

REVISION OF THE GENUS *CETRELIA* (LICHENISED ASCOMYCOTA) IN LATVIA

Polina DEGTJARENKO^{1,2*}, Rolands MOISEJEVS²

¹University of Tartu, Department of Botany, Lai Str. 40, 51005 Tartu, Estonia

²Daugavpils University, Institute of Life Sciences and Technology, Parādes Str. 1a, 5401 Daugavpils, Latvia*

Corresponding author. E-mail: polina.degtjarenko@ut.ee

Abstract

Degtjarenko P., Moisejevs R., 2020: Revision of the genus *Cetrelia* (lichenised Ascomycota) in Latvia. – *Botanica*, 26(1): 88–94.

All available specimens (98) of the genus *Cetrelia* from Latvia (Northern Europe) in the Herbaria DAU and RIG were revised. *Cetrelia cetrarioides*, *C. olivetorum* and *C. monachorum* were confirmed to occur in the country. The last taxon is new to Latvia. Distribution maps and habitat preferences of all three species in Latvia were presented, and their conservation status was discussed.

Keywords: cetrarioid lichens, *Cetrelia monachorum*, chemotypes, conservation, new record, Parmeliaceae.

INTRODUCTION

The genus *Cetrelia* W.L. Culb. & C.F. Culb. (Parmeliaceae, Lecanorales, Ascomycota) has been described by CULBERSON & CULBERSON (1968). The genus is characterised by a large foliose, loosely attached greyish-green thallus with rounded marginal lobes and laminal pseudocyphellae on an upper cortex, at least partly black lower surface with sparse rhizines, ellipsoid ascospores, and atranorin as the main cortical substance with different orcinol depsides and depsidones as diagnostic medullary substances (CULBERSON & CULBERSON, 1968, 1976; OBERMAYER & MAYRHOFER, 2007; MARK et al., 2019). The European *Cetrelia* species are characterised by the presence of marginal soralia. In Europe, the *Cetrelia* species are mostly epiphytic and found in old natural or seminatural forests on tree bark or occasionally on mossy rocks (OBERMAYER & MAYRHOFER, 2007; KUKWA et al., 2012; DEGTJARENKO et al., 2018). The genus includes 18 currently accepted species (THELL et al., 2012; RANDLANE et al., 2013), and most species are restricted to eastern and south-eastern Asia (CULBERSON & CULBERSON, 1968; RANDLANE & SAAG, 1991). In Europe, only four species are

known: *Cetrelia cetrarioides* (Delise) W.L. Culb. & C.F. Culb., *Cetrelia chicitae* (W.L. Culb.) W.L. Culb. & C.F. Culb., *Cetrelia monachorum* (Zahlbr.) W.L. Culb. & C.F. Culb., and *Cetrelia olivetorum* (Nyl.) W.L. Culb. & C.F. Culb. (CULBERSON & CULBERSON, 1968; HAWKSWORTH et al., 2008, 2011). The taxonomic affinities of these species have been discussed over the years. Several studies have suggested accepting only one species in the group with four chemotypes, separated according to the major medullary substances, which can be visualised by the standard thin-layer chromatography methods (TLC) (CLERC, 2004; SANTESSON et al., 2004; GILBERT & PURVIS, 2009), while others have considered the different chemotypes as separate species (RANDLANE & SAAG, 1991; WIRTH et al., 2013). Recently, MARK et al. (2019) have shown that these chemotypes are correlated with phylogenetic clades. Recognition of the species based on TLC results is, therefore, confirmed to be possible. The *Cetrelia* synthesise specific sets of related substances – chemosyndromes, where the same product may occur in several species, but in different quantities, acting either as a major or a minor compound – specific to its taxonomic affiliation (CULBERSON & CULBERSON, 1968). *Cetrelia monacho-*

