

The lichen genus *Ochrolechia* in the Baltic countries

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Abstract: Nine *Ochrolechia* species have been identified in a revision of the genus in the Baltic countries: *O. alboflavescens*, *O. androgyna*, *O. arborea*, *O. bahusiensis*, *O. frigida*, *O. microstictoides*, *O. pallescens*, *O. szatalaensis* and *O. turneri*. *O. bahusiensis* is reported for the first time for Estonia and Lithuania, the occurrence of *O. tartarea* in the Baltic countries is doubtful and *O. subviridis* should be excluded from the Estonian checklist. An identification key for all listed taxa is provided.

Kokkuvõte: Perekond purusamblik (*Ochrolechia*) Baltimaades.

Baltimaadest pärit materjali hulgast määrati üheksa purusambliku liiki: *O. alboflavescens*, *O. androgyna*, *O. arborea*, *O. bahusiensis*, *O. frigida*, *O. microstictoides*, *O. pallescens*, *O. szatalaensis* ja *O. turneri*. *O. bahusiensis* on esmasleid Eestile ja Leedule. *O. tartarea* leidumine Baltimaades jääb kaheldavaks. *O. subviridis* tuleb Eesti samblike nimekirjast välja arvata. Esitatakse purusamblike määramistabel, mis sisaldab kõiki mainitud liike.

INTRODUCTION

The lichen genus *Ochrolechia* A. Massal. (Ochrolechiaceae, Pertusariales, Ascomycota; see Schmitt et al., 2006) comprises crustose lichens with a usually conspicuous, continuous to areolate-cracked thallus and large apothecia. Some species have a thinner thallus and closed, ostiolate apothecia (Brodo, 1988; Schmitz et al., 1994) resembling some *Pertusaria* species, such as *P. pertusa* (Weigel) Tuck. Anatomically *Ochrolechia* is distinguished by a hamathecium of branched and anastomosing paraphysoids, strongly amyloid hymenium and asci, and simple thin-walled ascospores (Brodo, 1991; Schmitt & Lumbsch, 2004). At the infrageneric level secondary lichen metabolites are taxonomically very important; these include orcinol depsides, orcinol depsidones, β -orcinol depsides, fatty acid and non-chlorinated xanthenes (Hanko et al., 1986; Brodo, 1991; Tønsberg, 1992; Schmitz et al., 1994; Schmitt & Lumbsch, 2004; Jabłońska & Kukwa, 2007; Kukwa, 2008, 2009). Secondary chemistry is especially valuable in usually sterile, sorediate or isidiate species (Hanko et al., 1986; Brodo, 1988, 1991; Tønsberg, 1992).

At present, there is no comprehensive modern revision of the genus since Versegny's (1962) worldwide monograph. In her work morphological characters were much overestimated, numerous errors in the identification of lichen substances were made (see Brodo, 1991), and currently only few Versegny's taxa are accepted (e.g. Hanko et al., 1986; Brodo, 1991; Messutti &

Lumbsch, 2000; Kukwa, 2009). For the last c. 20 years, however, several further steps have been taken to solve the taxonomy of the genus. Hanko et al. (1986) studied the chemistry of European members of the genus and Brodo (1991) published an excellent revision of North American corticolous members providing new discriminating characters useful for defining the taxa. Tønsberg (1992) studied sorediate species of the genus, particularly in respect of *O. androgyna* s. lat., and Messutti and Lumbsch (2000) dealt with South American taxa. There are also some regional treatments (e.g. Roemer et al., 2004; Jabłońska & Kukwa, 2007; Kukwa, 2008, 2009), as well as papers dealing with single species or groups of species (e.g. Brodo, 1988; Lumbsch et al., 2003). Currently, the author is working on a revision of the genus in Europe, part of which is a study of material from the Baltic countries (Estonia, Latvia and Lithuania).

