



New records of lichens and lichenicolous fungi from Latvia, with a list of lichenicolous fungi reported from Latvia

Authors: Moisejevs, Rolands, Degtjarenko, P., Motiejūnaitė, J., Piterāns, A., and Stepanova, D.

Source: *Lindbergia*, 2019(1) : 1-6

Published By: Dutch Bryological and Lichenological Society and Nordic Bryological Society

URL: <https://doi.org/10.25227/linbg.01119>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

New records of lichens and lichenicolous fungi from Latvia, with a list of lichenicolous fungi reported from Latvia

Rolands Moisejevs, P. Degtjarenko, J. Motiejūnaitė, A. Piterāns and D. Stepanova

R. Moisejevs ✉ (rolands.moisejevs@biology.lv) and D. Stepanova, Inst. of Life Sciences and Technology, Daugavpils Univ., Parādes 1a, LV-5401 Daugavpils, Latvia. – P. Degtjarenko, Dept of Botany, Univ. of Tartu, Tartu, Estonia, and: Biodiversity and Conservation Biology, Swiss Federal Res. Inst. WSL, Birmensdorf, Switzerland. – J. Motiejūnaitė, Inst. of Botany, Nature Research Centre, Vilnius, Lithuania. – A. Piterāns, Dept of Botany and Ecology, Univ. of Latvia, Riga, Latvia.

Four species of lichen-forming fungi (*Calicium pinastri*, *Chaenotheca laevigata*, *Lecania croatica* and *Pycnora praestabilis*) and two lichenicolous fungi (*Arthrorhaphis aeruginosa* and *Chaenothecopsis epithallina*) are reported as new for Latvia. The first comprehensive list of lichenicolous fungi in Latvia is also presented, including their hosts and distribution in Latvia (northern Europe).

Keywords: Baltic countries, distribution, lichenized fungi

Our knowledge of the lichens and allied fungi in Latvia (northern Europe) has been considerably advanced in recent years. Currently ca 640 taxa of lichenized fungi are recorded for Latvia (Āboliņa et al 2015, Moisejevs 2015, 2017, Motiejūnaitė et al. 2016, Moisejevs and Degtjarenko 2017), which is comparable to the 620 taxa known from the geographically similar territory of Lithuania (Motiejūnaitė 2017).

Lichenicolous fungi, on the other hand, have been understudied in Latvia. The first mention of lichenicolous species can be found in the paper by Mereschkowski (1913), who reported *Acolium sessile* from Jaunugulbene (Vidzeme). Later, *Diploschistes muscorum* was reported from the Gauja river valley and Riga city environs (Malta 1926, Vimba 1971). During the 13th International Symposium of Lichenologists and Mycologists of the Baltic States, two more species of lichenicolous fungi were reported (Motiejūnaitė and Piterāns 1998); a further four species were reported in the first annotated Latvian checklist of lichens (Piterāns 2001) and 16 more were added by Motiejūnaitė et al. (2006), Czarnota and Kukwa (2010) and Motiejūnaitė and Grochowski (2014). The second annotated checklist of lichens listed 15 lichenicolous taxa as supplementary data (Āboliņa et al. 2015). Further contribution was made by Motiejūnaitė et al. (2016), with 33 lichenicolous fungi

reported for the first time from Latvia, complemented by the paper of Moisejevs (2017). Since a full and up-to-date list of lichenicolous fungi for Latvia is still lacking, a comprehensive list is provided here.

The current paper reports four new species of lichen-forming and two lichenicolous fungi new to Latvia, together with a list of lichenicolous fungi (61 taxa) known for Latvia, including their hosts and distribution data in the country (Table 1).

Material and methods

The material was determined by means of routine lichenological methods (Smith et al. 2009). Spot-tests were determined with 10% KOH (K), sodium hypochlorite (C), paraphenylenediamine in ethanol (Pd) and Lugol's solution (I), and secondary chemistry by thin layer chromatography (TLC) using solvent C (Orange et al. 2001). Specimens of the newly recorded species, according to the nomenclature of Wirth et al. (2010), are kept in the lichenological herbarium of University of Daugavpils (DAU).

The list of lichenicolous fungi presented below is a combination of published literature data and herbarium collections from DAU and the University of Latvia (RIG), together with those species reported in the current paper. Data on species distribution are derived from literature sources and herbarium collections (DAU and RIG). Regions of Latvia (Fig. 1) are abbreviated in the list as follows: K – Kurzeme (Kurland), V – Vidzeme, L – Latgale, R – Pierīga, Z – Zemgale, LV – all regions of Latvia; # = lichenicolous fungus.

This work is licensed under the terms of a Creative Commons Attribution 4.0 International License (CC-BY) <<http://creativecommons.org/licenses/by/4.0/>>. The license permits use, distribution and reproduction in any medium, provided the original work is properly cited.

