District, *Fagus sylvatica*, August 25, 1964, leg. B. Warmińska (LBL); Rudka village, *Corylus avellana*, September 1960, leg. J. Bystrek (LBL). **GF-13** – Roztocze, Central Roztocze: *Ulmus* sp., s. coll. (KRAM-L 39043); Hrebenne village, *Fagus sylvatica*, March 30, 1957, leg. K. Glanc (KRAM-L 39044). **GF-41** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Tarnogrodzki (Tarnogród Plateau): near Oleszyce town, *Fagus sylvatica*, 1973, leg. J. Bystrek (LBL); Bida village near Oleszyce town, *Fagus sylvatica*, leg. J. Bystrek (LBL). **GF-80** – Kotlina Sandomierska (Sandomierz Basin), Dolina Dolnego Sanu (Lower San River Valley): Przemyśl City, *Acer* sp., 1969, leg. J. Piórecki (LBL). **GG-71** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, *Abies alba*, June 19, 2002, leg. P. Czarnota (GPN 2875); Sianki village, Niedźwiedzi Stream, *Acer pseudoplatanus*, August 25, 1999, leg. R. Kościelniak (KRAP 1886).

Additional material examined. **AUSTRIA:** August 1890, leg. E. Fries (KRAM-L 3444): ca. 6 km N of Kaprun, *Carpinus betulus*, April 1, 2005, leg. A. Wieczorek (herb. Wieczorek). **BELARUS:** Gomel Region, Gomel District, Chenki forest, 52°19' N, 30°57' E, near F. Skorina Gomel State University field practice camp, *Populus* sp., June 20, 2006, leg. A. Tsurykau 01445 (GSU). **CZECH REPUBLIC:** Southern Moravia, Vyškov District, Moravský kras, Dražanská vrchovina, Ruprechtov, Malá Haná valley below castle ruins Kuchlov, *Acer campestre*, April 20, 2007, leg. U. Schiefelbein 2085 (herb. Schiefelbein); Botanischer Tauschverein in Wien No. 4120, 1854, leg. W. Siegmund (WA); South Moravia, Jihomoravsky kraj, S of Lanžhot, Polinský vršek, elev. 175 m, edge of a managed floodplain forest, ca. 80 years old, few isolated trees in an adjacent meadow, *Acer campestre*, March 31, 2014, leg. M. Kukwa 12364 (UGDA-L 12364). **DENMARK:** Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); Ekkodalen, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek (herb. Wieczorek). **FINLAND:** s. loc., January 5, 1933, s. coll., (WAR.). **GREAT BRITAIN:** Fountains Abbey, *Acer* sp., May 3, 2013, leg. V. John & M. R. D. Seaward (herb. Seaward). **GERMANY:** Fyn, Romso Island, *Fraxinus excelsior*, October 30, 1994, leg. J. Motiejunaite 7893 (BILAS); Mecklenburg-Vorpommern, Kreis Uecker-Randow, Kleppelshagener Forst, *Fagus sylvatica*, October 21, 1999, leg. U. Schiefelbein 500 (herb. Schiefelbein); ca. 3 km SSW of Mönkebude, ehemalige Hoftselle, *Acer pseudoplatanus*, April 8, 1999, leg. U. Schiefelbein 304 (herb. Schiefelbein); SE VW. Theerofen, *Ulmus* sp., November 22, 2001, leg. U. Schiefelbein 1241 (herb. Schiefelbein); N Landstraße Jatznick-Rothemühl, ca. 3 km S of Eichhof, *Fagus sylvatica*, June 3, 2001, leg. U. Schiefelbein 748 (herb. Schiefelbein); ca. 3 km E of Storkow, ca. 0.5 km NE of Kotzensee, *Ulmus* sp., May 15, 2002, leg. U. Schiefelbein 885 (herb. Schiefelbein); Wald, ca. 1.5 km N of Marienthal, *Ulmus* sp., December 17, 2001, leg. U. Schiefelbein 939 (herb. Schiefelbein); südlicher Rand des Thursees, ca. 1.2 km N of Pampow, *Fagus sylvatica*, April 6, 2002, leg. U. Schiefelbein 991 (herb. Schiefelbein); Landkreis Müritzk, Wäldchen W VW. Troja, ca. 0.2 km W of Troja, *Acer platanoides*, November 1, 2002, leg. U. Schiefelbein 1184 (herb. Schiefelbein); Landkreis Ostvorpommern, Insel Usedom, Wald

zwischen der Ortslage Ahlbeck und der polnischen Grenze, nördl. der Bundesstraße, *Fagus sylvatica*, November 3, 2003, leg. U. Schiefelbein 1926 (herb. Schiefelbein); Ückeritz, Naturschutzgebiet "Wockninsee", NE vom See, am Aussichtsturm, *Fagus sylvatica*, November 27, 2002, leg. U. Schiefelbein 1321 (herb. Schiefelbein); Greifswalder Oie am Leuchtturm, *Sambucus nigra*, November 7, 2002, leg. U. Schiefelbein 1324 (herb. Schiefelbein); Kreis Güstrow, May 10, 1998, leg. U. Schiefelbein 205 (herb. Schiefelbein); Niedersachsen, Landkreis Lychow-Dannenb, W Naturschutzgebiet Breerer Grund, ca. 4 km SSE of Gohrde, ca. 1.5 km S of Gr. Stern, *Fagus sylvatica*, October 26, 2003, leg. U. Schiefelbein 1376 (herb. Schiefelbein).

LITHUANIA: Biržų raj., Biržų giria, Spalviškių gja, 235 kvartalas, *Fraxinus excelsior*, July 7, 2003, leg. S. Skuja 10305 (BILAS); Akmenės raj., Kruopių g-ja, 548 kvartalas, 27/28 sklypas, *Fraxinus excelsior*, September 20, 2003, leg. E. Panovienė 10319 (BILAS); Naujosios Akmenės g-ja, 438 kvartalas, 16 sklypas, ant lapuočio medžio kamieno, September 2003, leg. E. Panovienė 8460 (BILAS); 441 kvartalas, 50 sklypas, ant lapuočio medžio kamieno, September 2003, leg. E. Panovienė 8461 (BILAS); Raseinų raj., Viduklės g-ja, 89 kvartalas, 11 sklypas, ant lapuočio medžio kamieno, November 26, 2003, leg. A. Masaitis 9468 (BILAS); Vilniaus raj., Liubavo dvaras, *Fraxinus excelsior*, October 11, 2007, leg. D. Stončius 9316 (BILAS); Kelmės raj., Užpelkių miškas, Tytuvėnu g-ja, 133 kvartalas, 14 sklypas, *Fraxinus excelsior*, January 7, 2007, leg. D. Stončius 9315 (BILAS); Ukmergės raj., Narkuškių miškas, Giedraičių g-ja, 56 kvartalas, 17 sklypas, *Fraxinus excelsior*, June 14, 2009, leg. D. Stončius 9317 (BILAS); Asvejos RP, Molėtų raj., Dubingiu g-ja, 1075 kvartalas, 48 sklypas, *Ulmus* sp., April 24, 2010, leg. D. Stončius 9622 (BILAS); Labanoras Regional Park, Molėtai District, Stirniai village, between Lakes Galnakis I and Galnakis II, *Acer platanoides*, April 4, 2011, leg. D. Stončius 10244 (BILAS); Elektrenų sav., Vievio miškas, Vievio g-ja, 153 kvartalas, 16 sklypas, *Acer platanoides*, November 14, 2006, leg. D. Stončius 9524 (BILAS); Kuršių Nerijos NP, palvės miškas ties II Nidos įvažiavimu, *Betula* sp., July 29, 2006, leg. D. Stončius 10267 (BILAS); Širvintų raj., Sailidžionių miškas, Širvintų g-ja, 34 kvartalas, 9 sklypas, *Quercus robur*, September 15, 2006, leg. D. Stončius 8706 (BILAS); Molėtų raj., Šešuolėlių g-ja, 18 kvartalas, 15 skl., Šilo miškas, *Fraxinus excelsior*, November 26, 2006, leg. D. Stončius 8281 (BILAS); Sartu RP, Dusetu giria, Vosynos rezervatas, 25 kvartalas, 8 sklypas, *Acer platanoides* kamieno pammatines dallies, June 10, 2003, leg. J. Motiejunaite 6578 (BILAS); Molėtų raj., miškelis į V nuo Aleksandriškių km., Giedraičių gja, 681 kvartalas, 63 sklypas, *Ulmus glabra*, December 7, 2006, leg. D. Stončius 7791 (BILAS); Panemunių regioninis parkas, Šakių raj., Ilguvos apyl., Valnjaravio rezervatas, *Fraxinus excelsior*, June 16, 2007, leg. A. Uselienė 9685 (BILAS); Vilniaus raj., Šuzionių g-ja, 74 kvartalas, 5 skl., Šuzionių miškas UTM: 595620-6094584, *Quercus robur*, October 24, 2012, leg. D. Stončius 10511 (BILAS); Žemaitijos NP, Plungės raj., Plateliai, *Fraxinus excelsior*, September 14, 2001, leg. J. Motiejunaite 5636 (BILAS); Liepijos miškas, *Tilia cordata*, May 12, 2002, leg. J. Motiejunaite 5863 (BILAS); Lazdijų raj., Rinkoto miškas, 1 kvartalas, Dusios ežero krantas, *Quercus robur*, April 3, 2001, leg. J. Motiejunaite 5635 (BILAS); Kurtuvėnų RP, Šiaulių raj., Vainagiai, *Acer platanoides*, July 2003, leg. V. Lopeta 7134 (BILAS); Bubių g-ja, 45 kvartalas, 2 sklypas, *Fraxinus excelsior*, August 27, 2002, leg. V. Lopeta 5813 (BILAS); Ažuolijos miškas, Utenos raj., 44 kvartalas, 7 sklypas, *Quercus robur*, September 8, 2001, leg. I. Prigodina 2916 (WI); 47 kvartalas, 7 sklypas, Utenos raj., *Quercus robur*, August 22, 2001, leg. I. Prigodina 3133 (WI); Dūkstu ažuolynas, 3 kvartalas, Neries RP, Vilniaus raj., *Quercus robur*, June 25, 2002, leg. I. Prigodina 1276 (WI); 10 kvartalas, 3 sklypas, Neries RP, *Quercus robur*, September 13, 2001, leg. I. Prigodina 2944 (WI); 9 kvartalas, 4 sklypas, Neries RP, Vilniaus raj., *Quercus robur*, July 10, 2002, leg. I. Prigodina 1275 (WI); Varnikų miškas, 95 kvartalas, 4 sklypas,

Tarkų istorinis-nacionalinis parkas, *Quercus robur*, June 4, 2002, leg. I. Prigodina 1299 (WI); 95 kvartalas, 4 sklypas, Traku istornis nacionalinis parkas, *Quercus robur*, June 9, 2002, leg. I. Prigodina 2973 (WI); Palanga, ant klevo kamieno, August 8, 1975, leg. T. Rudzinskaitė 2166 (WI); Juodkrantė, Kuršių Nerija, ant klevo kamieno, August 2, 1971, leg. T. Rudzinskaitė 2456 (WI). **NETHERLANDS:** Olanda, Ohenby, 1943, leg. O. Almborn. **NORWAY:** Stryn, forest, *Abies alba*, August 28, 1995, leg. A. Wieczorek (herb. Wieczorek). **RUSSIA:** Republic of Karelia, Sortavala District, Ladoga Lake, Valaamarchipelago, W of Valaam island, peninsula between Bolshaya Nikonovskaya Bay and Krasny Gulf, *Sorbus aucuparia*, August 13, 2004, leg. U. Schiefelbein 1820 (herb. Schiefelbein); Nizhni Novgorod Oblast, Sharanga region, Kilemarsky Reserve, linden-spruce forest, *Tilia* sp., September 27, 1999, leg. A. Shestakova (NNSU); Arzamas region, near Staray Pustyn village, Biological Station of State University, *Tilia* sp., August 24, 1994, leg. P. Suvorov (NNSU); Baikalsky Nature Reserve, Republic of Buryatia, Khamar-Daban, near of mouth of Verkhniy Khandagaita River, pine(sibirica)-spruce-birch forest, *Populus* sp., July 29, 2002, leg. G. P. Urbanavichus 1990 (KPABGI); Kalujskie zaseki Reserve, Kaluga Province, Ulyanovsky District, flood plain, limeoak forest, *Quercus* sp., July 27, 2004, leg. A. V. Gudovicheva 11989 (KPABGI); Orel region, T. 217, Znamensky Distr., Orlovskoye Polesie National Park, Krasnikovskoye Forestry, 33 quar., broad-leaved forest, bark of *Ulmus* sp., 53°29.175' N, 35°33.951' E, alt. 196 m, June 12, 2012, leg. E. E. Muchnik 9048 (OHHI); Ryazan region, T. 112, Kadomsky Distr., right bank of Moksha River, oak forest, bark of *Ulmus*, 54°26.156' N, 42°27.710' E, alt. 116 m, July 27, 2010, leg. E. E. Muchnik & L. A. Konoreva 102 (RUS); Ryazan region, T. 106, Kadomsky Distr., Kadomskoye Forestry, 28 quar., mied forest, bark of *Quercus*, 54°30.561' N, 42°23.399' E, alt. 111 m, July 25, 2010, leg. E. E. Muchnik & L. A. Konoreva 120 (RSU); Bryansk region, T. 378, Suzemsky Distr., Bryansky les State Nature Reserve, 103 quar., broad-leaved forest, bark of *Fraxinus excelsior*, 52°27.286' N, 33°51.155' E, alt. 153 m, August 10, 2015, leg. E. E. Muchnik (herb. Muchnik). **SLOVAKIA:** August 5, 1959, leg. Vězda (WAAR). **SWEDEN:** *Populus* sp., July 13, 1949, leg. E. Smaland, P. Dodershult, ST. Ekershult & A. H. Magnusson (KRAM-L 34679). **UKRAINE:** near Kamenets-Podolsk, an baumrinden, 1909, leg. V. Kutak (WRSL). **USA:** New York, *Carya alba*, May 1893, leg. N. Y. Alcove (herb. Seaward e Mus. Bot. Stockh.).

Exsiccatae seen. Wetmore, Lich. Exs. No. 44, as *Opegrapha varia* (KRAM); Poelt & Steiner, Lich. Alp. No. 342, as *Opegrapha lichenoides* var. *chlorina* (KRAM); Poelt & Steiner, Lich. Alp. No. 371 as *Opegrapha lichenoides* var. *chlorina* (KRAM); Savic, Lichenotheca Rossica. Decas 3, as *Opegrapha lichenoides* (BILAS, WI); Lich. Helv. Exs. No. 282 (WRSL).

***Arthonia atra* (Pers.) A. Schneid.**

Specimens examined. **AB-24** – Pobrzeże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands; Wolin Island, Wolin National Park, *Carpinus betulus*, August 15, 1996, leg. A. Wieczorek (herb. Wieczorek). **AB-94** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Puszcza Bukowa (Beech Forest), Szczecin Landscape Park, *Carpinus betulus*, August 20, 1997, leg. A. Wieczorek (herb. Wieczorek). **BA-88** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Wodzisław town, *Quercus* sp., August 28, 1987, leg. W. Fałtynowicz & J. Miądlikowska (UGDA-L 3901). **BA-93** – Pobrzeże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Slovincian Coast): Mielno town, *Fagus sylvatica*, June 8,

1984, leg. W. Fałtynowicz (UGDA-L 2845). **BC-12** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Trangankowe Urwisko Nature Reserve, about 2 km of Zatom village, *Fagus sylvatica*, May 6, 2010, leg. U. Schiefelbein 2621 (herb. Schiefelbein). **BC-22** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Lake Ostrowiec, *Fraxinus* sp., August 17, 1989, leg. L. Lipnicki (herb. Lipnicki); Radęcin Nature Reserve, *Fagus sylvatica*, July 7, 2002, leg. A. Wieczorek (herb. Wieczorek); beech forest, forest section No. 250, *Carpinus betulus*, July 7, 2002, leg. A. Wieczorek (herb. Wieczorek). **BF-13** – Central Sudetes, Stołowe Mountains: near Karłów–Kudowa highway, *Acer pseudoplatanus*, September 25, 1951, leg. Z. Tobolewski (POZ). **CA-38** – Pobrzeże Koszalińskie (Koszalin Coastland)land, Wybrzeże Słowińskie (Slovincian Coast): Bielawskie Błoto near Silice village, *Populus tremula*, August 19, 1951, leg. Z. Tobolewski (POZ). **CA-58** – Pobrzeże Koszalińskie (Koszalin Coastland), Pradolina Redy-Łeby (Reda-Łeba Urstromtal): 2 km of Wejherowo town, *Fagus sylvatica*, July 1983, leg. A. Zalewska (UGDA-L 2882). **CA-69** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): between Rumia and Zagórze towns, *Fagus sylvatica*, March 28, 1987, leg. W. Fałtynowicz (UGDA-L 3268). **CA-99** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Dolina Reknicy (Reknica River Valley), *Acer* sp., December 5, 1976, leg. W. Fałtynowicz (UGDA-L 3405). **CB-09** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Zaskoczyn village, *Acer* sp., April 5, 1986, leg. W. Fałtynowicz & Z. Tobolewski (UGDA-L 3388). **CB-75** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Dolina Brdy (Brda River Valley): Piekło Nad Brdą Nature Reserve, *Quercus* sp., March 30, 1985, leg. L. Lipnicki (TRN). **CC-27** – Pradolina Toruńsko-Eberswaldzka (Toruń-Eberswalder Urstromtal), Kotlina Toruńska (Toruń Basin): Ostromecko village, Chełmno County, *Carpinus betulus*, May 22, 1952, leg. J. Hutorowicz (TRN). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit): Krynica Morska town, forest section No. 26m, *Populus* sp., August 7, 1981, leg. E. Budzbon (UGDA-L 2188). **DB-05** – Pobrzeże Gdańskie (Gdańsk Coastland), Wysoczyzna Elbląska (Elbląg Highland): Elbląg City, *Betula* sp., June 21, 1978, leg. H. Karwowska (TRN). **DB-53** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Iławskie (Iława Lake District): E of Szadowo village, valley of Liwa River, N bank of the river, hornbeam-linden forest, *Carpinus betulus*, April 16, 2006, leg. M. Kukwa 4949 (UGDA-L 13532). **DE-57** – Wyżyna Przedborska (Przedborska Upland), Wzgórze Radomszczańskie (Radomsko Hills): Kobile Wielkie Nature Reserve, *Quercus robur*, July 7, 1971, leg. K. Czyżewska (LOD-L 1643). **DE-68** – Wyżyna Przedborska (Przedborska Upland), Niecka Włoszczowska (Włoszczowa Basin): Dębowiec Nature Reserve, forest section No. 162, *Ulmus glabra*, October 30, 1969, leg. K. Czyżewska (LOD-L 1022). **EB-01** – Nizina Staropruska (Old Prussian Lowland), Równina Ornecka (Orneta Plain): Mingajny village, *Salix* sp., May 10, 1989, leg. S. Cieśliński (KTC). **EB-22** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): about 1.5 km NNE of Smolajny village, *Fraxinus excelsior*, August 23, 1993, leg. S. Cieśliński (KTC). **ED-91** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Piotrkowska (Piotrków Plain): Puszcza Pilicka (Pilica Forest), Konewka Nature Reserve, forest section No. 153, *Quercus petraea*, in thermophilous oak forest, October 10, 1974, leg. K. Czyżewska (LOD-L 4497). **EE-83** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Podzamcze near Chęciny town, forest section No. 176, *Quercus*

sp., March 10, 1977, leg. K. Toborowicz (KTC). **EG-11** – West Beskids, Gorce Mountains: in Lasek Żydowski by Polana Jaworzynka in valley of Gorcowy Potok (Gorcowy Stream), *Acer pseudoplatanus*, February 12, 1997, leg. P. Czarnota (GPN 1841); in shady gorge above stream, at field edges in Lubomierz town (housing estate Borki), *Salix* sp., May 29, 2000, leg. P. Czarnota (GPN 2311). **EG-21** – West Beskids, Gorce Mountains: Turbacz Nature Reserve, *Fagus sylvatica*, May 12, 1992, leg. P. Czarnota (GPN 231), September 6, 1959, leg. K. Glanc (KRAM-L 39395). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: by Pieniński Potok (Pieniny Stream), *Corylus avellana*, August 20, 1955, leg. Z. Tobolewski (POZ). **FB-03** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Elckie (Elk Lakeland): Puszcza Borecka (Borki Forest), forest section No. 195, *Fagus sylvatica*, May 21, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC); Puszcza Borecka (Borki Forest), near Czerwony Dworek village, *Fraxinus excelsior*, May 21, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-56** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Elckie (Elk Lakeland): Kopijki village near road to Prostki village, *Fagus sylvatica*, August 31, 1988, leg. S. Cieśliński (KTC). **FG-08** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): Leszczawa Góra village, near cemetery, *Carpinus betulus*, July 21, 1984, leg. J. Piórecki (BDPA). **FG-69** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Ustrzyki Górne village, *Acer pseudoplatanus*, August 5, 1959, leg. K. Glanc (KRAM-L 39496). **GB-31** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Starożyn Nature Reserve, forest section No. 195, *Fraxinus excelsior*, September 17, 1986, leg. S. Cieśliński (KRAM-L 31823).

Additional material examined. **AUSTRIA:** Botanischer Tauschverein in Wien, leg. Versegghy (KRAM-L 381, 388). **CZECH REPUBLIC:** Deutschbrod in Böhmen, leg. Jul. Svacha (KRAM-L 390, 396). **DENMARK:** Damshalte, Hyelmsmark, *Populus* sp., June 13, 1947, leg. M. Christiansen (POZ); Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); Ekkodalen, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek). **GERMANY:** Blankenberg, Hampe, (KRAM-L 27008, 26977); Balingen, 1950, leg. F. O. Westerberg (WA); Mecklenburg-Vorpommern, Ucker-Randow, mied forest, October 14, 2001, leg. U. Schiefelbein 743 (herb. Schiefelbein); moist alder forest, *Fraxinus excelsior*, March 12, 2000, leg. U. Schiefelbein 497 (herb. Schiefelbein); Straße Jatznick-Rothemühl, ca. 1 km E of Rothemühl, *Fagus sylvatica*, October 19, 1999, leg. U. Schiefelbein 614 (herb. Schiefelbein); Buchenwald auf dem Butterberg, *Fagus sylvatica*, April 1, 2001, leg. U. Schiefelbein 609 (herb. Schiefelbein); Demnitzer Bruch, Eschen-Mischwald, *Fraxinus excelsior*, October 22, 2000, leg. U. Schiefelbein 711 (herb. Schiefelbein); Klepelshagen Nature Reserve on Knüppelbach, Quell-Eschenwald forest, *Carpinus betulus*, October 20, 1999, leg. U. Schiefelbein 455 (herb. Schiefelbein); 2.5 km N of Ahlbeck, Eschen-Mischwald, *Fraxinus excelsior*, April 24, 1998, leg. U. Schiefelbein 460 (herb. Schiefelbein); Nordwestmecklenburg, Klützer Winkel, Brooker forest, 1 km NE of Schlossgut Groß Schwanensee, *Fagus sylvatica*, October 29, 2010, leg. U. Schiefelbein 2464 (herb. Schiefelbein); Landkreis Ostvorpommern, Greifswalder Oie, orchard near lamppost, *Malus sylvestris*, August 11, 2007, leg. U. Schiefelbein 2123 (herb. Schiefelbein); Mecklenburg Vorpommern, Ostvorpommern region, Eschenwald N Müggenburg, July 30, 1996, leg. U. Schiefelbein 152 (herb. Schiefelbein); Blesewitzer Holz, 1.5 km SE of Sanitz, July 30, 1996, leg. U. Schiefelbein 149 (herb. Schiefelbein); W Spantekow, Kaiserkoppel, *Fraxinus* sp., July 17, 1996, leg. U. Schiefelbein 148 (herb. Schiefelbein); ca.