In the Baltic countries, ten *Ochrolechia* species have been reported so far, ten in Estonia (Randlane & Saag, 2004, Randlane et al., 2008), six in Lithuania (Almborn, 1948; Motiejūnaitė, 1999) and five in Latvia (Piterans, 2001) (Table 1). Several records are unreliable, since determinations were based mainly on morphological characters, which, especially in sorediate members of the genus, overlap in many respects. Chemistry was often studied by spot test reagents and lacked thin-layer-chromatography (TLC) (J. Motiejūnaitė, pers. comm;

A. Suija, pers. comm). Therefore, the material from these countries was in need of revision; the results of such studies are presented in the present paper.

MATERIALS AND METHODS

All examined specimens from the Baltic countries (156 from Estonia, 18 from Lithuania and 3 from Latvia) are housed in the following herbaria: BILAS, GPN, H, PRA, S, TU and UGDA. Several additional specimens, including types, were studied for comparison from B, BG, BM, BP, E, GB, H, S, TRH and W. Morphology was studied with a stereoscopic microscope and anatomy by means of hand-sectioned preparations mounted in water or KOH. Lichen substances were identified by thin layer chromatography (in solvents A, B or B' and C) according to the methods of Orange et al. (2001). Spot-test reactions with C and KC were applied to different parts of the thallus and apothecia, including sections, to determine the location of gyrophoric, variolaric and alecronic acids.

RESULTS

Nine *Ochrolechia* species have been identified in the studied material: *O. alboflavescens* (Wulfen) Zahlbr., *O. androgyna* Hoffm. s. str., *O. arborea* (Kreyer) Almb., *O. bahusiensis* H. Magn., *O. frigida* (Sw.) Lynge, *O. microstictoides* Räsänen, *O. pallescens* (L.) A. Massal., *O. szatalaensis*

Verseghy and *O. turneri* (Sm.) Hasselrot. All these species have been confirmed from Estonia, but only four from Lithuania and two from Latvia (Table 1). In the last case, however, very limited material was available for the study, and other taxa may also occur in there. In case of *O. androgyna*, the narrow taxonomic concept proposed by Tønsberg (1992) was used, and *O. androgyna* B and *O. androgyna* C were identified in the studied material. Since these strains differ significantly in morphology and chemistry, Tønsberg (1992) and Jabłońska and Kukwa (2007) concluded that they deserved species status. According to these authors, *O. androgyna* B is believed to be conspecific with *O. androgyna* s. str., and this concept is followed here. Furthermore, it has been recently showed that *O. androgyna* C is identical with *O. bahusiensis* (Kukwa, 2009; see also below), which is reported here for the first time for Estonia and Lithuania.

Two species, *O. subviridis* (Høeg) Erichsen and *O. tartarea* (L.) A. Massal. were not confirmed in the examined material. Several specimens from Estonia, Latvia and Lithuania earlier identified as *O. subviridis* all represented *O. androgyna* s. str., *O. arborea* or *Pertusaria flavida* (DC.) J. R. Laundon. All these taxa can be separated mainly by the chemistry, as *O. subviridis* contains only gyrophoric acid (with lecanoric acid), *O. androgyna* s. str. and *O. arborea* produce additional substances called 'androgyna B unknowns 1–3' and lichexantone,

Table 1. Occurrence of *Ochrolechia* species in the Baltic countries according to published sources and to studied material. (NB! *O. tartarea* was included in the Estonian list as doubtful.)

Species	Estonia		Latvia		Lithuania	
	Randlane et al., 2008	Present study	Piterans, 2001	Present study	Motiejūnaitė, 1999	Present study
<i>O. alboflavescens</i>	+	+				
<i>O. androgyna</i>	+	+	+		+	
<i>O. arborea</i>	+	+	+	+	+	+
<i>O. bahusiensis</i>		+				+
<i>O. frigida</i>	+	+				
<i>O. microstictoides</i>	+	+			+	+
<i>O. pallescens</i>	+	+	+		+	
<i>O. subviridis</i>	+				+	
<i>O. szatalaensis</i>	+	+				
<i>O. tartarea</i>	?		+			
<i>O. turneri</i>	+	+	+	+	+	+

respectively (see below), and *P. flavida* has thiophanic acid as a major secondary metabolite (Tønsberg, 1992). As regards the known distribution of *O. subviridis* in Europe (Kukwa, 2009), the occurrence of *O. subviridis* in the Baltic countries seems unlikely, and therefore, based on present knowledge, the taxon should be excluded from the Estonian checklist.