rum contains imbricarinic acid as the major medullary substance and, additionally perlatolic, 4-O-demethylimbricarinic, and anziaic acids in minor or trace amounts in the medulla (OBERMAYER & MAYRHOFER, 2007; KUKWA & MOTIEJŪNAITĒ, 2012). *Cetrelia cetrarioides* contains perlatolic acid as the major and imbricarinic acid as minor medullary substance (OBERMAYER & MAYRHOFER, 2007; KUKWA & MOTIEJŪNAITĒ, 2012). *Cetrelia olivetorum* can be separated from the morphologically similar species *C. cetrarioides* and *C. monachorum* by a strong sanguineous/red reaction with the spot-test reaction with solution of sodium hypochlorite (C), which is caused by the presence of olivetoric acid in medulla (with trace of anziaic acid and 4-O-de-methylmicrophyllinic acid) (OBERMAYER & MAYRHOFER, 2007; GOLUBKOV et al., 2015). *Cetrelia chicitae* produces alectoronic acid and a-collatolic acid, including physodic acid and 4-O-methylphysodic acid in traces (OBERMAYER & MAYRHOFER, 2007). Also, all discussed *Cetrelia* species contain atranorin in the cortex.

In Latvia, two species, *C. olivetorum* and *C. cetrarioides*, have been recorded and distinguished by morphology and a spot-test reaction with solution of sodium hypochlorite (C) (ĀBOLIŅA et al., 2015). In the neighbouring countries, Estonia, Lithuania and Belarus, three species of the genus *Cetrelia* have been confirmed by TLC (KUKWA & MOTIEJŪNAITĒ, 2012; GOLUBKOV et al., 2015; DEGTJARENKO et al., 2018). To date, no particular chemical studies using TLC and distributional survey of the genus *Cetrelia* have been performed in Latvia. This study aimed to revise the *Cetrelia* taxa from available herbarium material to determine the species, their distribution and habitat preferences according to the European Union Habitats Directive in Latvia.

MATERIALS AND METHODS

The present study was based on herbarium material collected in Latvia from 1957 to 2018. A total of 98 specimens from the Lichenological Herbarium of Daugavpils University (DAU) and the University of Latvia (RIG) were studied. Morphology of the *Cetrelia* specimens was examined using a stereomicroscope. The specimens were tested for lichen substances by thin-layer chromatography (TLC; solvent A) (ORANGE et al., 2001). Localities of Latvian specimens and their

substrates were transcribed from the labels. Distribution maps of the *Cetrelia* species were created using ESRI ArcGIS pro 2.3. (ESRI, 2011).

RESULTS AND DISCUSSION

Heretofore, only two species, *Cetrelia olivetorum* and *C. cetrarioides*, had been known in Latvia (ĀBOLIŅA et al., 2015), *Cetrelia monachorum* was reported new to Latvia. *Cetrelia cetrarioides* and *C. olivetorum* accounted for 43% and 42% of the examined specimens, respectively. Amongst other *Cetrelia* species in Latvia, *Cetrelia monachorum* appeared to be the rarest – with 15% of the examined specimens. All studied material was sterile (without apothecia).

Cetrelia cetrarioides and *C. olivetorum* were first recorded in Latvia in 1957 (ANDRUŠAITIS et al., 1996) in the Numerne Forest near Donikava town. Since then, it has been recorded from other parts of Latvia as well (PITERĀNS, 2001; ĀBOLIŅA et al., 2015). Most collections of the *Cetrelia* are from the north-eastern and central parts of Latvia (Figs 1, 2). There are no records from the western part of the country. The distribution of *C. monachorum* is congruent with the distribution of other *Cetrelia* species (Fig. 3).

