

The lichen genus *Ochrolechia* in Poland II. Sorediate taxa with variolaric acid

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Abstract: KUKWA, M. 2008. The lichen genus *Ochrolechia* in Poland II. Sorediate taxa with variolaric acid. – *Herzogia* 21: 5–24.

The taxonomy, chemistry, morphology, habitat requirements and distribution of *Ochrolechia alboflavescens*, *O. microstictoides* and *O. turneri* in Poland are detailed. Notes on several type collections are provided. New substances with unknown structure provisionally called ‘microstictoides unknowns’ are characterized. They appear to be related to variolaric acid. Alecoronic acid is reported from apothecia of *O. turneri* for the first time. It is also discovered in the cortex of apothecia of *Ochrolechia* spp. for the first time. Its occurrence in soralia of *O. turneri* is also discussed. *O. alboflavescens* is reported for the first time for Montenegro. Notes on the related species, *O. azorica*, *O. dalmatica*, *O. gowardii* and *O. pseudopallescens*, are also provided.

Zusammenfassung: KUKWA, M. 2008. Die Flechtengattung *Ochrolechia* in Polen II. Sorediöse Taxa mit Variolarsäure. – *Herzogia* 21: 5–24.

Taxonomie, Flechtenstoffe, Morphologie, Standortsansprüche und Verbreitung von *Ochrolechia alboflavescens*, *O. microstictoides* und *O. turneri* in Polen werden dargestellt. Anmerkungen zu den Typusaufsammlungen von verschiedenen Namen werden gegeben. Neue Flechtenstoffe mit unbekannter Struktur und dem provisorischen Namen „Microstictoides unknowns“ werden charakterisiert. Diese scheinen mit Variolarsäure verwandt zu sein. Alecoronsäure wird erstmals in den Apothecien und in der Apothecienrinde von *O. turneri* nachgewiesen. Das Vorkommen dieses Flechtenstoffes in den Soralen von *O. turneri* wird auch diskutiert. *O. alboflavescens* wird erstmals von Montenegro gemeldet. Die verwandten Arten *O. azorica*, *O. dalmatica*, *O. gowardii* und *O. pseudopallescens* werden kurz behandelt.

Key words: Lichen taxonomy, chemotaxonomy, new lichen substances, Ochrolechiaceae, Pertusariales, lichenized Ascomycota.

Introduction

The lichen genus *Ochrolechia* A.Massal. (Ochrolechiaceae, Pertusariales, Ascomycota; see SCHMITT et al. 2006) can be divided into four morphologically, anatomically and chemically well-characterized entities. In her monograph, VERSEGHY (1962) recognized them as sections called *Tartareae*, *Parellae*, *Harmandii* and *Upsalienses*; her fifth group, *Geminiparae* with *P. geminipara* (Th.Fr.) Knight ex Brodo now belongs to *Pertusaria* s.l. (see BRODO 1991). BRODO (1991) agreed with her concept of infrageneric division, but used some other characters to discriminate them, preferring to call them: *tartarea-*, *parella-*, *africana-* and *upsaliensis-* groups, respectively. In the light of recent molecular studies, it seems that none of them is monophyletic (see SCHMITT & LUMBSCH 2004).

All those groups are mainly characterized by chemical and morphological data. The *tartarea-* group is characterized by the presence of gyrophoric acid in the cortex and disc, the rare oc-

currence of variolaric acid, and mainly epruinose apothecia. Members of the *parella*-group contain variolaric acid in the cortex, gyrophoric acid in the apothecial disc (in some species also in the soralia) and commonly the presence of lichesterinic acid. The *upsaliensis*-group is similar, but do not produce gyrophoric and lichesterinic acids. The tropical to subtropical *africana*-group has usually a C+ red apothecial medulla and possesses *o*-methylhiassic acid (BRODO 1991). Taxa of all those groups can produce soredia, some producing them only occasionally, but in some species their presence appears to be permanent (see e.g. BRODO 1991, MESSUTTI & LUMBSCH 2000).

There are only six sorediate *Ochrolechia* species in Poland, and these belong to the *tartarea*- and *parella*-groups, each with 3 taxa (see NOWAK & TOBOLEWSKI 1975, BRODO 1991). Some taxa of the former group have already been treated by JABŁOŃSKA & KUKWA (2007). In this, the second paper in a series dealing with the revision of *Ochrolechia* in Poland, sorediate members of the *parella*-group are treated in detail. Its main aim is to present the results of studies on their taxonomy, chemistry, morphology, habitat requirements and distribution of sorediate taxa, together with records from elsewhere. Type collections and several additional specimens of the group have been studied for comparison.

Material and methods

Material studied, including types, are housed in the following herbaria: B, BG, BM, BSG, CANB, E, GPN, GZU, H, KRA, KRAM, KTC, LBL, LOD, OLTC, OLS, POZ, SLTC, TU, UCR, UGDA, WA, WRSL and the private herbaria of Kukwa, Palice, Schiefelbein, Seaward and Szczepańska. As some samples of treated *Ochrolechia* species were found under *Pertusaria albescens* (Huds.) M.Choisy & Werner, some material stored under that name was also studied.

Specimens were studied for morphological, anatomical and chemical characters. Chemical analyses were performed by TLC (in solvents A, B or B' and C) according to the methods of ORANGE et al. (2001). Samples of each taxon were sent to Prof. J. A. Elix (Canberra) who confirmed the identification of substances. Spot-test reactions with C and KC were applied to different parts of the thallus to determine the location of gyrophoric, variolaric and alectoronic acids. The following characters were examined under the stereoscopic microscope: thickness, morphology and colour of thallus, colour, shape and size of soralia and apothecia.

The general distribution of the taxa is based mainly on the literature. However, many specimens from several countries were also examined. If the record for the country is corroborated also with at least one specimen, the country is marked with an asterisk (*). Other records, especially those of HANKO et al. (1986), are considered as highly reliable, if not otherwise stated.

All Polish localities of examined material are mapped according to the ATPOL grid square system (ZAJĄC 1978, modified by CIEŚLIŃSKI & FAŁTYNOWICZ 1993; see also KUKWA et al. 2002, KUKWA 2004, 2005 and JABŁOŃSKA & KUKWA 2007). The following abbreviations in the chapters with localities are used: fs – forest section(s); NP – National Park; NR – nature reserve.

Results

According to FAŁTYNOWICZ (2003), three species were reported from Poland, *O. alboflavescens* (Wulfen) Zahlbr., *O. microstictoides* Räsänen and *O. turneri* (Sm.) Hasselrot. These were also found during my research, but many misidentified specimens appeared in the studied material. Thus, the distribution and frequency data are different from those previously reported.

O. dalmatica (Erichsen) Boqueras (as *Pertusaria dalmatica* Erichsen) was also reported from Poland (RYDZAK 1961), but it was excluded from the list by CIEŚLIŃSKI (2003) as doubtfully occurring in Poland (see also FAŁTYNOWICZ 2003). The material cited by RYDZAK (1961) has not been seen, but to my knowledge the occurrence of *O. dalmatica* in Poland is very unlikely.

O. dalmatica has never been included in the *parella*-group before, but according to criteria of BRODO (1991) it matches the group very well. Only BOQUERAS et al. (1999) compared the species with *O. gowardii* Brodo, the other member of the group, but they never directly linked *O. dalmatica* to the *parella*-group. Both taxa have C+ red soralia and produce the same substances, but they differ morphologically very significantly. *O. dalmatica* produces a thick, areolate and folded thallus with C+ yellow cortex, irregular and crowded soralia and large, rather lightly pruinose apothecia (based on the only fertile specimen observed), but *O. gowardii* has a very thin, membranous and C– thallus with rather scattered and smaller, coarsely pruinose apothecia (BRODO 1991, BOQUERAS et al. 1999); they also have different distributions: according to my studies, *O. dalmatica* is known only from the Mediterranean region, whereas *O. gowardii* is found in western North America (BRODO 1991) and northern Europe in Norway and Sweden (JONSSON 2002, SANTESSON et al. 2004). Although both of these taxa do not occur in Poland, reference specimens of them are cited below.

During studies of the chemistry, new substances related to variolaric acid were discovered. They were found in all taxa treated here and in other *Ochrolechia* species containing variolaric acid. These substances are tentatively called ‘microstictoides unknowns’ since they were first detected in *O. microstictoides*, the best known and the commonest taxon in this group. The substances have the following characteristics: Rf classes A4(4–5), B3, C3(3–4) and A5, B4–5, C5; usually not visible in short UV wave, but observable if in high concentration; ice-blue in long UV wave before charring, usually not visible after reaction with sulphuric acid, but sometimes, if highly concentrated, a faint ice-blue colour was observed. Usually both those substances were observed in each samples (very rarely a third substance was observed on plates developed in solvent B in Rf class B2–3), but sometimes only one or neither were detected, most probably due to their presence in low concentrations, especially when only a small piece of the thallus was taken for TLC. Usually the lower spot had stronger and more intensive colour, but in few specimens the substance with a higher position was more concentrated. The positions of all substances on the TLC plates are shown on Fig. 1.

Alectoronic acid was also found for the first time in apothecia of *O. turneri*; where it is produced in the margin cortex. Previously it had only been reported from the thallus of *O. turneri* (TØNSBERG 1992) and from the margin medulla, e.g. in *O. parella* (L.) A.Massal., *O. pallescens* (L.) A.Massal. or *O. subplicans* (Nyl.) Brodo s.lat. (see HANKO et al. 1986, BRODO 1988, BOQUERAS et al. 1999; also author’s own observations). Alectoronic acid has also been found in the margin cortex of *O. szatalaensis* Verseghy (Kukwa, in prep.).

Specimens of *Ochrolechia dalmatica* examined (selected): Greece. Crete, Levka Ori, just W of Agii Theodori, c. 3 km SW of Omalos, alt. 1050–1100 m, 35°20’N/23°51’W, on *Pinus brutia*, 10.05.2004, T. Spribille 13325 (B, fertile). **Montenegro.** Petrovac distr., in montibus Rumija, secus viam inter Petrovac et Bukovik, alt. 900 m, on *Quercus* sp., 15.07.1968, A. Vězda, Vězda, Lich. Sel. Exs. 708 (sub *Pertusaria dalmatica*, B–37019). **Spain.** Prov. Barcelona, Sierra de Montseny, NE der Passhöhe des Coll Formic, 1200 m, on *Quercus pubescens*, 28.05.1983, J. Hafellner 17349 (GZU).

Specimens of *Ochrolechia gowardii* examined (selected): Canada. Newfoundland-Québec border, Central Labrador, Knob Lake area, Irony Mountain, subalpine, on twigs of *Picea glauca*, 01.09.1948, I. Hustich (H). **Norway.** Nordland, Rana, Dunderlandsdalen, NW-facing slope SW of Lian, alt. 220–300 m, on *Picea abies*, 16.06.1992, H. Holien 5163 (BG-L–15343).