To date, no specimens identified as *O. tartarea* from the Baltic countries have been located. Based on a 19th century literature report by Andreas Bruttan, it was included in the Estonian checklist as doubtful (Randlane & Saag, 1999, 2004). It may, however, occur in the studied area as there are suitable habitats (e.g. rocky outcrops) in Estonia and Latvia.

KEY TO THE SPECIES OF *OCHROLECHIA* IN THE BALTIC COUNTRIES

- 1 Variolaric acid present (C+ yellow); gyrophoric acid absent or present only in epihymenium (C+ red) 2
 - Gyrophoric acid present (C+ red); variolaric acid absent 6
- 2 Thallus sorediate, usually sterile; murolic acid complex absent 3
 - Thallus without soredia, always fertile; murolic acid complex often present 5
- 3 Lichesterinic and protolichesterinic acids always absent; soralia usually regular, at least in some parts of the thallus *O. turneri*
 - Lichesterinic acid always present; protolichesterinic acid present or absent; soralia regular or irregular 4
- 4 Protolichesterinic acid always present; thallus thick; soralia usually more or less delimited *O. alboflavescens*
 - Protolichesterinic acid usually absent (so far not found in material from the Baltic countries); thallus usually thin; soralia rather irregular and soon confluent, at least in central part of the thallus *O. microstictoides*
- 5 Gyrophoric acid present in epihymenium *O. pallescens*
 - Gyrophoric acid absent in epihymenium *O. szatalaensis*
- 6 Thallus with soredia or isidia; apothecia present or absent. 7
 - Thallus usually fertile, without vegetative diaspores; apothecia almost always present, but often absent in terricolous material. 10
- 7 Soralia UV+ orange; lichexanthone present *O. arborea*
 - Soralia UV–; lichexanthone absent 8
- 8 ‘Androgyna B unknowns 1–3’ present *O. androgyna*
 - ‘Androgyna B unknowns 1–3’ absent 9
- 9 Thallus with isidia (sometimes soredioid); murolic acid complex absent *O. subviridis*¹
 - Thallus sorediate; murolic acid complex present *O. bahusiensis*
- 10 ‘Androgyna B unknowns 1–3’ present; thallus usually saxicolous, fertile, without spines *O. tartarea*²
 - ‘Androgyna B unknowns 1–3’ absent (outside study area sometimes with murolic acid complex); thallus terricolous, often fertile, with spines *O. frigida*

¹ not recorded so far for the Baltic countries (excluded from the Estonian checklist)

² doubtful for the Baltic countries (record for Estonia based on literature data only)

THE SPECIES

Ochrolechia alboflavescens (Wulfen) Zahlbr.

This sorediate species has a thick and often folded thallus containing lichesterinic, protolichesterinic and variolaric acids, commonly accompanied by ‘microstictoides unknowns’

(Kukwa, 2008). The soralia are white, often concave and at least in part very distinctly delimited. The species is frequently fertile and produces gyrophoric acid (with lecanoric acid in minor to trace amounts) in the epihymenium (Hanko et al., 1986; Tønsberg, 1992; Kukwa, 2008).

O. alboflavescens can be mistaken for *O. microstictoides* and *O. turneri*, two sorediate

species containing variolaric acid. However, *O. microstictoides* can be distinguished by its irregular and soon coalescing soralia, much thinner thallus and frequent lack of protolicheterrinic acid (never found in Estonian material). *O. turneri* is morphologically more similar to *O. alboflavescens* as it also has well delimited soralia, but *O. turneri* contains no fatty acids (Tønsberg, 1992; Kukwa, 2008).

In the Baltic countries *O. alboflavescens* has to date been found only in Estonia, where it appears to be common on *Pinus sylvestris* (56% of specimens); less frequently it was found on *Betula* spp., *Picea abies*, *Juniperus communis*, unidentified coniferous trees and wood.

The species is widely distributed in Europe, with only single records from Africa and Asia (Kukwa, 2008 and literature cited therein).