Table 1. The list of lichenicolous fungi known from Latvia, their distribution and hosts known in the country and the references that mention the species. For the abbreviations see Fig. 1.

S. No.	Species	Host(s)	Distribution	Reference(s)
1.	<i>Acolium sessile</i> (Pers.) Arnold.	<i>Pertusaria</i> sp.	K, V	Mereschkowski 1913, Piterāns 1982, 2001, Āboliņa et al. 2015
2.	<i>Arthonia epiphyscia</i> Nyl.	<i>Physcia aipolia</i>	K	Motiejūnaitė et al. 2016
3.	<i>Arthonia parietinaria</i> Hafellner & A.Fleischhacker	<i>Xanthoria parietina</i>	K	Motiejūnaitė et al. 2016 (as <i>Arthonia molendoi</i> (Heufl. ex Frauenf.) R.Sant.)
4.	<i>Arthrorhaphis aeruginosa</i> R.Sant. & Tønsberg	<i>Cladonia</i> sp.	L	This paper
5.	<i>Bachmanniomyces punctum</i> (A. Massal.) Diederich & Pino-Bodas	<i>Cladonia digitata</i> , <i>C. macilenta</i>	K	Motiejūnaitė et al. 2016
6.	<i>Biatoropsis usnearum</i> Räsänen	<i>Usnea subfloridana</i>	V, K	Motiejūnaitė et al. 2006, Āboliņa et al. 2015, DAU Herbarium
7.	<i>Briancoppinsia cytospora</i> (Vouaux) Diederich et al.	<i>Evernia prunastri</i> , <i>Melanelixia subaurifera</i>	K, V	Czarnota and Kukwa 2010, Āboliņa et al. 2015, Motiejūnaitė et al. 2016
8.	<i>Chaenothecopsis consociata</i> (Nádv.) A.F.W.Schmidt	<i>Chaenotheca chrysocephala</i>	LV	Piterāns 2001
9.	<i>Chaenothecopsis epithallina</i> Tibell	<i>Chanotheca trichialis</i>	K	This paper
10.	<i>Chaenothecopsis pusilla</i> (A.Massal.) A.F.W.Schmidt	<i>Chaenotheca</i> sp.	LV	Piterāns 2001
11.	<i>Clypeococcum cetrariae</i> Hafellner	<i>Cetraria islandica</i>	V	Motiejūnaitė and Piterāns 1998
12.	<i>Clypeococcum hypocenomycis</i> D.Hawksw.	<i>Hypocenomyce scalaris</i>	LV	Moisejevs 2017
13.	<i>Corticifraga fuckelii</i> (Rehm) D.Hawksw. & R.Sant.	<i>Peltigera neckeri</i>	K	Motiejūnaitė et al. 2016
14.	<i>Didymocyrtis epiphyscia</i> Ertz & Diederich	<i>Xanthoria parietina</i>	K	Motiejūnaitė et al. 2016
15.	<i>Didymocyrtis pseudeverniae</i> (Etayo & Diederich) Ertz & Diederich	<i>Pseudevernia furfuracea</i>	V	Motiejūnaitė and Grochowski 2014, Āboliņa et al. 2015
16.	<i>Didymocyrtis ramalinae</i> (Roberge ex Desm.) Ertz, Diederich & Hafellner	<i>Ramalina fraxinea</i>	LV	Motiejūnaitė et al. 2016