2 km E of Wockninsee, *Carpinus betulus*, November 27, 2002, leg. U. Schiefelbein 1296 (herb. Schiefelbein); Koserow, an der Steilküste, NW of Streckelberg Nature Reserve, *Fagus sylvatica*, April 2, 2002, leg. U. Schiefelbein 1299 (herb. Schiefelbein); waldgebiet zwischen Seebad Bansin und Ückeritz, ca. 0.5 km westlich der ehemaligen Selliner Bootstelle, *Fraxinus excelsior*, November 14, 2003, leg. U. Schiefelbein 1382 (herb. Schiefelbein). **GREAT BRITAIN:** Worcestershire, Alfrick, leg. H. B. Holl (KRAM-L 26998). **ITALY:** Caldes, Baglietto, (KRAM-L 26800). **IRELAND:** Mullet Peninsula, Lighthouse Island, *Sambucus* sp., June 12, 1996, leg. M. R. D. Seaward 107490 (herb. Seaward). **POLAND:** s. loc., March 19, 1864, leg. Strasburger (WA). **RUSSIA:** Nizhni Novgorod Oblast, Vetluga region, Klenovik forest reserve, birch forest, *Sorbus* sp., August 13, 1999, leg. M. Sharapova (NNSU); Varnavino region, between Nepogodiha and Reshetiha villages, spruce forest, on young *Sorbus* sp., August 7, 1999, leg. M. Sharapova (NNSU); Bogorodsk region, near Shoniha station, coniferous-deciduous forest, on *Populus tremula*, August 2, 1998, leg. M. Sharapova (NNSU). **SWITZERLAND:** Zurich, October 1877, leg. J. G. Winter (KRAM-L 27014).

Exsiccate seen. Arnold, Lich. Exs. No. 767, as *Opegrapha gyrocarpa* for. *rhododendri* (KRAM); Krypt. Exs. No. 1526, as *Opegrapha atra* (KRAM); Bot. Mus. Hist. Versegghy Lich. Exs. No. 76, as *Opegrapha atra* (KRAM); Baglietto, Cesati & Notaris, Erb. Critt. Ital. Ser. I No. 203, as *Opegrapha atra* (KRAM).

***Arthonia calcarea* (Turner ex Sm.) Ertz & Diederich**

Specimens examined. **DG-39** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pogórze Spisko-Gubałowskie (Spisz-Gubałówka Foothills): Skalice Nowotarskie, limestone, July 20, 1997, leg. A. Wieczorek (herb. Wieczorek). **DG-58** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Chochołowska (Chochołów Valley), rock, July 24, 1997, leg. A. Wieczorek (herb. Wieczorek).

Additional material examined. **DENMARK:** Jylland, leg. M. Christiansen (LBL); Bornholm: an Wallen des Schlosses Hamnershuus auf der Insel, 1884, leg. Hellbom (KRAM-L 44331). **GERMANY:** Hansted, limestone, July 25, 1942, (BMUC); Schleswig-Holstein, Nordfriesland, Insel Föhr, Süderende, Kirchof St. Laurentius, concrete, October 9, 2009, leg. U. Schiefelbein 2424 (herb. Schiefelbein); Niedersachsen, Landkreis Leer, Gem. Jemgum, Holtgaste, alte Kirche am Ortsrand, concrete, October 23, 2004, leg. U. Schiefelbein 1874 (herb. Schiefelbein); Gem. Weener, Stapelmoor, alte Kirche im Dorfszentrum mit Baumbestand, concrete, October 23, 2004, leg. U. Schiefelbein 1872 (herb. Schiefelbein). **GREAT BRITAIN:** Herb. C. du Bois Larbalestier, April 1896, (KRAM-L 27266).

Exsiccate seen. Arnold, Lich. Exs. No. 1398, as *Opegrapha conferta* (KRAM); Anzi, Lich. Exs. No. 36, as *Opegrapha calcarea* (KRAM); Anzi, Lich. Exs. No. 37, as *Opegrapha calcarea* (KRAM); Zwackh, Lich. Exs. No. 1194, as *Opegrapha calcarea* (KRAM).

***Gyroglypha gyrocarpa* (Flot.) Ertz & Tehler**

Specimens examined. **AE-78** – Western Sudetes, Karkonosze Mountains: Owcze Skały, July 30, 2008, leg. M. Kossowska (herb. Kossowska); Twarożnik Mount, October 6, 2007,

leg. M. Kossowska (herb. Kossowska). **AE-88** – Western Sudetes, Karkonosze Mountains: Łabski Szczyt Mount, July 31, 2008, leg. M. Kossowska (herb. Kossowska). **BF-06** – Western Sudetes, Sowie Mountains: Srebrna Góra (Silver Mount), walls by fortress, rock, April 22, 2004, leg. M. Kukwa 3102 (UGDA-L 10288). **BF-14** – Central Sudetes, Stołowe Mountains: ca. 5 km of Karlów village, August 26, 1954, leg. Z. Tobolewski (POZ); near road from Karlów to Radków villages, July 17, 1951, leg. Z. Tobolewski (POZ); near road from Pasterka to Nowy Karlów villages, August 6, 1960, leg. Z. Tobolewski (POZ). **BF-38** – Eastern Sudetes, Góry Złote (Golden Mountains): Bialskie Mountains, Trzy Siostry, August 7, 2003, leg. K. Szczepańska (herb. Szczepańska). **BF-47** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Bialskie Mountains, Goworek Mount, June 28, 2004, leg. K. Szczepańska (herb. Szczepańska). **DG-13** – West Beskids, Beskid Śląski Mountains: western slope of Barania Góra (Ram Mountain), sandstone, July 22, 1965, leg. J. Kiszka (KRAP); SW crest of Barania Góra (Ram Mountain), sandstone, June 8, 1966, leg. J. Kiszka (KRAP); sandstone, June 7, 1966, leg. J. Kiszka (KRAP); Barania Góra (Ram Mountain), Biała Wisielka Stream, sandstone, June 9, 1966, leg. J. Kiszka (KRAP). **DG-17** – West Beskids, Beskid Żywiecki Mountains: Pasma Policy (Polica Range), Hala Śmietanowa, October 21, 1965, leg. J. Nowak (KRAM-L 15921). **DG-25** – West Beskids, Beskid Żywiecki Mountains: Pilsko Massif, Skalka Mount, July 16, 1966, leg. J. Nowak (KRAM-L 17040). **DG-33** – West Beskids, Beskid Żywiecki Mountains: Przysłop Wielki Mount, sandstone, August 1, 1962, leg. J. Kiszka (KRAP). **EG-21** – West Beskids, Gorce Mountains: Gorc Mount, S slope, August 23, 1967, leg. K. Glanc (KRAM-L 39486); Gorce National Park, under glade, N slope of Mostownica village, in Roztoka Stream catchment area, July 30, 1999, leg. P. Czarnota (GPN); crest under Przysłop Mount, sandstone, June 9, 1966, leg. J. Kiszka (KRAP); above Kopa gorge, near black tourist trail, November 4, 1999, leg. B. J. Coppins (GPN 2145). **EG-22** – West Beskids, Gorce Mountains: Lubań Mount, August 9, 1968, leg. K. Glanc (KRAM-L 39485); N slope of Mostownica, July 30, 1999, leg. P. Czarnota (GPN 2244). **EG-36** – West Beskids, Beskid Sądecki Mountains: Jaworzyna Krynicka Mount, August 11, 1989, leg. A. Wieczorek (herb. Wieczorek); Żebracze Nature Reserve, July 30, 1999, leg. P. Czarnota (GPN 2052); July 5, 2001, leg. P. Czarnota (GPN 2584, 2528); Pasma Jaworzyny (Jaworzyna Range), Pusta Wielka Mount, August 23, 1967, leg. M. Olech (KRA). **EG-50** – West Tatras: Dolina Gąsienicowa (Gąsienica Valley) by Czarny Potok (Black Stream) near Czarny Staw Gąsienicowy (lake), among scree in moist place, on granitic stone, August 29, 2002, leg. A. Flakus 142 (KRAM-L 48297). **EG-60** – West Tatras: Wyznia Spadowa Przełęczka (pass), on granite rock, W aspect, the subnival belt; alt. 2,222 m, August 20, 2005, leg. A. Flakus 5417 (KRAM-L 52156); valley behind Mnich Mount, on granite, alt. 1,950 m, August 21, 2002, leg. A. Flakus 107 (KRAM-L 48293); Ciemnosmerczyńska Przełęczka (pass), in vertical rock crack, mylonite area, alt. 2,115 m. N aspect slope 900, August 16, 2003, leg. A. Flakus 1785 (KRAM-L 48343). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Połonina Wetlińska (alpine meadow), Roh Mount, rock debris on SW slope, sandstone, September 11, 2004, leg. R. Kościelniak (KRAP 1870); alpine meadow, Osadzki Wierch Mountain, sandstone, September 10, 2004, leg. J. Kiszka & R. Kościelniak (KRAP 1872); rock outcrops under mountain hut, sandstone, September 12, 2007, leg. J. Kiszka & R. Kościelniak (KRAP 965); SE crest under mountain hut, sandstone, September 9, 2004, leg. J. Kiszka & R. Kościelniak (KRAP 1874); S slope of Halicz Mount, near tourist trail, sandstone, July 12, 2005, leg. J. Kiszka & R. Kościelniak (KRAP 930). **FG-69** – Beskidy Lesiste Mountains, West Bieszczady Mountains; Bieszczady National Park, Brzegi Górne village, valley of Prowcza Stream, near a quarry, sandstone,

July 16, 2005, leg. R. Kościelniak (KRAP 1875). **GG-60** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Tarnica Mount, sandstone, July 18, 2005, leg. J. Kiszka (KRAP 1876). **GG-70** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, rock outcrops S of Rozsypaniec Mount, near tourist trail, July 7, 2004, leg. J. Kiszka (KRAP 1869).

Additional material examined. **AUSTRIA:** 1878, (WRSL). **GREAT BRITAIN:** Westmorland (V.C69), Great Asby Scar National Nature Reserve, grid ref. 35/65.10 and 64.10., on acidic rock, August 30, 2006, leg. B. Krzewicka (KRAM-L 50190). **CZECH REPUBLIC:** Southern Moravia, Brno Venkov District, Dolní Loučky-Mezihorí, boulder scree flow at N foot of Pásník hill, below point Bílá skála, schist, April 19, 2007, leg. U. Schiefelbein 2078 (herb. Schiefelbein); Severo-Český kraj, Lužické hory, CHKO Lužické hory, Spravedlnost, April 27, 2003, leg. U. Schiefelbein 1364 (herb. Schiefelbein). **GERMANY:** Niedersachsen, Landkreis Leer, Gem. Westoverledingen, Großwolde, alte Kirche am Ortsrand, brick, September 22, 2004, leg. U. Schiefelbein 1857 (herb. Schiefelbein); Gem. Leer, Bingum, alte Kirche am Ortsrand, brick, October 23, 2004, leg. U. Schiefelbein 1864 (herb. Schiefelbein); Gem. Jemgum, Holtgaste, alte Kirche am Ortsrand, brick, October 23, 2004, leg. U. Schiefelbein 1873 (herb. Schiefelbein). **HUNGARY:** 1867, 1872 (WRSL). **ITALY:** Auf den Stammchen und Zweigen von Rhodod. Ferrugin in einem Syenitgerolle am Fusse der Margola unweit Predazzo in Sudtiro, September 17, 1878, leg. Arnold (herb. Seaward).

Opegrapha dolomitica (Arnold) Clauzade & Cl. Roux ex Torrente & Egea

Specimens examined. **DE-51** – Wyżyna Woźnicko-Wieluńska (Woźniki-Wieluń Upland), Wyżyna Wieluńska (Wieluń Upland): Węże Nature Reserve, Góra Zelce (Zelce Mountain), on vertical limestone rocks in slightly shaded habitat, N exposure, May 30, 1963, leg. J. Nowak (KRAM-L 12349). **DE-52** – Wyżyna Woźnicko-Wieluńska (Woźniki-Wieluń Upland), Wyżyna Wieluńska (Wieluń Upland): Zalesiaki village near Działoszyn town, on slightly sunny limestone rocks, June 1, 1963, leg. J. Nowak (KRAM-L 12158). **DE-62** – Wyżyna Woźnicko-Wieluńska (Woźniki-Wieluń Upland), Wyżyna Wieluńska (Wieluń Upland): Kamyk village near Kłobuck town, on vertical limestone rock, NW exposure, May 21, 1964, leg. J. Nowak (KRAM-L 12273). **DF-58** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Dolina Kobylańska (Kobylańska Valley), limestone, slope E, August 6, 1957, leg. J. Nowak (KRAM-L 4131); between Rudawa and Nielepice villages, of Jurassic limestone, slope N, October 9, 1971, leg. J. Nowak (KRAM-L 29981); Dolina Sąpowska (Sąpowska Valley), rocks, October 10, 1956, leg. K. Glanc (KRAM-L 39406). **DF-68** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Garb Tenczyński (Tenczynek Ridge): Kamyk near Nielepice villages, vertical rock of Jurassic limestone, July 30, 1990, leg. J. Nowak (KRAM-L 34351); September 30, 1986, leg. J. Nowak (KRAM-L 30447). **DF-96** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: Żurawnica Mount, sandstone, 1961, leg. J. Nowak (KRAM-L 9661). **DG-58** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Chochołowska (Chochołów Valley), August 21, 1956, leg. Z. Tobolewski (POZ); Dolina Białego (Valley of the White), near tourist trail, September 10, 1955, leg. Z. Tobolewski (POZ); Dolina Kościeliska (Kościeliska Valley), near road from Hala Pisana to Hala Ornak, June 22, 1954, leg. Z. Tobolewski (POZ); Tatras gorge, June 23, 1954, leg. Z. Tobolewski (POZ). **EE-82** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains:

Chęciny Forest Division, Polichno village, limestone, October 21, 1986, leg. K. Toborowicz (KTC). **EE-83** – Wyżyna Kielecka (Kielce Upland), Dolina Nidy (Nida River Valley): Chęciny Forest Division, Tokarnia village near Chęciny town, June 12, 1975, leg. K. Toborowicz (KTC); Zelejowa Mount, N slope, August 14, 1976, leg. K. Toborowicz (KTC). **EG-20** – West Beskids, Gorce Mountains: Goła Góra Mount, N slope, June 27, 1955, leg. Z. Tobolewski (POZ); Nowy Targ County, Białe Skały, August 19, 1955, leg. Z. Tobolewski (POZ). **EG-32** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Skalice Nowotarskie, rock outcrop above Falsztyn village, limestone, August 12, 1968, leg. J. Kiszka (KRAP 11101). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Wąwóz Szopczański [Sobczański] (Szopczański Gorge), limestone, August 11, 1967, leg. K. Glanc (KRAM-L 39407); Podskalnia Góra (Podskalnia Mountain), limestone, August 4, 1955, leg. Z. Tobolewski (POZ); Wąwóz Szopczański [Sobczański] (Szopczański Gorge), limestone, June 30, 1955, leg. Z. Tobolewski (POZ); limestone, April 6, 1954, leg. Z. Tobolewski (POZ). **EG-34** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Valley of Krupianka Stream, Wąwóz Homole (Homole Gorge), July 28, 1955, leg. Z. Tobolewski (POZ); right slope of Wąwóz Homole (Homole Gorge), September 16, 1956, leg. Z. Tobolewski (POZ); Pieninki Mountains, Czerszlowe Skałki, September 18, 1969, leg. J. Nowak (LOD).

Additional material examined. GREAT BRITAIN: Westmorland, Great Asby Scar National Nature Reserve, grid ref. 35/65.10 and 64.10, on limestone, August 30, 2000, leg. B. Krzewicka (KRAM-L 50189). **RUSSIA:** Orel region, T. 301, Krasnozorensky Distr., near v. Elagino, bank of Lubovsha River, limestone rocks in deciduous forest, on limestone, 52°50.438' N, 37°33.978' E, alt. 182 m, July 9, 2012, leg. E. E. Muchnik 11474 (OHHI). **SWITZERLAND:** 1876, (WRSL).

Exsiccata seen. Weber, Lich. Exs. No. 198, as *Opegrapha saxicola* (KRAM); Poelt & Steiner, Lich. Alp. No. 331, as *Opegrapha saxicola* (KRAM).

****Opegrapha geographicola* (Arnold) Hafellner**

Specimens examined. EG-60 – Łańcuch Tatrzański Mountains, Eastern Tatras: High Tatras, Rysy Mount, the subnival belt; alt. 2,160 m, on granite rock, on thallus of *Rhizocarpon badioatrum*, July 20, 2004, leg. A. Flakus 2740/1 (KRAM-L 15542, herb. Flakus).

***Opegrapha lithyrga* Ach.**

Specimens examined. DG-05 – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: Czarne Działy hill near Ślemień village, sandstone, August 6, 1965, leg. J. Nowak (KRAM-L 5059). **DG-34** – West Beskids, Beskid Żywiecki Mountains: Wielka Racza Massif, Zimna Woda forest, on slopes of Smerkówka Mała Mount, rock, August 14, 1964, leg. J. Nowak (KRAM-L 13909). **EG-50** – Łańcuch Tatrzański Mountains, Eastern Tatras: in forest near glade under the rock, above Dolina Roztoki (Roztoka Stream Valley), sandstone, October 17, 1966, leg. J. Nowak (KRAM-L 5557).

Additional material examined. CZECH REPUBLIC: Třebíč in decl. collis drinora hora in vallem fluvii Jihlanka limestone, 1929, leg. J. Suza (LBJS).

***Opegrapha niveoatra* (Borrer) J. R. Laundon**

Specimens examined. BA-87 – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Wodzisław town, S of Sławno town, *Fagus sylvatica*, August 28, 1987, leg. W. Fałtynowicz & J. Miądlukowska (UGDA-L 3653). **BA-98** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Chomicz village near Janiewie village, *Quercus* sp., August 27, 1987, leg. W. Fałtynowicz & J. Miądlukowska (UGDA-L 3673). **BA-91** – Pobrzeże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Slovincian Coast): 5 km E of Ustronie Morskie village, *Salix* sp., June 15, 1986, leg. W. Fałtynowicz (UGDA-L 2791). **BA-97** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Drzeńsko village, *Fagus sylvatica*, August 28, 1987, leg. W. Fałtynowicz & J. Miądlukowska (UGDA-L 3947). **BB-29** – Pojezierze Zachodniopomorskie (West Pomeranian Lake District), Pojezierze Bytowskie (Bytowskie Lake District): Krzeszewo village, *Quercus* sp., August 29, 1987, leg. W. Fałtynowicz & J. Miądlukowska (UGDA-L 3657). **BC-22** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Wydrzy Głaz Nature Reserve, 3 km N of Moczele village, *Fagus sylvatica*, May 8, 2010, leg. U. Schiefelbein 2720 (herb. Schiefelbein). **CA-58** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Reda town, Pielaszewo District, *Fagus sylvatica*, May 1, 1985, leg. W. Fałtynowicz (UGDA-L 3435). **CA-66** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Porzecze village, S of Strzebielina village, *Fagus sylvatica*, July 15, 1985, leg. W. Fałtynowicz (UGDA-L 2872). **CA-86** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): near Staniszewskie Zdroje Nature Reserve, *Fagus sylvatica*, April 4, 1986, leg. W. Fałtynowicz (UGDA-L 3377). **CA-99** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Jar Reknicy Nature Reserve, *Fagus sylvatica*, September 19, 1983, leg. W. Fałtynowicz & Z. Tobolewski (UGDA-L 1755). **CB-04** – Pojezierze Zachodniopomorskie (West Pomeranian Lake District), Pojezierze Bytowskie (Bytowskie Lake District): Glinowo Forest District, *Fagus sylvatica*, April 3, 1986, leg. W. Fałtynowicz (UGDA-L 3448); *Quercus* sp., April 3, 1986, leg. W. Fałtynowicz & Z. Tobolewski (UGDA-L 3378). **CB-08** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Przywidz village, *Fagus sylvatica*, October 25, 1985, leg. W. Fałtynowicz (UGDA-L 2952). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit): Mierzeja Wiślana Landscape Park, Buki Mierzei Wiślanej Nature Reserve, beech forest with small patches of black alder bog forest around small ponds, on *Quercus robur*, April 21, 2013, leg. M. Kukwa 12078 (UGDA-L19246). **DF-48** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Ojców National Park, Wąwóz Jamki (Jamki Gorge), *Acer pseudo-platanus*, September 22, 2005, leg. J. Kiszka (KRAP). **DG-34** – West Beskids, Beskid Żywiecki Mountains: Oszast forest reserve, Oszus Mount, slope N, *Acer pseudo-platanus*, September 4, 1964, leg. J. Nowak (KRAM-L 14871). **DG-49** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Rów Podtatrzański (Podtatrzański Trench): Gubałówka, *Abies alba*, September 19, 1964, leg. J. Kiszka (KRAP); tree stump, August 18, 1964, leg. J. Kiszka, (KRAP);