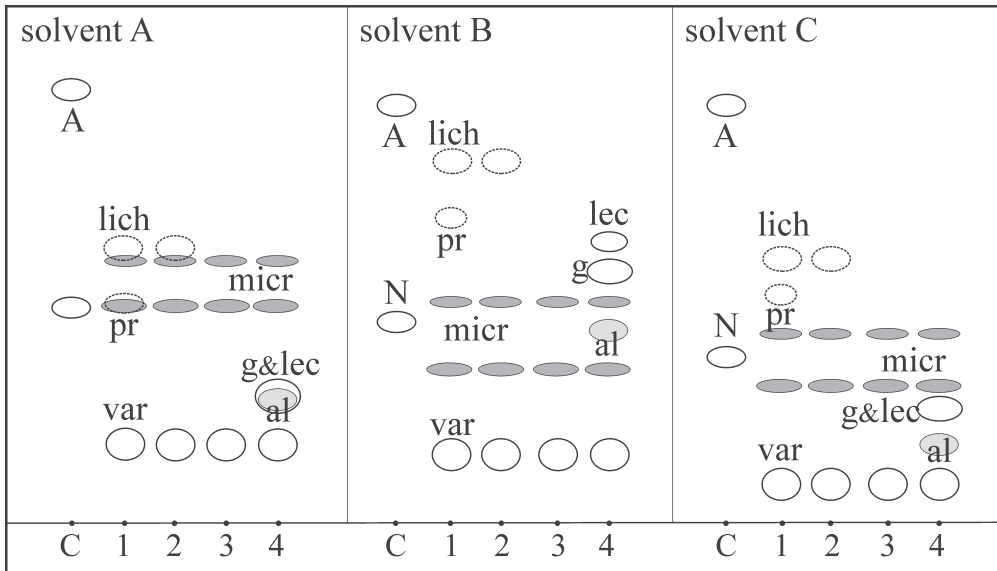


Fig. 1: Lichen substances found in the thallus of *Ochrolechia alboflavescens* (1), *O. microstictoides* (2) and thallus (3) and apothecia (4) of *O. turneri* (C – control, *Cladonia symphylicarpia*); substances: A – atranorin, al – alectoronic acid, g – gyrophoric acid, lec – lecanoric acid, lich – lichesterinic acid, micr – ‘microstictoides unknowns’, N – norstictic acid, pr – prolichesterinic acid, var – variolaric acid.

***Ochrolechia alboflavescens* (Wulfen) Zahlbr.**

Verh. Zool.-Bot. Ges. Wien **76**: 94 (1927). – *Lichen alboflavescens* Wulfen, in Jacquin, Coll. Bot. **III**: 111 (1789). – *Lecanora parella* var. *alboflavescens* (Wulfen) Rabenh., Rabenh. Krypt.-Fl. **2**: 35 (1845). – *Lecanora tartarea* var. *alboflavescens* (Wulfen) Flot., Jahresber. Schles. Ges. Vaterl. Cult. **27**: 132 (1849). – *Lecanora pallescens* var. *alboflavescens* (Wulfen) Schaer., Enum. Critic. Lich. Europ.: 79 (1850). – *Ochrolechia tartarea* var. *alboflavescens* (Wulfen) A.Massal., Ricerch. Auton. Lich.: 31 (1852). – *Ochrolechia parella* var. *alboflavescens* (Wulfen) Arnold, Flora **65**: 79 (1882). – *Ochrolechia pallescens* var. *alboflavescens* (Wulfen) Dalla Torre & Sarnth., Die Flechten von Tirol: 316 (1908).

Type: In *Quercu Robore* sylvarum Hasbergensium inveni (not typified, see comments below).

= *Ochrolechia alboflavescens* f. *subfarinosa* Verseghy, Ann. Hist.-nat. Mus. Nat. Hung. **7**: 297 (1956).

Type: Russia, Karelia ladogensis, Hiitala, Kyljärvi, Valtinmäki, on *Juniperus communis*, 17.10.1931, V. Räsänen (H – holotype).

= *Ochrolechia parella* f. *papillata* Räsänen, Ann. Bot. Soc. Zool.-Bot. Fenn. ‘Vanamo’ **12**: 61 (1939). – *O. papillata* (Räsänen) Verseghy, Ann. Hist.-nat. Mus. Nat. Hung. **7**: 294 (1956).

Type: Russia, Karelia ladogensis, Hiitala, Kyljärvi, Valtinmäki, on *Juniperus communis*, 17.10.1931, V. Räsänen (H – lectotype; see HANKO et al. 1986: 173).

= *Pertusaria decipiens* Erichsen, Rev. Mycol, (Paris) Nov. Ser. **3**: 110 (1938).

Type: Switzerland, Cant. Bern, Aletsch National Reserve, 1750 m, on *Sorbus aucuparia*, 1935, E. Frey (HBG – holotype, not seen; see ALMBORN 1955).

Exsiccates examined: Arnold, Lich. Exs. Lich. Jur. 140b (sub *Ochrolechia pallescens* f. *corticola*, B-32191, WRSL). Arnold, Lich. Exs. Lich. Jur. 140c (sub *O. pallescens* f. *corticola*, BM, B-32190, H, KRAM-L-4658, WRSL). Baglietto, Cesati & de Notaris, Erb. Critt. Ital. 671 (sub *O. parella* WRSL). Britzelmayr, Lich. Bav. Exs. 895 (sub *O. pallescens*, BM). Claudel, Claudel & Harmand, Lich. Gall. 550 (sub *Lecanora (Ochrolechia) parella*, B-31988, BM). Obermayer, Lichenoth. Graec. 142 (E, H). Poelt, Pl. Graec. Lich. 1 (B-31997, H). Poelt, Pl. Graec. Lich. 40 (B-31994). Poelt, Lich. Alp. 11 (B-31986, H). Räsänen, Lichenoth. Fenn. 174 (B-31991, H). Räsänen, Lichenoth. Fenn. 394 (B-31989, H). Schaerer, Lich. Helv. Exs. Ed. I 318 (E, WRSL). Vězda, Lich. Sel. Exs. 240 (H). Zahlbruckner, Krypt. Exs. 1664 (B-31995, H – two specimens).

Description: Thallus thin or thick, variable in morphology, even, folded and/or cracked to verruculose, sometimes tuberculate, ± flat at the edge of the thallus, whitish-grey, grey, pale straw, yellow-grey to brown-grey; prothallus not clearly visible; soralia usually common, but scattered in richly fertile specimens, usually well-delimited, rounded or rarely irregular, convex or crateriform and then with a distinct thalline rime, concolorous with the thallus in grey samples, but evidently brighter and white in specimens with straw or yellow coloured thalli, very rarely with beige tinge (as in the type of *O. alboflavescens* f. *subfarinosa*); in some specimens a few soralia were almost completely fused into a sorediate crust, but boundaries between them were still preserved; soredia granular, never similar to isidia; apothecia rather common, up to 3 mm in diam., thalline margin even or rarely flexuose, epruinose, esorediate or rarely partly sorediate, salmon discoid tissues not observed; disc brownish, sometimes scabrid, lightly or heavily pruinose, pruina farinose to granular; algae present in margin in ± continuous layer or almost absent, or absent; algae in irregular groups or forming a continuous layer below hypothecium (sometimes all states observed in one specimen); spores 2–4 in ascus, thin-walled, 25–57 × (10–)20–38 µm. The above description is based on Polish as well as foreign material. For descriptions see also BRODO (1991), SCHREINER & HAFELLNER (1992), TØNSBERG (1992) and BOQUERAS et al. (1999).

Chemistry: The species produces variolaric acid (major), sometimes with the same unknown metabolite as described by TØNSBERG (1992) in minor to trace amounts, lichesterinic (major) and protolichesterinic (submajor) acids and very rarely atranorin (minor to trace amounts). In almost all cases variolaric acid was accompanied by 1 or 2 unknown metabolites, called here ‘microstictoides unknowns’.

When the samples are fertile, gyrophoric acid (major to minor) with lecanoric acid (minor to trace amounts) are produced in epihyemium. When those two substances are highly concentrated, they can be accompanied by the same pigments as described in *O. androgyna* s.lat. and *O. arborea* by JABŁOŃSKA & KUKWA (2007).

In general, HANKO et al. (1986), SCHREINER & HAFELLNER (1992), BRODO (1991), TØNSBERG (1992) and BOQUERAS et al. (1999) reported the same substances, but HANKO et al. (1986) did not find protolichesterinic acid in all specimens and in traces only, whereas BRODO (1991) detected one or both of the fatty acids, lichesterinic and protolichesterinic acids. Several specimens in B and H (cited by HANKO et al. 1986) have been examined, and protolichesterinic acid has been detected in all of them; perhaps this substance was not detected previously due to the used of limited fragments for TLC. Interestingly, in the morphologically typical specimen of *O. alboflavescens* from Montenegro (Vitikainen 7153, H, see additional specimens cited below), only lichesterinic acid was detected. No specimens investigated by BRODO (1991) were revised.

The thalline cortex, apothecial margin cortex and soredia always react C+ yellow due to the presence of variolaric acid, whereas all part of the medulla are C–. The apothecial pruina is C+ yellow or C–. It is difficult to explain this phenomenon, but it seems that sometimes the pruina

do not contain variolaric acid. The epithecium gives a C+ red reaction as it contains gyrophoric and lecanoric acids.

Notes: *Ochrolechia alboflavescens* is one of the oldest names in the genus. It was described and illustrated by Wulfen and published in JACQUIN's book (1789), but it has not been typified. The original Wulfen's collection may exist in Natural History Museum of Vienna (W). If the specimen is lost, then the colour illustration in Jacquin's book should be selected as the lectotype; however, before the typification, the collection in W should be searched for the Wulfen's material.

The illustration in Jacquin's book shows the crustose lichen with grey-brownish, areolate thallus and lecanoroid apothecia with an orange-brown disc. No parts of the thallus resemble soralia, the characteristic feature of *O. alboflavescens*, but sometimes the soralia are very sparse or even absent in some specimens (as in some collections from Poland and Finland, see below). Thus, the illustration can represent an esorediate morph of *O. alboflavescens* with lightly pruinose, and therefore distinctly brown, discs.

The type of *O. parella* f. *papillata* has a thallus with numerous and crowded papillae. Similar specimens are known from Poland (Augustowska Forest, leg. S. Cieśliński & Z. Tobolewski, KTC) and Switzerland (leg. V. J. Grummann, B-32199). Originally these papillae were thought to be pycnidia, but closer examination of sections proved that they were very young apothecia. The inside part reacted C+ red and gyrophoric acid was detected by TLC. No fertile specimen of *O. alboflavescens* was found with so many mature apothecia, thus the discussed specimens seem to be an abnormal form with a high number of immature ascomata.

The type of *O. alboflavescens* f. *subfarinosa* is represented by a specimen with numerous, but nevertheless well separated soralia and whitish convex areoles on a rather typical thallus.

Among specimens examined for this study, five specimens from Białowieża Forest were labeled *O. pallescens*. Soralia were not developed at all or they were very scattered at the edge of thalli; therefore, using only morphological characters, the samples could have been easily classified as *O. pallescens*. Both taxa can be easily differentiated chemically, as *O. alboflavescens* contains lichesterinic and protolichesterinic acids, but *O. pallescens* does not possess any fatty acids or the murolic acid complex is produced (BRODO 1991, TØNSBERG 1992, BOQUERAS et al. 1999).