The three *Cetrelia* taxa are morphologically very similar, and difficult to distinguish based on morphology alone (RANDLANE & SAAG, 1991; OBERMAYER & MAYRHOFER, 2007; MARK et al., 2019). In our study, twenty-one *C. cetrarioides* specimens were previously determined as *C. olivetorum*, and seven *C. olivetorum* specimens as *C. cetrarioides*. A possible explanation

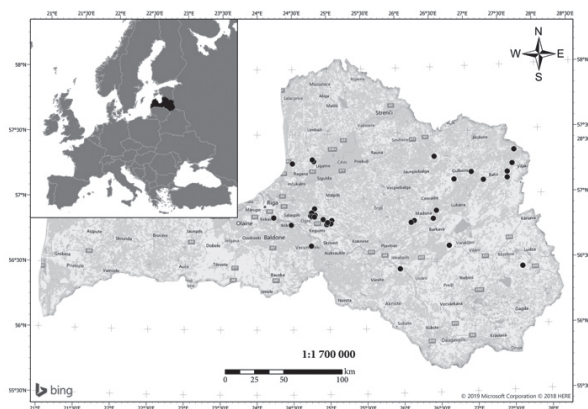


Fig. 1. Map of *Cetrelia cetrarioides* distribution in Latvia (marked with black circles); based on the herbarium collection from 1957 to 2018

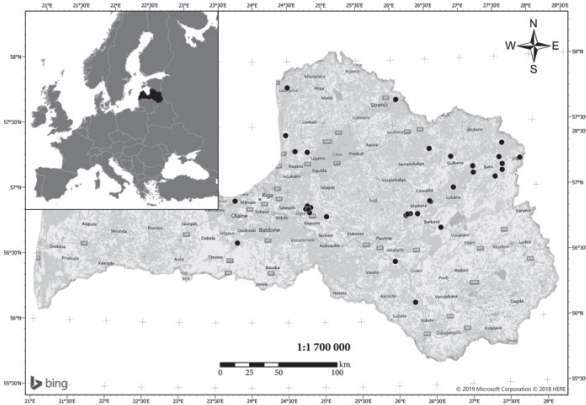


Fig. 2. Map of *Cetrelia olivetorum* distribution in Latvia (marked with black circles); based on the herbarium collection from 1957 to 2018

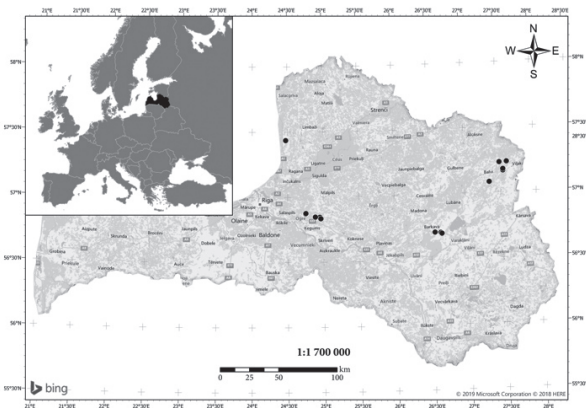


Fig. 3. Map of *Cetrelia monachorum* distribution in Latvia (marked with black circles); based on the herbarium collection from 1957 to 2018

for this might be that *C. olivetorum* and *C. cetrarioides* had been treated in Latvia as one species until 2001 (PĪTERĀNS, 2001). Since 2001, the determination of these taxa continued to be mainly based on morphology and spot-test reactions which are unreliable. Fifteen specimens were determined as *C. monachorum* (previously determined as *C. cetrarioides* and *C. olivetorum* and kept in the herbarium collections under *C. cetrarioides* or *C. olivetorum* names). The determination of lichen secondary substances using TLC proved to be a reliable tool to distinguish between these taxa (OBERMAYER & MAYRHOFER, 2007; KUKWA et al., 2012; MARK et al., 2019).