Abies alba, September 16, 1964, leg. J. Kiszka (KRAP). **EB-26** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mragowskie (Mragowo Lake District): ca. 2 km E of Otry village, *Fagus sylvatica*, May 8, 1990, leg. S. Cieśliński (KTC). **ED-99** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Zagożdżon Nature Reserve, *Carpinus betulus*, October 12, 1969, leg. S. Cieśliński (KTC). **EE-65** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Dolina Wilkowska (Wilkowska), forest section No. 266, *Alnus glutinosa*, September 23, 2000, leg. A. Donica (KTC). **EE-66** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Świętokrzyski National Park, Miejska Góra, forest section No. 15, *Quercus robur*, September 5, 1999, leg. A. Donica (KTC); forest section No. 26, September 5, 1999, leg. A. Donica (KTC). **EE-74** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Kielce Forest Division, forest section No. 6, *Quercus* sp., 1986, leg. Bidzyński (KTC). **EE-76** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Św. Katarzyna Forest District, forest section No. 138, *Sorbus aucuparia*, September 25, 2000, leg. A. Donica (KTC); *Acer pseudoplatanus*, September 25, 2000, leg. A. Donica (KTC); forest section No. 103, *Carpinus betulus*, leg. A. Donica (KTC); forest section No. 142, *Acer pseudoplatanus*, August 10, 2000, leg. A. Donica (KTC). **EE-77** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Świętokrzyski National Park, Nowa Słupia village, Dębno Forest District, forest section No. 125, *Acer platanoides*, July 19, 2001, leg. A. Donica (KTC); Łysa Góra (Bald Mountain), forest section No. 118, *Acer* sp., July 4, 2000, leg. A. Donica (KTC); Św. Krzyż Forest District, Łysa Góra (Bald Mountain), forest section No. 117, *Fagus sylvatica*, July 3, 2000, leg. A. Donica (KTC); *Acer pseudoplatanus*, July 3, 2000, leg. A. Donica (KTC); forest section No. 115, *Acer pseudoplatanus*, leg. A. Donica (KTC). **EG-32** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Pieniny Czorsztyńskie Mountains, *Abies alba*, September 20, 1993, leg. J. Kiszka (KRAP); Zielone Skałki (Green Rocks), *Tilia cordata*, May 29, 1970, leg. J. Kiszka (KRAP 10726, 10678). **EG-41** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pogórze Spisko-Gubałowskie (Spisz-Gubałówka Foothills): *Abies alba*, June 19, 1970, leg. J. Kiszka (KRAP 10940, 10902). **FB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Ełckie (Ełk Lakeland): Puszcza Borecka (Borki Forest), *Quercus* sp., May 17, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC); Borki Nature Reserve, forest section No. 20, *Tilia cordata*, May 19, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **FG-21** – Beskidy Środkowe Mountains, Beskid Niski Mountains: Magurski National Park, Hucisko forest, ca. 2.5 km SSW of Huta Krempska settlement, September 11, 2009, leg. M. Kukwa 7653, K. Szczepańska (UGDA-L 15904). **FG-58** – Beskidy Lesiste Mountains, Sanocko-Turczyńskie Mountains: Bieszczady National Park, Suche Rzeki (part of Zatwarnica village), NW slope of Wierch Mountain, *Fagus sylvatica*, September 3, 2001, leg. J. Kiszka (KRAP 1881). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Dolina Moczarnego (Moczarny Valley), between Lutowy and Tarnica streams, *Acer pseudoplatanus*, August 10, 2001, leg. R. Kościelniak (KRAP 1880). **FG-69** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, valley of Rzczyca Stream, *Fagus sylvatica*, July 9, 2003, leg. R. Kościelniak (KRAP 1878); Widełki near Bereżki villages, *Acer pseudoplatanus*, July 15, 2001, leg. J. Kiszka (KRAP 1877); valley of Rzczyca Stream, *Acer pseudoplatanus*, July 11, 2009, leg. R. Kościelniak (KRAP 4334). **GB-10** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Wigry National Park, *Fraxinus excelsior*, September 1984, leg. W. Fałtynowicz (UGDA-L 2772). **GB-40** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain):

Puszcza Augustowska (Augustów Primeval Forest), forest section No. 153, *Quercus* sp., September 21, 1989, leg. S. Cieśliński (KRAM-L 31963). **GB-91** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), 1 km NWW of Machnacz village, *Carpinus betulus*, 1987, leg. Z. Tobolewski & K. Glanc (KTC). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, *Corylus avellana*, May 13, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology). **GC-02** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): 4 km SW of Sokołda village, near road Sokołda–Supraśl, *Carpinus betulus*, August 4, 1994, leg. S. Cieśliński (KTC). **GC-12** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Stare Biele Nature Reserve, plots 7, 8, s.coll. (University of Białystok, Institute of Biology). **GC-45** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Browsk Forest District, forest section No. 101b, plot 216, *Acer platanoides*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-54** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Hajnówka Forest District, forest section No. 246b, plot 374, *Alnus glutinosa*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 333b, plot 154, *Fraxinus excelsior*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park; forest section No. 256, *Carpinus betulus*, 1988, leg. S. Cieśliński, (KTC); *Alnus glutinosa*, 1988, leg. S. Cieśliński (KTC); forest section No. 320b/d, *Carpinus betulus*, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC); plot 341c, *Tilia cordata*, 1984, leg. S. Cieśliński & Z. Tobolewski (KTC); Białowieża, *Fraxinus* sp., September 14, 1953, leg. J. Rydzak (LBL); forest section No. 256, on *Thelotrema lepadinum* growing on *Quercus robur*, August 2014, leg. M. Kukwa 12877, A. Łubek (UGDA-L 20426); on bark of snag (*Fraxinus excelsior*), October 2014, leg. M. Kukwa 13060, A. Łubek (UGDA-L 20570); *Tilia cordata*, August 2014, leg. M. Kukwa 13972, 14102, A. Łubek (UGDA-L 21590, 21688); May 2014, leg. M. Kukwa 12866, A. Łubek (UGDA-L 20418); *Alnus glutinosa*, October 2014, leg. M. Kukwa 14199, 14259, A. Łubek (UGDA-L 22068, 22116); August 2014, leg. M. Kukwa 13841, 14047, A. Łubek (UGDA-L 21506, 21639); *Fraxinus excelsior*, October 2014, leg. M. Kukwa 13070, A. Łubek (UGDA-L 20578); *Quercus robur*, August 2014, leg. M. Kukwa 13872, A. Łubek (UGDA-L 21526); *Carpinus betulus*, August 2014, leg. M. Kukwa 13859, A. Łubek (UGDA-L 21518); May 2014, leg. M. Kukwa 13802, A. Łubek (UGDA-L 21479). **GC-65** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): forest section No. 607b/d, *Quercus robur*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-66** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Białowieża Forest District, Białowieża Forest Division, forest section No. 429, *Tilia cordata*, 1981, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-75** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): forest section No. 673a, *Carpinus betulus*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC). **GG-60** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Tarnica Mount, valley of Zwór Stream, *Fagus sylvatica*, October 2, 2000, leg. J. Kiszka (KRAP 1879).

Additional material examined. **BELARUS:** Puszcza Białowieża (Białowieża Primeval Forest), Kamienivki village, *Acer* sp., 2000, leg. S. Ciesliński (KTC). **CZECH REPUBLIC:** South Moravia, Jihomoravský kraj, S of Lanžhot, Cahnov-Soutok National Nature Reserve, the protected area Cahnov, elev. 152 m, *Fraxinus angustifolia*, April 1, 2014, leg. M. Kukwa 12403 (UGDA-L 20009); Polinský vršek, elev. 175 m, edge of a managed floodplain forest, ca. 80 years old, few isolated trees in an adjacent meadow, *Carpinus betulus*, May 31, 2014, leg. M. Kukwa 12362 (UGDA-L 19967). **DENMARK:** Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek). **LITHUANIA:** Kaišiadorių raj., Laukystos žemupys, 500 m aukščiau Jonavos-Žašlių plento, Laukystos slėnio dešinysis šlaitas, *Betula* sp., October 23, 2005, leg. J. Motiejūnaitė 8455 (BILAS); *Quercus robur*, October 13, 2005, leg. D. Stončius 8387 (BILAS); Vilniaus raj., Taurų g-ja, 46 kv., 26 skl., ant lapuocio medžio kamieno, June 10, 2003, leg. T. Navsutis 10047 (BILAS); Brižių giria, *Alnus* sp., September 16, 1992, leg. J. Motiejūnaitė 1484 (BILAS); Nemuno kilpų regioninis parkas, Alytaus raj., Punios šilas, 17 kv., 1 skl., *Acer platanoides*, June 14, 2006, leg. J. Motiejūnaitė 7681 (BILAS); Joniškio raj., Endriškių g-ja, 73, kv., 18 skl., *Fraxinus excelsior*, September 2003, leg. Ž. Sinkevičius 8385 (BILAS); 36 kv., 1 skl., *Quercus robur*, September 2003, leg. Ž. Sinkevičius 8386 (BILAS); Akmenės raj., Naujosios Akmenės g-ja, 438 kv., 16 skl., ant lapuocio medžio kamieno, September 2013, leg. E. Panovienė 8485 (BILAS); Neries RP, Trakų raj., Panerių miškas, Lentvario g-ja, 10 kv., 3 skl., dešinysis Saidės slėnio šlaitas, *Quercus robur*, October 14, 2006, leg. D. Stončius 9473 (BILAS); Sartų RP, Dusetų giria, Vasynos rezervatas, 25 kv., *Tilia* sp., June 10, 2003, leg. J. Motiejūnaitė, 6793, 6557 (BILAS); Dusetų giria, 17 kv., 4 skl., *Tilia* sp., August 18, 2003, leg. J. Motiejūnaitė 680 (BILAS); Raseinių m. ū., Paliepių g-ja, 7 kv., 10 skl., *Quercus robur*, September 18, 2003, leg. A. Masaitis 6270 (BILAS); Raseinių raj., Padubysio g-ja, 3 Masaitis A. 6 kv. 17 skl., *Quercus robur*, October 21, 2003, leg. A. Masaitis 6357 (BILAS). **GERMANY:** Mecklenburg-Vorpommern, Vorpommern-Rügen, Isle of Rügen, coastal cliff N of Nardewitz, ca. 0.2 km NW of Rugeshus, alt. 5 m *Fraxinus excelsior*, October 25, 2013, leg. U. Schiefelbein 3791 (herb. Schiefelbein); Landkreis Ostvorpommern, Greifswalder Oie, Obstbäume am Leuchtturm, *Malus sylvestris*, August 11, 2007, leg. U. Schiefelbein 2122 (herb. Schiefelbein); Landkreis Uecker-Randow, Brohmer Berge, Kleppelshagener Forst, Einsberg, ca. 1.5 km N of Kleppelshagen, *Acer pseudoplatanus*, leg. U. Schiefelbein 2340 (herb. Schiefelbein); Münster in Westfalen, *Acer campestre* and *Fraxinus* sp., April 1880, leg. Reiss (herb. Seaward). **RUSSIA:** Leningrad region, Berezovye Islands, southern part of the island, *Quercus* sp., September 14, 2010, leg. U. Schiefelbein 2513 (herb. Schiefelbein).

Exsiccata seen. Arnold, Lich. Exs. No. 1129, as *Opegrapha subsiderella* (KRAM); Arnold, Lich. Exs. No. 855, as *Opegrapha subsiderella* (KRAM); Poelt & Steiner, Lich. Alp. No. 355, as *Opegrapha subsiderella* (KRAM).

Opegrapha saxicola Ach.

Specimens examined. **BF-47** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Białskie Mountains, Dolina Kleśnicy (valley of Kleśnica Stream), limestone, August 12, 2001, June 27, 2004, leg. K. Szczepańska (herb. Szczepańska). **DE-62** – Wyżyna Woźnicko-Wieluńska (Woźniki-Wieluń Upland), Wyżyna Wieluńska (Wieluń Upland): Biała village near Kłobuck town, hill W of Kłobuck, alt. 266 m, on vertical limestone rocks, in ± shaded habitats, May 21, 1964, leg. J. Nowak (KRAM-L 12277). **DF-37** – Wyżyna Krakowsko-Częstochowska

(Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Zubowa Skała near Olkusz town, limestone, April 7, 1956, leg. J. Nowak (KRAM-L 4136). **DF-48** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Ojców National Park, limestone, June 29, 2005, leg. J. Kiszka (KRAP); by the Pradnik-Ojców road, limestone, August 16, 1956, leg. J. Nowak (KRAM-L 4129). **DF-57** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland); Garb Tenczyński (Tenczynek Ridge): Kamyk village near Rudawa town, limestone, August 9, 1956, leg. J. Nowak (KRAM-L 4135). **DF-68** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland); Dolina Sanki (Sanka River Valley) near Mników village, limestone, August 1956, leg. J. Nowak (KRAM-L 4130). **DF-96** – Beskid Mały Mountains; Żurawnica Mount near Krzeszów, sandstone, August 26, 1962, leg. J. Nowak (KRAM-L 9661). **DG-59** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Białego (Valley of the White), September 10, 1955, leg. Z. Tobolewski (POZ); limestone, June 17, 1998, leg. U. Bielczyk (KRAM-L 44572); Dolina Kościeliska (Kościeliska Valley), limestone, s. coll. (KRAM-L 18017). **EE-77** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Świętokrzyski National Park, Chełmowa Góra Forest District, on rock, September 30, 2001, leg. A. Donica (KTC); Łysogóry, on rock, July 1957, leg. B. Halicz & S. Kuziel (KTC); Święty Krzyż Mount, on rock, July 1957, leg. B. Halicz & S. Kuziel (KTC). **EG-31** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin): Kramnica Mount, rock, August 15, 1998, leg. J. Kiszka (KRAM-L 60043). **EG-32** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Macelowy Wąwóz (Macelowy Gorge), limestone, September 3, 1998, leg. J. Kiszka (KRAM-L 60044). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Podskalnia Góra (Podskalnia Mountain), Pieniński Potok (Pieniny Stream), without substrate, June 10, 1956, leg. Z. Tobolewski (POZ); Zamkowa Góra (Zamkowa Mount), limestone, May 5, 1957, leg. J. Nowak (KRAM-L 4124); Pieniny National Park road from Krościenka to Kras, Biała Skała (White Rock), July 19, 1998, leg. J. Kiszka (KRAM-L 56518). **EG-34** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Krupianka Mount, Wąwóz Homole (Homole Gorge), on rocky slope near stream, limestone, June 9, 1956, leg. Z. Tobolewski (POZ).

Additional material examined. **AUSTRIA:** Tirol, 1875, leg. Sander (WRSL). **DENMARK:** 1867, s. coll. (WRSL). **UKRAINE:** National Park “Podilskyi tovtry” Kitaihorod, 15 km SE of Kamianets Podilskyi, Khmelnytskyi region, Kamianets Podilskyi District, alt. 141 m, canyon of Tarnava River, SW slope, Silurian limestone, June 24, 2004, leg. M. Kukwa 1851a dupl. (UGDA-L 9493).

Referenced material examined. *Opegrapha rupestris* – **BELGIUM:** Mosan District, vicinity of Nismes, Roche á Lomme, on *Bagliettoa calciseda* on limestone, November 8, 2008, leg. M. Kukwa 7280, 7282, D. Ertz, A. Suija (UGDA-L 14839, 14841).

Opegrapha vermicellifera (Kunze) J. R. Laundon

Specimens examined. **AB-32** – Pobrzeże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands: Wolin Island, Wolin National Park, forest section No. 60 (plot 35), forest section No. 125 (plot 47), *Fagus sylvatica*, 1995, leg. A. Wieczorek (herb. Wieczorek). **AB-33** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Puszcza Bukowa

(Beech Forest), Szczecin Landscape Park, forest section No. 184 (plot 23), forest section No. 178 (plot 175), forest section No. 202 (plot 305), *Fagus sylvatica*, July 20, 1997, leg. A. Wieczorek (herb. Wieczorek). **BB-00** – Pobrzeże Szczecińskie (Szczecin Coastland), Równina Gryficka (Gryfice Plain): Kołobrzeg town, *Quercus* sp., June 8, 1986, leg. W. Fałtynowicz (UGDA-L 2785). **BC-22** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Radęcin Nature Reserve, 2001, leg. A. Wieczorek (herb. Wieczorek). **CA-36** – Pobrzeże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Slovincian Coast): near Białogóra village, Kaszebskie Liszaje (now Babnica) Nature Reserve, decaying wood, July 29, 1982, leg. W. Fałtynowicz (UGDA-L 2469). **CA-79** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Wysoka village, near Wosockie Lake, *Ulmus* sp., July 26, 1973, leg. K. Czyżewska (LOD-L 3810). **CC-27** – Pradolina Toruńsko-Eberswaldzka (Toruń-Eberswalder Urstromtal), Kotlina Toruńska (Toruń Basin): Ostromecko village, Chełmno County, decaying wood, June 16, 1981, leg. Z. Tobolewski (TRN). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit): Przebrno village, forest section No. 173, *Fagus sylvatica*, October 17, 1981, leg. E. Budzbon & Z. Tobolewski (UGDA-L 2195). **DB-53** – Pojezierze Iławskie (Iława Lake District), Szadowo village, *Quercus* sp., April 12, 2004, leg. M. Kukwa 3047 (UGDA-L-10258); March 28, 2005, leg. M. Kukwa 3832 (UGDA-L-11860); *Alnus glutinosa* and *Ulmus scabra*, May 15, 2006, leg. M. Kukwa 5133, 5134 (UGDA-L-12789, 12790). **DE-68** – Wyżyna Przedborska (Przedborska Upland), Niecka Włoszczowska (Włoszczowa Basin): Dębowiec Nature Reserve, forest section No. 161, *Ulmus glabra* by stream, August 25, 1970, leg. K. Czyżewska (LOD-L 833); forest section No. 162, *Acer platanoides*, August 27, 1970, leg. K. Czyżewska (LOD-L 832). **EB-67** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): Kukłanka Nature Reserve, *Acer* sp., May 1, 1989, leg. S. Cieśliński (KTC). **ED-99** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Zagożdżon Nature Reserve, *Carpinus betulus*, 2002, leg. S. Cieśliński (KTC). **EE-60** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Łopuszańskie (Łopuszańskie Hills): Oleszno Nature Reserve, forest section No. 53, *Acer pseudoplatanus*, July 19, 1974, leg. K. Czyżewska, (LOD-L 16372). **EE-66** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Świętokrzyski National Park, Podgórze Forest District, forest section No. 42/43, *Tilia cordata*, September 5, 1999, leg. A. Donica (KTC). **EE-76** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Podgórze Forest District, forest section No. 110, *Quercus robur*, September 5, 1999, leg. A. Donica (KTC). **EF-62** – Brama Krakowska, Pomost Krakowski: on E from Kraków City, Forest District No. 30, *Quercus* spp., November 3, 2000, leg. J. Kiszka (KRAP). **EG-50** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Olczyńska (Olcza Valley), *Acer pseudoplatanus*, May 12, 1998, leg. U. Bielczyk (KRAM-L 44575); Dolina Białego (Valley of the White), beside tourist trail near valley mouth, limestone, September 10, 1955, leg. Z. Tobolewski (POZ). **FB-68** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Biebrza National Park, Czerwone Bagno Nature Reserve, forest section No. 246, *Carpinus betulus*, September 24, 1986, leg. S. Cieśliński (KTC); Grzędy forest, *Quercus robur*, August 11, 2005, leg. J. Motiejūnaite 8388 (BILAS). **FG-19** – Beskidy Lesiste Mountains, Sanocko-Turczyńskie Mountains: Pasma Turnicy, *Fraxinus excelsior*, May 22, 1986, leg. J. Piórecki (BDPA); near Arłamów village, *Fraxinus excelsior*, May 22, 1986, leg. J. Kiszka & J. Piórecki (KRAM-L 60057). **FG-58** – Beskidy Lesiste Mountains, West Bieszczady Mountains: near road by Hylaty Stream, *Abies alba*,

September 3, 2001, leg. J. Kiszka & R. Kościelniak (KRAP 1891). **FG-59** – Beskidy Lesiste Mountains, West Bieszczady Mountains: between Pszczeliny and Stuposiany villages, on SE from Stuposiany village, *Acer pseudoplatanus*, July 29, 1959, leg. K. Glanc (KRAM-L 39484); between Pszczeliny and Jawor villages, *Acer pseudoplatanus*, July 29, 1959, leg. K. Glanc (KRAM-L 39481). **FG-69** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Widelki Mount, N slope, *Acer pseudoplatanus*, July 3, 1959, leg. K. Glanc (KRAM-L 39482). **FG-89** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): Hołubla Stream, forest, *Acer pseudoplatanus*, September 27, 1983, leg. J. Kiszka & J. Nowak (KRAM-L 60059). **GB-20** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Puszcza Augustowska (Augustów Primeval Forest), Płaska Forest District, forest section No. 30, *Fraxinus excelsior*, November 1, 1958, leg. K. Glanc (KRAM-L 39483). **GB-21** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Perkuć village, Puszcza Augustowska (Augustów Primeval Forest), *Acer* sp., September 18, 1986, leg. S. Cieśliński (KTC). **GB-30** – Pojezierze Wschodniosuwalskie (East Suwałki Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Płaska Forest District, *Fraxinus excelsior*, November 1, 1958, leg. K. Glanc (POZ). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, forest section No. 109i, *Quercus robur*, June 11, 1999, leg. K. Czyżewska (LOD-L 11146); *Ulmus* sp., August 5, 1994, leg. S. Cieśliński (KTC), 5919 (BILAS); *Quercus robur*, June 11, 1999, leg. S. Cieśliński 5920 (BILAS). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Białowieża National Park, *Carpinus betulus*, 1996, leg. S. Cieśliński (KTC); forest section No. 256d (plot 90), *Fraxinus excelsior*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 283 (plot 47), *Tilia cordata*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 316c (plot 92), *Quercus robur*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 369a (plot 44), *Acer platanoides*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 399b (plot 54), *Quercus robur*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 256, *Acer platanoides*, 1982, leg. S. Cieśliński (KTC); forest section No. 339b, *Tilia cordata*, 1992, leg. S. Cieśliński (KTC); forest section No. 256, *Tilia cordata*, September 16, 1987, leg. K. Czyżewska (LOD-L 8177); *Carpinus betulus*, September 16, 1987, leg. K. Czyżewska (LOD-L 9039). **GC-64** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Hajnówka Forest District, forest section No. 570b (plot 232), *Fraxinus excelsior*, 1984, leg. S. Cieśliński (KTC). **GC-65** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Białowieża Forest District, forest section No. 609a (plot 231), *Fraxinus excelsior*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-66** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park, forest section No. 340a, *Carpinus betulus*, August 12, 2002, leg. P. Czarnota (GPN 2946, 2947); ca. 3 km NNW of Białowieża, forest section No. 340c, *Carpinus betulus*, May 11, 2006, leg. U. Schiefelbein 2033 (herb. Schiefelbein); ca. 4 km NNW of Białowieża, forest section No. 314c, *Fraxinus excelsior*, May 11, 2006, leg. U. Schiefelbein 2047 (herb. Schiefelbein).

Additional material examined. AUSTRIA: ca. 6 km N of Kaprun, *Carpinus betulus*, April 1, 2005, leg. A. Wieczorek (herb. Wieczorek). **DENMARK:** Bornholm, Dondalen, forest,

Carpinus betulus, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek). **GERMANY:** Bayern, Lkr. Weilheim: Alpenvorland Paterzeller Eibenwald, südöstlich von Wessobrunn, atl. 620 m (MTB 8132/1). An loser Borke der Stämme einzeln stehender Bergahorne *Acer pseudoplatanus*, November 19, 1977, leg. T. Feuerer, H. M. Hertel & E. Krach (KRAM-L 25816); Mecklenburg-Vorpommern, Kreis Uecker-Randow, Wald westlich der Kirche Schmarsow, October 14, 2001, leg. U. Schiefelbein 741 (herb. Schiefelbein); Kreis Güstrow, May 10, 1998, leg. U. Schiefelbein 207 (herb. Schiefelbein); Demnitzer Bruch, ca. 1 km E of Charlottenhorst, *Carpinus betulus*, May 24, 2006, leg. U. Schiefelbein 2368 (herb. Schiefelbein). **LITHUANIA:** Kėdainių raj., Kėdainių m. ū., Skaistgirio g-ja, 42 kvartalas, 1 sklypas, *Acer platanoides*, October 3, 2008, leg. Ž. Preikša 8762 (BILAS). **SWITZERLAND:** Kanton Zug, an einer Eichne im Walde bei Kloster Frauenthal, September. 1886, leg. Hegetschweiler (herb. Seaward).