17.	<i>Diploschistes muscorum</i> (Scop.) R.Sant.	<i>Cladonia</i> sp.	K, V	Malta 1926, Vimba 1971, Piterāns 1982, 2001
18.	<i>Ellisembia lichenicola</i> Heuchert & U.Braun	<i>Ramalina fraxinea</i>	K	Motiejūnaitė et al. 2016
19.	<i>Epicladonia sandstedei</i> (Zopf) D.Hawksw.	<i>Cladonia coniocraea</i>	K	Motiejūnaitė et al. 2016
20.	<i>Erythrimum aurantiacum</i> (Lasch) D.Hawksw. & A.Henrici	<i>Physcia</i> spp.	K	Motiejūnaitė et al. 2016
21.	<i>Graphium aphthosae</i> Alstrup & D. Hawksw.	<i>Peltigera neckeri</i>	K	Motiejūnaitė et al. 2016
22.	<i>Heterocephalacria physciacearum</i> (Diederich) Millanes & Wedin	<i>Physcia</i> spp.	K	Czarnota and Kukwa 2010, Āboliņa et al. 2015, Motiejūnaitė et al. 2016
23.	<i>Homostegia piggotii</i> (Berk. & Broome) P.Karst.	<i>Parmelia submontana</i>	K	Motiejūnaitė et al. 2016
24.	<i>Illosporopsis christiansenii</i> (B.L.Brady & D.Hawksw.) D.Hawksw.	<i>Physcia</i> spp., <i>Xanthoria parietina</i>	LV	Piterāns 2001, Czarnota and Kukwa 2010
25.	<i>Lichenochora obscuroides</i> (Linds.) Triebel & Rambold	<i>Phaeophyscia orbicularis</i>	K	Motiejūnaitė et al. 2016
26.	<i>Lichenochora weillii</i> (Werner) Hafellner & R. Sant.	<i>Physconia enteroxantha</i>	K	Motiejūnaitė et al. 2016
27.	<i>Lichenconium erodens</i> M.S.Christ. & D.Hawksw.	<i>Evernia prunastri</i> , <i>Hypogymnia physodes</i> , <i>Parmeliopsis ambigua</i> , <i>Ramalina fraxinea</i>	LV	Motiejūnaitė et al. 2006, Āboliņa et al. 2015, Motiejūnaitė et al. 2016
28.	<i>Lichenconium lecanorae</i> (Jaap) D.Hawksw.	<i>Evernia prunastri</i>	K	Motiejūnaitė et al. 2016
29.	<i>Lichenconium pyxidatae</i> (Oudem.) Petr. & Syd.	<i>Cladonia chlorophaea</i>	K	Motiejūnaitė et al. 2016
30.	<i>Lichenconium usneae</i> (Anzi) D.Hawksw.	<i>Evernia prunastri</i>	K	Motiejūnaitė et al. 2016
31.	<i>Lichenconium xanthoriae</i> M.S.Christ.	<i>Xanthoria parietina</i>	LV	Motiejūnaitė et al. 2016
32.	<i>Lichenodiplis lecanorae</i> (Vouaux) Dyko & D.Hawksw.	<i>Caloplaca</i> sp., <i>Myriolecis</i> aff. <i>hagenii</i>	K, L	Motiejūnaitė et al. 2016
33.	<i>Lichenosticta alcornaria</i> (Linds.) D.Hawksw.	<i>Cladonia coniocraea</i> , <i>C. macilenta</i> , <i>C. ochrochlora</i>	K, L	Czarnota and Kukwa 2010, Āboliņa et al. 2015, Motiejūnaitė et al. 2016