In the continental parts of Europe, the *Cetrelia* species grow mostly in old deciduous or mixed forests, in localities of high humidity (OBERMAYER & MAYRHOFER, 2007), especially in swamp forests or

forests surrounded by a lake or river or on hillsides near lakes or streams (RANDLANE & SAAG, 1991; KUKWA et al., 2012; KUKWA & MOTIEJŪNAITĒ, 2012). The *Cetrelia* habitat requirements in Latvia according to the European Union Habitats Directive (AUNIŅŠ et al., 2013) were based only on 33 recorded specimens from DAU and RIG. Data on habitat requirements according to the EU Habitats Directive were not used for other 65 specimens due to insufficient data on the specimen labels and lack of knowledge on the EU habitat distribution in Latvia. The examined *Cetrelia* specimens were mainly found at the sites, which correspond to the habitat type “Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus*, *Tilia*, *Acer*, *Fraxinus* or *Ulmus*) rich in epiphytes” (habitat type code “9020”, 31% of the examined records), “Fennoscandian deciduous swamp forests” (habitat type code “9080*”, 24% of the examined records), and “Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*” (habitat type code “91E0*”, 24% of the examined records).

Elsewhere, the *Cetrelia* species usually occur on deciduous trees and are very rarely found on coniferous trees (OBERMAYER & MAYRHOFER, 2007; KUKWA et al., 2012; KUKWA & MOTIEJŪNAITĒ, 2012). In Latvia, the *Cetrelia* species prefer mostly *Alnus glutinosa*, *Fraxinus excelsior*, *Populus tremula*, *Tilia cordata*, *Quercus robur* and less frequently *A. incana*, *Betula pendula*, *Corylus avellana*, *Padus avium* and *Picea abies* (Table 1). The habitat preferences for 18 specimens were not recorded on the specimen labels (Table 1).

In the Baltic countries, the *Cetrelia* species are rare and threatened. In Estonia, *C. olivetorum* and *C. cetrarioides* are considered as endangered (EN) and *C. monachorum* as critically endangered (CR; LÖHMUS et al., 2019). In Lithuania, all species of the genus *Cetrelia* are considered as EN (Jurga Motiejūnaitė pers. comm.). In Fennoscandia, for example, in Sweden, *C. olivetorum* s. lat. is treated as CR (NORDIN et al., 2011; ARTFAKTA, 2019), and in Finland, *C. olivetorum* – as EN (HYVÄRINEN et al., 2019). In neighbouring Belarus, *C. olivetorum* and *C. monachorum* are treated as EN, and *C. cetrarioides* – as CR (BELY et al., 2014). *Cetrelia olivetorum* is classified in Category I of the Latvian Red Data Book; the assessment of status was based on only seven herbarium specimens and one historical record (ANDRUŠAITIS et al., 1996). The status of newly reported *C. monachorum* has not been

Table 1. Substrate requirements for *Cetrelia cetrarioides*, *Cetrelia monachorum* and *Cetrelia olivetorum* in Latvia; based on the herbarium collection from DAU and RIG

Substrate	<i>C. cetrarioides</i>	<i>C. monachorum</i>	<i>C. olivetorum</i>	Total
<i>Alnus glutinosa</i>	13	4	12	29
<i>Alnus incana</i>	2	1	1	4
<i>Betula spp.</i>	2	0	1	3
<i>Corylus avelana</i>	0	0	1	1
<i>Populus tremula</i>	2	0	3	5
<i>Fraxinus excelsior</i>	11	2	7	20
<i>Picea abies</i>	1	0	0	1
<i>Tilia cordata</i>	1	3	5	9
<i>Quercus robur</i>	0	3	3	6
<i>Padus avium</i>	1	1	0	2
Unknown	8	2	8	18

determined yet. *C. olivetorum* is also included into the Legislative List (Rules of Ministry Cabinet) of Legally Protected Lichens in Latvia (REGULATIONS, 2013). For the current species, micro-reserves of up to 30 ha might be established. The assessment of a threat status of Latvian *Cetrelia* species based on IUCN system (STANDARDS..., 2006) has not been performed yet. Further work needs to be carried out to assess the threat status of all three *Cetrelia* species in Latvia according to the IUCN system and reconsider their conservation status for the Latvian Legislative List of Legally Protected Lichens. It is also recommendable to include *C. olivetorum*, *C. monachorum* and *C. cetrarioides* into a species monitoring system (BARONIŅA, 2017) to estimate the size of species populations and potential threats for all three species.