Exsiccata seen. Arnold, Lich Exs. No. 1186, as *Opegrapha hapaleoides* (KRAM); Poelt, Lich. Alp. No. 126, as *Opegrapha fuscella* (KRAM); Poelt & Steiner, Lich. Alp. No. 307 (KRAM).

Opegrapha vulgata (Ach.) Ach.

Specimens examined. **BC-46** – Pradolina Toruńsko-Eberswaldzka (Toruń-Eberswalder Urstromtal), Kotlina Gorzowska (Gorzów Basin): Noteć District, near Czarnków village, *Alnus glutinosa*, March 12, 1967, leg. K. Glanc (KRAM-L 39101). **BF-38** – Eastern Sudetes, Góry Złote (Golden Mountains): Bialskie Mountains, red tourist trail from Gieraltów to Czernica villages, *Acer* sp., September 19, 2003, leg. K. Szczepańska (herb. Szczepańska); Bialska Pętla road, *Acer* sp., July 29, 2003, leg. K. Szczepańska (herb. Szczepańska); Dolina Czarnego Potoku (Black Stream Valley), *Acer* sp., June 25, 2004, leg. K. Szczepańska (herb. Szczepańska). **BF-46** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Bialskie Mountains, Dolina Wilczki (Wilczka Stream Valley), *Acer* sp., July 10, 2003, leg. K. Szczepańska (herb. Szczepańska); Jaworek Mount, *Acer* sp., August 23, 2003, leg. K. Szczepańska (herb. Szczepańska); road from Idzików to Biała Woda villages, *Acer* sp., August 25, 2008, leg. K. Szczepańska (herb. Szczepańska). **BF-47** – Eastern Sudetes, Góry Złote (Golden Mountains): Dolina Kleśnicy (valley of Kleśnica Stream), *Acer* sp., June 30, 2001, May 25, 2004, leg. K. Szczepańska (herb. Szczepańska); Nowa Morawa Nature Reserve, *Acer* sp., July 7, 2003, leg. K. Szczepańska (herb. Szczepańska); Dolina Kamienicy (Kamienica River Valley), yellow tourist trail, *Acer* sp., August 2, 2003, leg. K. Szczepańska (herb. Szczepańska); tree near stream, *Acer* sp., August 2, 2003, leg. K. Szczepańska (herb. Szczepańska). **BF-48** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Bialskie Mountains, forest road, near stream, *Acer* sp., August 1, 2003, leg. K. Szczepańska (herb. Szczepańska); Czarna Droga (Black Route), *Fagus sylvatica*, July 10, 2003, leg. K. Szczepańska (herb. Szczepańska); valley of the Nowinka Stream, *Acer* sp., August 22, 2003, leg. K. Szczepańska (herb. Szczepańska). **BF-56** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): road from Jodłowa to Goworów villages, *Acer* sp., August 24, 2003, leg. K. Szczepańska (herb. Szczepańska); Dolina Goworówki (Goworówka Stream Valley), *Acer* sp., August 24, 2003, leg. K. Szczepańska (herb. Szczepańska). **CA-69** – Pobrzeże Gdańskie (Gdańsk Coastland), Pobrzeże Kaszubskie (Kashubian Coastland): Gdynia City, Kępa Radłowska Nature Reserve, *Quercus* sp., August 6, 1983, leg. W. Fałtynowicz (UGDA-L 1834). **CA-86** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Wysoczyzna Staniszevska (Staniszevska Highland), forest section No. 227, *Fagus sylvatica*, September 27, 1983, leg. W. Fałtynowicz

(UGDA-L 1761); forest section No. 208, *Fagus sylvatica*, September 27, 1983, leg. W. Fałtynowicz (UGDA-L 1781). **CA-99** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Jar Reknicy Nature Reserve, *Fagus sylvatica*, September 19, 1983, leg. W. Fałtynowicz & E. Budzbon (UGDA-L 1875). **CB-16** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Bory Tucholskie (Tuchola Forest): Kościerzyna town, near road to Gdynia City, March 24, 1959, leg. Z. Jarocka (TRN). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit); Przebrno village, forest section No. 127, *Fagus sylvatica*, August 6, 1982, leg. E. Budzbon (UGDA-L 2194); forest section No. 128/129, *Quercus* sp., August 6, 1981, leg. E. Budzbon (UGDA-L 2191); decaying wood, July 23, 1982, leg. E. Budzbon (UGDA-L 2193); Krynica Morska town, forest section No. 122, *Acer* sp., 1982, leg. E. Budzbon & Z. Tobolewski (UGDA-L 2192). **DE-29** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Opoczyńskie (Opoczno Hills): Puszcza Pilicka (Pilica Forest), Błogie Forest District, Jaksonek Forest District, forest section No. 374, *Quercus robur*, associated with *Chrysothrix candelaris*, in thermophilous oak forest, October 11, 1974, leg. K. Czyżewska (LOD-L 4520). **DE-38** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Piotrkowska (Piotrków Plain): Puszcza Pilicka (Pilica Forest), Lubień Forest District, forest section No. 123, Lubień Forest District, *Quercus petraea*, June 9, 1971, leg. K. Czyżewska (LOD-L 1648). **DE-48** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Radomszczańskie (Radomsko Hills): Puszcza Pilicka (Pilica Forest), Bąkowa Góra Forest District, forest section No. 39, *Quercus petraea*, in thermophilous oak forest, April 28, 1971, leg. K. Czyżewska (LOD-L 1846). **DE-57** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Radomszczańskie (Radomsko Hills): Puszcza Pilicka (Pilica Forest), Kobile Wielkie Nature Reserve, forest section No. 175f, *Quercus robur*, associated with *Chrysothrix candelaris* and *Schismatomma pericleum*, October 27, 1970, leg. K. Czyżewska (LOD-L 1647). **DF-03** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Pogórze Śląskie (Silesian Foothills): Szyndzielnia Mount, *Fagus sylvatica*, June 25, 1964, leg. J. Kiszka (KRAP). **DF-94** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: valley stream behind Okrągłak *Acer pseudoplatanus*, October 5, 1961, leg. J. Nowak (KRAM-L 10012), Zwalisko Mount, *Fagus sylvatica*, May 11, 1960, leg. J. Nowak (KRAM-L 7289); valley of Cisowy Stream, alt. 600 m, *Abies alba*, April 12, 1961, leg. J. Nowak (KRAM-L 7288); valley stream on S Wielki Cisownik Mount, alt. 580 m *Abies alba*, April 13, 1961, leg. J. Nowak (KRAM-L 10299, 7287); valley stream on S slope of Czarne Działy Mount alt. 600 m, *Abies alba*, April 24, 1961, leg. J. Nowak (KRAM-L 10343); valley stream, on S slope Potrójna Mount, alt. 630 m, *Abies alba*, April 14, 1961, leg. J. Nowak (KRAM-L 10137); Ślemień village by the way to Hucisko, alt. 500 m, *Fraxinus excelsior*, April 26, 1961, leg. J. Nowak (KRAM-L 7252). **DF-96** – Pogórze Zachodniobeskidzkie (West Beskids Foothills), Beskid Mały Mountains: Targoszów village, gorge between Zwalisko and Czarna Góra mounts, alt. 600 m, *Abies alba*, May 11, 1960, leg. J. Nowak (KRAM-L 6226). **DG-12** – West Beskids, Beskid Śląski Mountains: Barania Góra (Ram Mountain), valley of Biała Wisielka Stream, *Abies alba*, October 2, 1975, leg. U. Bielczyk (KRAM-L 44023). **DG-16** – West Beskids, Beskid Żywiecki Mountains: Pasma Jałowieckie (Jałowieckie Range), Zasepnica Mount, alt. 460 m *Acer pseudoplatanus*, September 6, 1965, leg. J. Nowak (KRAM-L 15430); *Alnus* sp., September 6, 1965, (KRAM-L 15809); *Abies alba*, September 6, 1965, leg. (KRAM-L 15808); Opaczny Potok (Opaczny Stream), alt. 800 m, *Abies alba*, July 14, 1965, leg. J. Nowak (KRAM-L 15779); Dolina Roztoki (Roztoka Valley), alt. 700 m, *Abies alba*, August 16, 1965, leg. J. Nowak (KRAM-L 15768); near Siwcówka village, alt. 580 m, *Abies alba*, August 16, 1965, leg. J. Nowak

(KRAM-L 15769); valley of Magurek Mount, *Abies alba*, July 15, 1965, leg. J. Nowak (KRAM-L 15788). **DG-18** – West Beskids, Beskid Żywiecki Mountains: Pasma Policy (Polica Range), valley of Syhleć Stream, alt. 920 m, *Abies alba*, June 23, 1965, leg. J. Nowak (KRAM-L 37465); valley of Kamiński Stream, *Abies alba*, May 26, 1965, leg. J. Nowak (KRAM-L 16211); Sidzina village, valley of Ciśniawka Stream, *Abies alba*, May 22, 1965, leg. J. Nowak (KRAM-L 15061). **DG-22** – West Beskids, Beskid Śląski Mountains: Gańczorka Mount, *Fagus sylvatica*, August 4, 1962, leg. J. Kiszka (KRAP). **DG-24** – West Beskids, Beskid Żywiecki Mountains: Pilsko Massif, Pod Rysianką Nature Reserve, *Acer pseudoplatanus*, May 23, 1966, leg. J. Nowak (KRAM-L 17303). **DG-25** – West Beskids, Beskid Żywiecki Mountains: Pilsko Massif, valley stream under Hala Lipowska alp, alt. 800 m, *Abies alba*, September 6, 1964, leg. J. Nowak (KRAM-L 14823); valley of Nickulin Stream, *Abies alba*, August 16, 1964, leg. J. Nowak (KRAM-L 13952); valley of Straceniec Stream, *Abies alba*, September 5, 1964, leg. J. Nowak (KRAM-L 14886); valley of Buczynka Stream, *Abies alba*, September 17, 1964, leg. J. Nowak (KRAM-L 14831). **DG-26** – West Beskids, Beskid Żywiecki Mountains: Babia Góra Mount, Markowe Szczawiny alp, *Pinus* sp., June 24, 1974, leg. U. Bielczyk (KRAM-L 44022). **DG-32** – West Beskids, Beskid Żywiecki Mountains: Wielka Racza Massif, valley of Danielka Stream, *Abies alba*, August 8, 1964, (KRAM-L 17213); Beskid Bednarów Mountains, *Pinus* sp., September 4, 1964, leg. J. Nowak (KRAM-L 14729). **DG-33** – West Beskids, Beskid Żywiecki Mountains: Pilsko Massif, Szeroki Kamieniec place, *Abies alba*, September 6, 1964, leg. J. Nowak (KRAM-L 14860); Złatna village, Szeroki Kamieniec place *Abies alba*, September 6, 1964, leg. J. Nowak (KRAM-L 16456); Pasma Policy (Polica Range), between Talapka and Matjasikowa, alt. 650 m, *Fagus sylvatica*, May 27, 1965, leg. J. Nowak (KRAM-L 16223); valley of Wężna Stream, alt. 600 m, *Abies alba*, May 27, 1965, leg. J. Nowak (KRAM-L 17205); Śrubita Nature Reserve, *Abies alba*, August 12, 1964, leg. J. Nowak (KRAM-L 14448); valley of Plaskurówki Stream, *Abies alba*, August 6, 1964, leg. J. Nowak (KRAM-L 14476); Beskid Bednarów Mountains, *Fagus sylvatica*, September 4, 1964, leg. J. Nowak (KRAM-L 14780). **DG-58** – Łańcuch Tatrzański Mountains, Western Tatras: on right hand slope below Polana Jarząbca (Jarząbca Glade), *Pinus* sp., August 19, 1961, leg. Z. Tobolewski (POZ); Dolina Chochołowska (Chochołów Valley), near trail end, decaying wood, August 14, 1960, leg. Z. Tobolewski (POZ); near Ścieżka nad Regłami (trail), above Kamienisty Żleb, *Pinus* sp., August 14, 1960, leg. Z. Tobolewski (POZ). **DG-59** – Łańcuch Tatrzański Mountains, Western Tatras: Dolina Spadowiec (Spadowiec Valley), *Fagus sylvatica*, April 12, 1999, leg. U. Bielczyk (KRAM-L 44616); Dolina Strążyska (Strążyska Valley), near trail to Wielka Równia under Giewont Mount, *Acer pseudoplatanus*, August 18, 1959, leg. Z. Tobolewski (POZ); on slope, Dolina ku Dziurze (Ku Dziurze Valley), *Abies alba*, September 1959, leg. Z. Tobolewski (POZ). **DG-68** – Łańcuch Tatrzański Mountains, Western Tatras: N slope of Czerwony Wierch Mountain, *Pinus* sp., August 18, 1960, leg. Z. Tobolewski (POZ). **EA-82** – Nizina Staropruska (Old Prussian Lowland), Wzniesienia Górowskie (Górowo Hills), ca. 1 km N of Garbniki village, *Tilia cordata*, May 8, 1989, leg. S. Cieśliński (KTC); Zamkowa Góra (Zamkowa Mount), *Tilia cordata*, May 8, 1989, leg. S. Cieśliński (KTC). **EA-83** – Nizina Staropruska (Old Prussian Lowland), Nizina Sępolska (Sępolska Lowland): 1.5 km to Nowa Wieś village, *Quercus robur*, May 5, 1989, leg. S. Cieśliński (KTC). **EB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2 km SW of Lidzbark Warmiński town, *Alnus glutinosa*, September 14, 1989, leg. S. Cieśliński (KTC). **EB-22** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District), ca. 1.5 km NE of Smolajny village, *Carpinus betulus*, August 23, 1993, leg. S. Cieśliński (KTC); *Tilia*

cordata, August 23, 1993, leg. S. Cieśliński (KTC). **EB-26** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): ca. 2 km E of Otry village, *Fagus sylvatica*, May 8, 1990, leg. S. Cieśliński (KTC); 3 km of Bredynki village, *Fraxinus excelsior*, May 7, 1990, leg. S. Cieśliński (KTC). **EB-32** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Las Warmiński Nature Reserve on Łyna River, *Carpinus betulus*, May 28, 1994, leg. S. Cieśliński (KTC, OLTC); *Tilia cordata*, August 29, 1993, leg. S. Cieśliński (KTC); ca. 2 km SW of railway station in Cerkiewniki village, *Tilia cordata*, September 14, 1989, leg. S. Cieśliński (KTC); 3 km from Dobre Miasto village, *Acer* sp., September 14, 1989, leg. S. Cieśliński (KTC). **EB-42** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Olsztyn City, city forest, *Quercus robur*, August 9, 2000, leg. D. Kubiak (OLTC); *Carpinus betulus*, June 5, 2001, leg. D. Kubiak (OLTC); *Corylus avellana*, October 2000, leg. D. Kubiak (OLTC); *Acer* sp., October 21, 2000, leg. D. Kubiak (OLTC); *Acer* sp., August 3, 2000, leg. D. Kubiak (OLTC); *Aesculus hippocastanum*, May 2001, leg. D. Kubiak (OLTC). **EB-49** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Masurian Landscape Park, Strzałowo Forest District, forest section No. 99, *Quercus robur*, July 1998, leg. D. Kubiak (OLTC). **EB-51** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): 3 km SWW of Łupstych village, *Quercus robur*, July 21, 1988, leg. S. Cieśliński (KTC); road from Olsztyn City to Gietrzwałd town, ca. 2.5 km S of Łupstych village, forest section No. 299, *Quercus robur*, July 21, 1988, leg. S. Cieśliński (KTC). **EB-52** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Olsztyn City, housing estate Dajtki, *Acer* sp., July 24, 2003, leg. D. Kubiak (OLTC). **EB-59** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Masurian Landscape Park, Strzałowo Forest District, forest section No. 99, *Quercus robur*, July 1998, leg. D. Kubiak (OLTC); Puszcza Piska (Pisz Forest), Krutynia Nature Reserve, *Quercus robur*, August 31, 1987, leg. S. Cieśliński (KTC); *Tilia cordata*, August 31, 1987, leg. S. Cieśliński (KTC). **EB-60** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2 km E of railway station in Stare Jabłonki village, *Tilia cordata*, September 20, 1994, leg. S. Cieśliński (KTC). **EB-71** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): near road, Pawłowo village, *Quercus robur*, July 20, 1988, leg. S. Cieśliński (KTC). **EB-79** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): Puszcza Piska (Pisz Forest), forest section Nos 145/134, ca. 1 km NNW of forester's lodge Ruczaj, *Quercus robur*, September 3, 1987, leg. S. Cieśliński (KTC). **ED-99** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Zagożdżon Nature Reserve, *Carpinus betulus*, 2002, leg. S. Cieśliński (KTC). **EE-00** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Piotrkowska (Piotrków Plain): Puszcza Pilicka (Pilica Forest), Spała Nature Reserve, forest section No. 286, *Acer pseudoplatanus*, September 2, 1969, leg. K. Czyżewska (LOD-L 520). **EE-21** – Wyżyna Przedborska (Przedborska Upland), Wzgórza Opoczyńskie (Opoczno Hills): Białaczów Nature Reserve, forest section No. 101b, *Carpinus betulus*, in oak-linden-hornbeam forest, April 20, 2002, leg. K. Czyżewska (LOD-L 11360). **EE-55** – Wyżyna Kielecka (Kielce Upland), Płaskowyż Suchedniowski (Suchedniów Plateau): Bliżyńskie forests, near Skarżysko-Kamienna town, Świnia Góra Nature Reserve, *Quercus petraea*, June 6, 1974, leg. K. Czyżewska (LOD-L 3106). **EE-65** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Pasma Klonowskie (Klonowskie Range), Bukowa Góra (Bukowa

Mount), *Abies alba*, 1980, leg. K. Toborowicz (KTC). **EE-86** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Cisów Nature Reserve, *Quercus* sp., August 21, 2000, leg. Supeł & S. Cieśliński (KTC); Pasma Orłowińskie (Orłowińskie Range), N slope of Słowiec Mount, *Acer pseudoplatanus*, 1981, leg. K. Toborowicz & S. Cieśliński (KTC). **EG-01** – West Beskids, Beskid Wyspowy Mountains: Śnieżnica Mount, *Fagus sylvatica*, August 11, 1966, leg. J. Nowak (KRAM-L 4632). **EG-10** – West Beskids, Gorce Mountains: Niedźwiedź village, by Porębianka Stream, *Salix* sp., June 10, 1999, leg. P. Czarnota (GPN 1954). **EG-11** – West Beskids, Gorce Mountains: N slope of Gorce Porębski glade, *Alnus* sp., October 4, 1996, leg. P. Czarnota (GPN 1192); by Gorce Potok Stream, N exposure, *Fagus sylvatica*, October 4, 1996, leg. P. Czarnota (GPN 1159); stream above Stara Huta, valley of Turbacz Stream, SW exposure, *Abies alba*, October 26, 1995, leg. P. Czarnota (GPN 569); SW exposure, *Fagus sylvatica*, October 26, 1995, leg. P. Czarnota (GPN 391); valley of Gorce Potok (Gorce Stream), in its catchment, N exposure, *Acer* sp., October 4, 1996, leg. P. Czarnota (GPN 1212); NE slope of Kudłoń Mount, below Adamówka glade, *Abies alba*, August 25, 1967, leg. K. Glanc (KRAM-L 39502). **EG-20** – West Beskids, Gorce Mountains: under Giecka glade, N exposure, *Fagus sylvatica*, November 8, 1994, leg. P. Czarnota (GPN 690); under Obidowiec Mount, NE exposure, *Fagus sylvatica*, November 9, 1994, leg. P. Czarnota (GPN 678); under Suhora Mount, NE exposure, *Fagus sylvatica*, November 9, 1993, leg. P. Czarnota (GPN 985); plot 25, valley of Olszowy Potok (Olszowy Stream), decaying wood, *Abies alba*, March 9, 1994, leg. P. Czarnota (GPN 274); N exposure, *Acer* sp., March 9, 1994, leg. P. Czarnota (GPN 273); plot 4, W exposure, *Fagus sylvatica*, July 5, 1994, leg. P. Czarnota (GPN 986); water gap of Olszowy Potok (Olszowy Stream), NW exposure, *Abies alba*, June 26, 1996, leg. P. Czarnota (GPN 1222); Turbacz Nature Reserve, NW exposure, *Fagus sylvatica*, June 21, 1994, leg. P. Czarnota (GPN 768); W exposure, *Fagus sylvatica*, May 12, 1992, leg. P. Czarnota (GPN 231); slope of Suhora Mount, NE exposure, *Fagus sylvatica*, July 4, 1994, leg. P. Czarnota (GPN 591); Pod Suhorą Forest District, *Abies alba*, May 24, 1995, leg. P. Czarnota (GPN 758); Suche Buczki Forest District, N exposure, *Fagus sylvatica*, July 31, 1995, leg. P. Czarnota (GPN 1850); near road in valley of Olszowy Potok (Olszowy Stream), decaying wood, *Abies alba*, May 6, 1993, leg. P. Czarnota (GPN 516); under Obidowiec Mount, in Ścisłe Brzyżki Forest District, in Olszowy Potok (Olszowy Stream) catchment area, *Fagus sylvatica*, November 9, 1994, leg. P. Czarnota (GPN 695). **EG-21** – West Beskids, Gorce Mountains: under Szyja Turbacza in Dolina Roztoki (Roztoka Stream Valley), E exposure, decaying wood, *Fagus sylvatica*, May 26, 1994, leg. P. Czarnota (GPN 1014); Znaki Forest District, N exposure, under Polana Bieniowe (Bieniowe Glade), *Fagus sylvatica*, May 26, 1997, leg. P. Czarnota (GPN 1655); Dolina Łopusznej (Łopuszna Valley), plot 115, W exposure, *Fagus sylvatica*, August 25, 1994, leg. P. Czarnota (GPN 783); Dolina Łopusznej (Łopuszna Valley), S slope of Turbacz Mount, *Abies alba*, August 24, 1966, leg. K. Glanc (KRAM-L 39501); Ustępny Stream Valley, SW exposure, *Abies alba*, February 20, 1995, leg. P. Czarnota (GPN 237); by Kamienica Stream, N exposure, *Fagus sylvatica*, May 15, 1997, leg. P. Czarnota (GPN 1699); SE exposure, *Acer* sp., June 11, 1996, November 24, 1992, leg. P. Czarnota (GPN 587); under Przysłop Mount, S exposure, *Abies alba*, December 16, 1994, leg. P. Czarnota (GPN 689); under Zrąb on S slope of Polana Pustak (Pustak Glade), Dolina Kamienicy (Kamienica River Valley), *Fagus sylvatica*, June 26, 1997, leg. P. Czarnota (GPN 1642); Polana Stawieniec (Stawieniec Glade), S exposure, *Fagus sylvatica*, July 14, 1994, leg. P. Czarnota (GPN 792); in Łopuszanka Stream catchment area, W exposure, *Fagus sylvatica*, May 26, 1993, leg. P. Czarnota (GPN 1022); Konina Stream, under Przełęcz Borek (Borek Pass), N exposure, *Acer* sp., May 10, 1994, leg. P. Czarnota (GPN