(Continued)

Table 1. Continued

S. No.	Species	Host(s)	Distribution	Reference(s)
34.	<i>Marchandiomyces corallinus</i> (Roberge) Diederich & D.Hawksw.	<i>Physcia tenella</i>	K	Motiejūnaitė et al. 2016
35.	<i>Monodictys epilepraria</i> Kukwa & Diederich	<i>Lepraria</i> spp.	K	Czarnota and Kukwa 2010, Āboliņa et al. 2015, Motiejūnaitė et al. 2016
36.	<i>Muellerella hospitans</i> Stizenb.	<i>Bacidia rubella</i>	L, V	Czarnota and Kukwa 2010, Āboliņa et al. 2015
37.	<i>Microcalicium disseminatum</i> (Ach.) Vain.	<i>Chaenotheca</i> sp.	LV	Moisejevs 2015, DAU Herbarium
38.	<i>Nectriopsis lecanodes</i> (Ces.) Diederich & Schroers	<i>Peltigera canina</i> , <i>Peltigera rufescens</i>	LV	Motiejūnaitė et al. 2006, Āboliņa et al. 2015, RIGG Herbarium
39.	<i>Nectriopsis rubefaciens</i> (Ellis & Everh.) M.S.Cole & D.Hawksw.	<i>Parmelia sulcata</i>	LV	Motiejūnaitė et al. 2016
40.	<i>Plectocarpon lichenum</i> (Sommerf.) D.Hawksw.	<i>Lobaria pulmonaria</i>	V	Strazdiņa et al. 2017
41.	<i>Pronectria anisospora</i> (Lowen) Lowen	<i>Hypogymnia physodes</i>	K, L, V	Motiejūnaitė et al. 2016
42.	<i>Pronectria leptaleae</i> (J.Steiner) Lowen	<i>Physcia aipolia</i>	K	Motiejūnaitė et al. 2016
43.	<i>Pronectria robergei</i> (Mont. & Desm.) Lowen	<i>Peltigera didactyla</i> , <i>P. extenuata</i>	K, L	Moisejevs 2017, DAU Herbarium
44.	<i>Pronectria xanthoriae</i> Lowen & Diederich	<i>Xanthoria parietina</i>	LV	Motiejūnaitė et al. 2006, Āboliņa et al. 2015, Motiejūnaitė et al. 2016
45.	<i>Pyrenochaeta xanthoriae</i> Diederich	<i>Xanthoria parietina</i>	LV	Motiejūnaitė et al. 2016
46.	<i>Reconditella physconiarum</i> Hafellner & Matzer	<i>Physconia distorta</i>	K	Motiejūnaitė et al. 2016
47.	<i>Refractohilum intermedium</i> Cl.Roux & Etayo	<i>Pachyphiale fagicola</i>	K	Czarnota and Kukwa 2010, Āboliņa et al. 2015
48.	<i>Refractohilum peltigerae</i> (Keissl.) D.Hawksw	<i>Peltigera</i> spp.	K	Motiejūnaitė et al. 2016
49.	<i>Sphinctrina turbinata</i> (Pers.) De Not.	<i>Pertusaria pertusa</i>	K, V	Motiejūnaitė et al. 2016
50.	<i>Stigmidium microspilum</i> (Körb.) D.Hawksw.	<i>Graphis scripta</i>	K	Motiejūnaitė et al. 2016
51.	<i>Taeniolella punctata</i> M.S.Christ. & D.Hawksw.	<i>Graphis scripta</i>	K	Motiejūnaitė et al. 2016
52.	<i>Teloggia olivieri</i> (Vouaux) Nik.Hoffm. & Hafellner	<i>Xanthoria parietina</i>	K	Motiejūnaitė et al. 2016
53.	<i>Thelocarpon epibolum</i> var. <i>epibolum</i> Nyl.	<i>Peltigera neckeri</i>	K	Motiejūnaitė et al. 2016
54.	<i>Tremella candelariellae</i> Diederich & Etayo	<i>Candelariella</i> sp.	LV	Czarnota and Kukwa 2010, Āboliņa et al. 2015
55.	<i>Tremella cetrariicola</i> Diederich & Coppins	<i>Nephromopsis chlorophylla</i>	K	Motiejūnaitė et al. 2006, Āboliņa et al. 2015
56.	<i>Tremella hypogymniae</i> Diederich & M.S.Christ.	<i>Hypogymnia physodes</i>	K	Motiejūnaitė and Grochowski 2014, Motiejūnaitė et al. 2016
57.	<i>Tremella lichenicola</i> Diederich	<i>Violella fucata</i>	K	Motiejūnaitė et al. 2016
58.	<i>Tremella phaeophysciae</i> Diederich & M.S.Christ.	<i>Phaeophyscia orbicularis</i>	K	Motiejūnaitė et al. 2016
59.	<i>Vouauxiella lichenicola</i> (Linds.) Petr. & Sydow	<i>Lecanora chlorotera</i> , <i>L. pulicaris</i>	K, V	Āboliņa et al. 2015, Motiejūnaitė et al. 2016
60.	<i>Vouauxiomyces santessonii</i> D.Hawksw.	<i>Platismatia glauca</i>	K, V	Motiejūnaitė et al. 2016
61.	<i>Xanthoriicola physciae</i> (Kalchbr.) D.Hawksw.	<i>Xanthoria parietina</i>	K	Czarnota and Kukwa 2010, Āboliņa et al. 2015, Motiejūnaitė et al. 2016

Results

New records for Latvia

#*Arthrorhaphis aeruginosa* R.Sant. & Tønsberg

Distribution

Arthrorhaphis aeruginosa is known from Europe (Wirth et al. 2010, Motiejūnaitė 2017, Tsurykau 2017), including Fennoscandia (Santesson and Tønsberg 1994, Nordin et al. 2011), and also from Greenland (Alstrup et al. 2009), North America (Esslinger 2007), South America (Flakus et al. 2008) and Asia (Sohrabi and Alstrup 2007).

Material examined

Krāslavas Co., Īdrišu Dist., Nature Park 'Daugavas loki', Tartaka Forest, ca 350 m W of Tartaks village, 55°53'6.9"N, 26°59'18.1"E, 150 m a.s.l., on side of old forest road in boreal forest with *Pinus sylvestris* and *Picea abies*, on primary thallus of *Cladonia* sp., 25 May 2018, leg. & det.: R.Moisejevs (DAU600000910).

Notes

The collected specimen was sterile, but it was recognized by the characteristic colour of the infected host thallus. Only *A. aeruginosa* is known to turn the infected lichen an aeruginose colour and, as stated in the protologue of the