Esorediate specimens could be classified as *O. pseudopallescens* Brodo, an esorediate, North American taxon with the same chemistry (BRODO 1991). A similar poorly to non-sorediate collection from Finland (1863, leg. Norrlin, H, see under additional specimens examined) has been noted; in the same envelope there were two pieces of bark, one with a sparingly sorediate thallus and with large, flexuose apothecia, and the other with smaller regular apothecia and no soralia. It is preferred to include all these in *O. alboflavescens*, rather than in *O. pseudopallescens*, since intermediate forms exist between non-sorediate and typical specimens in several examined collections. BRODO (1991) considered *O. alboflavescens* and *O. pseudopallescens* as a possible species pair with the latter as the primary taxon. This may be true, but they differ at least in the number of spores per ascus: *O. alboflavescens* produces 4 spores (rarely up to 8, see BOQUERAS et al. 1999), whereas *O. pseudopallescens* has 8 (see BRODO 1991) – perhaps these two taxa are not closely related? The sorediate counterpart of *O. pseudopallescens* may be represented by specimens with a morphology and chemistry as *O. pseudopallescens*, but with C+ red soralia (BRODO 1991) (soralia in *O. alboflavescens* are C+ yellow). Only molecular studies can solve this problem.

O. alboflavescens can be mistaken for *O. microstictoides* and *O. turneri*. Both are quite similar in terms of morphology and chemistry. *O. microstictoides* usually produces only lichesterinic acid, but sometimes both fatty acids can be present, and can be separated by its numerous rather irregular and soon confluent soralia (at least in central part of the thallus) and usually thinner thallus (soralia delimited and thallus thicker in *O. alboflavescens*), which is never so yellowish as it is usually found in *O. alboflavescens*. *O. turneri* has delimited soralia, and because of that, about three-quarters of specimens of *O. alboflavescens* from NE Poland were determined as *O. turneri*. However, *O. turneri* differs in having smaller soralia and in the absence of fatty acids. *O. alboflavescens* and *O. microstictoides* grow on acidic bark, but *O. turneri* prefers more eutrophic substrata (see TØNSBERG 1992 and under those species below).

Another similar species, *O. azorica* Purvis, P. James & Brodo, also contains variolaric, lichesterinic and protolichesterinic acids with gyrophoric acid present only in the epithecium. However, it differs in its very thin, even thallus, smaller apothecia with an epruinose or sparingly white-pruinose disc. To date, *O. azorica* is known only from the Azores (PURVIS et al. 1994).

Habitat requirements: *O. alboflavescens* prefers acidic and oligotrophic bark of birch and coniferous trees. It is also found on some neutral and eutrophic substrata, but at least in case of *Acer platanoides*, it was found in polluted areas in the Karkonosze Mts. The frequency on different substrata is as follows: *Betula* spp. (24), *Pinus sylvestris* (9), *Picea abies* (7), *Acer platanoides* (2), *Alnus glutinosa* (2) and *Fraxinus excelsior* (1).

A very similar observation is provided by TØNSBERG (1992), but in Norway it was more frequent on *Pinus sylvestris* and *Picea abies* than on birches. In the eastern part of the Alps it is found on a very similar spectrum of phorophytes as in Poland, but not on birch (SCHREINER & HAFELLNER 1992). In Estonia and Spain it is reported as being exclusively on coniferous trees (BOQUERAS et al. 1999, RANDLANE & SAAG 1999).

Distribution: *O. alboflavescens* is a rare lichen in Poland (Fig. 2). Most of the localities are situated in the north-eastern part of the country and only few are known from the mountains. Most probably it is under-recorded in southern Poland, but this hypothesis needs more field studies in the Carpathians and Sudety Mts. Its known Polish distribution suggests that it may be a boreal-mountain species in Poland.

To date it has been reported mostly from Europe, where it is known from Austria* (HANKO et al. 1986, SCHREINER & HAFELLNER 1992, HAFELLNER & TÜRK 2001), Bulgaria (MAYRHOFER et al. 2005), Czech Republic (VĚZDA & LIŠKA 1999), Estonia* (RANDLANE & SAAG 1999), Finland* (VERSEGHY 1956, HANKO et al. 1986, SANTESSON et al. 2004), France* (HANKO et al. 1986), Germany* (HANKO et al. 1986, SCHOLZ 2000), Italy* (HANKO et al. 1986, NIMIS 2003), Norway* (TØNSBERG 1992, SANTESSON et al. 2004), Romania (VERSEGHY 1956, FEUERER 2007), Russia* (HANKO et al. 1986), Slovakia* (PIŠŮT et al. 1996, BIELCZYK et al. 2004), Slovenia (MAYRHOFER et al. 1996), Spain* (BOQUERAS et al. 1999, LLIMONA & HLADUN 2001), Sweden* (ALMBORN 1952, SANTESSON et al. 2004) and Switzerland* (VERSEGHY 1956, HANKO et al. 1986, FEUERER 2007). Here it is reported for the first time for Montenegro. It has also been reported from Africa (Morocco) (BURGAZ et al. 2002) and Asia (Mongolia*) (FEUERER 2007; see also under additional specimens examined). Probably it is more frequent in Asia, especially in taiga, but other collections from there have not been examined. *O. alboflavescens* was reported from Greece by SZATALA (1943), but that record may belong to *O. dalmatica*, and HOWARD (1970) reported it from North America, but BRODO (1991) doubted if those records were correct.

Number of specimens examined – 45

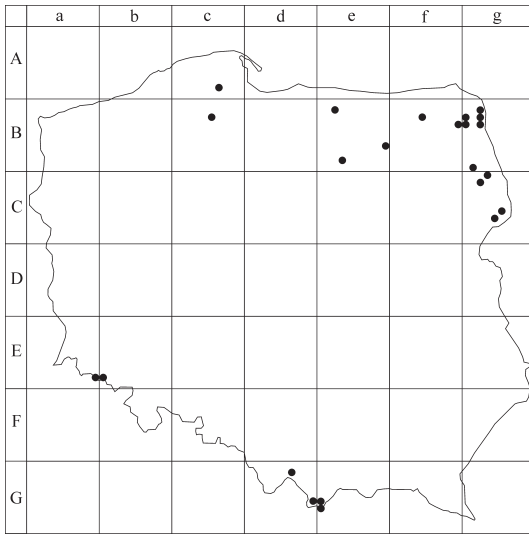


Fig. 2: Distribution of *Ochrolechia alboflavescens* in Poland based on ATPOL grid square system.

fs 663, between Giby and Zelwa villages, on *Betula* sp., 12.09.1986, S. Cieśliński (KRAM-L-31962); [**Bg-20**] – Augustowska Forest, fs no. 244, between Tobolewo to Suche Doly villages, on *Betula pendula*, 20.09.1986, S. Cieśliński (KRAM-L-31936); by the road between Suche Doly and Strzelcowizna villages, fs no. 269, on *Betula pendula*, 20.09.1986, S. Cieśliński, Z. Tobolewski (KTC); [**Bg-22**] – Augustowska Forest, fs no. 1056, N of Głębokie Lake, on *Betula* sp., 29.08.1995, S. Cieśliński (KTC); fs. No. 1042, on *Betula* sp., 29.08.1995, S. Cieśliński (KTC); fs no. 1014, on *Picea abies*, 29.08.1995, S. Cieśliński (KTC); [**Bg-30**] – Augustowska Forest, fs nos 210-211, by the road between Plaska and Hruskie villages, on *Betula* sp., 22.09.1986, S. Cieśliński, Z. Tobolewski (KTC); vicinity of Mały Borek, on *Pinus sylvestris*, 02.11.1958, K. Glanc (KRAM-L-35821); 1.5 km S of Serwy village, on *Pinus sylvestris*, 28.08.1995, S. Cieśliński (KTC); fs no. 147, on *Betula* sp., 29.08.1995, S. Cieśliński (KTC); [**Bg-32**] – Augustowska Forest, fs 198-199, c. 2 km S of Mały Borek forester's lodge, on *Pinus sylvestris*, 17.09.1986, S. Cieśliński, Z. Tobolewski (KTC); [**Bg-91**] – Karczmiszko NR, on *Alnus glutinosa*, 1991, S. Cieśliński (KTC); [**Cg-03**] – 1.5 km SW of Grodzisk village, on *Alnus glutinosa*, 04.08.1994, S. Cieśliński (KTC); [**Cg-22**] – 5 km NE of Folwark Male village, on *Betula* sp., 28.06.1991, S. Cieśliński (KTC); [**Cg-55**] – Białowieża NP, fs no. 256, on *Betula* sp., 16.10.1988, S. Cieśliński, K. Czyżewska (KTC), 17.10.1989 & 20.10.1987, S. Cieśliński (KTC), 18.10.1988, S. Cieśliński (KTC), 17.06.1988, K. Glanc (KTC, LOD-L-9029) & 16.10.1988, S. Cieśliński, K. Czyżewska (KTC); at the junction of fs nos 127D, 128C, 157B and 158A, on *Betula pendula*, 1984, S. Cieśliński, Z. Tobolewski (KTC); [**Cg-64**] – Białowieża Primeval Forest, fs no. 570B, on *Betula* sp., 1984, S. Cieśliński, Z. Tobolewski (KTC); [**Ea-89**] – Karkonoski NP, Rówienka point, by the road to Pielgrzymy rocks, 50°46'26"N/15°42'55"E, on *Acer platanoides*, 03.05.2007, M. Kukwa 5556 (UGDA); [**Eb-80**] – Karkonosze Mts, Karpacz town, 50°46'17"N/15°45'46"E, alt. 610 m, on *Acer platanoides*, 02.05.2007, M. Kukwa 5555 (UGDA); Karkonoski NP, Czarna Kopa Mt. (orig. Schwarze Koppe), on *Pinus* sp., 30.04.1864, B. Stein (WRSL); [**Gd-16**] – below Hala Mędralowa pass, on *Picea abies*, 11.09.1964, J. Nowak (KRAM-L-14992 & 16501); [**Gd-59**] – Dolina Lejowa valley, Polana Biały glade, 49°17'02.4"N, 19°50'48.3"E, on *Picea abies*, 17.07.2004, L. Śliwa 3282 (KRAM); Dolina Kościeliska valley, on *Picea abies*, 06.08.1957, T. Sulma (UGDA-L-12757); [**Ge-50**] – Tatra NP, near Małe Ciche village, Brzanówka glade, 49°17'22.6"N/20°05'21.0"E, on *Fraxinus excelsior*, 24.07.2004, L. Śliwa 3384 (KRAM). [**Ge-60**] – Tatra NP, Zabie Mt., on *Picea abies*, 06.08.1924 & 12.08.1929, J. Motyka (LBL).

Additional selected specimens examined (96 specimens): **Austria.** Tirol, Ötztal, W of Sölden, near Obiswald, alt. 1800 m, on *Larix* sp., 10.06.1975, H. Sipman 7561 (B). **Estonia.** Jõgeramaa County, Endla Nature Reserve, Männikjärve Bog, 58°52'21"N/26°14'56"E, on *Pinus sylvestris*, 22.08.2004, P. Czarnota 3965 (GPN). **Finland.** V. Vihty, Moksjärvi, Konianvuori, on *Pinus sylvestris*, 07.07.1969, O. Vitikainen 5618 (H). **France.** Claudel, Claudel & Harmand, Lich. Gall. 550 (sub. *Lecanora (Ochrolechia) parella*, B-31988, BM). **Germany.** Schwarzwald, Feldberg, 07.07.1958, V. J. Grummann (B-31984). **Mongolia.** Hangay Mts, range Hanhöhiy, Uvs aimak, somon Tsagaan Hayrhaan, Öndör-Hangay, 49°N/95°E, on *Larix sibirica*, 07-08.07.1976 L. G. Biazrov 2228 & 2402 (H).