Record new to Latvia

Cetrelia monachorum (Zahlbr.) W.L. Culb. & C.F. Culb.

C. monachorum is morphologically similar to other sorediate species of the genus *Cetrelia* and is characterised by the presence of (mainly) marginal soredia. The soralia of *C. monachorum* are often coarse and irregular in shape with soredia usually exceeding 40 µm in diam. On the upper part of cortex, typically small and raised pseudocyphellae are found, sometimes associated with large ones, the lower cortex often lacks pseudocyphellae (CULBERSON & CULBERSON, 1968, 1976; OBERMAYER & MAYRHOFER, 2007). Morphologically similar sorediate *Cetrelia* species (*C. cetrarioides*, *C. chicitae* and *C. olivetorum*) are distinguished from *C. monachorum* by their different content sec-

ondary metabolites profile (OBERMAYER & MAYRHOFER, 2007; RANDLANE & SAAG, 1991; MARK et al., 2019). The species is known in the following European countries: Austria (OBERMAYER & MAYRHOFER, 2007), Belarus (GOLUBKOV et al., 2015), Bosnia-Herzegovina (BILOVITZ & MAYRHOFER, 2011), the Czech Republic (OBERMAYER & MAYRHOFER, 2007), Estonia (DEGTJARENKO et al., 2018), France, Germany, Italy (OBERMAYER & MAYRHOFER, 2007), Lithuania (KUKWA & MOTIEJŪNAITE, 2012), Montenegro (OBERMAYER & MAYRHOFER, 2007; KNEZEVIC & MAYRHOFER, 2009), Norway (OBERMAYER & MAYRHOFER, 2007), Poland (Kukwa et al., 2012), Portugal (LLIMONA & HLADUN, 2001), Romania (OBERMAYER & MAYRHOFER, 2007), Russia (European part, Tver Oblast, STEPANCHIKOVA et al., 2011), Slovakia, Slovenia, (OBERMAYER & MAYRHOFER, 2007), Spain (BARBERO et al., 1995), Sweden (NORDIN et al., 2011), Switzerland (OBERMAYER & MAYRHOFER, 2007), Ukraine (KONDRATYUK et al., 2003), the United Kingdom (OBERMAYER & MAYRHOFER, 2007). It is also known from the Republic of Armenia, the Republic of Azerbaijan (SOHRABI et al., 2007), China (WEI, 1991), Georgia (OBERMAYER & MAYRHOFER, 2007; SOHRABI & ALSTRUP, 2007), Hawaii (ELIX & MCCARTHY, 1998), India (MISHRA & UPRETI, 2015), Japan (KUROKAWA, 2003), North American mainland (OBERMAYER & MAYRHOFER, 2007), and from the Asian part of Russia (URBANAVICHUS & ANDREEV, 2010).

Specimens examined. Ogres distr., Suntažu Forest, forest square – 88, forest site 5, on unknown substrate, 16 Oct. 2002, I. Grīsele (RIG15910). Viļakas distr., Žīguru Forest, forest square – 504, forest site 2, on *A. glutinosa*, 2 Oct. 2012, V. Lārmanis (RIG16132).