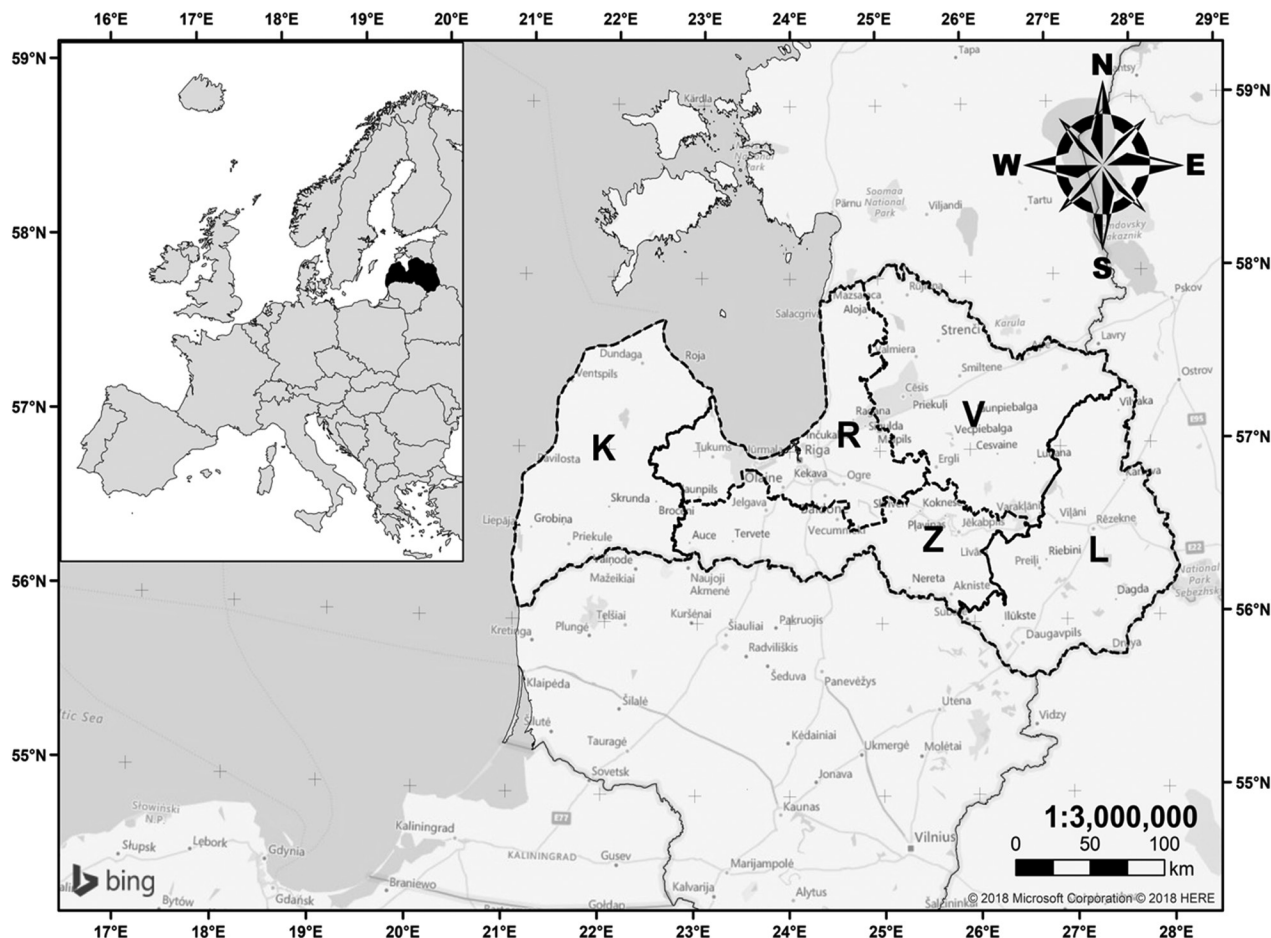


Figure 1. Regions of Latvia: K – Kurzeme (Curland), V – Vidzeme, L – Latgale, R – Pīrija, Z – Zemgale.

species ‘... is therefore easily recognized even when sterile’ (Santesson and Tønberg 1994).

Calicium pinastri Tibell

Distribution

Calicium pinastri is known from Europe (Tibell 1999, Śliwa and Kukwa 2008, Istomina and Likhacheva 2010, Wirth et al. 2010, Nordin et al. 2011) and North America (Hardman et al. 2017).

Material examined

Krāslava Co., Ūdrišu Dist., Nature Park ‘Daugavas loki’, Tartaka forest, ca 500 m SW of Tartaks village, 55°53’7.6”N, 26°59’30.8”E, 130 m a.s.l., old-growth dry boreal forest, on bark of *P. sylvestris*, 20 June 2018, leg. & det.: R.Moisejevs (DAU600000911).

Notes

The lichen was found growing close to *Calicium parvum*, a species that resembles *C. pinastri*, but has clavate asci, while *C. pinastri* has cylindrical asci when mature.

Chaenotheca laevigata Nád.

Distribution

Chaenotheca laevigata is a rare lichen with a wide distribution in Northern Hemisphere, being known from Europe

(Wirth et al. 2010, Nordin et al. 2011), Asia (Titov 2000) and North America (Hardman et al. 2017).