Specimens examined: [**Ac-86**] – Stanisławskie Błoto NR, between fs nos 209/210, on *Pinus sylvestris*, 07.07.1983, W. Fałtynowicz (UGDA-L-10051, BG, CANB); ibidem, fs no. 210d, on *Betula* sp., 07.07.1983, W. Fałtynowicz (UGDA-L-1866); Kurze Grzędy NR, on *Betula* sp., 15.06.1982, W. Fałtynowicz (UGDA-L-1773); ibidem, fs no. 102f, by the smaller lake called Bule Oko, on *Betula pubescens*, 26.05.2005, M. Kukwa 4129 (UGDA); [**Af-86**] – Dziki Kąt NR, on *Betula* sp. and *Pinus sylvestris*, 14 & 15.05.1985, S. Cieśliński, Z. Tobolewski (KTC); [**Bc-25**] – by Debrzyno Lake, near Wąglikowice village, on *Pinus sylvestris*, 14.11.1976, W. Fałtynowicz (UGDA-L-3265); [**Be-12**] – c. 4 km NWW of Łaniewo village, on *Pinus sylvestris*, 11.05.1989, S. Cieśliński (KTC); [**Be-69**] – Piska Forest, fs no. 17, by the road between Karwica, Mazurska and Krzyże villages, on *Betula* sp., 03.09.1987, S. Cieśliński (KTC); [**Be-83**] – 3.5 km SSW of Wikno village, by the road to Nidzica town, on *Betula* sp., 18.05.1989, S. Cieśliński (KTC); [**Bf-24**] – N of Sajzy village, on *Betula pendula*, 10.06.1980, J. Zielińska (WA 22); [**Bf-39**] – c. 2.5 km N of Przewież village, fs no. 44, on *Pinus sylvestris*, 19.09.1986, leg. S. Cieśliński (KTC); [**Bg-12**] – Augustowska Forest,

Montenegro. 40 km NNE of Nikšić, Žabljak, Mt Durmitor near Crno Jezero, alt. 1600 m, *Pinus mugo* zone just above *Fagus* forest, on *Pinus sylvestris*, 17.06.1971, O. Vitikainen 7153 (H). **Norway.** Aust-Agder, Bykle, between State Road 12 and hill Ægråsen, UTM: 32V, ML 0987, alt. 660–690 m, on *Pinus sylvestris*, 26.07.1987, T. Tønberg 10136 (BM-dupl.). **Russia.** Karelia (transonegensis), Pudozh District, Vodlozero National Park, NE shore of Lake Vodlozero, along Tonda River, alt. 140–160 m, on *Pinus sylvestris*, 22.06.1991, T. Ahti 50087 (H). **Slovakia.** Muránska planina plateau, nature reserve Poludnica, 48°45'18"N/20°02'56"E, alt. 570 m, on *Quercus* sp., 26.10.2001, A. Guttová, Z. Palice 5686 (herb. Palice). **Spain.** Larra, on wood, s.dat., J. Etayo 1633 (E). **Sweden.** Jämtland, Åre, c. 4 km S of Enafors, near Silverfallet, alt. 650 m, on *Picea abies*, 14.08.1975, T. Ahti 30321 (H). **Switzerland.** Engadin, Chünetta b. Pontresina, 2000 m, on bark of conifer, 08.1912, G. Lettau (B). Wendernalp, c. 1850 m, Waldgrenze, on *Picea abies*, 20.07.1929, V. J. Grummann (B–32199).

Specimen of *O. azorica* examined: **Azores.** NW slopes of Pico, c. 3 km S of road EN3 through Cerrado de Sonicas, S of tracks leading to aerial, alt. c. 1000–1150 m, on decorticated *Erica arborea*, 11.04.1992, O. W. Purvis, P. W. James (BM – holotype).

Specimen of *O. pseudopallescens* examined (selected): **U.S.A.** New Hampshire, Coos County, White Mts National Forest, Great Gulf Wilderness Area, around Great Gulf Trail and W. Peabody River, elev. 2300 ft., along river and river with black spruce, some balsam fir and rocks, on black spruce, 09.07.1988, C. M. Wetmore 61787 (GZU).

Ochrolechia microstictoides Räsänen

Lich. Fenn. Exs. No. 226 (1936).

Type: Finland, Ostrobothnia borealis, Simo, Simonkyläe, Pahnilankangas, on *Juniperus communis*, 15.07.1936, V. Räsänen (H, Räsänen, Lich. Fenn. Exs. 226 – lectotype; see HANKO et al. 1986: 181; BM, BM ex K, H (3 duplicates) as Räsänen, Lich. Fenn. Exs. 226, H (2 specimens, one fertile) – isotypes); ibidem, 02.06.1931, V. Räsänen (H – topotype); ibidem, 10.06.1946, V. Räsänen (B–32100 & 32102, as Räsänen, Lichenoth. Fenn. 107, H – topotypes).

= *Pertusaria jurana* var. *grisea* Erichsen, Feddes Repert. **41**: 100 (1936).

Type: Germany, Schleswig-Holstein, Krs. Pinneberg, Karstenfeld bei Wedel, 08.03.1936, C. F. E. Erichsen (KIEL–4580 – holotype, not seen; see HANKO et al. 1986; B–32096 – isotype).

= *Pertusaria silvatica* H.Magn., Bot. Not. **1942**: 16 (1942). – *P. leprarioides* var. *silvatica* (H.Magn) Almb., Bot. Not. **1942**: 397 (1942).

Type: Sweden, H. Magnusson 17890 (UPS – holotype, not seen; see TØNSBERG 1992).

= *Ochrolechia turneri* auct. non. (Sm.) Hasselrot (see LAUNDON 1963)

= *Pertusaria leprarioides* auct. non Erichsen (see SANTESSON et al. 2004)

Exsiccates examined: Hansen & Christensen, Lich. Dan. Exs. 35 (B–101771, KRAM-L– 44536, UGDA). Räsänen, Lich. Fenn. Exs. 226 (BM, H, type collections of *O. microstictoides*). Räsänen, Lichenoth. Fenn. 107 (B–32100 & 32102, topotypes of *O. microstictoides*). Vězda, Lich. Sel. Exs. 1113 (H).

Description: Thallus very thin to thick, ± even, folded and/or cracked to distinctly tuberculate, ± flat at the edge of the thallus, whitish-grey, grey, rarely with pale yellowish tinge; prothallus whitish; soralia usually very common, white-grey or grey, rarely with pale yellowish tinge, varies in shape and size, irregular, at the very beginning delimited, but soon becoming confluent, and commonly forming a ± leprose crust in the central part of the thallus; soralia whitish to white-grey, usually brighter than the thallus, formed from the cracks of the thallus, on the top of tuberculae or the thallus surface disintegrating into soralia; rarely soralia separated and scattered over the thallus, but always irregular in shape; soredia granular, in some cases resembling soredioid isidia, especially when areoles start to form soralia; apothecia rare, not seen in Polish material, up to c. 2 mm in diam.; margin even to rugose in lower part, epruinose, esorediate or partly to entirely sorediate; salmon discoid tissues usually clearly visible as a thin or thick and

distinct ring around the disc, or barely visible; disc flesh coloured to brown, smooth or rarely rugose, not pruinose or pruina indistinct; algae present in margin layer, absent or forming a continuous layer below hypothecium; spores thin-walled, $48\text{--}52 \times 17\text{--}25 \mu\text{m}$ [BOQUERAS et al. (1999) report relatively shorter, but wider spores, $30\text{--}40 \times 18\text{--}33 \mu\text{m}$]. The above description is based on Polish as well as on foreign material. For other descriptions see SCHREINER & HAFELLNER (1992), TØNSBERG (1992) and BOQUERAS et al. (1999).

Chemistry: The species produces variolaric acid (major), usually with an unknown substance reported by TØNSBERG (1992) in minor to trace amounts, lichesterinic acid (major), in few specimens also protolichesterinic acid (submajor) and in most specimens one to two 'microstictoides unknowns'. Very rarely atranorin was detected (minor to trace amounts).

In fertile specimens (not observed in Polish material), usually only a few apothecia were developed; thus the chemical results for apothecia were based only on a few analyses. In addition to the substances detected in the thallus, apothecia also contained gyrophoric acid, accompanied in one sample by lecanoric acid and pigments described by JABŁOŃSKA & KUKWA (2007). In general, the chemistry agrees with that reported by HANKO et al. (1986), SCHREINER & HAFELLNER (1992) and TØNSBERG (1992).

The thalline cortex, apothecial margin cortex and soredia always react C+ yellow due to the presence of variolaric acid, whereas all parts of the medulla react C-. Sometimes the reaction is very faint, and the thallus may not react at the edge. The apothecial pruina were not tested in all specimens, but seems to be C-. Epithecium gives a C+ red reaction as it contains gyrophoric acid.

Notes: *O. microstictoides* is very variable in terms of morphology. Some specimens from the bark of pine have very thin, even and almost endophloedic thalli, but when it grows, for example, on beech, the thallus can be much thicker, folded and with very distinct tuberculae. A spectrum of intermediates exists between those two forms, but the characters uniting all these forms are the more or less irregular and confluent soralia and the production of lichesterinic acid (typically without protolichesterinic acid). A similar variation was also observed by SCHREINER & HAFELLNER (1992).

In the past, *O. microstictoides* was included in a very broad sense within *O. turneri* (LAUNDON 1963), but both taxa are very distinct; the former has more or less diffuse soralia and produces variolaric and lichesterinic acids, but *O. turneri* is characterized by its usually discrete and regular soralia and it contains no fatty acids (see also TØNSBERG 1992).

In Polish material, many samples of *O. microstictoides* were found to be labelled as *Pertusaria leprarioides* Erichsen, which is a synonym of *P. albescens* (see HANKO et al. 1986); however, as the description provided by NOWAK & TOBOLEWSKI (1975) matched *O. microstictoides* and no other alternative name was present in the key, the name *P. leprarioides* was commonly used for samples with confluent soralia and a grey thallus. The description of ascomata of *P. leprarioides* did not match *O. microstictoides*, but there was no fertile material of *O. microstictoides* in Polish collections.

In some herbaria all samples called '*P. leprarioides*' were found to be united with *P. albescens*. FAŁTYNOWICZ (1993) treated *P. leprarioides* sensu Erichsen as a synonym of *O. microstictoides*, but a year later it was treated as a synonym of *P. albescens* (FAŁTYNOWICZ & SUMA 1994); in the next checklist it was corrected and *P. leprarioides* sensu auct. was given as a synonym of *O. microstictoides* (FAŁTYNOWICZ 2003). Most probably after the revision of all material of *P. albescens*, several additional records of it may belong to *O. microstictoides*.

Some morphs of *O. microstictoides* can be mistaken for *O. alboflavescens* (for the differences see under *O. alboflavescens*). It can also be confused with *Phlyctis argena* (Ach.) Flot. Both taxa have a very similar thallus appearance, but the latter produces norstictic acid and thus the thallus reacts K⁺ red (orange needle crystals are formed in the squash preparation of the thallus); furthermore, *P. argena* usually grows on more eutrophic substrata, exceptionally on coniferous trees (see TØNSBERG 1992).