Selected specimens examined (43 samples studied): **ESTONIA.** Harjumaa, Kuusalu, Anija, 59°23'N, 25°17'E, on coniferous tree, 3.5.1947, leg. E. Parmasto 1028 (TU-28074); **Ida-Virumaa**, Remniku, 59°04'N/27°39'E, on *Pinus sylvestris*, 8.7.1999, leg. I. Jüriado (TU-44094); **Jõgevamaa**, Endla Nature Reserve, Männikjärve Bog, by the shore of Männikjärve lake, 58°52'21"N, 26°14'56"E, peat bog pine forest, on *Pinus sylvestris*, 22.8.2004, leg. P. Czarnota 3965 (GPN); **Tartumaa**, Laeva soo, 58°29'N, 26°16'E, on *Betula pendula*, 2.8.2004, leg. P. Lõhmus (TU-29086); **Viljandimaa**, Taevere, Kuresoo, 58°30'N, 25°08'E, on coniferous tree, s. dat., leg. E. Parmasto (TU-27928).

***Ochrolechia androgyna* Hoffm. s. str. (syn. *O. androgyna* B sensu Tønsberg 1992)**

O. androgyna can be distinguished from other sorediate *Ochrolechia* species by its thick, tuberculate thallus, rather coarse soredia and consoredia in regular to irregular soralia, large apothecia, and the production of unidentified substances called 'androgyna B unknowns 1-3' and gyrophoric acid (with minor amounts of lecanoric minor) (Tønsberg, 1992; Jabłońska & Kukwa, 2007).

Only *O. arborea* and *O. bahusiensis* can be confused with *O. androgyna* s. str. as they are also sorediate and contain gyrophoric acid in the thallus. However, the thalli of both these taxa are thinner, never tuberculate, soredia are smaller, and usually in regular and convex soralia. They differ also in the chemistry, as *O. arborea* produces lichexanthone (thallus UV+ orange) while *O. bahusiensis* contains fatty acids of murolic acid complex (Hanko et al., 1986;

Tønsberg, 1992; Jabłońska & Kukwa, 2007; Kukwa, 2009).

In the Baltic countries, *O. androgyna* s. str. has only been confirmed from Estonia. No material has been seen from Latvia, and Lithuanian material identified as *O. androgyna* s. lat. represents *O. bahusiensis*, which has only recently been distinguished as a separate taxon (see Tønsberg, 1992; Kukwa, 2009). Possibly *O. androgyna* s. str. occurs in both Latvia and Lithuania, since it is known from neighbouring areas in Estonia and Poland (see Jabłońska & Kukwa, 2007).

O. androgyna s. str. is rather widespread in Europe, outside of which it is known only in USA (Tønsberg, 1992; Jabłońska & Kukwa, 2007).

Selected specimens examined (38 samples studied): **ESTONIA.** Harjumaa, Viimsi, Randvere, on rock, 20.5.1974, leg. E. Nilson (TU); **Hiiumaa**, Köpu, Heistesoo, 58°55'N, 22°17'E, on bark, 19.6.1984, leg. T. Randlane (TU-28134); **Ida-Virumaa**, Agusalu Landscape Reserve, Kivinõmme, 59°07'13"N, 27°34'36"E, on *Betula* sp., 3.9.2006, leg. A. Suija 159 (TU-39786); **Lääne-Virumaa**, Paasvere, 59°05'N, 26°46'E, on *Betula* sp., 28.6.1999, leg. I. Jüriado (TU-28054); **Pärnumaa**, Jäärja, 58°02'N, 24°57'E, on bark, 25.9.1999, leg. I. Jüriado (TU-28053).

***Ochrolechia arborea* (Kreyer) Almb.**

O. arborea is the only sorediate member of the genus which produces gyrophoric acid and lichexanthone. Due to the presence of the latter substance, the soralia fluoresce UV+ yellow-orange to orange (Brodo, 1991; Tønsberg, 1992; Jabłońska & Kukwa, 2007).

The species has been infrequently recorded from all Baltic countries.