Ogres distr., Suntažu Forestry, forest square – 256, forest site 12, on *A. glutinosa*, 16 Oct. 2002, I. Grīšle (RIG15925). Ogres distr., Suntažu Forestry, forest square – 79, forest site 8, on *A. incana*, 16 Oct 2002, I. Grīšle (RIG15917). Balvu distr., Kupravas Forest on *T. cordata*, 3 Oct. 1996, A. Piterāns (RIG14313). Balvu distr., Tilža, Dominava Forest of high humidity on *F. excelsior*, 13 Aug. 1957, A. Piterāns (RIG2038). Balvu distr., Kupravas Forest on *T. cordata*, 3 Oct. 1996, A. Piterāns (without number). Ogres distr., Suntažu Forestry, forest square – 274, forest site 10 on unknown substrate, in 2002, I. Grīšle (RIG15905). Ogres distr., Suntažu Forestry, forest square – 157, forest site 8, on *A. glutinosa*, 1 Dec. 2002, I. Grīšle (RIG15908). Madonas distr., Barkavas Rural Municipality, on *Q. robur*, 22 May 1997, A. Piterāns (RIG15353). Madonas distr., on *Q. robur*, 22 May 1997, A. Piterāns (RIG15352). Madonas distr., Nature ‘Barkavs ozolu audze’, *Q. robur* forest, 22 May 1997, A. Piterāns (RIG15245). Balvu distr., Vīksnas Rural Municipality, Nature Reserve ‘Kupravas liepu audze’, *T. cordata* forest, 26 May 1976, A. Piterāns (RIG15244). Salacgrīvas distr., 2 km to the east of Mustkalni town, on *A. glutinosa* in alluvial swamp forest (91E0*), 1 July 2017, R. Moisejevs (DAU600000477). Krimulda distr., about 3 km of Lēdurga town to the east, on *F. excelsior*, in old-growth broadleaved forest dominated by *Q. robur*, 19 Sep. 2016, R. Moisejevs (DAU600000476).

ACKNOWLEDGEMENTS

This work was supported by the Estonian Research Council under Grants PUT1017, IUT20-30, and IUT34-7; and Latvia’s State Forests (LVM) under Grant 140619/S53. We are grateful to Māris Nitcis (Daugavpils University, Latvia) for help in preparing the maps, Kerry Knudsen (Czech University of Life Sciences, Prague, the Czech Republic) for proofreading of the manuscript, Tiina Randlane (University of Tartu, Estonia) for valuable comments on the paper, and to reviewers for their constructive comments.

REFERENCES

ĀBOLIŅA A., PITERĀNS A., BAMBE B., 2015: Lichens and bryophytes in Latvia: Checklist. – Salaspils.

- ANDRUŠAITIS G., VIMBA E., PITERĀNS A., 1996: Latvian Red Data Book. Rare and extinct plant and animal species. Mushrooms and lichens, 1. – Rīga.
- ARTFAKTA, 2019: ArtDatabanken, SLU. <https://artfakta.se/rodlistan> [Accessed 14 August, 2019].
- AUNIŠ A., LĀRMANIS V., ROVE I., RŪSIŅA S., LAIME B. (eds), 2013: European Union Protected Habitats in Latvia. – Riga.
- BARBERO M., ETAYO J., GÓMEZ-BOLEA A., 1995: Chemotypes of *Cetrelia cetrarioides* s. l. (Lichenes) in the Iberian Peninsula. – Cryptogamic Botany, 5: 28–30.
- BARONIŅA V., 2017: Augu monitoringa metodika Natura 2000 teritorijās. www.daba.gov.lv/upload/File/DOC.../MET_2017_augi_N2000_un_arpus.docx [Accessed 14 August, 2019].
- BILOVITZ P.O., MAYRHOFER H., 2011: Epiphytic lichen mycota of the virgin forest reserve Rajhenavski Rog (Slovenia). – Herzogia, 24(2): 315–324.
- BELY P., GOLUBKOV V., TSURYKAU A., SIDOROVICH E., 2014: The lichen genus *Cetrelia* in Belarus: distribution, ecology and conservation. – Botanica Lithuanica, 20 (2): 69–76.
- CLERC P., 2004: Les champignons lichénisés de Suisse. – Cryptogamica Helvetica, 19: 1–320.
- CULBERSON W.L., CULBERSON C.F., 1968: The lichen genera *Cetrelia* and *Platismatia* (Parmeliaceae). – Washington.
- CULBERSON W.L., CULBERSON C.F., 1976: Chemosyn-dromic variation in lichens. – Systematic Botany, 1(4): 325–339.
- DEGTJARENKO P., JŪRIADO I., LŌHMUS P., 2018: New Estonian records: Lichenized fungi. – Folia Cryptogamica Estonica, 55: 151–154.
- ELIX J.A., MC CARTHY P.M., 1998: Catalogue of the lichens of the smaller Pacific Islands. – Bibliotheca Lichenologica, 70: 1–361.
- ESRI, 2011: ArcGIS Desktop, Release 10. – Redlands.
- GILBERT O.L., PURVIS O.W., 2009: *Cetrelia* W.L. Culb. & C.F. Culb. (1968). – In: SMITH C.W., APTROOT A., COPPINS B.J., FLETCHER A., GILBERT O.L., JAMES P.W., WOLSELEY P.A. (eds), The lichen flora of Great Britain and Ireland: 296–297. – London.
- GOLUBKOV V., MATWIEJUK A., BELY P., TSURYKAU A., 2015: Revision of the genus *Cetrelia* (Lecanorales, Ascomycota) in the Białowieża Forest (Belarusian part). – Steciana, 19(3): 123–132.