917); plot 71, under Szyja Turbacza, NE exposure, *Fagus sylvatica*, June 5, 1994, leg. P. Czarnota (GPN 994); near blue tourist trail, Dolina Kamienicy (Kamienica River Valley), E exposure, *Abies alba*, June 11, 1996, leg. P. Czarnota (GPN 1391); Turbacz Nature Reserve, E exposure, *Fagus sylvatica*, May 23, 1996, leg. P. Czarnota (GPN 1230); Nad Huciskiem Forest District, E exposure, *Acer* sp., July 11, 1994, leg. P. Czarnota (GPN 383); under Szyja Gorca Porębskiego, E slope, in Dolina Kamienicy (Kamienica River Valley), *Acer pseudoplatanus*, December 1, 1997, leg. P. Czarnota (GPN 1838); Pasma Pewelskie (Pewelskie Range), Wątrobów Potok (Wątrobów Stream), *Abies alba*, July 25, 1965, leg. J. Nowak (KRAM-L 15252); Wątrobów Potok (Wątrobów Stream), *Abies alba*, leg. J. Nowak (KRAM-L 15263); Dolina Łopusznej valley, S slope of Turbacz Mount, *Abies alba*, August 24, 1966, (KRAM-L 39501); Polana pod Przysłopem, *Fagus sylvatica*, August 2, 1962, leg. J. Kiszka (KRAP); N slope of Kiczora Mount, *Fagus sylvatica*, *Abies alba*, June 11, 1963, leg. J. Kiszka (KRAP). **EG-32** – West Beskids, Gorce Mountains: valley of Kluszkowianka Stream, *Abies alba*, September 10, 1967, leg. K. Glanc (KRAM-L 39498). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Toporzyska village, at forest edge, *Abies alba*, May 4, 1955, leg. J. Nowak (KRAM-L 1482); Nowy Targ County, near trail from Wyrobek glade to Zamkowa Góra (Zamkowa Mount), *Abies alba*, June 12, 1956, leg. Z. Tobolewski (POZ); Wielka Racza Massif, Śrubita forest reserve, *Fagus sylvatica*, August 12, 1964, leg. J. Nowak (KRAM-L 14471); Pasma Radziejowej (Radziejowa Range), *Abies alba*, September 13, 1967, leg. M. Olech (KRA); valley of Czercz Stream, *Abies alba*, August 4, 1990, leg. L. Śliwa (KRA); Pasma Radziejowej (Radziejowa Range), Baniska Nature Reserve, *Fagus sylvatica*, July 23, 1990, leg. L. Śliwa (KRA). **EG-34** – West Beskids, Beskid Sądecki Mountains: Pasma Radziejowej (Radziejowa Range), Mała Sucha Dolina (Mała Sucha Valley), *Abies alba*, May 30, 1990, leg. L. Śliwa (KRA); Dolina Białego (Valley of the White), *Abies alba*, June 28, 1965, leg. M. Olech (KRA); ca. 300 m from Kamień Św. Kingi, *Acer pseudoplatanus*, August 18, 1960, leg. J. Nowak (KRAM-L 9178). **EG-36** – West Beskids, Beskid Sądecki Mountains: Żebracze Nature Reserve, *Fagus sylvatica*, July 5, 2001, leg. P. Czarnota (GPN 2490). **EG-37** – West Beskids, Beskid Sądecki Mountains: foot of Jaworzynka Mount, *Abies alba*, August 18, 1960, leg. J. Nowak (KRAM-L 9186); Pasma Jaworzyny (Jaworzyna Range), valley of Czercz Stream, *Fagus sylvatica*, February 21, 1990, leg. L. Śliwa (KRA); valley of Kyców Stream, *Abies alba*, July 18, 1967, leg. M. Olech (KRA). **EG-50** – Łańcuch Tatrzański Mountains, Eastern Tatras: Dolina Filipka (Filipka Valley), *Fagus sylvatica*, May 14, 1998, leg. U. Bielczyk (KRAM-L 44403); near road from Zakopane town to Morskie Oko Lake, between Przyporniak Stream and Zazadnia glade, *Abies alba*, September 21, 1966, leg. Z. Tobolewski (POZ). **FA-84** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): near road to Jurkiszki village, *Salix* sp., September 19, 1992, leg. M. Wojciechowska-Gutowska (University of Białystok, Institute of Biology); forest section No. 252/253, *Fraxinus* sp., May 14, 1985, leg. S. Cieśliński (KTC). **FB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Ełckie (Ełk Lakeland): forest section No. 134, ca. 3 km N of Zakątek Leśny village, *Fraxinus* sp., May 21, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); Puszcza Borecka (Borki Forest), forest section No. 168, near Litygajno Lake, *Carpinus betulus*, May 21, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 104, *Carpinus betulus*, May 18, 1997, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 41, *Tilia* sp., May 20, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 48, *Acer* sp., May 19, 1987, leg. S. Cieśliński & Z. Tobolewski (KTC). **FB-58** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Czerwone Bagno Nature Reserve, forest section No. 246, *Carpinus*

betulus, September 24, 1986, leg. S. Cieśliński (KTC); *Tilia cordata*, 24 September, 1986, leg. S. Cieśliński (KTC). **FD-45** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Łukowska (Łuków Plain): Jata Nature Reserve, near Łuków town, *Fraxinus* sp., November 3, 1972, leg. M. Motyka-Zgłobicka (LBL). **FG-18** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): crest of Chwaniów Mount, near tributary of Ropienka Stream, *Acer pseudoplatanus*, June 3, 1987, leg. Piórecki (BDPA). **FG-39** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Puszcza Bukowa (Beech Forest), near Wetlina village, by Beskidnik Stream, *Acer pseudoplatanus*, August 28, 1957, leg. Z. Tobolewski (POZ). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: by Wielki Lutowy Stream, Puszcza Bukowa (Beech Forest), *Abies alba*, August 18, 1958, leg. K. Glanc (KRAM-L 39102); Bieszczady National Park, Moczarne village, Wielki Lutowy Stream, *Acer pseudoplatanus*, July 24, 2002, leg. J. Kiszka & R. Kościelniak (KRAP-L 1890); Dolina Moczarnego (Moczarne Valley), Głuchy Stream under Czerteż Mount, *Acer pseudoplatanus*, July 5, 2002, leg. J. Kiszka & R. Kościelniak (KRAP-L 1892). **GB-31** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Puszcza Augustowska (Augustów Primeval Forest), Starozyn Nature Reserve, *Quercus robur*, July 15, 1965, leg. J. Zielińska (WA); forest section No. 95/96, *Carpinus betulus*, September 21, 1986, leg. S. Cieśliński (KTC); forest section No. 211/212, *Fraxinus excelsior*, September 17, 1986, leg. Z. Tobolewski & S. Cieśliński (KTC). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, *Tilia cordata*, August 5, 1994, leg. S. Cieśliński (KTC); *Alnus glutinosa*, August 5, 1994, leg. S. Cieśliński (KTC); *Tilia cordata*, May 13, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology); *Carpinus betulus*, October 21, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology). **GC-02** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): forest section No. 72/73, *Quercus robur*, August 6, 1994, leg. S. Cieśliński (KTC); forest section No. 121/122, *Carpinus betulus*, September 8, 1987, leg. K. Toborowicz (KTC). **GC-03** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Stare Biele Nature Reserve, *Fraxinus excelsior*, 1999, leg. S. Cieśliński (KTC); (University of Białystok, Institute of Biology). **GC-44** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Browsk Forest District, *Carpinus betulus*, September 13, 1964, leg. J. Rydzak (LBL); Narewka Forest District, *Betula* sp., September 18, 1964, leg. J. Rydzak (LBL). **GC-54** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieska (Białowieża Primeval Forest), Zwierzyniec Forest District, *Carpinus betulus*, August 25, 1965, leg. J. Rydzak (LBL); forest section No. 257, *Betula* sp., 1995, leg. S. Cieśliński (KTC). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park, forest section No. 256, *Pinus sylvestris*, 1988, leg. S. Cieśliński (KTC); *Corylus avellana*, 1988, leg. S. Cieśliński (KTC); *Fraxinus excelsior*, 1987, leg. S. Cieśliński (KTC); *Tilia cordata*, 1988, leg. S. Cieśliński (KTC); *Tilia cordata*, June 16, 1988, leg. S. Cieśliński (LOD-L 7479); *Carpinus betulus*, 1987, 1988, leg. S. Cieśliński (KTC); forest section No. 340a, *Abies* sp., August 12, 2002, leg. P. Czarnota (GPN 3006); forest section No. 343, *Carpinus betulus*, August 5, 1953, leg. J. Rydzak (LBL). **GC-56** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): near Dziedzinka village, *Carpinus betulus*, 1988, leg. S. Cieśliński (KTC). **GG-70**

– Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Syhłowaty Stream, *Acer pseudoplatanus*, July 19, 2001, leg. J. Kiszka & R. Kościelniak (KRAP-L 1889).

Additional material examined. **AUSTRIA:** ca. 6 km N of Kaprun, *Carpinus betulus*, April 1, 2005, leg. A. Wieczorek (herb. Wieczorek). **BELARUS:** Puszcza Białowieża (Białowieża Primeval Forest), Kamieniwiki [Kamenivki], *Acer* sp., leg. S. Cieśliński (KTC). **DENMARK:** Møn, Damsholte, Hjelmmark, *Alnus glutinosa*, June 15, 1947, leg. M. S. Christiansen (KRAM-L 29853); *Populus* sp., June 13, 1947, leg. M. S. Christiansen (BMUC); *Populus* sp., February 25, 1952, leg. M. S. Christiansen (herb. Seaward); Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); Ekkodalen, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek). **FRANCE:** between Latrusd Ansergne and Mont-Dore, leg. J. J. Barkman. **GERMANY:** München, 1957: Allgauer, Alpen, Bayern, leg. Schropfel, J. Poelt; Mecklenburg-Vorpommern, Kreis Uecker-Randow, Buchenwald auf dem Butterberg, *Fagus sylvatica*, September 1, 2001, leg. U. Schiefelbein 712 (herb. Schiefelbein); Kleppelshagener Forst, ca. 1 km S of Gehren, *Quercus* sp., December 1, 1999, leg. U. Schiefelbein 704 (herb. Schiefelbein); ca. 0.3 km W of Mümmelkensee, *Fraxinus excelsior*, December 3, 2002, leg. U. Schiefelbein 1367 (herb. Schiefelbein); Landkreis Ostvorpommern, Ückeritz, Naturschutzgebiet “Wockninsee”, *Alnus glutinosa*, November 27, 2002, leg. U. Schiefelbein 1308 (herb. Schiefelbein). **GIBRALTAR:** N. Lincolnshire, *Acer* sp., April 4, 1987, leg. M. R. D. Seaward (herb. Seaward); **LITHUANIA:** Žemaitijos NP, Plungės raj., Liepijos miškas, *Tilia* sp., May 12, 2002, leg. J. Motiejūnaite 5740 (BILAS); *Ulmus* sp., May 12, 2002, leg. J. Motiejūnaite 5739 (BILAS); Kauno raj., Vytėnų g-ja, 73 kvartalas, 12 sklypas, *Quercus robur*, November 3, 2004, leg. D. Stončius 7099 (BILAS); Panemunių RP, Šakių raj., Ilguvos apyl., Velnariavo rezervatas, *Fraxinus excelsior*, June 16, 2007, leg. A. Uselinė 9669 (BILAS); Raseinių raj., Padubysio g-ja, 41 kvartalas, 6 sklypas, *Quercus robur*, October 21, 2003, leg. A. Masaitis 9472 (BILAS); 42 kvartalas, 7 sklypas, *Quercus robur*, October 21, 2003, leg. A. Masaitis 9470 (BILAS); Biržų giria, Spalviškių g-ja, 209 kvartalas, 14 sklypas, ?, June 18, 2003, leg. S. Skuja 9471 (BILAS); Vilniaus raj., Neries RP, Saiės upės slėnis ties Saidžiais, *Fraxinus excelsior*, April 21, 2004, leg. J. Motiejūnaite 6466 (BILAS); Sartų RP, Dusėtų giria, Vasynos rezervatas, 25 kvartalas, *Fraxinus excelsior*, June 10, 2003, leg. J. Motiejūnaite 6560 (BILAS); Joniškio raj., Endriškiu g-ja, 36 kvartalas, 1 sklypas, *Quercus robur*, September 2003, leg. Ž. Sinkevičius 8462 (BILAS); Liepijos miškas, 37 kvartalas, 4 sklypas Žemaitijos NP, *Quercus robur*, September 29, 2001, leg. I. Prigodina 2151 (WI); 19 sklypas, Žemaitijos NP, Plunges raj., *Quercus robur*, September 29, 2001, leg. I. Prigodina 1306 (WI); Griekynės miškas 2.5 km I vakaris Nuo Juodkrantės, Kuršių Nerija, *Quercus robur*, May 24, 2001, leg. I. Prigodina 1770 (WI). **NORWAY:** Stryn village, forest, *Abies alba*, August 28, 1995, leg. A. Wieczorek (herb. Wieczorek). **RUSSIA:** Nizhni Novgorod Oblast, Sharanga region, Kilemarsky Reserve, Rhe Yuronga River floodplain, spruce-broad-leaved forest, *Tilia* sp., July 1999, leg. S. Bakka (NNSU); dead tree, July 1999, leg. S. Bakka (NNSU); Tonshaevo region, nature sanctuary, southern taiga forest, areas in Burepolom Forestry qu. 33, 34, 35, *Betula* sp., August 2000, leg. A. Shestakova (NNSU). **SLOVAKIA:** prov. Brezno, Western Carpathians, Nizke Tatry Mountains, Krpáčovo, ca. 0.4 km SE of hotel Junior, *Abies alba*, August 2, 2002, leg. U. Schiefelbein 1152 (herb. Schiefelbein). **SWITZERLAND:** Kanton Zug, an Weisstannen bei Bliggenstorf, September 1885, leg. Hegetschweiler (herb. Seaward). **SWEDEN:** Västra Götaland, leg. C. Stenholm (WA); Osterskar, *Fraxinus* sp., June 13, 1947, leg. M. S. Christiansen, (BMUC).

Exsiccata seen. Arnold, Lich. Exs. No. 855, as *Opegrapha subsiderella* (KRAM).

****Phacographa glaucomaria* (Nyl.) Hafellner**

Specimens examined. **EG-60** – Łańcuch Tatrzański Mountains, Eastern Tatra: High Tatra, Mięguszwiecka Przełęcz Wyznia, alt. 2,330 m, on thallus of *Protoparmelia badia*, August 30, 2005, 49°11'12" N, 20°03'48" E, leg. A. Flakus, 5537/1 (herb. Flakus); Mięguszwiecki Szczyt Czarny, alt. 2,409 m, on granite rock, on thallus of *P. badia*, August 11, 2003, 49°10'52" N, 20°04'08" E, leg. A. Flakus, s.n. (KRAM-L 52516).

Additional material examined. **ITALY:** Paneveggio in Sudtirolo, Parasitisch auf *Lecanora sordida* an Felsklippen der Campiler Schichten auf der Hohe ober dem Rollepasse, July 21, 1887, leg. Arnold (herb. Seaward).

***Pseudoschismatomma rufescens* (Pers.) Ertz & Tehler**

Specimens examined. **AB-23** – Pobreże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands: Wolin Island, Wolin National Park, *Fraxinus* sp., November 11, 1996, leg. A. Wieczorek (herb. Wieczorek); Wolin Island, Warnowo Forest District, Międzyzdroje Forest District, forest section No. 215, *Fagus sylvatica*, October 1, 1955, leg. Z. Tobolewski (POZ). **AB-93** – Pobreże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Puszcza Bukowa (Beech Forest), Szczecin Landscape Park, Rozdoły Forest District, near Glinna village, *Fraxinus* sp., November 12, 1953, leg. Z. Tobolewski (POZ). **AD-35** – Pradolina Warciańsko-Odrzańska (Warta-Oder Marginal Valley), Dolina Środkowej Odry (Central Oder Valley): Retno village, *Fagus sylvatica*, July 30, 1982, leg. Z. Tobolewski (TRN); *Acer* sp., July 28, 1985 (TRN). **BB-31** – Pobreże Szczecińskie (Szczecin Coastland), Równina Gryficka (Gryfice Plain): E of Sidłowo village, *Carpinus betulus*, October 18, 1987, leg. W. Fałtynowicz & J. Miądlkowska (UGDA-L 3747). **BF-46** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Białskie Mountains, Szklary village, bark, August 25, 2003, leg. K. Szczepańska (herb. Szczepańska). **BF-47** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): Białskie Mountains, forest road, *Acer* sp., August 1, 2003, leg. K. Szczepańska (herb. Szczepańska); valley of Kleśnica Stream, *Acer* sp., April 1, 2001, leg. K. Szczepańska (herb. Szczepańska); *Acer* sp., September 21, 2003, leg. K. Szczepańska (herb. Szczepańska); valley of Równica Stream, Modrzeńce hill, *Acer* sp., June 26, 2004, leg. K. Szczepańska (herb. Szczepańska); Dolina Wilczki (Wilczka Stream Valley), *Acer* sp., July 10, 2003, leg. K. Szczepańska (herb. Szczepańska). **CA-36** – Pobreże Koszalińskie (Koszalin Coastland), Wybrzeże Słowińskie (Słowinian Coast): Białogóra village, Kaszebskie Liszaje Nature Reserve, *Fagus sylvatica*, July 29, 1982, leg. W. Fałtynowicz (UGDA-L 2568). **CA-81** – Pojezierze Zachodniopomorskie (West Pomeranian Lake District), Wysoczyzna Polanowska (Polanowska Highland): Dębica Kaszubska village, 1978, leg. M. Seaward (herb. Seaward). **CA-86** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): 2 km N of Mirachowo village, *Fraxinus* sp., April 4, 1986, leg. W. Fałtynowicz & Z. Tobolewski (UGDA-L 3408). **CA-99** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): *Acer* sp., April 14, 1973, leg. W. Fałtynowicz (UGDA); Jar Reknicy Nature Reserve, ca. 2 km from Kołbudy village, *Acer* sp., December 5, 1976, leg. W. Fałtynowicz (UGDA-L 1683); near Reknica River, close to the Kołbudy village, *Ulmus* sp.,

December 1, 1974, leg. W. Fałtynowicz (UGDA-L 1853). **CB-09** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Zaskoczyn village, *Aesculus* sp., April 5, 1986, leg. W. Fałtynowicz (UGDA-L 3293). **CB-53** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Pojezierze Krajeńskie (Krajna Lake District): Bory Tucholskie (Tuchola Forest), 5 km from Chojnice village, near road to Konarzyny village, *Quercus* sp., August 17, 1980, leg. L. Lipnicki (herb. Lipnicki, TRN). **CB-75** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Charzykowska (Charzykowy Plain): Bory Tucholskie (Tuchola Forest), near Brda River mouth, *Alnus* sp., August 10, 1986, leg. L. Lipnicki (herb. Lipnicki). **CC-27** – Pradolina Toruńsko-Eberswaldzka (Toruń-Eberswalder Urstromtal), Kotlina Toruńska (Toruń Basin): Ostromecko village, Chełmno County, *Carpinus betulus*, May 22, 1952, leg. J. Hutorowicz (TRK). **CC-80** – Pojezierze Wielkopolskie (Wielkopolska Lake District), Pojezierze Gnieźnieńskie (Gniezno Lake District): Zielonka Forest District near Poznań City, forest section No. 3, *Salix* sp., August 10, 1963, leg. K. Glanc (KRAM-L 39492); forest section No. 111a, *Ulmus* sp., June 7, 1963, leg. K. Glanc (KRAM-L 39493). **CE-11** – Wał Trzebnicki (Trzebnica Embankment), Wzgórze Twardogórskie (Twardogóra Hills): Milicz County, Kubryk Forest District, *Fraxinus* sp., June 27, 1969, leg. K. Glanc (KRAM-L 39490). **DA-82** – Pobrzeże Gdańskie (Gdańsk Coastland), Żuławy Wiślane: near road Gdańsk–Świbno, forest section No. 211, *Fraxinus* sp., July 29, 1983, leg. W. Fałtynowicz (UGDA-L 2645). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiślana (Vistula Spit): Krynica Morska, forest section No. 21, *Salix* sp., January 12, 1983, leg. E. Budzbon (UGDA-L 2190). **DA-96** – Pobrzeże Gdańskie (Gdańsk Coastland), Wysoczyzna Elbląska (Elbląg Highland): Kadyny, on *Malus domestica*, November 30, 2003, leg. M. Kukwa 2853 (UGDA-L 11071). **DB-42** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Iławskie (Iława Lake District): Kwidzyń town, forest section No. 191, *Malus domestica*, April 10, 2004, leg. M. Kukwa 3022 (UGDA-L 10681); Biały Dwór, forest section No. 244, *Malus domestica*, s.d., leg. M. Kukwa (UGDA-L 14073). **DB-53** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Iławskie (Iława Lake District): ca. 0.5 km N of Szadowo village, road in mixed forest, *Acer platanoides*, September 11, 2005, leg. M. Kukwa 4599 (UGDA-L 12405). **DF-48** – Wyżyna Krakowsko-Częstochowska (Kraków-Częstochowa Upland), Wyżyna Olkuska (Olkusz Upland): Ojców village, Wąwóz Korytania (Korytania Gorge), *Carpinus betulus*, June 28, 1955, leg. J. Nowak (KRAM-L 2051); Dolina Sąspowska (Sąspowska Valley), *Fagus sylvatica*, June 28, 1955, leg. J. Nowak (KRAM-L 4126); Ojców village, leg. A. Rehmann (KRAM-L 10198). **DG-06** – West Beskids, Beskid Żywiecki Mountains: alt. 500 m, *Fraxinus* sp., August 16, 1965, leg. J. Nowak (KRAM-L 15776). **DG-07** – West Beskids, Beskid Makowski Mountains: alt. 460 m, *Acer pseudoplatanus*, September 6, 1965, leg. J. Nowak (KRAM-L 15829). **DG-15** – West Beskids, Beskid Makowski Mountains: Pasma Pewelskie (Pewelskie Range), Janikowa Grapa Mount, alt. 690 m, *Fagus sylvatica*, September 17, 1965, leg. J. Nowak (KRAM-L 13511); Kaczanka Stream, alt. 480 m, *Fraxinus* sp., s.d., leg. J. Nowak (KRAM-L 17450). **DG-16** – West Beskids, Beskid Żywiecki Mountains: Pasma Jałowieckie (Jałowieckie Range), Dolina Bystra (Bystra Valley), *Acer pseudoplatanus*, July 24, 1965, leg. J. Nowak (KRAM-L 15761). **DG-17** – West Beskids, Beskid Żywiecki Mountains: Pasma Policy (Polica Range), Osielec village, valley of Baranów Potok (Baranów Stream), *Salix* sp., May 23, 1965, (KRAM-L 16213, 16215). **DG-24** – West Beskids, Beskid Żywiecki Mountains: Masyw Pilska (Pilsko Massif), Pod Rysianką Nature Reserve, *Fagus sylvatica*, May 25, 1966, leg. J. Nowak (KRAM-L 17271). **DG-33** – West Beskids, Beskid Żywiecki Mountains: Grupa Wielkiej Raczy Mountains, Bednarów Beskid Mount, *Fagus*