In Europe, *O. arborea* has rather a wide distribution range, but, as in the study area, it is not common (Jabłońska & Kukwa, 2007 and literature cited therein). Outside Europe it has only been reported from Mongolia (Biazrov, 2007) and USA (Brodo, 1991).

Specimens examined (18 samples studied): **ESTONIA.** **Ida-Virumaa**, Agusalu Landscape Reserve, Feodori bog, 59°03'34"N, 27°42'06"E, on *Pinus sylvestris*, 5.8.2006, leg. A. Suija (TU-58476); **Läänemaa**, Haapsalu District, Laeltu forest meadow, c. 2 km E of Virtsu, 58°35'N, 23°35'E, on *Fraxinus excelsior*, 12.6.1989, leg. G. Thor 7922b (SL-41263); **Pärnumaa**, Audru, Kõdusoo, 58°21'N, 24°13'E, on bark, 24.9.1999, leg. I. Jüriado (TU-28140); **Põlvamaa**, Värskä, Lutepää (Verhulitsa), Pikaliiva Sand Field Landscape Reserve, open pine-lichen woodland,

on *Populus tremula*, 27.4.1991, leg. T. Ahti 49722, H. Trass, T. Randlane (H); **Saaremaa**, Mändjala, close to the hotel, 58°12'42"N, 22°19'16"E, dunes along the sea shore, on *Salix* sp., 20.9.2008, leg. M. Kukwa 7266 (UGDA-L-14818). **LATVIA**. Gaujas National Park, Gauja river valley, vicinity of Sigulda, 57°09'29"N, 24°50'14"E, forest by river, on *Populus tremula*, 28.7.2003, leg. M. Kukwa 2058 (UGDA). **LITHUANIA**. Ignalina distr., ±1 km SW of Vaišniūnai, shore of Dringis lake, 55°22'N, 26°05'E, on *Alnus glutinosa*, 27.06.1995, leg. J. Motiejūnaitė (BILAS-2142); Varenos distr., between Krušavo dvaras and Maksimai, on Nemunas river bank, 54°06'N, 24°09'E, on *Alnus glutinosa*, 19.07.1996, leg. J. Motiejūnaitė (BILAS-2254); Molėtai distr., Stirniai environs, 55°13-15'N, 25°38-41'E, on *Pinus sylvestris*, 01.10.1961, leg. A. Minkevičius (BILAS-1706); Trakai distr., vicinity of Strėva, 54°34'N, 24°43'E, on *Alnus* sp., 27.06.1997, leg. J. Motiejūnaitė (BILAS-3093).

***Ochrolechia bahusiensis* H. Magn.**

The species was neglected for many years after its description in 1927 since it was considered by Almborn (1952) as synonymous 'at least pro p.' with *O. subviridis*. Recently it was found to be distinct from *O. subviridis* and identical with *O. androgyna* C sensu Tønsberg (1992) (Kukwa, 2009). As *O. bahusiensis* appeared to be the oldest name for *O. androgyna* C, this name should be used.

Material of *O. bahusiensis* is often included in *O. androgyna* s. lat. Tønsberg (1992) has pointed out the heterogeneity of this taxon. Specimens developing a rather thin thallus with small, rarely enlarged, separated from each other, tubercules, usually regular and convex soralia and producing murolic acid complex and gyrophoric acid were distinguished as *O. androgyna* C by Tønsberg (1992) and are now considered as belonging to *O. bahusiensis*. For differences with similar taxa, see under *O. androgyna* s. str.

Currently, *O. bahusiensis* is known only from Europe, where it seems to be widely distributed (Tønsberg, 1992; Jabłońska & Kukwa, 2007; Kukwa, 2009). Here it is reported as new to Estonia and Lithuania.