Habitat requirements: *O. microstictoides* is found mainly on the bark of deciduous trees, but mostly those with acidic bark. It is also found on wood, and outside Poland also on rocks (Britain, leg. Coppins 4000, Gilbert, Purvis, E). The frequency on different substrata in Poland is as follows: *Betula* spp. (34), *Quercus robur* and *Q. petraea* (28), *Fagus sylvatica* (23), *Alnus glutinosa* (12), *Acer pseudoplatanus* (10), *Sorbus aucuparia* (10), *Fraxinus excelsior* (8), *Pinus sylvestris* (8), *Tilia cordata* (8), *Quercus rubra* (5), wood (5), *Acer platanoides* (4), *Picea abies* (4), *Carpinus betulus* (3), deciduous tree (2), *Ulmus* sp. (2), *Abies alba* (1), *Aesculus hippocastanum* (1) and twigs of *Pinus mugo* (1).

The species was reported from similar habitats in Norway by TØNSBERG (1992) and in the Alps by SCHREINER & HAFELLNER (1992), but, compared with Poland, it was collected more often on coniferous trees. BOQUERAS et al. (1999) found it on coniferous trees, oaks and *Castanea sativa*.

Distribution: *O. microstictoides* is unevenly distributed in Poland, with most of the localities situated in Gdańsk Pomerania (Fig. 3); however, it should be noted that T. Sulma worked there for a very long time and made many local collections. The presence of some scattered localities in other regions suggests that it is also common elsewhere.

To date, the species has been reported mostly from Europe, where it is known from Austria (SCHREINER & HAFELLNER 1992, HAFELLNER & TÜRK 2001), Belgium (DIEDERICH & SÉRUSIAUX 2000), Czech Republic* (VĚZDA & LIŠKA 1999), Denmark* (SØCHTING & ALSTRUP 2002), Estonia* (RANDLANE & SAAG 1999), France* (SCHREINER & HAFELLNER 1992), Finland* (VERSEGHY 1956, HANKO et al. 1986, SANTESSON et al. 2004), Germany* (VERSEGHY 1956, HANKO et al. 1986, SCHOLZ 2000), Greece (CHRISTENSEN 1994a), Italy (NIMIS 2003), Lithuania (MOTIEJŪNAITĖ 1999), Luxembourg (DIEDERICH & SÉRUSIAUX 2000), Netherlands* (SPIER & VAN HERK 1999, APTROOT et al. 2004), Norway* (TØNSBERG 1992, SANTESSON et al. 2004), Portugal (FEUERER 2007), Romania (PIȘŪT 1995), Russia (HANKO et al. 1986), Slovakia (PIȘŪT et al. 1996, BIELCZYK et al. 2004), Slovenia (MAYRHOFER et al. 1996), Spain (BOQUERAS et al. 1999, LLIMONA & HLADUN 2001), Sweden* (ALMBORN 1952, HANKO et al. 1986, SANTESSON et al. 2004), Switzerland (FEUERER 2007), Ukraine (KONDRATYUK et al. 2003) and United Kingdom* (HANKO et al. 1986, COPPINS 2002). Outside Europe it has only been reported from Turkey (BREUSS & JOHN 2004).

Number of specimens examined – 170

Specimens examined (selected): [Ab–32] – E of Świnoujście town, by the road to Karsibór village, 53°53'40"N/14°18'54"E, on *Acer pseudoplatanus*, 30.09.1955, Z. Tobolewski (POZ); [Ac–35] – Szklana Huta koło Choczewa, on *Fagus sylvatica*, 13.09.1957, T. Sulma (UGDA-L–14251); [Ac–36] – vicinity of Wierzchucino village, 53°32'40"N/18°06'44"E, on *Acer platanoides*, 10.1952, Z. Tobolewski (POZ); [Ac–43] – Słowiński NP, c. 1 km N of Rąbka, on *Quercus robur*, 24.10.1999, M. Kukwa (UGDA-L–9331) & on *Pinus sylvestris*, 24.10.1999, A. Zalewska (OLS); [Ac–52] – Słowiński NP, Izbićkie Bagno NR, 54°39'57"N/17°25'09"E, on *Fraxinus excelsior*, 28.09.1967, Z. Tobolewski (POZ); [Ac–58] – Stoborowe Lake, near Wejherowo town, on *Pinus sylvestris*, 18.09.1998, M. Kukwa (herb. Kukwa 276); [Ac–61] – Damnica village near Słupska town, 1.5 km on SE, on *Betula pendula*, 20.11.1987, W. Fałtynowicz (UGDA-L–3564, CANB, KRAM-L–21804); [Ac–66] – c. 3.5 km of SSE of Strzebielino Morskie, 54°32'55"N/18°01'26"E, on *Sorbus aucuparia*, 04.08.2004, M. Kukwa 3410 (UGDA-L–10973); [Ac–74] – c. 0.5 km

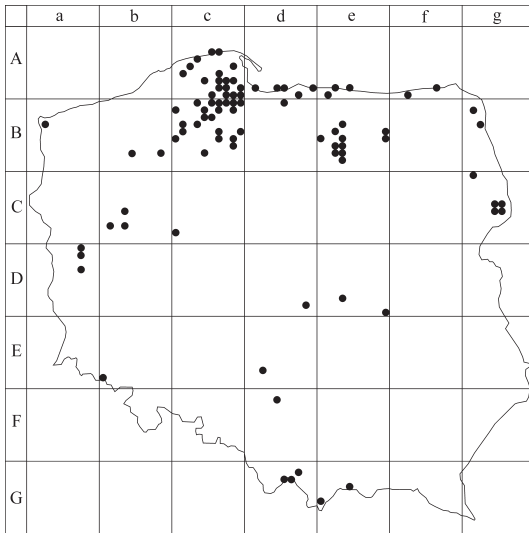


Fig. 3: Distribution of *Ochrolechia microstictoides* in Poland based on ATPOL grid square system.

16.03.1991, B. Sagin (UGDA-L-12536); [Ad-81] – Wyspa Sobieszewska Island, Gdańsk Sobieszewo town, 54°20'52"N/18°49'35"E, on *Betula pendula*, 06.05.2006, M. Kukwa 5073 (UGDA); [Ad-84] – Kały Rybackie village, fs no. 33/88, on *Pinus sylvestris*, 13.01.1983, E. Budzbon (UGDA-L-2230, UCR); [Ad-85] – Krynica Morska town, on *Pinus sylvestris*, 16.05.1982, E. Budzbon (UGDA-L-2228); [Ad-89] – c. 1 km SE of Wola Lipowska village, by the road to Piotrowice village, on *Acer platanoides*, 27.08.1993, S. Cieśliński (KTC); [Ad-97] – Wysoki Bór forest district, on *Fagus sylvatica*, 19.07.1957, T. Sulma (UGDA-L-13619); [Ae-82] – Dzikowo Hłowieckie village, 54°20'01"N/20°24'11"E, on *Betula* sp., 08.05.1989, S. Cieśliński (KTC); [Ae-84] – forest inspectorate Mała Wola, 3.5 km SW of Bezledy village, 54°19'09"N/20°42'48"E, on *Quercus* sp., 05.05.1989, S. Cieśliński (KTC); [Ae-91] – c. 0.5 km S of Skarbiec village, 54°18'11"N/20°17'32"E, on *Betula* sp., 09.05.1989, S. Cieśliński (KTC); [Af-86] – Puszcza Romincka, by Bludzia river, on *Quercus* sp. and *Betula* sp., 15.05.1985 & 14.05.1985, S. Cieśliński, Z. Tobolewski (KTC); [Af-92] – Lasy Skaliskie, fs no. 207/184, on *Pinus sylvestris*, 18.05.1987, S. Cieśliński (KTC); [Bb-74] – W of Czaplnek, S of Kocury village, on *Fagus sylvatica*, 08.07.2007, P. Czarnota (UGDA-L-14246); [Bb-79] – near Lędyczek village, 53°32'N/16°57'E, on *Betula* sp., 22.10.1065, Z. Tobolewski (POZ); [Bc-03] – vicinity of Pomysk village, 54°12'59"N/17°33'14"E, on deciduous tree, 08.10.1955, T. Sulma (UGDA-L-13999); [Bc-06] – 1 km E of Węsiory village, 54°13'56"N/17°51'26"E, on *Tilia cordata*, 21.09.1973, Z. Tobolewski (POZ); [Bc-07] – Wieżyca hill, c. 0.5 km NE of Szymbark village, on *Fagus sylvatica*, 23.05.1974, Z. Tobolewski (POZ); [Bc-08] – Przywidz village, on *Fagus sylvatica*, 26.09.1959, T. Sulma (UGDA-L-9659 & 14252); [Bc-10] – Stara Karczma Wojanowo village, on *Fagus sylvatica*, 12.10.1960, T. Sulma (UGDA-L-14247); [Bc-14] – c. 2 km SSE of Czarna Dąbrowa village, 54°07'03"N/17°38'17"E, on *Sorbus aucuparia*, 08.08.1974, Z. Tobolewski (POZ); [Bc-16] – Strzelnica NR, on *Quercus* sp., 16.05.1972, Z. Tobolewski (POZ); [Bc-18] – c. 1.5 km NE of Sucha Huta village, on *Fagus sylvatica*, 17.05.1973, Z. Tobolewski (POZ); [Bc-24] – 2.5 km N of Dziemiiany village, on *Tilia cordata*, 27.03.1973, Z. Tobolewski (POZ); [Bc-25] – Węsków Bagna glądle, 54°02'N/17°52'E, on *Quercus robur*, 12.09.2002, A. Kowalewska (UGDA-L-7769); [Bc-31] – Bagno Biel near Lipczynek village, on *Betula pendula*, 11.07.1987, W. Fałtynowicz, J. Miądlkowska (UGDA-L-3459; KRAM-L-21773); [Bc-33] – fs no. 122g, between Łaska village and Zmarłe Lake, 53°55'41"N/17°30'35"E, on *Fagus sylvatica*, 28.03.1975, W. Fałtynowicz (UGDA-L-1059); [Bc-41] – Pojezierze Krajeńskie, c. 0.5 km SW of Pakotulsko village, on *Betula pendula*, 04.08.1999, A. Winkowska (UGDA-L-9258); [Bc-46] – NW of Czersk town, Malachin gamekeeper's cottage, 53°48'53"N/17°57'19"E, on *Aesculus hippocastanum*, 16.06.1969, W. Sodikiewicz (POZ); [Bc-49] – Bojanowo village near Skórcz town, on *Fagus sylvatica*, 18.07.1970, T. Sulma (UGDA-L-2984); [Bc-50] – 1.5 km from Przechlewo village to Rzecznicza village, on *Betula pendula*, 03.08.1999, A. Winkowska (UGDA-L-12749); [Bc-56] – Czersk town, Łąkowa street, 53°47'20"N/17°57'56"E, on *Fraxinus excelsior*, 15.09.1968, s.coll. (POZ); [Bc-58] – c. 0.75 km SW of Łuby village, 53°42'N/18°22'E, on *Quercus* sp., 14.07.2003, M. Kukwa 1999 (UGDA); [Bc-68] – between Błędno and Stara Rzeką villages, 53°39'52"N/18°19'58"E, on wood, 06.07.2004, M. Kukwa 3380 (UGDA-L-11281); [Bc-74] – Lubnia vil-