- HAWKSWORTH D.L., BLANCO O., DIVAKAR P.K., AHTI T., CRESPO A., 2008: A first checklist of parmelioid and similar lichens in Europe and some adjacent territories, adopting revised generic circumscriptions and with indications of species distributions. – *The Lichenologist*, 40(1): 1–21.
- HAWKSWORTH D.L., DIVAKAR P.K., CRESPO A., AHTI T., 2011: The checklist of parmelioid and similar lichens in Europe and some adjacent territories: additions and corrections. – *The Lichenologist*, 43(6): 639–645.
- HYVÄRINEN E., JUSLÉN A., KEMPPAINEN E., UDDSTRÖM A., LIUKKO U.-M. (eds), 2019: The 2019 Red List of Finnish Species. – Helsinki.
- KNEZEVIĆ B., MAYRHOFFER H., 2009: Catalogue of the lichenized and lichenicolous fungi of Montenegro. – *Phyton*, 48(2): 283–328.
- KONDRATYUK S.Y., POPOVAL P., LACKOVIČOVŠŮT A., PIŠŮT J., 2003: A catalogue of eastern Carpathians lichens. – Kiev.
- KUROKAWA S. (ed.), 2003: Checklist of Japanese lichens. – Tokyo.
- KUKWA M., MOTIEJŪNAITĖ J., 2012: Revision of the lichen genera *Cetrelia* and *Punctelia* (Lecanorales, Ascomycota) in Lithuania with implications for their conservation. – *Herzogia*, 25(1): 5–14.
- KUKWA M., PIETNOCZKO M., CZYŻEWSKA K., 2012: The lichen family Parmeliaceae in Poland. II. The genus *Cetrelia*. – *Acta Societatis Botanicorum Poloniae*, 81(1): 43–52.
- LLIMONA X., HLADUN N., 2001: Checklist of the lichens and lichenicolous fungi of the Iberian Peninsula and Balearic Islands. – *Bocconea*, 14: 5–58.
- LÖHMUS P., MARMOR L., JÜRiado I., SUIJA A., OJA E., DEGTJARENKO P., RANDLANE T., 2019: Red List of Estonian lichens: revision in 2019. – *Folia Cryptogamica Estonica*, 56: 63–76.
- MARK K., RANDLANE T., THOR G., HUR J.S., OBERMAYER W., SAAG A., 2019: Lichen chemistry is concordant with multilocus gene genealogy in the genus *Cetrelia* (Parmeliaceae, Ascomycota). – *Fungal Biology*, 123(2): 125–139.
- MISHRA G.K., UPRETI D.K., 2015: The lichen genus *Cetrelia* (Parmeliaceae, Ascomycota) in India. – *Phytotaxa*, 236(3): 201–214.
- NORDIN A., MOBERG R., TØNSBERG T., VITIKAINEN O., DALSAÄTT Å., MYRDAL M., SNITTING D., EKMAN S., 2011: Data from: Santesson's Checklist of Fennoscandian Lichen-forming and Lichenicolous Fungi. Ver. 29 April 2011. <http://130.238.83.220/santesson/home.php> [Accessed 14 August, 2019].
- OBERMAYER W., MAYRHOFFER H., 2007: Hunting for *Cetrelia chicitae* (lichenized Ascomycetes) in the eastern European Alps (including an attempt for a morphological characterization of all taxa of the genus *Cetrelia* in Central Europe). – *Phyton*, 47(1–2): 231–290.
- ORANGE A., JAMES P.W., WHITE F.J., 2001: Microchemical methods for the identification of lichens. – London.
- PITERĀNS A., 2001: Checklist of the lichens of Latvia. – *Latvijas Veģetācija*, 3: 5–45.
- RANDLANE T., SAAG A., 1991: Chemical and morphological variation in the genus *Cetrelia* in the Soviet Union. – *The Lichenologist*, 23(2): 113–126.
- RANDLANE T., SAAG A., THELL A., AHTI T., 2013: Third world list of cetrarioid lichens - in a new databased form, with amended phylogenetic and type information. – *Cryptogamie Mycologie*, 34(1): 79–84.
- REGULATIONS, 2013: Regulations Regarding the Establishment and Management of Micro-reserves, Their Conservation, as well as Determination of Micro-reserves and Their Buffer Zones. <https://likumi.lv/ta/en/en/id/253746> [Accessed 14 August, 2019].
- SANTESSON R., MOBERG R., NORDIN A., TØNSBERG T., VITIKAINEN O., 2004: Lichen-forming and lichenicolous fungi of Fennoscandia. – Uppsala.
- SOHRABI M., AHTI T., URBANAVICHUS G., 2007: Parmelioid lichens of Iran and the Caucasus Region. – *Mycologia Balcanica*, 4(1–2): 21–30.
- STANDARDS AND PETITIONS WORKING GROUP, 2006: Guidelines for Using the IUCN Red List Categories and Criteria: Version 6.1. Prepared by the Standards and Petitions Working Group for the IUCN SSC Biodiversity Assessments Sub-Committee in July 2006. <http://app.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf> [Accessed 14 August, 2019].
- STEPANCHIKOVA I., KUKWA M., NOTOV A., HIMELBRANT D., 2011: Novye dannye o lixeno-flore Tverskoj oblasti. – *Vestnik TvGU, Biologija i ekologija*, 23: 137–142.
- THELL A., CRESPO A., DIVAKAR P.K., KÄRNEFELT I.,