Specimens examined (13 samples studied): **ESTONIA**. **Ida-Virumaa**, Agusalu Landscape Reserve, Kivinõmme, 59°07'26"N, 27°37'18"E, on *Populus tremula*, 5.8.2006, leg. A. Suija (TU-39782); Remniku, 59°02'N, 27°35'E, on *Alnus glutinosa*, 8.7.1999, leg. I. Jürriado (TU-28046); **Jõgevamaa**, Saare community, Pala, 58°39'N, 26°59'E, on *Alnus glutinosa*, 30.7.1968, leg. A. L. Sõmermaa (TU-28130); **Lääne-**

Virumaa, Käsnu, 59°36'N, 25°54'E, on *Alnus glutinosa*, 25.7.1975, leg. H. Trass (TU-58470); **Pärnumaa**, Koonga community, Kalli-Nedrema wooded meadow, 58°32'N, 24°04'E, on *Betula pendula*, 14.7.2004, leg. E. Leppik (TU-31069); **Saaremaa**, Abruka, 58°09'N, 22°30'E, on *Betula pendula*, 14.8.1964, leg. H. Trass (TU-28175); Kihelkonna community, Tagamõisa, 58°27'N, 21°59'E, on *Quercus robur*, 23.8.1974, leg. E. Nilson (TU-58471); Loodo wooded meadow, 58°14'N, 22°26'E, on *Quercus robur*, 27.8.1991, leg. T. Randlane (TU-33383); **Valgamaa**, Koorküla, 57°55'N, 25°46'E, on *Betula pendula*, 20.9.1998, leg. I. Jürriado (TU-28047); **Võrumaa**, Misso, Tsirgumäe, 57°35'N, 27°04'E, on *Picea abies*, 5.6.1967, leg. A. L. Sõmermaa 1591 (TU-28094); Vastseliina, Kana, 57°44'N, 27°14'E, on *Picea abies*, 4.8.1967, leg. A. L. Sõmermaa (TU-28095). **LITHUANIA**. Šalčininkai distr., Rūdinkai, 54°24'N, 25°08'E, on *Betula* sp., 24.06.1996, leg. J. Motiejūnaitė (BILAS-2193); Trakai distr., Aukštadvaris environs, 54°34'N, 24°31'E, 'Velnio duobė', on *Quercus robur*, 27.06.1997, leg. J. Motiejūnaitė (BILAS-3120).

***Ochrolechia frigida* (Sw.) Lyngé**

This is a mostly terricolous lichen containing gyrophoric acid as the major secondary compound. It is very variable (Kukwa, 2009), but in Estonia it was found in a typical form with very characteristic spines.

O. frigida is the only species in the Baltic countries growing on ground or mosses, having spines and producing gyrophoric acid; thus it cannot be mistaken for any other taxon recorded from the studied area. Presently it is known only from Estonia, unexceptionally growing in raised bogs.

The species is widespread, but not reported from Africa (Kukwa, 2009 and literature cited therein).

Specimens examined (a total of 4 samples studied): **ESTONIA**. **Läänemaa**, Risti, 58°59'N, 24°05'E, on ground, 17.4.1999, leg. T. Ploompuu (TU-28146); **Raplamaa**, Järlepa, 59°06'N, 24°56'E, on ground, 2005, leg. T. Ploompuu (TU-45001); **Viljandimaa**, Kikepera, 58°24'N, 24°59'E, on ground, 19.7.1980, leg. T. Randlane (TU-33381); Taevere, Kuresoo, 58°30'N, 25°10'E, on *Sphagnum*, 8.1948, leg. E. Parmasto (TU-28148);

***Ochrolechia microstictoides* Räsänen**

This species is characterized by its more or less thin, rarely tuberculate thallus, irregular, diffuse and often coalescing soralia, production of variolaric and lichesterinic acids (usually without protolichesterinic acid) and a preference

for acidic substrata (coniferous trees, birches, oaks, wood) (Hanko et al., 1986; Tønsberg, 1992; Kukwa, 2008).

O. microstictoides is similar to *O. alboflavescens* and *O. turneri*; it has often been confused with those two species, but they can be separated by chemistry and morphology (see under *O. alboflavescens*).

In the Baltic countries, the species occurs in Estonia and Lithuania, where it seems to be a common lichen on coniferous trees (pine and spruce; 41 % of samples), *Betula* spp. (17%) and wood (14 %); it most probably occurs also in Latvia.

O. microstictoides is widely distributed in Europe (Kukwa, 2008 and literature cited therein), with only a single record elsewhere, namely Turkey (Breuss & John, 2004).