Material examined

Ventspils Co., Usmas Dist., Nature Reserve ‘Moricsala’, ca 400 m NE of guest house, 57°11’28.6”N, 22°8’12.0”E, 25 m a.s.l., in a humid old-growth deciduous forest with *Picea abies*, on the bark of *P. abies*, 9 July 2018, leg. & det.: R.Moisejevs (DAU600000917).

Notes

Chaenotheca laevigata can be confused with *Chaenotheca chlorella*, from which it differs by its immersed thallus, ellipsoid to short cylindrical ascospores and longer ascomata.

#Chaenothecopsis epithallina Tibell

Distribution

Chaenothecopsis epithallina is distributed in central Europe, Fennoscandia (Tibell 1975, Wirth et al. 2010, Nordin et al. 2011, Tsurykau 2017) and North America (Hardman et al. 2017).

Material examined

(1) Ventspils Co., Usmas Dist., Nature Reserve ‘Moricsala’, ca 400 m NE of guesthouse, 57°11’33.5”N, 22°8’12.3”E, 25 m a.s.l., in an old-growth deciduous forest, on thallus of *Chaenotheca trichialis* growing on the bark of *Quercus robur*,

9 July 2018, leg. & det.: R. Moisejevs; (2) Kocēnu Co., Dikļu Dist., ca 200 m S of Rāķis Lake, 57°35'34.1"N, 24°55'6.2"E, 120 m a.s.l., in a deciduous forest, on thallus of *C. trichialis* growing on the bark of old *Q. robur*, 23 March 2018, leg.: M. Kalniņš, det.: R. Moisejevs (DAU600000912).

Notes

Chaenothecopsis epithallina differs from the similar species *Chaenothecopsis nigra* by its association with *C. trichialis*, darker ascospores with less contrasting septum and dark green hypothecium.

Lecania croatica (Zahlbr.) Kotlov

Distribution

Lecania croatica is known from Europe (Printzen 1995, Mrak et al. 2004, Hafellner et al. 2005, Eichler et al. 2010, Vondrák et al. 2010, Kukwa et al. 2012, Motiejūnaitė 2017, Tsurukau 2017) and North America (Tønsberg 2004, Harris and Lendemer 2010).

Material examined

Daugavpils Co., Skrudalienas Dist., Nature Park 'Silene', ca 500 m N of Ilgas manor house, 55°41'54.5"N, 26°47'34.5"E, m a.s.l., in a deciduous forest with *Tilia cordata*, *Populus tremula* and *P. abies*, on the bark of *T. cordata*, 27 May 2018, leg. & det.: R. Moisejevs (DAU600000913).

Notes

The collected sterile specimen was checked using TLC, but no secondary compounds were found. The species was distinguished from species with a similar morphology and chemistry following the same characters as employed by Motiejūnaitė et al. (2012) and Tsurukau (2017).

Pycnora praestabilis (Nyl.) Hafellner

Distribution

Pycnora praestabilis is known in North America (Hodkinson 2009), Europe (Śliwa and Kukwa 2012, Randlane et al. 2016, Motiejūnaitė 2017), including Fennoscandia (Bendiksby and Timdal 2013).

Material examined

Daugavpils Co., Skrudalienas Dist., ca 3.5 km E of Silene town, 55°45'41.60"N, 26°52'58.08"E, 130 m a.s.l., in periphery of raised bog, on dry wood (snag) of *P. sylvestris*, 20 July 2017, leg. & det.: R. Moisejevs (DAU600000918).

Notes

From similar species of *Pycnora* and several morphologically similar species from *Xylopsora* genus, *P. praestabilis* differs in its lack of soredia, normally abundant pycnidia up to 0.3 mm diam., typical spot test reactions and presence of alectorialic acid.

Discussion

According to our data, 61 species of lichenicolous fungi have been recorded from Latvia. *Acolium inquinans*

mentioned by Āboliņa and Vimba (1959), who described it as 'a parasitic lichen, growing on thalli of other lichens', has been excluded since it is a lichenized species that lacks a lichenicolous habit (Tibell 1999). Specimen on which the record was based is lacking, therefore it is impossible to check its identity. Furthermore, Piterāns (1982) did not mention *A. inquinans* in his list of Latvian lichens and Āboliņa et al. (2015) described the species as an epiphytic lichen; therefore, it can be assumed that the aforementioned report was based on misidentification. Specimens of *Biatoropsis usnearum* reported by Motiejūnaitė et al. (2006) (both on *Usnea subfloridana*) are housed in the herbaria of the Institute of Botany, Nature Research Centre (BILAS) and University of Tartu (TU); the BILAS specimen and DAU specimens were checked in accordance with the description of *B. usnearum* (s. str.) given by Millanes et al. (2016), so it is assumed that only one species of *Biatoropsis* is known from Latvia.