S of Małoszyn village, 54°27'N/17°44'E, on *Betula* sp., 15.06.1973, Z. Tobolewski (POZ); [Ac-76] – c. 1 km SW of Pobłocie village, 54°27'52"N/18°03'40"E, on *Fraxinus excelsior*, 16.05.1973, Z. Tobolewski (POZ); [Ac-77] – c. 0.1 km N of Lebno village, 54°27'57"N/18°08'24"E, on *Fraxinus excelsior*, 28.03.1973, Z. Tobolewski (POZ); [Ac-78] – c. 2 km NW of Koleczkowo village, 54°30'01"N/18°19'44"E, on *Ulmus* sp., 28.03.1973, Z. Tobolewski (POZ); [Ac-86] – Staniszewskie Błoto NR, fs nos 209/210, on *Pinus sylvestris*, 07.07.1983, W. Fałtynowicz (UGDA-L-9823); [Ac-87] – Łapalicevillage, 54°20'52"N/18°09'52"E, on *Acer platanoides*, 26.05.2005, M. Kukwa 4115 (UGDA); [Ac-95] – 3 km E of Sulęcyno village, on *Fraxinus excelsior*, 21.09.1973, Z. Tobolewski (POZ); [Ac-97] – Gołubie village, on *Fagus sylvatica*, 07.09.1963, T. Sulma (UGDA-L-14255); [Ac-98] – 2 km NE of Dierzążno, by Karlikowskie Lake, 54°19'17"N/18°18'17"E, on *Tilia cordata*, 28.09.1972, Z. Tobolewski (POZ); [Ac-99] – c. 2.5 km SE of Skrzeszewo Żukowskie village, 54°16'25"N/18°22'24"E, on *Fagus sylvatica*, 18.04.1973, Z. Tobolewski (POZ); [Ad-70] – Kępa Redłowska NR, fs no. 18, 54°29'54"N/18°33'17"E, on *Quercus* sp.,

lage, 53°55'N/17°45'E, on *Sorbus aucuparia*, 15.06.1960, J. Nowak (KRAM-L-8566); [**Bd-06**] – forest near Dąbrowa village, on *Betula pendula*, 20.08.1954, T. Sulma (UGDA-L-13629); [**Be-33**] – c. 3 km SW of Gady village, on *Carpinus betulus*, 11.05.1989, S. Cieśliński (KTC); [**Be-42**] – Olsztyn city, Redykajny NR, on *Alnus glutinosa* and wood, 14.05.2000, D. Kubiak (OLTC); [**Be-49**] – Lipowo village, 53°46'30"N/21°26'40"E, on wood, 07.1999, D. Kubiak (OLTC); [**Be-50**] – Łęguty village, by Pasłęka river, on *Betula* sp., 18.07.1988, S. Cieśliński (KTC); [**Be-53**] – Mazuchy village, on *Pinus sylvestris*, 07.05.1974, J. Nowak (KRAM-L-31579); [**Be-59**] – Puszcza Piska forest, fs 203, 3 km E of Nowa Uka village, pine forest, on *Alnus glutinosa*, 02.09.1987, S. Cieśliński, Z. Tobolewski (KTC); [**Be-62**] – Olsztyn city, Las Warmiński NR, 53°40'34"N/20°30'15"E, on *Alnus glutinosa* and *Quercus robur*, 06.06.2006 & 07.2005, D. Kubiak (OLTC); [**Be-63**] – Nowe Ramuki, fs 111/171, on *Quercus robur*, 2006, D. Kubiak (OLTC); [**Be-72**] – Nowe Ramuki, Lalka split, 53°35'32"N/20°30'06"E, on *Quercus rubra*, 2005, D. Kubiak (OLTC); [**Be-73**] – Czarny Piec settlement, on *Quercus robur*, 2006, D. Kubiak (OLTC); [**Be-83**] – c. 3.5 km SSW of Wikno village, 53°29'03"N/20°32'13"E, on *Betula* sp., 12.05.1989, S. Cieśliński (KTC); [**Bf-51**] – W sides of Seksty and Kaczerajno lakes, 53°41'07"N/21°46'10"E, on *Alnus glutinosa*, 10.05.1990, S. Cieśliński (KTC); [**Bg-11**] – Puszcza Augustowska forest, between fs nos 615 & 616, 54°01'53"N/23°21'19"E, on *Betula* sp., 12.09.1986, S. Cieśliński, Z. Tobolewski (KTC); [**Bg-32**] – fs no. 200, by the road between Czarny Bród and Hruskie villages, on *Alnus glutinosa*, 22.09.1986, S. Cieśliński (KTC); [**Cb-53**] – by the road near Miały village, 52°48'21"N/16°10'18"E, on *Acer pseudoplatanus*, 22.07.1954, Z. Tobolewski (POZ); [**Cb-71**] – by the road between Międzychód town and Sowia Góra village, 52°39'01"N/15°51'19"E, on roadside *Tilia cordata*, 04.09.1974, A. Kozłowska (POZ); [**Cb-73**] – by the road near Miały village, 52°48'21"N/16°10'18"E, on *Acer pseudoplatanus*, 22.07.1954, Z. Tobolewski (POZ); [**Cc-80**] – vicinity of Potasze village, on *Betula pendula*, 17.06.1961, K. Glanc (KRAM-L-38579); [**Cg-01**] – Podsupraśl village, on wood, 03.08.1994, S. Cieśliński (KTC); [**Cg-54**] – Białowieża Primeval Forest, at the junction of fs nos 127D, 128C, 157B and 158A, on *Betula* sp., 1983, S. Cieśliński, Z. Tobolewski (KTC); [**Cg-55**] – Białowieża Primeval Forest, at the junction of fs nos 127D, 128C, 157B and 158A, on *Betula pendula*, 1984, S. Cieśliński, Z. Tobolewski (BSG, KTC, specimen of *O. alboflavescens*); [**Cg-64**] – Topiło village, 52°38'12"N/23°37'24"E, on *Carpinus betulus*, 12.05.2006, M. Kukwa 5078 (UGDA); [**Cg-65**] – Białowieża Primeval Forest, fs no. 472C, on *Betula* sp., 1983, S. Cieśliński, Z. Tobolewski (KTC); [**Da-07**] – by the road from Łągów village to Pożrzadło village, 52°19'37"N/15°16'28"E, on *Quercus* sp., 30.08.1962, M. Janicka (POZ); [**Da-17**] – SW of Pożrzadło village, 52°17'20"N/15°14'14"E, on *Sorbus aucuparia*, 18.09.1961, M. Janicka (POZ); [**Da-37**] – Gryżyna river valley, on *Quercus* sp., 22.08.2005, K. Szczepańska (herb. Szczepańska); [**Dd-88**] – Łąznów Nature Reserve, fs. No. 33d, 51°40'N/19°46'E, on *Quercus robur*, 07.11.1996, K. Czyżewska (LOD-L-12192); [**De-73**] – Trębaczew NR, on *Quercus* sp., 28.04.1969, K. Czyżewska (LOD-L-255); [**De-99**] – Zagożdżon NR, on *Betula* sp., 2000, S. Cieśliński (KTC); [**Ea-78**] – Karkonosze Mts, Szklarska Poręba town, on *Fraxinus excelsior*, 27.05.1998, M. Ratajczak (LOD-L-10786); [**Eb-80**] – Karkonosze Mts, Karkonoski NP, Czarne Zbocze range by Sowia Pass, on *Sorbus aucuparia*, 03.05.2002, M. Kukwa 1533 (UGDA-L-6341); [**Ed-72**] – Kłobuck, 50°53'58"N/18°55'39"E, on *Alnus glutinosa*, 02.06.1964, J. Nowak (KRAM-L-34267 & 29972); [**Fb-14**] – Narożnik Mt., alt. 825 m, on *Acer pseudoplatanus*, 09.12.1979, M. R. D. Seaward, E. A. Bylińska (herb. Seaward 103843); [**Gd-17**] – Polica Mt., 1250 m, on *Sorbus aucuparia*, 24.06.1965, J. Nowak (KRAM-L-17184); [**Gd-25**] – Beskid Żywiecki Mts, Pilsko Mt., 1320 m, on *Picea abies*, 09.07.1974, U. Bielczyk (KRAM-L-42059); [**Gd-26**] – Babia Góra Mt., 1300 m, on *Picea abies*, 25.06.1974, U. Bielczyk (KRAM-L-42060); [**Ge-34**] – Beskid Sądecki Mts, Nad Kotelnicznym Potokiem NR, 960 m, on *Abies alba*, 31.08.1990, L. Śliwa (KRA); [**Ge-50**] – Tatry Wysokie, Hala Gąsienicowa, 1450 m, on twigs of *Pinus mugo*, 18.06.1998, U. Bielczyk (KRAM-L-44576).

Additional selected specimens examined (131 specimens): **Czech Republic.** W Bohemia, Krušné hory Mts, Přebuz, near ruined gamekeeper cottage, close to N margin of 'Velký močál' NR, 50°24'N/12°38'30"E, on *Sorbus aucuparia*, 20.10.1997, Z. Palice, P. Uhlik (herb. Palice). **Denmark.** Hansen & Christensen, Lich. Dan. Exs. 35 (B-101771, KRAM-L-44536, UGDA). **Estonia.** Jõgeramaa County, Endla NR, hiking trail, N of Lake Männikjärv, 58°52'N/26°14'E, on *Pinus sylvestris*, 22.08.2004, M. Kukwa 3441 (UGDA-L-10088). **Finland.** Varsinais-Suomi, Vihti, Irjala, Varemäki, 04.06.1964, T. Ahti 10241 (H). **France.** Dép. Vosges, La Bresse, near Lac des Corbeaux, alt. 800 m, on *Abies alba*, 26.06.1975, H. Sipman 7632 (B). Corsica, Distr., Calacuccia, Valdo Niello, prope domum saltuoriorum Popaja dictum, alt. 1100 m, on *Pinus* sp., 30.06.1969, A. Vězda (GZU, KRAM-L-22983). **Germany.** Mecklenburg-Vorpommern, Kreis Uecker-Randow, c. 3.5 km NE der ehemaligen Ortslage Jägerbrück, MTB 2350/4, einzelstehende Buche in einem jungen Kiefernforst, on *Fagus sylvatica*, 01.08.2001, U. Schiefelbein 724 (herb. Schiefelbein). **Netherlands.** Prov. Gelderland, W of Apeldoorn, old *Fagus-Quercus* forest on sand, on *Quercus robur*, 29.04.1973, H. Sipman 6047b (B). **Norway.** Troms, Skåland, SE of Breistrand, hil Gårdslettåsen, alt. 40–80 m, on *Betula pubescens*, 30.07.1982, T. Tønsgberg 7369 (E, ex BG). **Sweden.** Värmland, Karlskoga par., Lerängen, 59°22'N/14°35'E, alt. 100 m, on *Alnus incana*, 26.07.1981, L.-E. Muhr 4046 (E). **British Isles.** Scotland, East Sutherland (VC 107), W of Dornoch, Cuthill Links, alt. <10 m, on *Calluna vulgaris*, 10.08.1999, B. J. Coppins 18899, A. M. Coppins (E). Scotland, West Perth (VC 87), Clackmannan, c. 0.6 km E of Brucefield, Craigmad Wood, alt. 55 m, on *Quercus* sp., 11.06.1989, B. J. Coppins 13005 (E). Ireland, Tyrone (VC H36), c. 5 km E of Gortin, S side of Owenkilwey River, Drumlea Wood, on *Quercus* sp., s.dat., B. J. Coppins 14383, A. M. Coppins (E).