Selected specimens examined (29 samples studied):

ESTONIA. **Hiumaa**, Vohilaid, 58°54'N, 23°01'E, on wood, 7.7.2004, leg. A. Suija, I. Jüriado (TU-33382); **Jõgevamaa**, Endla Nature Reserve, hiking trail, N of Lake Männikjärvi, 58°52'N, 26°14'E, mixed forest, on *Betula* sp. and *Pinus sylvestris*, 22.8.2004, leg. M. Kukwa (UGDA-L-10080 & 10088); **Põlvamaa**, Meenikunno raised-bog, c. 57°56'30"N, 27°19'15" E, on *Pinus sylvestris*, 22.8.2004, leg. Z. Palice 8680 (PRA); **Tartumaa**, Järvselja to Rökka, forest section no. 242, 58°13'N, 27°17'E, on *Pinus sylvestris*, 5.9.1999, leg. M. Kukwa (UGDA-L-9642); **Viljandimaa**, Tipu, 58°22'N, 25°03'E, on bark, s. dat., leg. H. Trass (TU-28156). **LITHUANIA.** Šalčininkai distr., Rūdninkai, 54°24'N, 25°08'E, on *Alnus* sp., 08.09.1994, leg. J. Motiejūnaitė (BILAS-1719); Žemaitija NP., Plateliai lake, Auksalė, 56°02'N, 21°50'E, on *Pinus sylvestris*, 12.09.2001, leg. J. Motiejūnaitė (BILAS-6237); Viešvilė Strict Nature Reserve, 55°04'N, 22°23'E, on *Fraxinus excelsior*, 31.03.2004, leg. A. Uselienė (BILAS-7234); Šakiai distr., Gelgaudiškis, 55°04'N, 22°58'E, on *Fraxinus excelsior*, 11.04.2004, leg. J. Motiejūnaitė (BILAS-6989).

***Ochrolechia pallescens* (L.) A. Massal.**

This species can be separated from all similar species due to the combination of the constant presence of apothecia with usually strongly white or yellowish pruinose disc, production of gyrophoric acid in the epihymenium, variolaric acid in the thallus and apothecial margin, and corticolous habitat (Hanko et al., 1986; Boqueras et al., 1999; Messutti & Lumbsch, 2000; Kukwa, 2009). It can also contain murolic acid complex and alectoronic acid, but these substances are not constantly present, and in Estonian material

only murolic acid complex was detected in three of four specimens.

Only *O. szatalaensis* is morphologically similar to *O. pallescens* in the study area, but that species lacks gyrophoric acid and usually has a thinner thallus (Hanko et al., 1986; Brodo, 1991; Messutti & Lumbsch, 2000; Kukwa, 2009).

O. pallescens has been reported from Estonia and Lithuania (Motiejūnaitė, 1999; Randle & Saag, 1999), but can only be confirmed for Estonia; however, it probably occurs in Latvia and Lithuania.

The species is widely distributed in Europe, and also known from Africa and Asia, though rarely reported (Kukwa, 2009 and literature cited therein). According to Brodo (1991), it does not occur in North America; records from South America (Messutti & Lumbsch, 2000) and Australia (McCarthy, 2008) are dubious.

Specimens examined (4 samples studied): **ESTONIA.**

Ida-Virumaa, Iisaku, 59°10'N, 27°09'E, on *Populus tremula*, 17.8.1999, leg. I. Jüriado (TU-28168); Kuremäe, 59°12'N, 27°32'E, on *Quercus robur*, 20.7.1996, leg. I. Jüriado (TU-28160); **Pärnumaa**, Nigula, 58°01'N, 24°41'E, on bark, 23.7.1983, leg. T. Mihkelev (TU-28173); **Viljandimaa**, Taevere, Pärassaare, 58°36'N, 25°13'E, on *Populus* sp., 23.8.1947, leg. E. Parmasto (TU-28162).