- LEAVITT S.D., LUMBSCH H.T., SEAWARD M.R., 2012: A review of the lichen family Parmeliaceae – history, phylogeny and current taxonomy. – *Nordic Journal of Botany*, 30(6): 641–664.
- URBANAVICHUS G., ANDREEV M., 2010: A checklist of lichen flora of Russia. – St. Petersburg.
- WEI J.C., 1991: An enumeration of lichens in China. – Beijing.
- WIRTH V., HAUCK M., SCHULTZ M., 2013: Die Flechten Deutschlands, 1. – Stuttgart.

CETRELIA GENTIES (LICHENIZUOTI AUKŠLIAGRYBŪNAI) REVIZIJA LATVIJOJE

Polina DEGTJARENKO, Rolands MOISEJEVS

Santrauka

Buvo patikrinti visi DAU ir RIG herbariumuose laikomi *Cetrelia* pavyzdžiai (iš viso 98), surinkti Latvijoje. Inventorizacija patvirtino, kad šalyje aptinkamos trys *Cetrelia* genties rūšys: *Cetrelia cetrarioides*, *C. olivetorum* ir *C. monachorum*. Pastaroji rūšis yra nauja Latvijos lichenobiotai. Straipsnyje pateikiami visų trijų rūšių paplitimo žemėlapiai bei jų buveinės Latvijoje, aptariamas rūšių apsaugos statusas.