Acknowledgements – We are grateful to Mārtiņš Kalniņš (Latvia's State Forests, Latvia) for collecting specimens, Dana Krasnopolska (Univ. of Daugavpils, Latvia) for assistance during the fieldwork, and Prof. Mark Seaward (Univ. of Bradford, UK) for the technical and linguistic support, and valuable comments.

Funding – The current study was supported by Erasmus+ KA2 Strategic Partnership Project No 2016-1-LV01-KA203-022685 and by the Estonian Research Council (grant IUT20-30).

References

- Āboliņa, A., Piterāns, A. and Bambe, B. 2015. Lichens and bryophytes in Latvia. Checklist. Latvijas Valsts mežzinātnes institūts 'Silava'. – DU AA Saule, in Latvian.
- Āboliņa, A. and Vimba, E. 1959. Latvijas PSR Mežu ķērpju un sūnu noteicējs. – Latvijas valsts izdevniecība, in Latvian.
- Alstrup, V., Kocourková, J., Kukwa, M. et al. 2009. The lichens and lichenicolous fungi of south Greenland. – *Folia Cryptog. Estonica* 46: 1–24.
- Bendiksby, M. and Timdal, E. 2013. Molecular phylogenetics and taxonomy of *Hypocenomyce* sensu lato (Ascomycota: Lecanoromycetes): extreme polyphyly and morphological/ecological convergence. – *Taxon* 62: 940–956.
- Czarnota, P. and Kukwa, M. 2010. New and noteworthy lichenized and lichenicolous fungi from Latvia. – *Bot. Lithuan.* 16: 21–27.
- Eichler, M., Cezanne, R., Diederich, P. et al. 2010. New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. XIII. – *Bull. Soc. Nat. Luxemb.* 111: 33–46.
- Esslinger, T. L. 2007. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. – North Dakota State Univ., Fargo.
- Flakus, A., Ahti, T., Kukwa, M. et al. 2008. New and interesting records of *Cladonia* and their lichenicolous fungi from the Andean cloud forest in Bolivia. – *Ann. Bot. Fenn.* 45: 448–454.
- Hafellner, J., Petutschnig, W., Taurer-Zeiner, C. et al. 2005. Über einige bemerkenswerte Flechtenfunde in Kärnten, hauptsächlich in den Gurktaler Alpen. – *Carinthia II.* 195: 423–440.
- Hardman, A., Stone, D. and Selva, S. B. 2017. Calicioid lichens and fungi of the Gifford Pinchot and Okanogan-Wenatchee National Forests in Washington, U.S.A. – *Opusc. Philolichenum* 16: 1–14.