sylvatica, September 4, 1964, leg. J. Nowak (KRAM-L 14789). **EA-80** – Nizina Staropruska (Old Prussian Lowland), Wzniesienia Górowskie (Górowo Hills): 2 km SW of Wyszkowo village, *Fraxinus* sp., May 9, 1989, leg. S. Cieśliński (KTC). **EA-82** – Nizina Staropruska (Old Prussian Lowland), Wzniesienia Górowskie (Górowo Hills): E slope of Zamkowa Góra (Zamkowa Mount), *Fraxinus* sp., May 8, 1989, leg. S. Cieśliński (KTC). **EB-04** – Nizina Staropruska (Old Prussian Lowland), Nizina Sępopolska (Sępopolska Lowland): ca. 2 km N of Galiny village, *Fraxinus* sp., May 7, 1989, leg. S. Cieśliński (KTC). **EB-06** – Nizina Staropruska (Old Prussian Lowland), Nizina Sępopolska (Sępopolska Lowland): NW of Sporwiny village, *Ulmus* sp., May 6, 1989, leg. S. Cieśliński (KTC). **EB-07** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): ca. 1.5 km NW of Grudniki village, near road Reszel–Korsze, *Fraxinus* sp., May 4, 1989, leg. S. Cieśliński (KTC). **EB-08** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 0.5 km S of Dębiany village, *Fraxinus* sp., May 6, 1989, leg. S. Cieśliński (KTC). **EB-15** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2.5 km SEE of Bisztynek town, *Populus* sp., May 7, 1989, leg. S. Cieśliński (KTC). **EB-19** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Gierłoż village, *Populus tremula*, September 3, 1988, leg. S. Cieśliński (KTC). **EB-22** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 4 km NNE of Smolajny village, *Quercus* sp., August 23, 1993, leg. S. Cieśliński (KTC); ca. 3.5 km of Dobrze Miasto, *Fraxinus* sp., September 14, 1989, leg. S. Cieśliński (KTC). **EB-36** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): ca. 2 km ENE of Stryjewo village, *Fraxinus* sp., May 8, 1990, leg. S. Cieśliński (KTC); 1.5 km SE of Oterki village, *Acer* sp., May 8, 1990, leg. S. Cieśliński (KTC). **EB-52** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Olsztyn City, Kortowo, *Populus* sp., October 15, 2003, leg. D. Kubiak (OLTC). **EB-58** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): Szklarnia village, ca. 4.5 km NW of Piecki village, *Populus tremula*, May 1, 1989, leg. S. Cieśliński (KTC). **EB-59** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): Puszcza Piska (Pisz Forest), ca. 1.5 km E of Krutyń village, *Acer* sp., September 2, 1987, leg. S. Cieśliński (KTC). **EB-63** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District), Las Warmiński Nature Reserve, forest section No. 252, *Acer* sp., May 2001, leg. D. Kubiak (OLTC); Nowe Ranuki Forest District, Las Warmiński Nature Reserve, *Populus* sp., May 18, 2001, leg. D. Kubiak (OLTC). **EB-67** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): Kukłanka Range, near road Marksady–Babięta, *Fraxinus* sp., May 1, 1989, leg. S. Cieśliński (KTC). **EB-77** – Pojezierze Mazurskie (Masurian Lake District), Równina Mazurska (Masurian Plain): ca. 1 km N of Cąjki Nowe village, near road Szczytno–Rozłogi, *Fraxinus* sp., May 4, 1990, leg. S. Cieśliński (KTC). **ED-09** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Kotlina Warszawska (Warsaw Basin), Równina Wołomińska (Wołomin Plain): Dębina Nature Reserve, *Ulmus* sp., August 1955, leg. J. Zielińska (WA). **ED-12** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Kotlina Warszawska (Warsaw Basin): Kampinos National Park, near park border, *Quercus* sp., September 4, 1962, leg. J. Zielińska (WA); near Gajówka Dębowskie village, *Salix* sp., September 1, 1962, leg. J. Zielińska (WA). **EE-54** – Wyżyna Kielecka (Kielce Upland), Płaskowyż Suchedniowski (Suchedniów Plateau): Lasy Bliżyńskie (Bliżyńskie Forests), near Skarżysko-Kamienna town, Świnia Góra Nature Reserve, *Carpinus betulus*, May 4, 1959, leg.

J. Nowak (KRAM-L 2311, 5401). **EG-20** – West Beskids, Gorce Mountains: Kowaniec Stream, *Alnus* sp., July 21, 1971, leg. K. Glanc (KRAM-L 11832). **EG-21** – West Beskids, Gorce Mountains: under Gorc Porębski glade, near Plot 273, by valley of Gorcowy Potok (Gorcowy Stream), in Dolina Kamienicy (Kamienica River Valley), *Fagus sylvatica*, October 4, 1996, leg. P. Czarnota (GPN 1181/94); Nad Huciskiem Forest District, on E slope of Gorc Porębski glade, in Dolina Kamienicy (Kamienica River Valley), *Acer pseudoplatanus*, July 11, 1999, leg. P. Czarnota (GPN 773/94); S slope of Kudłoń Mount, *Acer pseudoplatanus*, August 28, 1961, leg. K. Glanc (KRAM-L 39492); S slope of Kudłoń Mount, near route down to Kamienica Stream, *Acer pseudoplatanus*, August 28, 1961, leg. K. Glanc (KRAM-L 39488). **EG-28** – Central Beskids, Beskid Niski Mountains: Polana Mount, between Zdynia and Ropa rivers, *Quercus* sp., leg. M. Olech (KRA). **EG-32** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Czorsztyń village, *Salix* sp., August 5, 1968, leg. J. Kiszka (KRAP); August 10, 1968, leg. J. Kiszka (KRAP). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: near trail from Polana Wyrobek to Zamkowa Góra (Zamkowa Mount), *Abies alba*, August 8, 1954, leg. Z. Tobolewski (POZ); Pieniński Potok (Pieniny Stream) valley, near Burzyna glade tourist trail, *Fagus sylvatica*, June 10, 1956, leg. Z. Tobolewski (POZ); between Wyrobek glade and Zamkowa Góra (Zamkowa Mount), *Corylus avellana*, June 12, 1956, leg. Z. Tobolewski (POZ); by the road from Korścienko to Zamkowa Góra, *Abies alba*, May 4, 1955, leg. J. Nowak (KRAM-L 2360). **EG-36** – West Beskids, Beskid Sądecki Mountains: Żebracze Nature Reserve, in its central part, *Fagus sylvatica*, July 5, 2001, leg. P. Czarnota (GPN 2551). **FA-85** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): forest section No. 88, *Fraxinus* sp., May 16, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); Boczki Nature Reserve, forest section No. 86, *Fraxinus* sp., May 16, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 88, *Fraxinus* sp., May 16, 1985, leg. S. Cieśliński (KRAM-L 31921). **FA-86** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): ca. 1 km N of Bludzie Małe village, forest section No. 273, *Fraxinus* sp., May 13, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); ca. 2.5 km N of Czerwona Struga Nature Reserve, *Fraxinus* sp., May 14, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); *Fraxinus* sp., May 14, 1985, leg. S. Cieśliński (KRAM-L 31916). **FA-87** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romnicka (Romincka Forest): 2.5 km SSW of Żytkiejmy village, *Acer* sp., May 15, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); ca. 1.5 km of Żytkiejmy village, near road to Gołdap town, *Acer* sp., May 25, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC). **FA-92** – Pojezierze Mazurskie (Masurian Lake District), Kraina Węgorapy: ca. 0.5 km S of Lisy village, *Fraxinus* sp., May 18, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **FA-97** – Pojezierze Litewskie (Lithuanian Lake District), Pojezierze Wschodniosuwalskie (East Suwałki Lake District): NW edge of Hańcza Lake, *Salix* sp., May 18, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC). **FB-00** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Mokre Nature Reserve near Mamry Lake, *Fraxinus* sp., September 4, 1988, leg. S. Cieśliński (KTC). **FB-03** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Ełckie (Ełk Lakeland): Puszcza Borecka (Borki Forest), forest section No. 195, near Czerwony Dwór village, *Fraxinus* sp., May 21, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC); forest section No. 135, ca. 3 km N of Leśny Zakątek, *Fraxinus* sp., May 21, 1985, leg. Z. Tobolewski (KTC), ca. 3 km N of Zakątek Leśny, forest section No. 134, *Fraxinus* sp., May 21, 1985, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Ełckie (Ełk Lakeland): Puszcza Borecka (Borki Forest), near Litygajno

Lake, forest section No. 168, *Fraxinus* sp., May 21, 1985, leg. S. Cieśliński & Z. Tobolewski (KTC). **FB-19** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Wigry National Park, near Białe Lake, forest section No. 224, *Salix* sp., September 11, 1984, leg. Z. Tobolewski (UGDA-L 2723). **FB-50** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Smolak Duży bog near Popielno and Wierzba villages, on dry stalks of sedge (*Carex*), August 8, 1978, leg. J. Nowak (KRAM-L 25005). **FB-58** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Czerwone Bagno Nature Reserve, forest section No. 246, *Fraxinus* sp., September 24, 1986, leg. S. Cieśliński (KTC). **FB-77** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Biebrzański National Park, E of Płochowo village, the edge of small deciduous forest by the road, on *Salix* sp., April 30, 2005, leg. M. Kukwa 3939 (UGDA-L 11495). **FC-05** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Kolneńska (Kolneńska Highland): edge of Męczi village, *Salix* sp., August 22, 1990, leg. S. Cieśliński (KTC). **FD-08** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Drohiczyńska (Drohiczyń Highland): ca. 1.5 km W of Zajęczniki village, *Salix* sp., 9 August.1987, leg. S. Cieśliński & Z. Tobolewski (KTC). **FD-56** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Łukowska (Łuków Plain): Jata Nature Reserve near Łuków town, *Alnus* sp., May 30, 1972, leg. M. Motyka-Zgłobicka (LBL); *Alnus* sp., November 3, 1973, leg. M. Motyka-Zgłobicka & B. Żabińska (LBL). **FD-68** – Polesie Zachodnie (Western Polesie), Zakłęśłość Łomaska (Łomaska Depression): Omelno Nature Reserve, *Quercus* sp., August 3, 1982, leg. B. Ordyczyńska (LBL). **FD-83** – Nizina Południowopodlaska (South Podlachian Lowland), Wysoczyzna Żelechowska (Żelechowska Highland): Ryki village by Zalesianka River, *Salix* sp., August 18, 1957, leg. B. Wielgosz (LBL); *Acer* sp., August 18, 1957, leg. B. Wielgosz (LBL); levee between pond and Ryki River, *Alnus glutinosa*, August 18, 1957, leg. B. Wielgosz (LBL). **FE-07** – Nizina Południowopodlaska (South Podlachian Lowland), Wysoczyzna Lubartowska (Lubartów Highland): Lubartów County, Kozłówka Forest District, Nasutów Forest District, forest section No. 52, *Quercus* sp., September 12, 1962, leg. L. Jędrzejewska (LBL); Dąbrówka Forest District, Kozłówka Forest District, *Alnus glutinosa*, August 28, 1961, leg. L. Jędrzejewska (LBL); *Quercus* sp., August 28, 1961, leg. L. Jędrzejewska (LBL); *Quercus* sp., September 15, 1962, leg. L. Jędrzejewska (LBL). **FE-53** – Wyżyna Lubelska (Lublin Upland), Wzniesienia Urzędowskie (Urzędów Hills): Wólka Kolczyńska village near Józefów on Vistula River, *Betula* sp., May 6, 1975, leg. Z. Flisińska (LBL). **FE-90** – Wyżyna Kielecka (Kielce Upland), Wyżyna Sandomierska (Sandomierz Upland): Żyznów Forest District, near Klimontów village, forest section No. 71, *Acer pseudoplatanus*, 1985, leg. Dziubek (KTC). **FF-36** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Kolbuszowski (Kolbuszowa Plateau): Leżajsk County, Puszcza Sandomierska (Sandomierz Forest), Jelna Forest District, *Alnus* sp., July 25, 1963, leg. B. Ordyczyńska (LBL); **FF-37** – Kotlina Sandomierska (Sandomierz Basin), Płaskowyż Kolbuszowski (Kolbuszowa Plateau): Jelna Forest District, forest section No. 113, *Quercus* sp., 1963, leg. B. Ordyczyńska (LBL); forest section No. 104, *Betula* sp., 1963, leg. B. Ordyczyńska (LBL); Marynin Forest District, forest section No. 149, *Alnus glutinosa*, July 25, 1963, leg. B. Ordyczyńska (LBL); Julin Forest District, forest section No. 241, *Quercus* sp., 1963, leg. B. Ordyczyńska (LBL); Brzózka Królewska Forest District, forest section No. 210, *Quercus* sp., 1963, leg. B. Ordyczyńska (LBL). **FF-99** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Dynowskie (Dynowskie Foothills): Krasiczyn village, on the San River, *Salix* spp., leg. J. Kiszka & J. Piórecki (KRAM-L 60014). **FG-07** – Pogórze Środkowobeskidzkie

(Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): Leszczawka village, near the manor house No. 2068, *Salix* sp., July 21, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60017). **FG-08** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): Leszczawa Górna village No. 2045, *Malus domestica*, July 21, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60021). **FG-09** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): Turnica valley, *Fraxinus excelsior*, July 27, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60026). **FG-16** – Góry Sanocko-Turczańskie (Sanok-Turka Mountains), West Bieszczady Mountains: Wujskie village, *Fraxinus excelsior*, July 23, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60020). **FG-17** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): Kreców village, *Tilia* sp., June 5, 1986, leg. J. Kiszka & J. Piórecki (KRAM-L 60022). **FG-18** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemyśl Foothills): crest of Chwaniów Mount, *Acer pseudoplatanus*, June 3, 1987, leg. J. Piórecki (BDPA), Wojtkowa village, *Fraxinus excelsior*, July 23, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60015). **FG-19** – Góry Sanocko-Turczańskie (Sanok-Turka Mountains), West Bieszczady Mountains: hummock under Arłamów village, *Salix* spp., May 22, 1986, leg. J. Kiszka & J. Piórecki (KRAM-L 60011). **FG-27** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Bukowskie (Bukowskie Foothills); Słonne Mountains, Manasterzec village, *Fraxinus excelsior*, July 8, 1988, leg. J. Kiszka & J. Piórecki (KRAM-L 60016). **FG-28** – Góry Sanocko-Turczańskie (Sanok-Turka Mountains), West Bieszczady Mountains: Serednica village, No. 103, *Fraxinus excelsior*, May 4, 1990, leg. J. Kiszka (KRAM-L 60025). **FG-47** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, ruins of Orthodox church in Bukowiec village, *Fraxinus excelsior*, January 1, 1997, leg. R. Kościelniak (KRAP 1883). **FG-48** – Beskidy Lesiste Mountains, West Bieszczady Mountains: the road between Studenne village and Tworylne village, *Populus tremula*, August 8, 1998, leg. J. Kiszka (KRAM-L 60040). **FG-58** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Berdo village, *Salix* spp., May 6, 1990, leg. J. Kiszka & J. Piórecki (KRAP-L 60029). **FG-59** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Nasiczne village, by Prowcza Stream, *Acer pseudoplatanus*, July 16, 2005, leg. J. Kiszka & R. Kościelniak (KRAP 908); *Fraxinus* sp., July 16, 2005, leg. J. Kiszka & R. Kościelniak (KRAP 01884). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Wetlina village, glade near stream, *Fraxinus* sp., August 8, 2001, leg. J. Kiszka (KRAP 01882). **FG-69** – Beskidy Lesiste Mountains, West Bieszczady Mountains: near valley of Rzeczyca Stream, *Alnus* sp., July 7, 1959, leg. K. Glanc (KRAM-L 39491), Widelki village, No 2036, *Acer pseudoplatanus*, July 27, 1984, leg. J. Kiszka & J. Piórecki (KRAM-L 60013). **FG-79** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Wołosate village, Przełęcz Żydowski Beskid (Żydowski Beskid Pass), *Acer pseudoplatanus*, July 8, 2004, leg. J. Kiszka (KRAP 909). **GB-01** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): forest section No. 20, near road Augustów–Sejny, *Salix* sp., September 19, 1986, leg. S. Cieśliński (KTC). **GB-10** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Wigry National Park, *Quercus robur*, September 15, 1984, leg. H. Wójciak (LBL); forest section No. 102, *Carpinus betulus*, September 1984, leg. K. Górzynska & S. Cieśliński (UGDA-L 2710). **GB-31** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Puszcza Augustowska (Augustów Primeval Forest), Starożyn Nature Reserve, forest section Nos 211, 212, *Fraxinus excelsior*, September 17, 1986, leg. S. Cieśliński (KTC); forest section No. 195, *Fraxinus* sp., September 17, 1986, leg.

S. Cieśliński (KRAM-L 31823); *Acer* sp., July 17, 1965, leg. B. Żabińska (WA). **GB-40** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), ca. 1 km NE of Balinka village, forest section Nos 95, 96, 69, 70, *Fraxinus excelsior*, September 21, 1986, leg. S. Cieśliński (KTC); forest section Nos 51, 24, *Fraxinus excelsior*, September 13, 1986, leg. S. Cieśliński (KRAM-L 31973); Kozi Rynek Nature Reserve, *Fraxinus excelsior*, September 22, 1986, leg. S. Cieśliński (KTC). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, *Fraxinus excelsior*, August 5, 1994, leg. S. Cieśliński (KTC). **GC-01** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Krasne village, near road Supraśl–Białystok, *Salix* sp., August 3, 1994, leg. S. Cieśliński (KTC). **GC-11** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): ca. 3.5 km E of Ciasne village, *Fraxinus* sp., June 30, 1991, leg. S. Cieśliński (KTC). **GC-20** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): 0.5 km SE of Niewodnica Korycka village, *Salix* sp., August 26, 1991, leg. S. Cieśliński (KTC). **GC-35** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Białowieża (Białowieża Primeval Forest), Browsk Forest District, Browsk Forest Division, forest section No. 259a, *Alnus* sp., leg. S. Cieśliński & Z. Tobolewski (KTC); forest section Nos 747b, 748a, *Fraxinus excelsior*, 1983, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park, forest section No. 256, *Tilia cordata*, October 18, 1989, leg. S. Cieśliński (KTC); forest section No. 256, *Quercus robur*, 1990, leg. S. Cieśliński (KTC); forest section No. 256, *Fraxinus excelsior*, October 16, 1989, leg. S. Cieśliński (KTC); forest section No. 340a, *Fraxinus excelsior*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC); forest section No. 256, *Carpinus betulus*, August 2014, leg. M. Kukwa 13232, A. Łubek (UGDA-L 20700); May 2015, leg. M. Kukwa 1511, A. Łubek (UGDA-L 22427). **GC-64** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Hajnówka Forest District, Leśna Forest Division, forest section No. 575a, Berezowo Forest District, *Fraxinus* sp., 1982, leg. Z. Tobolewski & S. Cieśliński (KTC); Hajnówka Forest Division, forest section No. 389d, *Fraxinus* sp., 1983, leg. Z. Tobolewski & S. Cieśliński (KTC); Hajnówka Forest Division, forest section No. 307d, *Fraxinus excelsior*, 1983, leg. Z. Tobolewski & S. Cieśliński (KTC); Starzyna Forest Division, forest section Nos 629b, 630a, Perebel River, *Fraxinus excelsior*, 1982, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-90** – Wysoczyzny Podlasko-Białoruskie (Podlachian-Belarusian Highlands), Wysoczyzna Drohiczyńska (Drohiczyń Highland): Sokole Nature Reserve, *Carpinus betulus*, August 16, 1992, leg. S. Cieśliński (KTC). **GD-20** – Nizina Południowopodlaska (South Podlachian Lowland), Równina Łukowska (Łuków Plain): Chmielinne Nature Reserve, *Alnus glutinosa*, May 18, 1962, leg. B. Ordyczyńska (LBL); Leśna near Biała Podlaska town, *Alnus glutinosa*, May 18, 1962, leg. B. Ordyczyńska (LBL). **GD-90** – Polesie Zachodnie (Western Polesie), Zakłęśłość Sosnowicka (Sosnowica Depression): Białka village near Parczew town, *Quercus* sp., October 30, 1986, leg. Z. Szczepańska (LBL). **GD-91** – Polesie Zachodnie (Western Polesie), Zakłęśłość Sosnowicka (Sosnowica Depression): Sosnowica Forest District, Bohutyn village, *Betula* sp., May 1973, leg. H. Siegieda (LBL). **GE-91** – Roztocze, Central Roztocze: Hrebenne village, *Acer pseudoplatanus*, March 30, 1957, leg. K. Glanc (KRAM-L 39487); Lublin Province, Zamość County, Kosobudy Forest District, Czerkies Forest District, *Fagus*

sylvatica, June 30, 1952, leg. Z. Tobolewski (POZ); Kosobudy near Zamość town, Słupy Forest District, *Alnus* sp., August 25, 1964, leg. B. Warmińska (LBL); *Alnus* sp., August 26, 1964, leg. B. Warmińska (LBL); Roztoczański National Park, SE of Guciów village, Nart Nature Reserve, beech forest, *Tilia cordata*, September 17, 2015, leg. M. Kukwa 17525 (UGDA-L 22020). **GE-92** – Roztocze, Central Roztocze: Lublin Province, Zamość County, Kosobudy Forest District, Wólka Forest District, *Quercus* sp., August 24, 1964, leg. B. Warmińska (LBL). **GF-01** – Kotlina Sandomierska (Sandomierz Basin), Równina Biłgorajska (Biłgorajska Plain): Szum Nature Reserve near Józefów, *Alnus* sp., October 16, 1970, leg. B. Żabińska (LBL). **GF-12** – Roztocze, Central Roztocze: Susiec village, by Tanew River, *Alnus* sp., May 2, 1964, leg. J. Krygler (LBL).