Ochrolechia turneri (Sm.) Hasselrot

Svensk Bot. Tidskr. **39**: 130 (1945). – *Lichen turneri* Sm., in Sm. & Sowerby, Engl. Bot. **12**: tab. 857 (1801). – *Parmelia turneri* (Sm.) Ach., Method. Lich.: 165 (1803). – *Lecanora turneri* (Sm.) Ach., Lichenogr. Univers.: 373 (1810). – *Rinodina turneri* (Sm.) Gray, Nat. Arr. Brit. Pl. (London) **1**: 454 (1821). – *Ochrolechia pallescens* var. *turneri* (Sm.) Körb., Syst. Lich. Germ.: 149 (1855). – *Lecanora parella* var. *turneri* (Sm.) Nyl., Mem. Soc. Nat. Sci. Cherbourg **5**: 113 (1857). – *Ochrolechia parella* var. *turneri* (Sm.) de Lesd., Recherch. Lich. Dunkerque: 185 (1910). – *O. alboflavescens* var. *turneri* (Sm.) Verseghy, Ann. Hist.-nat. Mus. Nat. Hung. **7**: 296 (1956). – *O. turneri* (Sm.) J.R.Laundon, London Naturalist **1957**: 76 (1957).

Type: United Kingdom, England, Norfolk, Coltishall, in a wood, on tree bark, s.datum, D. Turner (BM – holotype, with drawings for Engl. Bot.; H-ACH 1263A & 1263B – possible isotypes; see below).

= *Ochrolechia parella* var. *turneri* Arnold, Flora **65**: 135 (1882).

Type: United Kingdom, Ayton, Yorkshire, on bark, 06.1889, Herg. H. Piggot, Leighton, Lich. Brit. Exs. 237 (BM, E – isotypes).

= *Pertusaria henrici* Harm. ex Erichsen, Verh. Bot. Vereins Prov. Brandenburg **71**: 126 (1929).

Type: France, Briehambeau, 1898, Harmand, Lich. Lothar. 733b (M, W – syntypes, not seen; see HANKO et al. 1986: 193).

= *Pertusaria henrici* var. *pallescens* Erichsen, Rabenh. Krypt.-Fl. **9**: 677 (1936).

Type: Serbia, Kukuljasch by Rtany, 750 m, 1931, Zimmermann (HBG – lectotype, not seen; see HANKO et al. 1986: 193).

Exsiccates examined: Hansen & Christensen, Lich. Dan. Exs. 123 (B, GZU, KRAM-L-44097, UGDA). Leighton, Lich. Brit. Exs. 237 (BM, E, isotypes of *O. parella* var. *turneri*). Vězda, Lich. Sel. Exs. 688 (BM, H). Mudd, Lich. Brit. 127 (E).

Description: Thallus thin to thick, usually even, or cracked to distinctly tuberculate (in one specimen tuberculae similar to those of *O. androgyna* B sensu Tønberg 1992), ± flat at the edge of the thallus, whitish-grey or grey, rarely with pale to distinct brown tinge; prothallus if present clearly evident, thick, zonate, whitish to brownish-pink; soralia more or less plane, but sometimes convex, abundant, orbicular to irregular, usually discrete, and separated from each other, sometimes elongated and formed in the long cracks of the thallus or confluent in some specimens and forming a leprose crust in the centre of the thallus; rarely soralia are produced on the top of distinct tuberculae; soralia white-grey to grey, sometimes with brownish tinge, usually brighter than the thallus; apothecia (absent in Polish specimens, present, but usually rare in material from Western and Southern Europe), up to 2 mm in diam., regularly rounded or rarely irregular; thalline margin even or rarely flexuose, esorediate to entirely sorediate, salmon discoid tissues observed in non-sorediate parts of the margin, pruinose; disc flesh coloured, even or rugose, with white and dense farinose pruina; algae present in margin, absent or present below hypothecium; asci 8-spored, 52–64 × 25–32 μm according to BOQUERAS et al. (1999). The above description is based on Polish as well as foreign material. For other descriptions see SCHREINER & HAFELLNER (1992), TØNSBERG (1992) and BOQUERAS et al. (1999).

Chemistry: Analyses of the thallus showed that the species produces variolaric acid (major), rarely with the unknown substance as reported by TØNSBERG (1992) in minor to trace amounts, one or, usually, two ‘microstictoides unknowns’ in most specimens and traces of alecronic

acid in a few specimens (perhaps in soralia only). Very rarely a trace of atranorin is detected. In apothecia gyrophoric and lecanoric acids were detected in addition to the substances known from the thallus and, when present, alectoronic acid was sometimes accompanied by an unknown substance visible in Rf class 3 only on plates developed in solvent B (probably not separable from alectoronic acid in other solvents). In a very few specimens a trace of an unknown fatty acid with Rf classes A 3–4, B 1, C 2–3 was found; whether this was a natural substance or due to a contaminant or an artefact could not be confirmed by TLC analysis. Except for the accessory alectoronic acid, the chemistry agrees with that reported by HANKO et al. (1986) and TØNSBERG (1992).

To date, alectoronic acid has only been reported in *O. turneri* from the thallus (see TØNSBERG 1992), but never from the apothecia. When a spot-test-reaction with KC was applied to the sectioned apothecia it was found that alectoronic acid is produced only in the cortex of apothecia, a character not known in any other *Ochrolechia* species.

The outer part of the apothecial margin cortex and soredia always react C+ yellow due to the presence of variolaric acid. The thallus cortex usually does not react with C, or the reaction is very faint. The medulla in all parts is C-. The apothecial pruina in tested apothecia was always C-, whereas the epithecium gives a C+ red reaction as it contains gyrophoric acid. The inner part of the apothecial cortex margin reacted KC+ red when alectoronic acid was present. When a trace of the latter substance was detected in the analyzed thallus fragments, places beneath external soredia usually gave a faint red reaction with KC.

Notes: *Ochrolechia turneri* is quite variable in terms of the thallus and soralia development. Usually the thallus is thin, and soralia are discrete, but several specimens resembled *O. microstictoides* since the soralia were fused or irregularly developed in thallus fissures. Such forms were considered to be a new taxon, but several intermediate forms between these and those with typically developed soralia were subsequently found. In general, TLC is required for a certain determination of *O. turneri*.

The holotype of *O. turneri* in BM (stored together with drawings to Engl. Bot.; see also LAUNDON 1963) is a very small piece of bark covered with a thallus producing typical usually well delimited soralia and a few apothecia with a sorediate margin. As the specimen is small and the morphology perfectly matches the current concept of *O. turneri*, I did not remove any part of it for TLC. However, I did TLC a specimen designated by O. Almborn as the syntype, and variolaric acid together with ‘microstictoides unknowns’ were detected. According to the annotated label, the specimen was found in a miscellaneous collection of D. Turner, but Almborn noted that there was no evidence that it had been seen by Smith. Thus, the specimen cited above as holotype seems to be the only original type material deposited in BM.

HANKO et al. (1986) cited two specimens from H-ACH (Nos 1263A & 1263B) as possible isotypes. Both are marked with notes ‘Anglia’ (in ink) and ‘Turner’ (in pencil; perhaps added later). The appearance of those thalli is very similar to the holotype, and indeed they may be a part of the original collection.

Habitat requirements: In Poland, *O. turneri* is a species of eutrophic bark of deciduous trees. It usually grows in open areas, e.g. in villages on roadside trees and in parks. It is also found in forests, but this habitat seems to be less preferred by the species in Poland. The frequency on different substrata is as follows: *Acer platanoides* (20), *Fraxinus excelsior* (7), *Fagus sylvatica* (5), *Quercus petraea* and *Q. robur* (4), *Tilia cordata* (3), *Salix* sp. (2), *Acer pseudoplatanus*

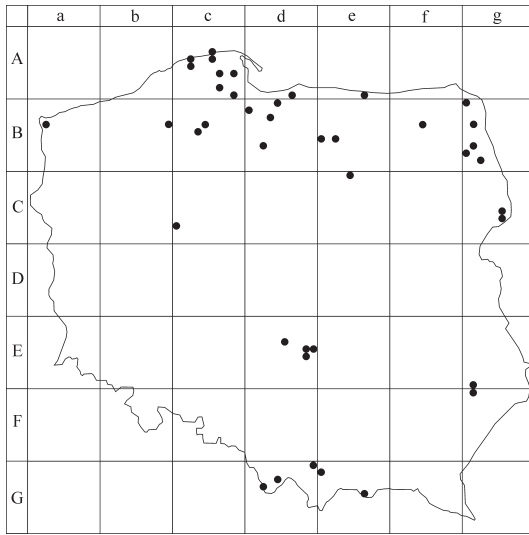


Fig. 4: Distribution of *Ochrolechia turneri* in Poland based on ATPOL grid square system.

(1), *Aesculus hippocastanum* (1), *Carpinus betulus* (1), *Malus sylvestris* (1), *Populus* sp. (1), *Quercus rubra* (1).

Very similar habitat preferences were reported for it in Norway (TØNSBERG 1992), but it was more frequently found on oaks, and also on wood. BOQUERAS et al. (1999) reported it almost exclusively from *Quercus* spp. and *Castanea sativa*, and, interestingly, they reported it also from pine bark. In the eastern Alps it has only been reported from deciduous, mostly cultivated (e.g. apple trees, walnuts), trees (SCHREINER & HAFELLNER 1992).

Distribution: *O. turneri* is uncommon in Poland (Fig. 4), but revisions of Polish material of *Pertusaria albescens* and other morphologically similar taxa may yield more specimens; however, it should be considered rare in Poland on the basis of my fieldwork experience.

To date, it has been reported mostly from Europe, where it is known from Austria (HANKO et al. 1986, SCHREINER & HAFELLNER 1992, HAFELLNER & TÜRK 2001), Bosnia and Herzegovina (CHRISTENSEN 1994b), Croatia* (sub Yugoslavia, Dalmatia; HANKO et al. 1986), Czech Republic (VĚZDA & LIŠKA 1999, BIELCZYK et al. 2004), Denmark* (SØCHTING & ALSTRUP 2002), Estonia* (RANDLANE & SAAG 1999), Finland* (HANKO et al. 1986, SANTESSON et al. 2004), France* (HANKO et al. 1986), Germany* (HANKO et al. 1986, SCHOLZ 2000), Greece* (GRUBE et al. 2001), Ireland (FEUERER 2007), Italy (NIMIS 2003), Latvia (PITERĀNS 2001), Lithuania (MOTIEJUNAITE 1999), Luxembourg (DIEDERICH & SÉRUSIAUX 2000), Netherlands (SPIER & VAN HERK 1999, APTROOT et al. 2004), Norway* (TØNSBERG 1992, SANTESSON et al. 2004), Portugal (BOQUERAS et al. 1999, FEUERER 2007), Russia (HANKO et al. 1986), Serbia (HANKO et al. 1986), Slovakia* (PIŠÚT 1995, PIŠÚT et al. 1996), Slovenia* (MAYRHOFER et al. 1996), Spain* (BOQUERAS et al. 1999, LLIMONA & HLADUN 2001), Sweden* (SANTESSON et al. 2004), Switzerland (HANKO et al. 1986, FEUERER 2007), Ukraine (KONDRATYUK et al. 2003) and United Kingdom* (HANKO et al. 1986, COPPINS 2002). It is also known from the Canary Islands (HAFELLNER 1995). It has been reported from Australia (MCCARTHY 2006), but since the distance from its known distribution is rather large, these records probably refer to another species; furthermore, the records from North America are thought to be questionable (see BRODO 1991, ESSLINGER 2007).