- Harris, R. C. and Lendemer, J. C. 2010. A review of *Lecania croatica* (syn. *Catillaria croatica*) in North America. – *Opusc. Philolichenum* 8: 41–49.
- Hodkinson, B. P. 2009. A first assessment of lichen diversity for one of North America's 'Biodiversity Hotspots' in the Southern Appalachians of Virginia. – *Castanea* 75: 126–133.
- Istomina, N. B. and Likhacheva, O. V. 2010. The preliminary list of lichens of the Pskov Region (Russia). – *Nov. Sist. Nizs. Rast.* 44: 171–199, in Russian.
- Kukwa, M., Łubek, A., Szymczyk, R. et al. 2012. Seven lichen species new to Poland. – *Mycotaxon* 120: 105–118.
- Malta, N. 1926. Die Kryptogamenflora der Sandstein in Lettland. – *Acta Hort. Bot. Univ. Latv.* 1: 13–32.
- Mereschkowski K. S. 1913. Spisok lishainikov Pribaltijskogo kraja. – *Uchenye zapiski Kazanskogo Universiteta* 30: 1–62, in Russian.
- Millanes, A. M., Diederich, P., Westberg, M. et al. 2016. Three new species in the *Biatoropsis usnearum* complex. – *Herzogia* 29: 337–354.
- Moisejevs, R. 2015. Some new to Latvia lichens and allied fungi. – *Acta Biol. Univ. Daugavp.* 15: 285–292.
- Moisejevs, R. 2017. New lichens and allied fungi for Latvia. – *Folia Cryptog. Estonica* 54: 9–12.
- Moisejevs, R. and Degtjarenko, P. 2017. Four species of saxicolous lichenized fungi new to Latvia. – *Bot. Lithuan.* 23: 68–70.
- Motiejūnaitė, J. 2017. Supplemented checklist of lichens and allied fungi of Lithuania. – *Bot. Lithuan.* 23: 89–106.
- Motiejūnaitė, J. and Piterāns, A. 1998. Materials on lichens and allied fungi of Ķemeri National Park (Latvia). – *Bot. Lithuan.* 4: 187–196.
- Motiejūnaitė, J. and Grochowski, P. 2014. Miscellaneous new records of lichens and lichenicolous fungi. – *Herzogia* 27: 193–198.
- Motiejūnaitė, J., Suija, A., Lohmus, P. et al. 2006. New or noteworthy lichens, lichenicolous and allied fungi found during the 16th Symposium of Mycologists and Lichenologists in Latvia. – *Bot. Lithuan.* 12: 113–119.
- Motiejūnaitė, J., Berglund, T., Czarnota, P. et al. 2012. Lichens, lichenicolous and allied fungi found in Asveja Regional park (Lithuania). – *Bot. Lithuan.* 18: 85–100.
- Motiejūnaitė, J., Chesnokov, S. V., Czarnota, P. et al. 2016. Ninety-one species of lichens and allied fungi new for Latvia with a list of additional records from Kurzeme. – *Herzogia* 29: 143–163.
- Mrak, T., Mayrhofer, H. and Batič, F. 2004. Contributions to the lichen flora of Slovenia XI. Lichens from the vicinity of Lake Bohinj (Julian Alps). – *Herzogia* 17: 107–127.
- Nordin, A., Moberg, R., Tønsberg, T. et al. 2011. Santesson's checklist of Fennoscandian lichen-forming and lichenicolous fungi. Ver. 29 April 2011. <<http://130.238.83.220/santesson/home.php>>, accessed 6 May 2018.
- Orange, A., James, P. W. and White, F. J. 2001. Microchemical methods for the identification of lichens. – British Lichen Society, London.
- Piterāns, A. 1982. Lishainiki Latvii. – Zinatne, in Russian.
- Piterāns, A. 2001. Checklist of the lichens of Latvia. – *Latvijas Veģetācija* 3: 5–45.
- Printzen, C. 1995. Die Flechtengattugn *Biatore* in Europa. – *Bibl. Lichenol.* 60: 1–275.
- Randlane, T., Saag, A. and Suija, A. 2016. Lichenized, lichenicolous and allied fungi of Estonia. Ver. December 31, 2016. <<http://esamba.bo.bg.ut.ee/checklist/est/home.php>>, accessed 29 July 2018.
- Santesson, R. and Tønsberg, T. 1994. *Arthrorhaphis aeruginosa* and *A. olivaceae*, two new lichenicolous fungi. – *Lichenologist* 26: 295–299.
- Šliwa, L. and Kukwa, M. 2008. *Calicium pinastri* (Lichenized Ascomycota), a lichen species new to Poland. – *Pol. Bot. J.* 53: 189–191.
- Šliwa, L. and Kukwa, M. 2012. New distribution data for sterile crustose lichens in the Polish Tatra Mts and its surroundings. – *Pol. Bot. J.* 57: 259–278.
- Smith, C. W., Aptroot, A., Coppins, B. J. et al. (eds). 2009. The Lichens of Great Britain and Ireland. – British Lichen Society.
- Sohrabi, M. and Alstrup, V. 2007. Additions to the lichen mycota of Iran from East Azerbaijan Province. – *Mycotaxon* 100: 145–148.
- Straziņa, L., Kluša, J., Leimanis, I. et al. 2017. New bryophyte and fungi records and rarities of Latvia in 2016. – *Latvijas Veģetācija* 26: 125–150, in Latvian.
- Titov, A. 2000. Notes on calicioid lichens and fungi from the Gongga Mountains (Sichuan, China). – *Lichenologist* 32: 553–569.
- Tibell, L. 1975. The Caliciales of boreal North America. Taxonomy, ecological and distributional comparisons with Europe, and ultrastructural investigations in some species. – *Symb. Bot. Ups.* 21: 1–128.
- Tibell, L. 1999. Caliciales. – In: *Nordic Lichen flora 1. Bohuslän* '5, pp. 20–92.
- Tønsberg, T. 2004. Additions to the lichen flora of Great Smoky Mountains National Park. – *ATBI Q.* 3: 6.
- Tsurykau, A. 2017. New or otherwise interesting records of lichens and lichenicolous fungi from Belarus. III. With an updated checklist of lichenicolous fungi. – *Herzogia* 30: 152–165.
- Vimba E. 1971. Materials of the 6th symposium of the Baltic republics on mycology and lichenology. – Zinatne, in Russian.
- Vondrák, J., Palice, Z., Khodosovtsev, A. et al. 2010. Additions to the diversity of rare or overlooked lichens and lichenicolous fungi in Ukrainian Carpathians. – *Chornomorskyi Bot Zhurnal* 6: 6–34.
- Wirth, V., Hauck, M., von Brackel, W. et al. 2010. Checklist of lichens and lichenicolous fungi in Germany. Ver. #2: 19 January 2011. <www.gwdg.de/~mhauck>, accessed 29 July 2018.