Additional material examined. AUSTRIA: Botanischer Tauschverein in Wien, 1833, (KRAM-L 384); leg. F. Hazslinszky (KRAM-L 395); Nenlengbach, 1940, (KRAM-L 386); ca. 6 km N of Kaprun, *Carpinus betulus*, April 1, 2005, leg. A. Wieczorek (herb. Wieczorek). **BELARUS:** Gomel Region, Gomel District, Korenevka forest, 52°22' N, 31°02' E, *Parnassius mnemosyne* microreserve, *Quercus* sp., 24 October. 2007, leg. A. Tsurykau 01443 (GSU); Gomel District, city of Gomel, Sverdlova Str. near hospital, *Alnus glutinosa*, April 15, 2007, leg. A. Tsurykau 01444 (GSU). **CZECH REPUBLIC:** Deutschbrod in Böhmen leg. Jul. Svacha (KRAM-L 387); Rychlebské Horý, N of Lipová lázně, Jeskyně na Pomezí, limestone outcrops covered with beech forest with sycamore, *Fraxinus excelsior*, April 24, 2004, leg. M. Kukwa 3206 (UGDA-L 10430). **DENMARK:** Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); Ekkodalen, *Carpinus betulus*, July 5, 2014, Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek (herb. Wieczorek). **ESTONIA:** Saaremaa Island, Saare Country, Torgu Community, Viieristi Nature Reserve, *Ulmus* sp., September 20, 2008, leg. J. Motiejūnaite 8608 (BILAS). **GERMANY:** Mecklenburg-Vorpommern, Rostock, Wustrow Peninsula, parkland of former manor, *Fraxinus excelsior*, October 20, 2014, leg. U. Schiefelbein 3694 (herb. Schiefelbein); October 20, 2012, leg. U. Schiefelbein 3687 (herb. Schiefelbein); Landkreis Uecker-Randow, Straße Ueckermünde-Heinrichshof, ca. 0.3 km E Kreuzung mit der Zarow, *Quercus* sp., May 3, 2002, leg. U. Schiefelbein 945 (herb. Schiefelbein); Ueckertal, Eschenwald, ca. 1 km NW of Schmarsow, *Fraxinus excelsior*, October 14, 2001, leg. U. Schiefelbein 1002 (herb. Schiefelbein); N Borken, Eichen-Ulmen-Hartholz-Auenwald, *Fraxinus excelsior*, leg. U. Schiefelbein 1242 (herb. Schiefelbein); an der Straße Jatznick-Rothemühl, ca. 1 km E of Rothemühl, *Fagus sylvatica*, March 6, 2001, leg. U. Schiefelbein 623 (herb. Schiefelbein); Demnitzer Bruch, *Fraxinus excelsior*, October 22, 2000, leg. U. Schiefelbein 610 (herb. Schiefelbein); Landkreis Ostvorpommern, Insel Usedom, Wald zwischen der Ortslage Ahlbeck und der polnischen Grenz, nördl. der Bundesstraße, *Fagus sylvatica*, December 19, 2003, leg. U. Schiefelbein 1928 (herb. Schiefelbein); Waldgebiet zwischen Seebad Bansin und Ückeritz, ca. 0.5 km westlich der ehemaligen Selliner Bootstelle, *Fraxinus excelsior*, November 14, 2003, leg. U. Schiefelbein 1383 (herb. Schiefelbein). **LITHUANIA:** Nemunas loops Regional Park, Prienai District, Balbieriškis forest, forest area No. 50, *Fagus sylvatica*, September 28, 2002, leg. P. Czarnota (GPN 3141); Molėtu raj., Giedraičių g-ja, 59 kvartalas, 11 sklypas, Zdoniškių miškas, *Fraxinus excelsior*, November 23, 2006, leg. D. Stončius 8280 (BILAS); Molėtu raj., Sadauskų miškas, pietinis Grabuosto ežero šlaitas, *Acer platanoides*, November 6, 2005, leg. D. Stončius 8459 (BILAS); Akmenės raj., Naujosios Akmenės g-ja, 49 kvartalas, 20 sklypas, *Alnus incana*, September 2003, leg. E. Panovienė 8458 (BILAS); 438 kvartalas, 16 sklypas, ant lapuocio medžio kamieno,

September 2003, leg. E. Panovienė 8457 (BILAS); Mažeikių raj., Ranavo g-ja, 272 kvartalas, 29 sklypas, ant lapuocio medžio kamieno, September 2003, leg. E. Panovienė 8456 (BILAS); Tralus raj., *Alnus glutinosa*, June 27, 1997, leg. J. Motiejūnaite 2569 (BILAS); ANP, Utenos raj., *Fraxinus excelsior*, May 15, 2001, leg. J. Motiejūnaite 5592 (BILAS); Ukmergės raj., Želvos g-ja, 27 kvartalas, 9 sklypas, Laumėnų miškas, *Fraxinus excelsior*, March 11, 2009, leg. D. Stončius 9203 (BILAS); Kaisiadorių raj., *Fraxinus excelsior*, September 18, 1996, leg. J. Motiejūnaite 3571 (BILAS); Traku raj., Aukitadvario apylinkis, *Tilia* sp., June 27, 1997, leg. J. Motiejūnaite 2517 (BILAS); Biržų raj., *Fraxinus excelsior*, September 16, 1992, leg. J. Motiejūnaite 1560 (BILAS). **LATVIA:** Kemeru National Park, Antinciems, Kanieru Lake, *Fraxinus excelsior*, September 28, 1996, leg. J. Motiejūnaite 5741 (BILAS); Juodkrantė, Kuršių Nerija, *Acer platanoides*, August 11, 1975, leg. T. Rudzinskaitė 2169 (WI); Biržų giria, 1963 kvartalas, Biržų raj, ant jauno lapuocio medžio kamieno, May 13, 2006, leg. I. Prigodina 4048 (WI); Dūkštų ąžuolynas, 9 kvartalas, 4 sklypas Neries RP, Vilniaus raj., *Quercus robur*, June 5, 2002, leg. I. Prigodina 1304 (WI). Talsi District, Šķēde Forest Research Station, Mežmāja, *Tilia cordata*, September 23, 2014, leg. M. Kukwa LV12955 (UGDA-L 19855). **NORWAY:** Stryn, forest, *Abies alba*, August 28, 1995, leg. A. Wieczorek (herb. Wieczorek). **RUSSIA:** Kalujskie zaseki Reserve, Kaluga Province, Ulyanovsky District, 2 km NW of Nogaja village, S plot of reserve, forest, *Acer* sp., June 22, 2004, leg. A. V. Gudovicheva 862 (KPABGI); 4.5 km NW of Nogaja village, S plot of reserve, *Acer* sp., June 22, 2004, leg. A. V. Gudovicheva 865 (KPABGI); Tula Province, Shchyokinsky District, museum Yasnaya Polyana, section Podkapustnik, *Betula* sp., August 1, 2001, leg. A. V. Gudovicheva 1243 (KPABGI); Orlovskoye region, T. 216, Znamensky Distr., Orlovskoye Polesie National Park, Krasnikovskoye Forestry, 33 quar., broad-leaved forest, bark of *Fraxinus*, N 53°29.142', E 35°33.750', 198 m alt., June 12, 2012, leg. E. E. Muchnik 9636 (OHHI); Orel region, T. 288, Shablykinsky Distr., near v. Belousovka, Shablykinsky forest, mixed forest, bark of *Populus tremula*, 53°53.177' N, 35°17.268' E, 226 m alt., July 25, 2013, leg. E. E. Muchnik 10601 (OHHI); Orel region, T. 287, Shablykinsky Distr., near v. Lesnichestvo, Shablykinsky forest, broad-leaved forest, bark of *Sorbus aucuparia*, 52°54.199' N, 35°10.892' E, 166 m alt., July 24, 2013, leg. E. E. Muchnik 10600 (OHHI); Bryansk region, T. 378, Suzemsky Distr., Bryansky Les State Nature Reserve, 103 quae., broad-leaved forest, bark of *Acer*, 52°27.286' N, 33°51.155' E, 153 m alt., August 10, 2015, leg. E. E. Muchnik (herb. Muchnik). **UKRAINE:** Lysa Hora, 2 km E of Vilshanytsya, Lviv region, Zolochir District, 49°48' N, 24°43' E, *Fraxinus* sp., June 5, 2000, leg. U. Bielczyk & J. Kiszka (KRAM-L 45153); Khmelnytskyi region, Kamianets Podilskyi District, National Park Podilskyi Tovtry, Privorita near Makiv, Hora Karmeluka forest, 223 m, 48°47'27" N, 26°38'41" E, *Carpinus betulus*, June 25, 2003, leg. A. Kowalewska (KRAM-L 49103, 49065); *Salix* sp., June 25, 2006, leg. M. Kukwa (KRAM-L 48776); An Waldbäumer 1876, leg. W. Krieger (WA).

Exsiccata seen. Erbar. Crittogam Ital. Exs. No. 430, as *Opegrapha herpetica* (KRAM); Wartmann & Schenk, Schweiz. Krypt. Exs. No. 675, as *Opegrapha herpetica* for. *fuscata* (KRAM); Lichen. Helvec Exs. Schaer. et Hepp. No. 550 (WA).

***Zwackhia soreidiifera* (P. James) Ertz**

Specimens examined. **AB-23** – Pobrzeże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands: Wolin Island, Wolin National Park, *Fraxinus* sp. September 22, 2014, leg. A. Wieczorek (herb. Wieczorek). **AB-94** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe

(Beech Hills): Puszcza Bukowa (Beech Forest), Szczecin Landscape Park, *Carpinus betulus*, August 21, 2014, leg. A. Wieczorek (herb. Wieczorek).

Additional material examined. ESTONIA: Saaremaa, Torgu Commune, Viieristi Nature Reserve, forest section No. 500, black alder forest with spruces and pines, *Alnus glutinosa*, September 20, 2008, leg. M. Kukwa 7259 (UGDA-L 14809). **LATVIA:** Talsi District, between Šķēde and Mežmāja, mixed humid forest, *Quercus robur*, September 24, 2014, leg. M. Kukwa LV12974 (UGDA-L 19874, KRAM-L 67700); *Abies alba*, September 24, 2014, leg. M. Kukwa LV12979 (UGDA-L 19879).

***Zwackhia viridis* (Ach.) Poetsch & Schied.**

Specimens examined. AB-15 – Pobrzeże Szczecińskie (Szczecin Coastland), Wybrzeże Trzebiatowskie (Trzebiatowskie Coast): Łukęcin village, *Quercus* sp., June 13, 1986, leg. W. Fałtynowicz (UGDA-L 2793). **AB-23** – Pobrzeże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands: Wolin Island, Wolin National Park, forest section Nos. 7, 14, 18, 52, 58, 60, 70, 83, 92, 95, 107, *Fagus sylvatica*, *Quercus* sp., 1996, leg. A. Wieczorek (herb. Wieczorek). **AB-24** – Pobrzeże Szczecińskie (Szczecin Coastland), Uznam and Wolin islands: Wolin Island, Kołczewo village, *Fraxinus excelsior*, 1996, leg. A. Wieczorek (herb. Wieczorek). **AB-93** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Puszcza Bukowa (Beech Forest), Szczecin Landscape Park, forest section Nos. 246, 284, *Fagus sylvatica*, July 15, 1998, leg. A. Wieczorek (herb. Wieczorek). **AB-94** – Pobrzeże Szczecińskie (Szczecin Coastland), Wzgórza Bukowe (Beech Hills): Puszcza Bukowa (Beech Forest), Szczecin Landscape Park, Źródłiskowa Buczyzna Nature Reserve, forest section Nos. 232, 227, *Fagus sylvatica*, July 12, 1997, leg. A. Wieczorek (herb. Wieczorek); *Fagus sylvatica*, forest section Nos. 240, 248, June 13, 1999, leg. A. Wieczorek (herb. Wieczorek). **BA-97** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Drzeńsko Młyn village *Fagus sylvatica*, August 28, 1987, leg. W. Fałtynowicz & J. Miądlkowska (UGDA-L 3889). **BA-98** – Pobrzeże Koszalińskie (Koszalin Coastland), Równina Słupska (Słupsk Plain): Janiewickie Bagno Nature Reserve near Sławno town, *Fagus sylvatica*, August 26, 1987, leg. W. Fałtynowicz & J. Miądlkowska (UGDA-L 3496). **BC-22** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Równina Drawska (Drawno Plain): Drawieński Park Narodowy (Drawa National Park), Ostrowiec Lake, *Tilia* sp., August 18, 1989, leg. L. Lipnicki & J. Kiszka (herb. Lipnicki). **BF-47** – Eastern Sudetes, Masyw Śnieżnika (Śnieżnik Massif): valley of Kalenica Stream, leg. K. Szczepańska & M. Kossowska (herb. Szczepańska); valley of Bogoryja Stream, *Acer* sp., August 27, 2003, leg. K. Szczepańska (herb. Szczepańska). **CA-61** – Pobrzeże Koszalińskie (Koszalin Coastland), Wysoczyzna Damnicka (Damnica Highland): Damnice village, *Carpinus betulus*, November 20, 1987, leg. W. Fałtynowicz & J. Miądlkowska (UGDA-L 3938). **CA-66** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Porzeczce hamlet, between Lębork and Wejherowo towns, *Fagus sylvatica*, July 23, 1985, leg. W. Fałtynowicz (KRAM-L 21767, 21882). **CA-68** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): between Rumia town and Zagórze, *Quercus* sp., August 23, 1987, leg. W. Fałtynowicz (UGDA-L 3475). **CA-98** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): Jar Rzeki Raduni Nature Reserve, *Carpinus betulus*, September 19, 1983, leg. W. Fałtynowicz

(UGDA-L 1760); November 1, 1973, leg. W. Fałtynowicz (UGDA-L 1771); *Fraxinus excelsior*, December 5, 1976, leg. W. Fałtynowicz (UGDA-L 1860); *Fagus sylvatica*, September 19, 1983, leg. W. Fałtynowicz (UGDA-L 3015); *Acer* sp., April 14, 1973, leg. W. Fałtynowicz (UGDA-L 3252). **CA-99** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District): ca. 1.5 km of Kolbudy village, *Acer* sp., April 14, 1973, leg. W. Fałtynowicz (UGDA-L 1748). **CB-04** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Bory Tucholskie (Tuchola Forest): SW edge of Mausz Lake, *Fagus sylvatica*, April 3, 1986, leg. W. Fałtynowicz (UGDA-L 3356). **CB-56** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Bory Tucholskie (Tuchola Forest): Ustronie and Twarożnica villages, *Carpinus betulus*, September 18, 1974, leg. L. Lipnicki (herb. Lipnicki). **CB-85** – Pojezierze Południowopomorskie (South Pomeranian Lake District), Dolina Brdy (Brda River Valley): Piekło Nature Reserve by Brda River, *Carpinus betulus*, March 30, 1985, leg. L. Lipnicki (TRN). **CC-80** – Pojezierze Wielkopolskie (Wielkopolska Lake District), Pojezierze Gnieźnieńskie (Gniezno Lake District): Zielonka Forest District near Poznań City, forest section No. 4, 8, 73, *Tilia cordata*, June 17, 1961, leg. K. Glanc (KRAM-L 39382); forest section No. 73, *Acer platanoides*, June 17, 1961, leg. K. Glanc (KRAM-L 39383); forest section No. 73, *Acer* sp., September 15, 1961, leg. K. Glanc (KRAM-L 39391); forest section No. 8r, *Tilia* sp., October 29, 1960, leg. K. Glanc (KRAM-L 39393); forest section No. 73, *Tilia cordata*, September 15, 1961, leg. K. Glanc (KRAM-L 39403); forest section No. 4j, *Acer pseudoplatanus*, October 28, 1960, leg. K. Glanc (KRAM-L 39404). **CE-00** – Obniżenie Milicko-Głogowskie (Milicz-Głogów Depression), Kotlina Milicka (Milicz Basin): Milicz County, Kubryk Forest District, *Carpinus betulus*, June 27, 1969, leg. K. Glanc (KRAM-L 39389). **DA-70** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pobrzeże Kaszubskie (Kashubian Coastland), Sopot town, forest near Reja Str., *Fagus sylvatica*, March 8, 1959, leg. W. Fałtynowicz (UGDA-L 3450). **DA-85** – Pobrzeże Gdańskie (Gdańsk Coastland), Mierzeja Wiśłana (Vistula Spit): Przebrno village, forest section No. 173, *Carpinus betulus*, August 6, 1982, leg. E. Budzbon & W. Fałtynowicz (UGDA-L 2196); *Fagus sylvatica*, August 15, 1982, leg. E. Budzbon & Z. Tobolewski (UGDA-L 2197). **DB-36** – Pojezierze Wschodniopomorskie (East Pomeranian Lake District), Pojezierze Kaszubskie (Kashubian Lake District), Porzecze village, forest section No. 261, *Acer* sp., July 15, 1985, leg. W. Fałtynowicz (UGDA-L 2868); Porzecze village, Łeba River, *Fagus sylvatica*, July 23, 1985, leg. W. Fałtynowicz (UGDA-L 2888). **DB-42** – Pojezierze Południowobałtyckie (South Baltic Lakeland), Pojezierze Hławskie (Hława Lake District): Kwidyn town, forest section No. 190, Dolina Postolińskiej Strugi (Postolińska Struga Valley), *Tilia cordata*, April 21, 2003, leg. M. Kukwa 1787 (UGDA-L 13466). **DE-68** – Wyżyna Przedborska (Przedborska Upland), Niecka Włoszczowska (Włoszczowa Basin): Dębowiec Forest District, forest section No. 165, *Ulmus glabra*, associated with *Chrysothrix candelaris* and *O. vermicellifera*, September 21, 1971, leg. K. Czyżewska (LOD-L 1023). **DG-02** – West Beskids, Beskid Śląski Mountains: Brennica Stream, *Abies alba*, August 20, 1965, leg. J. Kiszka (KRAP). **DG-03** – West Beskids, Beskid Śląski Mountains: Skrzyczne village, *Fagus sylvatica*, September 4, 1964, leg. J. Kiszka (KRAP). **DG-06** – West Beskids, Beskid Makowski Mountains: Pasma Jałowieckie (Jałowieckie Range), Stryżawa, Siwówka hamlet, *Abies alba*, August 16, 1965, leg. J. Nowak (KRAM-L 15766). **DG-12** – West Beskids, Beskid Śląski Mountains: Barania Góra (Ram Mountain), valley of Biała Wisielka Stream, *Fagus sylvatica*, October 2, 1975, leg. U. Bielczyk (KRAM-L 43944); alp below Przysłop Mountain, *Fagus sylvatica*, August 2, 1962, leg. J. Kiszka (KRAP); Skrzyczne Mount, S-slope, *Fagus sylvatica*, September 4, 1964, leg. J. Kiszka (KRAM-L 19354). **DG-13** – West Beskids,

Beskid Śląski Mountains: Malinowska Skała Mount, *Acer pseudoplatanus*, September 6, 1962, leg. J. Kiszka (KRAP). **DG-25** – West Beskids, Beskid Żywiecki Mountains: Pilsko Massif, valley of Straceniec Stream, *Acer pseudoplatanus*, September 5, 1964, leg. J. Nowak (KRAM-L 14816, 14817). **DG-26** – West Beskids, Beskid Żywiecki Mountains, Babia Góra National Park, s.d., leg. U. Bielczyk (POZ). **DG-38** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Kotlina Orawsko-Nowotarska (Orava-Nowy Targ Basin): Piekielnik Stream, *Fagus sylvatica*, May 30, 1970, leg. J. Kiszka (KRAP 10817); *Abies alba*, June 20, 1970, leg. J. Kiszka (KRAP 10838). **DG-49** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Rów Podtatrzański (Podtatrzański Trench): Gubałówka, *Picea abies*, August 18, 1964, leg. J. Kiszka (KRAP); Bystrzyk Valley, *Picea abies*, July 24, 1963, leg. J. Kiszka (KRAP). **EA-82** – Nizina Staropruska (Old Prussian Lowland), Wzniesienia Górowskie (Górowo Hills), ca. 1 km N of Garbniki village, *Tilia* sp., May 8, 1989, leg. S. Cieśliński, (KTC). **EB-22** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 1.5 km NE of Smolajny village, *Tilia* sp., August 23, 1993, leg. S. Cieśliński (KTC); *Carpinus betulus*, August 23, 1993, leg. S. Cieśliński (KTC); ca. 3 km NNE of Smolajny village, *Acer platanoides*, August 23, 1993, leg. S. Cieśliński (KTC); ca. 4 km NNE of Smolajny village, *Fraxinus excelsior*, August 23, 1993, leg. S. Cieśliński (KTC). **EB-26** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): ca. 2 km E of Otry village, *Fagus sylvatica*, May 8, 1990, leg. S. Cieśliński (KTC). **EB-27** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District): W edge of Legińskie Lake, *Carpinus betulus*, May 3, 1989, leg. S. Cieśliński (KTC). **EB-31** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2.5 km SW of Różynka village, *Fraxinus excelsior*, September 14, 1989, leg. S. Cieśliński (KTC). **EB-32** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Las Warmiński Nature Reserve by Lyna River, forest section No. 139, *Fraxinus excelsior*, July 19, 1988, leg. S. Cieśliński (KTC); *Carpinus betulus*, May 28, 1994, leg. S. Cieśliński (KTC); *Fraxinus excelsior*, May 28, 1994, leg. S. Cieśliński (KTC); ca. 2 km SW of railway station in Cerkiewniki village, *Fagus sylvatica*, September 14, 1989, leg. S. Cieśliński (KTC); *Acer* sp., September 14, 1989, leg. S. Cieśliński (KTC). **EB-36** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Mrągowskie (Mrągowo Lake District), ca. 0.5 km NE of Dębowo Nature Reserve, *Fagus sylvatica*, August 28, 1993, leg. S. Cieśliński (KTC). **EB-42** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Olsztyn City, city forest, *Acer* sp., October 21, 2000, leg. D. Kubiak (OLTC); *Carpinus betulus*, October 21, 2000, leg. D. Kubiak (OLTC). **EB-59** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): Strzałowo Nature Reserve, *Tilia cordata*, September 1, 1987, leg. S. Cieśliński (KTC); Puszcza Piska (Pisz Forest), Krutynia Nature Reserve, *Acer* sp., August 31, 1981, leg. S. Cieśliński (KTC); *Carpinus betulus*, August 31, 1987, leg. S. Cieśliński (KTC). **EB-60** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Olsztyńskie (Olsztyn Lake District): ca. 2 km E of Stare Jabłonki railway station, *Tilia cordata*, September 20, 1994, leg. S. Cieśliński (KTC). **ED-09** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Kotlina Warszawska (Warsaw Basin), Równina Wołomińska (Wołomin Plain): Dębina Nature Reserve, *Carpinus betulus*, September 1955, leg. J. Zielińska (WA). **ED-99** – Nizina Środkowomazowiecka (Central Mazovian Lowland), Równina Kozienicka (Kozienice Plain): Puszcza Kozienicka (Kozienice Forest), Zagożdżon Nature Reserve, *Carpinus betulus*, July 25, 1968, leg. S. Cieśliński (KTC). **EE-00** – Wzniesienia Południowomazowieckie (South Mazovian Hills), Równina Piotrkowska (Piotrków Plain):