***Ochrolechia szatalaensis* Versegly**

A strongly pruinose apothecial disc, a distinctly expanded and glassy, but opaque, basal cortex of the apothecial margin, presence of variolaric acid, absence of gyrophoric acid, usually thin thallus and corticolous habitat distinguish *O. szatalaensis* from all other morphologically and chemically similar species (Brodo, 1991; Messutti & Lumbsch, 2000; Kukwa, 2009). It can also produce alectoronic acid (e.g. Brodo, 1991), which was detected in four of the five Estonian specimens.

The species can be misidentified with *O. pallescens*, and with *O. upsaliensis* which, however, is not recorded from the study area. *O. pallescens* is distinguished from *O. szatalaensis* by its C+ red epihymenium containing gyrophoric acid (see under that species). *O. upsaliensis* is characterized by its white and indistinctly expanded basal cortex, constant absence of alectoronic acid and its occurrence in terricolous habitats (Brodo, 1991; Kukwa, 2009).

The report of *O. szatalaensis* from Estonia (Randlane & Saag, 1999) is confirmed here.

The species is rather widely distributed in Europe (Kukwa, 2009). It is also known from Africa (Hafellner, 2002), North America (Brodo, 1991), South America (Messutti & Lumbsch, 2000) and Papua New Guinea (Aptroot, 1998).

Specimens examined (4 samples studied): **ESTONIA.** **Ida-Virumaa**, Oonurme, 59°08'N, 27°00'E, on *Populus tremula*, 12.9.1999, leg. I. Süda (TU-28169); **Pärnumaa**, Koonga vald, Peantse, 58°32'N, 23°58'E, on *Populus tremula*, 15.7.2004, leg. E. Leppik (TU-31072); Nigula LKA, 58°01'N, 24°41'E, on *Acer platanoides*, 7.7.2003, leg. M. Nõmm (TU-28174); **Saaremaa**, Muhu Island, Üügu cliffs, 58°40'N, 23°16'E, on *Juniperus communis*, 7.8.1991, leg. H. Trass (TU-28165).

Ochrolechia turneri Versegly

The species is characterized by the presence of variolaric acid, usually discrete and separated soralia and deficiency of lichesterinic and protolichesterinic acids (Tønsberg, 1992; Kukwa, 2008). It is chemically and/or morphologically similar to *O. alboflavescens* and *O. microstictoides* (for the differences see under those taxa).

The species is here confirmed from all Baltic countries.

O. turneri is widely distributed in Europe, and known also from the Canary Islands (Kukwa, 2008 and literature cited therein). Its occurrence in North America is questionable (Brodo, 1991); it has also been reported from Australia (McCarthy, 2008), but on the basis of its known distribution, these records probably refer to another species.

Selected specimens examined (16 samples studied): **ESTONIA.** **Harjumaa**, Suurupi, 59°27'N, 24°22'E, on *Acer platanoides*, 29.8.2002, leg. I. Jüriado (TU-28043); **Põlvamaa**, Ahja Park, 58°12'N, 27°04'E, on bark, 7.7.1964, leg. T. Piin (TU-58478); **Saaremaa**, Kärla vald, Kärla park, 58°19'52"N, 22°15'26"E, on *Padus avium*, 3.7.2007, leg. E. Leppik, M. Nõmm (TU-55205); **Viljandimaa**, Olustvere, 58°33'N, 25°34'E, on bark, 15.8.1963, leg. T. Piin (TU-58479); **LATVIA.** Gaujas National Park, Gauja river valley, vicinity of Sigulda, 57°09'29"N, 24°50'14"E, forest by the river, on *Populus tremula*, 28.7.2003, leg. M. Kukwa 2059 (UGDA). **LITHUANIA.** Klaipėda distr., Vėžaičiai, 55°43'00"N, 21°28'60"E, on *Acer* sp. and *Tilia* sp., 07.08.1986, leg. J. Motiejūnaitė (BILAS-3421 & 5695); Kretinga distr., Darbėnai, 56°02'N, 21°16'E, on *Acer platanoides*, 08.07.1986, leg. J. Motiejūnaitė

(BILAS-2984); Vilnius, Žaliųjų ežerų preserve, 54°47'N, 25°19'E, on *Quercus robur*, 18.06.1997, leg. J. Motiejūnaitė (BILAS-3096).

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