Number of specimens examined – 47

Specimens examined: [Ac-35] – Szklana Huta village, on *Acer pseudoplatanus*, 13.09.1957, T. Sulma (UGDA-L-14256); [Ac-42] – Słowiński NP, on roadside between Kluki and Wilkowo villages, on *Fagus sylvatica*, 06.05.1967, Z. Tobolewski (POZ); Kluki forest district, fs no. 77, near the border of the park, on *Fagus sylvatica*, 17.05.1968, Z. Tobolewski (POZ); [Ac-45] – between Kurowo and Choczewko villages, on *Acer platanoides*, 07.06.1984, W. Fałtynowicz (UGDA-L-3843); [Ac-52] – Słowiński NP, Izbickie Bagno, between Izbica and Głównyzyce villages, on *Acer platanoides*, 15.08.1969, Z. Tobolewski (POZ); [Ac-66] – Paraszyno village, 54°32'15"N/18°00'34"E, on *Acer platanoides*, 04.08.2004, M. Kukwa 3416 (UGDA-L-10979); [Ac-68] – Rumia Zagórze town, on *Quercus petraea*, 28.03.1987, W. Fałtynowicz (UGDA-L-3234); [Ac-86] – by the Bilowo gamekeeper's cottage, on *Tilia cor-*

data, 13.05.1959, T. Sulma (UGDA-L-13897); 3 km NEE of Borkowo village, on *Acer platanoides*, 15.05.1986, W. Faltynowicz (UGDA-L-3295); [Ac-98] – ‘Jar rzeki Raduni’ NR, 54°18'N/18°18'E, on *Malus sylvestris*, 14.06.1966, T. Sulma (UGDA-L-13995); [Ad-97] – Górkki forest district, on *Fagus sylvatica*, 02.07.1957, T. Sulma (UGDA-L-13641); [Ae-96] – c. 0.5 km W of Proсна village, by the road to Sepopól, on *Fraxinus excelsior*, 06.08.1989, S. Cieśliński (KTC); [Ba-32] – Uznam Island, Karsin village, on *Acer platanoides*, 05.06.1977, W. Faltynowicz (UGDA-L-2981); [Bb-39] – Barnowiec village near Kolczygłowy village, 53°56'02"N/16°59'01"E, on *Acer platanoides*, 19.10.1979, I. Izydorek (SLTC, material of *Phlyctis agelaea* and *P. argena*); [Bc-34] – Lešno village, on *Aesculus hippocastanum*, 07.03.2004, M. Kukwa 2923 (UGDA-L-11109); [Bc-53] – Stary Młyn village, 53°45'26"N/17°30'55"E, on *Acer platanoides*, 11.02.2006, M. Kukwa 4834 (UGDA-L-12323); [Bd-04] – Elbląg town, Bażantarnia park, on *Tilia cordata*, 02.04.1959, T. Sulma (UGDA-L-13624); [Bd-10] – near Boroszewo gamekeeper's cottage, on *Fagus sylvatica* and *Acer platanoides*, 08.04.1960, T. Sulma (UGDA-L-14253 & 14254); [Bd-23] – by the road between Malbork town, Goszczewo and Węgry villages, on *Carpinus betulus*, 07.09.1956, T. Sulma (UGDA-L-14059); [Bd-62] – between Bądkki village and Kwidzyn town, on *Tilia cordata*, 25.07.1957, T. Sulma (UGDA-L-14258); [Be-50] – Stare Jablonki village, 53°42'06"N/20°04'34"E, on *Fraxinus excelsior*, 10.05.1974, J. Nowak (KRAM-L-19662 & 34268); [Be-52] – Las Warmiński NR, 53°46'27"N/20°25'18"E, on *Quercus rubra*, 2005, D. Kubiak (OLTC); [Bf-34] – W part of Woszczelce village, 53°51'53"N/22°14'01"E, on *Acer platanoides*, 21.05.1987, S. Cieśliński (KTC); [Bg-00] – S of Żłobin village, on *Acer platanoides*, 30.08.1995, S. Cieśliński (KTC); [Bg-31] – vicinity of Perkuć sluce, Augustowski Canal, on *Acer platanoides*, 18.09.1986, S. Cieśliński, Z. Tobolewski (KTC); [Bg-32] – Kudryniki village near Rudawki village, on *Acer platanoides*, 16.09.1986, S. Cieśliński, Z. Tobolewski (KTC); [Bg-61] – c. 1 km W of Kolonia Sadowo village, 53°35'53"N/23°18'42"E, on *Acer platanoides*, 28.08.1990, S. Cieśliński (KTC); [Bg-70] – Chodorówka Nowa village, on *Acer platanoides*, 28.08.1990, S. Cieśliński (KTC); [Bg-82] – c. 1.5 km E of Lebedzin village, 53°24'56"N/23°21'55"E, on *Quercus* sp., 02.07.1991, S. Cieśliński (KTC); [Ce-70] – SE of Rogożno town, 52°41'06"N/17°05'36"E, on *Salix* sp., 25.08.1970, J. Kulikowska (POZ); [Ce-04] – Antonin village, on *Fraxinus excelsior*, 27.10.1969, K. Glanc (KRAM-L-38572); [Cg-55] – Białowieża NP, fs no. 256, on *Fraxinus excelsior*, 14.10.1987, S. Cieśliński, K. Czyżewska and on *Quercus* sp., 05.06.1990, S. Cieśliński, K. Czyżewska, K. Glanc (KTC); [Cg-65] – Białowieża village, Palace Park, on *Acer platanoides*, 15.06.1999, K. Czyżewska (LOD-L-10949); [Ed-35] – Lekawa village, on *Acer platanoides*, 27.09.1984, K. Czyżewska (LOD-L-8003, specimen of *Pertusaria albescens*); [Ed-48] – Przerąb village, on *Acer platanoides*, 24.04.1970, K. Czyżewska (LOD-L-2834, specimen of *Pertusaria albescens*); [Ed-49] – Bąkowa Góra village, on *Salix* sp., 29.04.1970, K. Czyżewska (LOD-L-2716, specimen of *P. albescens*); [Ed-58] – Chelmowa Góra Nature Reserve, on *Quercus petraea*, 14.09.1972, K. Czyżewska (LOD-L-2132, specimen of *Pertusaria albescens*); [Eg-91] – Zwierzyniec village, 50°36'29"N/22°58'12"E, c. 230 m, on *Acer platanoides*, 03.05.2006, M. Kukwa 5072 (UGDA); [Fg-01] – Florianka village, 50°33'25"N/22°59'15"E, c. 250 m, on *Acer platanoides*, 30.04.2006, M. Kukwa 5050 (UGDA); [Gd-09] – Beskid Makowski Mts, Pcim village, 495 m, on *Fraxinus excelsior*, 15.06.1966, J. Nowak (KRAM-L-29970); [Gd-24] – Beskid Żywiecki Mts, Hala Łyśniakowska village, 1190 m, on *Fagus sylvatica*, 06.09.1964, J. Nowak (KRAM-L-14983); [Gd-32] – Beskid Żywiecki Mts, S slope of Ozna Mt., 900 m, on *Fraxinus excelsior*, 05.08.1964, J. Nowak (KRAM-L-14116); [Ge-10] – Beskid Wyspowy Mts, slope of Kotelnica Mt., on *Acer platanoides*, 18.06.1966, J. Nowak (KRAM-L-17054); [Ge-46] – Beskid Sądecki Mts, Potok Szczawnik valley, 560 m, on *Populus* sp., 26.07.1967, M. Olech (KRA).

Additional selected specimens examined (58 specimens): **Croatia**. Island Krk, vicinity of Malinska, inland, c. 180 m, *Quercus pubescens* forest, on *Quercus pubescens*, 27.02.2001, S. Ozimec (GZU). **Denmark**. Hansen & Christensen, Lich. Dan. Exs. 123 (B, GZU, KRAM-L-44097, UGDA). **Estonia**. Tallinn-Sane, Mõisapark, 59°19'N/24°34'E, on bark, 22.08.1963, T. Piin (TU). **Finland**. Varsinais-Suomi, Nagu, Sjäälö Island, Archipelago Research Institute, alt. 10 m, park, on *Acer platanoides*, 21.07.1985, T. Ahti 42934 (H). **France**. Dép. Vosges, La Bresse, hill Supervallée, alt. 800 m, on *Abies alba*, 27.06.1975, H. Sipman 7661 (B). **Germany**. Mecklenburg-Vorpommern, Kreis Uecker-Randow, c. 1 km NW Altwigshagen, am nördlichen Waldrand, on *Fagus sylvatica*, 12.03.2000, U. Schiefelbein 695 (herb. Schiefelbein). **Greece**. East Aegean Islands, Nomos Samos, Ikaria Island, Frandato, W of Dafni, alt. 510 m, 37°36.13'N/26°08.34'E, on *Morus nigra*, 24.09.2002, H. Sipman 49602a, T. Raus (B). **Norway**. Buskerud, Ringerike, Norderhov Church, alt. 100 m, on *Acer platanoides*, 14.07.1990, T. Tønsgberg 13309 (E). **Slovakia**. Carpathians, Muránska planina plateau, Cigánka mount, E slope, a scree forest below the castle-ruin Muránský hrad, 48°45.56'N/20°03.72'E, alt. 840–850 m, on *Tilia cordata*, 18.10.2002, Š. Bayerová, A. Guttová, Z. Palice 6187 (herb. Palice). Považský Inovec, Tematíske Kopce, between Lúka village and Tematíska hrad castle, 48°39'52"N/17°53'56"E, alt. c. 230 m, deciduous forest, on *Acer platanoides*, 22.04.2006, M. Kukwa 4990 (UGDA-L-13225). **Slovenia**. Uršlja Gora S Ravne na Koroškem, Koča na Naravskih Ledinah, 46°29'10"N/14°56'15"E, on *Acer pseudoplatanus*, 13.05.1994, H. Mayrhofer (GZU). **Spain**. Bobastro, near El Chorro, alt. 600 m, on *Prunus dulcis*, 24.03.1982, M. R. D. Seaward (herb. Seaward 106089). **Sweden**. Bohuslän, par. Tuve, Spekeröd, E of the church, on *Quercus* sp., 18.08.1954, A. H. Magnusson (B-38480). **United Kingdom**. England, S. Somerset (VC 5), Exmoor, Barle Valley, Nine Acre Copse, on *Fraxinus excelsior*, 05.1987, A. M. O'Dare, P. A. Wolseley (E). Scotland, West Ross (VC 105), Kishorn, Rassal Ashwood NNR, on *Fraxinus excelsior*, 02.06.1999, B. J. Coppins 18513, A. M. Coppins (E). Wales, Pembroke (VC 45), Stackpole Estate, Castle Dock Wood, by boundary walls, alt. 65 m, on *Acer pseudoplatanus*, 01.09.1997, B. J. Coppins 17763, A. M. Coppins (E).

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