Puszcza Pilicka (Pilica Forest), Spała Nature Reserve, forest section No. 286, *Carpinus betulus*, in oak-linden-hornbeam forest, April 28, 1969, leg. K. Czyżewska (LOD-L 525). **EE-55** – Wyżyna Kielecka (Kielce Upland), Płaskowyż Suchedniowski (Suchedniów Plateau): Suchedniów Forest District, Dalejów Nature Reserve, *Acer pseudoplatanus*, July 1989, leg. Pańczyk & K. Toborowicz (KTC). **EE-64** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Gruchawka near Kielce City, Sufraganiec Nature Reserve, *Abies alba*, October 22, 1972, leg. K. Toborowicz (KTC). **EE-86** – Wyżyna Kielecka (Kielce Upland), Świętokrzyskie Mountains: Stołowa Góra (Stołowa Mount), *Carpinus betulus*, July 12, 1964, leg. S. Cieśliński (KTC). **EG-11** – West Beskids, Gorce Mountains: Kudłoń Mount, near Adamówka village, *Fagus sylvatica*, August 24, 1968, leg. K. Glanc (KRAM-L 39400). **EG-20** – West Beskids, Gorce Mountains: under Obidowiec Mount, Ścisłe Brzyzki Forest District, in Olszowy Potok (Olszowy Stream) catchment area, *Fagus sylvatica*, November 9, 1994, leg. P. Czarnota (GPN 679); under Obidowiec glade, in valley of Olszowy Potok (Olszowy Stream), *Fagus sylvatica*, July 4, 1994, leg. P. Czarnota (GPN 659); near Paciepnica Stream, leg. P. Czarnota (GPN 989); W slope of Suhora Mount, *Abies alba*, September 10, 1959, leg. K. Glanc (KRAM-L 39384); *Fagus sylvatica*, September 10, 1959, leg. K. Glanc (KRAM-L 39399). **EG-21** – West Beskids, Gorce Mountains: Turbacz Mount S slope, Kliczka forest, *Fagus sylvatica*, August 24, 1966, leg. K. Glanc (KRAM-L 39405); Gorc Mount, W slope, alt. 900 m, *Fagus sylvatica*, September 08, 1959, leg. K. Glanc (KRAM-L 35859); Dolina Łopusznej (Łopuszna Valley), *Fagus sylvatica*, August 23, 1965, leg. K. Glanc (KRAM-L 39401); under peak of W slope of Turbacz Mount, *Fagus sylvatica*, September 6, 1964, leg. K. Glanc (KRAM-L 39392); Turbacz Nature Reserve, on N slope of Turbacz Mount, Olszowy Potok (Olszowy Stream), *Fagus sylvatica*, June 27, 1966, leg. K. Glanc (KRAM-L 39388); in Łopuszanka Stream, leg. P. Czarnota (GPN 1018); Turbacz Nature Reserve, in valley of Olszowy Potok (Olszowy Stream), *Fagus sylvatica*, June 23, 1994, leg. P. Czarnota (GPN 598); Hucisko Forest District, on W slope of Gorc Porębski glade, Dolina Kamienicy (Kamienica River Valley), *Acer pseudoplatanus* July 11, 1994, leg. P. Czarnota (GPN 772); Znaki Forest District, Dolina Kamienicy (Kamienica River Valley), leg. P. Czarnota (GPN 1684); Turbacz Nature Reserve, near blue tourist trail, under Polana Średnie (Średnie Glade), in valley of Turbacz Stream, *Fagus sylvatica*, June 18, 1996, leg. P. Czarnota (GPN 1003, 1099); Szerokie Forest District, on S slope of Gorc glade in Dolina Kamienicy (Kamienica River Valley), under Gonadrowe Polanki, *Fagus sylvatica*, July 14, 1994, leg. P. Czarnota (GPN 759); Turbacz Mount, valley of Turbacz Stream, under Polana Średnie (Średnie Glade), *Fagus sylvatica*, May 23, 1996, leg. P. Czarnota (GPN 1296, GPN 1231); Turbacz Nature Reserve, under Polana Średnie (Średnie Glade), in valley of Olszowy Potok (Olszowy Stream), *Fagus sylvatica*, June 23, 1994, leg. P. Czarnota (GPN 639); Turbacz Mount, Łocha Forest District, in valley of Olszowy Potok (Olszowy Stream), leg. P. Czarnota (GPN 1113, 1048); near blue tourist trail, near Kamienica Stream, leg. P. Czarnota (GPN 965, 968, 1391); near Wspólny Potok (Wspólny Stream), in Dolina Kamienicy (Kamienica River Valley), *Fagus sylvatica*, June 9, 1997, leg. P. Czarnota (GPN 1647); near Roztoka Stream, leg. P. Czarnota (GPN 812, 814); Turbacz Nature Reserve, in Dolina Roztoki (Roztoka Stream Valley), leg. P. Czarnota (GPN 1557, 1014); at the hiking trail on Turbacz Mount, *Fagus sylvatica*, September 13, 1959, leg. K. Glanc (KRAM-L 39378); Lepietnica Forest District, *Fagus sylvatica*, September 12, 1964, leg. K. Glanc (KRAM-L 39390); S slope of Turbacz Mount, Dolina Łopusznej valley, *Fagus sylvatica*, August 24, 1966, leg. K. Glanc (KRAM-L 39402). **EG-22** – West Beskids, Gorce Mountains: Lubań Mount, S slope, valley of Skalny Stream, from Lubań Mount to Grywałd village, *Fagus sylvatica*, May 10, 1959, leg. K. Glanc

(KRAM-L 39386, 39379); Lubań Mount, slope N, from Tokarnia village on Lubań Mount, *Fagus sylvatica*, September 4, 1960, leg. K. Glanc (KRAM-L 39381); valley of Forędówka Stream, *Fagus sylvatica*, April 2, 1959, leg. K. Glanc (KRAM-L 39398). **EG-33** – Obniżenie Orawsko-Podhalańskie (Orava-Podhale Depression), Pieniny Mountains: Sokola Perć Mount, *Fagus sylvatica*, July 1, 1955, leg. Z. Tobolewski (POZ); Czertezik Mount, *Abies alba* *Fagus sylvatica*, September 14, 1957, leg. K. Glanc (KRAM-L 39375). **EG-34** – West Beskids, Beskid Sądecki Mountains: Pasma Radziejowej (Radziejowa Range), nature reserve above Kotelniczy Potok (Kotelniczy Stream), *Fagus sylvatica*, September 9, 1976, leg. U. Bielczyk (KRAM-L 42068); Baniska Nature Reserve, *Fagus sylvatica*, September 25, 1967, leg. M. Olech (KRA); July 23, 1990, leg. L. Śliwa (KRA); valley of Potok Kozlecki (Kozlecki Stream), *Fagus sylvatica*, June 15, 1965, leg. M. Olech (KRA); valley of Mała Roztoka Stream, *Fagus sylvatica*, August 24, 1968, leg. M. Olech (KRA). **EG-35** – West Beskids, Beskid Sądecki Mountains: valley of Czerch Stream, *Fagus sylvatica*, August 4, 1990, leg. L. Śliwa (KRA). **EG-36** – West Beskids, Beskid Sądecki Mountains: Pasma Jaworzyny (Jaworzyna Range), valley of Potok Łososiewski (Łososiewski Stream), *Fagus sylvatica*, October 14, 1967, leg. M. Olech (KRA); Kopiec Mount, S slope, *Fagus sylvatica*, September 9, 1967, leg. M. Olech (KRA); Jaworzyna Krynicka Mount, *Fagus sylvatica*, July 12, 1995, leg. A. Wieczorek (herb. Wieczorek). **EG-37** – West Beskids, Beskid Sądecki Mountains: valley of Kryściów Stream, *Abies alba*, July 18, 1967, leg. M. Olech (KRA). **EG-46** – West Beskids, Beskid Sądecki Mountains: Muszyna town, *Fagus sylvatica*, August 12, 1953, leg. J. Rydzak (LBL). **FA-85** – Pojezierze Litewskie (Lithuanian Lake District), Puszcza Romincka (Romincka Forest): forest section No. 91, *Fraxinus* sp. May 16, 1985, leg. S. Cieśliński (KRAM-L 31842; KTC). **FB-00** – Pojezierze Mazurskie (Masurian Lake District), Kraina Wielkich Jezior Mazurskich (Great Masurian Lakes Land): Mokre village, forest section No. 281, *Quercus* sp., 3 September. 1989, leg. S. Cieśliński (KTC). **FB-03** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Elćkie (Elk Lakeland): Puszcza Borecka (Borki Forest), nature reserve, *Carpinus betulus*, May 14, 1958, leg. K. Glanc (KRAM-L 39394, 39397); Puszcza Borecka (Borki Forest), near Czerwony Dwór village, forest section No. 195, *Fraxinus* sp., May 21, 1985, leg. S. Cieśliński (KTC); Puszcza Borecka (Borki Forest), forest section Nos 10, 205/206, 211/212, *Fraxinus* sp., May 21, 1985, leg. S. Cieśliński (KTC); forest section No. 10, *Carpinus betulus*, May 19, 1987, leg. Z. Tobolewski & S. Cieśliński (KTC). **FB-13** – Pojezierze Mazurskie (Masurian Lake District), Pojezierze Elćkie (Elk Lakeland): Puszcza Borecka (Borki Forest), Borki Nature Reserve, *Tilia* sp., May 19, 1987, leg. S. Cieśliński (KTC); forest section No. 172/173, *Acer* sp., May 20, 1987, leg. S. Cieśliński (KTC). **FB-58** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Czerwone Bagno Nature Reserve, forest section No. 246, *Tilia cordata*, 24 September. 1986, leg. S. Cieśliński (KTC). **FD-45** – Nizina Południowopodlaska (South Podlachian Lowland), Równina Łukowska (Łuków Plain): Jata Nature Reserve near Łuków town, *Alnus glutinosa*, June 23, 1971, leg. M. Motyka-Zgłobicka (LBL). **FD-68** – Polesie Zachodnie (Western Polesie), Zakłęsłość Łomaska (Łomaska Depression): Omelno Nature Reserve, *Quercus* sp., May 15, 1973, leg. B. Ordyczyńska (UMCS). **FE-25** – Wyżyna Lubelska (Lublin Upland), Płaskowyż Nałęczowski (Nałęczów Plateau): Wojciechowski Las near Nałęczów town, 1975, leg. Z. Flisińska (KTC). **FE-55** – Wyżyna Lubelska (Lublin Upland), Wzniesienia Urzędowskie (Urzędów Hills): Urzędów town, *Carpinus betulus*, 1975, leg. Z. Flisińska (UMCS). **FE-90** – Wyżyna Kielecka (Kielce Upland), Wyżyna Sandomierska (Sandomierz Upland): Żyznów near Klimontów village, forest section No. 72, *Acer pseudoplatanus*, 1984, leg. S. Cieśliński & Z. Torborowicz (KTC). **FF-89** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze

Dynowskie (Dynowskie Foothills): Holubla Stream, *Fraxinus excelsior*, September 27, 1983, leg. J. Kiszka & J. Piórecki (KRAM-L 60065). **FG-08** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): valley of Holubla Stream, *Fraxinus* sp., 27 September, 1983, leg. J. Kiszka & J. Piórecki (KRAM-L 30502). **FG-18** – Pogórze Środkowobeskidzkie (Central Beskidian Foothills), Pogórze Przemyskie (Przemysł Foothills): crest of Chwaniów Mount, *Acer pseudoplatanus*, June 3, 1987, leg. J. Piórecki (BDAP). **FG-19** – Beskidy Lesiste Mountains, Góry Sanocko-Turczańskie (Sanok-Turka Mountains): Jamna Gora village, forest No. 2292, *Acer pseudoplatanus*, July 27, 1984, Leg. J. Kiszka & J. Piórecki (KRAM-L 60068). **FG-59** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Nasiczne village, *Fagus sylvatica*, July 30, 1959, leg. K. Glanc (KRAM-L 39396); Pszczeliny village, *Abies alba*, July 29, 1959, leg. K. Glanc (KRAM-L 39387). **FG-68** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Puszcza Bukowa (Beech Forest), by Wielki Lutowy Stream, *Fagus sylvatica*, August 18, 1958, leg. K. Glanc (KRAM-L 39377); *Fagus sylvatica*, August 23, 1957, leg. Z. Tobolewski, (POZ); *Abies alba*, August 28, 1957, leg. K. Glanc (KRAM-L 39374). **GB-10** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Wigry National Park, ca. 2 km of Mikołajewo village, *Pinus* sp., September, 1984, leg. K. Toborowicz (UGDA-L 4068). **GB-30** – Pojezierze Wschodniosuwalskie (East Suwałki Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), forest section Nos. 51, 24, *Fraxinus* sp., September 13, 1989, leg. S. Cieśliński & Z. Tobolewski (KTC). **GB-31** – Pojezierze Litewskie (Lithuanian Lake District), Równina Augustowska (Augustów Plain): Puszcza Augustowska (Augustów Primeval Forest), Starożyn Nature Reserve, *Carpinus betulus*, July 15, 1965, leg. J. Zielińska (WA). **GB-32** – Pojezierze Wschodniosuwalskie, Równina Augustowska (Augustów Plain): ca. 2 km S of Gruszki village, forest section No. 94, *Fraxinus excelsior*, 13 September, 1989, leg. S. Cieśliński & Z. Tobolewski (KTC). **GB-40** – Nizina Północnopodlaska (North Podlachian Lowland), Kotlina Biebrzańska (Biebrza Basin): Puszcza Augustowska (Augustów Primeval Forest), forest section No. 51, Łozy Forest District, *Fraxinus excelsior*, September 13, 1989, leg. S. Cieśliński & Z. Tobolewski (KTC). **GB-91** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland), Puszcza Knyszyńska (Knyszyn Forest), ca. 1 km NWW of Machnacz village, forest section No. 130, *Carpinus betulus*, September 1997, leg. K. Glanc, Z. Tobolewski & M. Murati (KTC); *Quercus* sp., September 8, 1987, leg. Z. Tobolewski & K. Glanc (KTC); Brzozowy Gród Nature Reserve, *Carpinus betulus*, 1981, leg. Małyżko (LBL). **GB-92** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Białostocka (Białystok Highland): Puszcza Knyszyńska (Knyszyn Forest), Budzisk Nature Reserve, *Fraxinus excelsior*, August 5, 1994, leg. S. Cieśliński (KTC); *Carpinus betulus*, August 5, 1994, leg. S. Cieśliński (KTC); *Carpinus betulus*, 1980, leg. J. Bystrek (LBL); *Tilia cordata*, May 13, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology); *Carpinus betulus*, *Acer* sp., October 21, 1993, leg. K. Kolanko (University of Białystok, Institute of Biology); *Acer* sp., (LBL); *Carpinus betulus*, leg. J. Rydzak (LBL); forest area 1, *Fraxinus excelsior*, June 11, 1999, leg. S. Cieśliński (BILAS 5918). **GC-53** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Hajnówka Forest District, forest section No. 474, 2003, leg. S. Cieśliński (KTC); forest section No. 360b, *Fraxinus excelsior*, 1983, leg. S. Cieśliński (KTC); forest section No. 247b, *Carpinus betulus*, 1983, leg. S. Cieśliński (KTC); forest section No. 359d, *Fraxinus excelsior*, 1983, leg. S. Cieśliński (KTC); forest section No. 663d, *Carpinus betulus*, 1983, leg. S. Cieśliński (KTC); Zwierzyniec Forest District, forest section No. 392b (plot 133), *Fraxinus*

excelsior, 1982, leg. S. Cieśliński (KTC); *Fraxinus excelsior*, August 22, 1965, leg. J. Rydzak (LBL). **GC-55** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Białowieża National Park, *Fraxinus excelsior*, September 14, 1953, August 7, 1954, leg. J. Rydzak (UMCS); *Carpinus betulus*, August 5, 1954, leg. J. Rydzak (UMCS); *Acer pseudoplatanus*, July 31, 1963, leg. J. Rydzak (UMCS); forest section No. 314, *Betula* sp., September 15, 1953, leg. J. Rydzak (UMCS); forest section No. 399, *Carpinus betulus*, September 8, 1953, leg. J. Rydzak (UMCS); forest section No. 314, near Orłówka Stream, *Fraxinus excelsior*, October 28, 2003, leg. K. Czyżewska (LOD-L 11834); forest section No. 256, *Tilia cordata*, June 16, 1988, leg. S. Cieśliński (LOD-L 777), leg. S. Cieśliński & K. Czyżewska (KTC); June 15, 1988, leg. S. Cieśliński & K. Czyżewska (KTC); October 12, 1988, October 18, 1989, October 19, 1989, leg. S. Cieśliński (KTC); *Carpinus betulus*, June 17, 1988, leg. S. Cieśliński (KTC); *Carpinus betulus*, October 16, 1989, leg. S. Cieśliński (KTC); *Fraxinus* sp., October 15, 1988, September 16, 1989, October 17, 1989, October 18, 1989, leg. S. Cieśliński (KTC); *Acer platanoides*, October 18, 1989, leg. S. Cieśliński (KTC); forest section No. 398a/d, leg. S. Cieśliński (KTC); *Carpinus betulus*, May 2014, leg. M. Kukwa 12679, 13805, 12819, 12759, A. Łubek (UGDA-L 20295, 20382, 20350, 21481); August 2014, leg. M. Kukwa 13958, A. Łubek (UGDA-L 21579); May 2015, leg. M. Kukwa 15672, A. Łubek (UGDA-L 22251); *Fraxinus excelsior*, May 2014, leg. M. Kukwa 12690, A. Łubek (UGDA-L 20302); October 2014, leg. M. Kukwa 13061, A. Łubek (UGDA-L 20571). **GC-65** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Puszcza Białowieża (Białowieża Primeval Forest), Browsk Forest District, *Carpinus betulus*, September 13, 1964, leg. J. Rydzak 224 (UMCS); Browsk Forest District, (plot 162), *Fraxinus excelsior*, 1983, leg. S. Cieśliński (KTC); forest section No. 101b (plot 217), *Fraxinus* sp., 1983, leg. S. Cieśliński (KTC); forest section No. 160d, leg. S. Cieśliński (KTC); Białowieża Forest District, forest section No. 474, *Carpinus betulus*, 1981, leg. S. Cieśliński & Z. Tobolewski (KTC). **GC-66** – Nizina Północnopodlaska (North Podlachian Lowland), Równina Bielska (Bielsk Plain): Białowieża National Park, forest section No. 340a, 2002, leg. P. Czarnota (GPN 2955). **GC-91** – Nizina Północnopodlaska (North Podlachian Lowland), Wysoczyzna Drohiczyńska (Drohiczyn Highland): Nurzec village, *Carpinus betulus*, May 7, 1993, leg. S. Cieśliński (KTC). **GD-01** – Wysoczyzny Podlasko-Białoruskie (Podlachian-Belarusian Highlands), Wysoczyzna Drohiczyńska (Drohiczyn Highland): forest between Adamowo and Złotorka villages, *Fraxinus* sp., May 1, 1987, May 11, 1987, leg. S. Cieśliński & Z. Tobolewski (KTC). **GE-91** – Roztocze, Central Roztocze: near Kosobudy village, *Fagus sylvatica*, 1962, leg. J. Bystrek (UMCS). **GG-71** – Beskidy Lesiste Mountains, West Bieszczady Mountains: Bieszczady National Park, Sianki village, forest section No. 78i, *Acer* sp., June 19, 2002, leg. P. Czarnota (GPN 2860).

Additional material examined. **AUSTRIA:** ca. 6 km N of Kaprun, *Carpinus betulus*, April 1, 2005, leg. A. Wieczorek (herb. Wieczorek). **BELARUS:** Gomel Region, Zhitkovichi District, Pripyatsky National Park, Ozerany Forestry, 28 q., 52°01' N, 27°56' E, in ash forest, on *Fraxinus excelsior*, June 23, 1971, leg. O. Shakhrai 01489 (GSU). **CZECH REPUBLIC:** Moravia, N of Rychtářov village, Ne of Ošlouch Mount, Vápenný žleb valley, *Carpinus betulus*, April 21, 2007, leg. M. Kukwa 5546a (UGDA-L 15037). **DENMARK:** Bornholm, Dondalen, forest, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); Ekkodalen, *Carpinus betulus*, July 5, 2014, leg. A. Wieczorek & A. Łysko (herb. Wieczorek); South Jutland, Hoptrup, near Haderslev, *Carpinus*, September 11, 1969, leg. M. S. Christiansen (herb.

Seaward). **GERMANY:** Oldenburg, An *Fraxinus* bei Helle, No. 711, leg. H. Sandstede (WA); Mecklenburg-Vorpommern, Vorpommern-Rügen, Vordarß, Ahrenshooper Holz, northern part, alt. 2 m, September 8, 2013, leg. U. Schiefelbein 3580 (herb. Schiefelbein); Landkreis Müritztal, Wäldchen W Troja, ca. 0.2 km W of Troja, *Acer platanoides*, November 1, 2002, leg. U. Schiefelbein 1186 (herb. Schiefelbein); Landkreis Ostvorpommern, ca. 0.3 km W of Mümmelkensee, *Quercus* sp., December 3, 2002, leg. U. Schiefelbein 1317 (herb. Schiefelbein); Kreis Uecker-Randow, ca. 1 km N of Rödershorst, Eichenwald auf entwässertem Moor, *Quercus petraea*, May 20, 1999, leg. U. Schiefelbein 293 (herb. Schiefelbein); An glattrindigen Eschen in der Neehagen unweit Helle bei Zwischenahn in Oldenburg, 1890, leg. H. Sandstede (herb. Seaward). **LITHUANIA:** Kėdainių raj., Gelnų miškas, Labūnavos g-ja, 112 kvartalas, 10 sklypas, *Quercus robur*, June 10, 2008, leg. D. Stončius 9525 (BILAS); Nemuno kilpų regioninis parkas, Alytaus raj., Punios šilas, 17 kvartalas, 19 sklypas, *Fraxinus excelsior*, August 9, 2006, leg. J. Motiejūnaite 7682 (BILAS); 42 kvartalas, 17 sklypas, *Carpinus betulus*, August 10, 2006, leg. J. Motiejūnaite 7683 (BILAS); Radviliškio raj., Baisogalos g-ja, 83 kvartalas, *Fraxinus excelsior*, September 30, 2013, leg. V. Stukonis 10512 (BILAS); Aukštelkų g-ja, 62 kvartalas, 2 sklypas, *Fraxinus excelsior*, September 21, 2013, leg. V. Stukonis 10447 (BILAS). **NORWAY:** Stryn, forest, *Abies alba*, August 28, 1995, leg. A. Wieczorek (herb. Wieczorek). **RUSSIA:** Tula Province, Shchyokinsky District, museum Yasnaya Polana, section Afonina Grove, *Betula* sp., August 1, 2001, leg. A. V. Gudovicheva 1247 (KPABGI). **SWEDEN:** Ostergötland, Sund, *Pinus* sp., August 27, 1987, leg. E. Koziol (WRSL).

Exsiccata seen. Migula, Kryptogamae, Germaniae, Austriae et Helvetiae Exs. No. 1 (KRAM).