Folia Cryptog. Estonica, Fasc. 58: 35–40 (2021)
https://doi.org/10.12697/fce.2021.58.04

New records of lichens and lichenicolous fungi from Murmansk Region, Russia

Gennadii Urbanavichus[1] & Irina Urbanavichene[2]

[1]Institute of North Industrial Ecology Problems, Kola Science Centre RAS,
Akademgorodok 14a, Apatity, 184209 Murmansk region, Russia.
E-mail: g.urban@mail.ru
[2]Komarov Botanical Institute RAS, Professor Popov Str. 2, 197376 St Petersburg, Russia.
E-mail: urbanavichene@gmail.com

Abstract: As a contribution to the lichen flora of the Murmansk Region, eight taxa of lichens and lichenicolous fungi collected from the biogeographic province Kuusamo, are reported for the first time, including two species new to Russia: *Roselliniella nephromatis* and *Scytinium aquale*. *Arthonia granitophila* is new to European Russia, and *Sclerophora amabilis* – for North European Russia. Comments on habitats, substrates, key anatomical features and distribution of new records are provided.

Keywords: lichenized fungi, distribution, Kuusamo

INTRODUCTION

This article presents the new and noteworthy findings of lichens and allied fungi from the Murmansk Region continuing the series of publications on the same subject (see e.g., Urbanavichus, 2015, 2016, 2020; Urbanavichus & Urbanavichene, 2017, 2018, 2020; Urbanavichus & Fadeeva, 2018). Murmansk Region is divided into eight biogeographic provinces (Fig. 1)

Fig. 1. The location of study area (Δ) in the Kuusamo (Regio kuusamoënsis) and other biogeographic provinces in the Murmansk Region. The abbreviations of the biogeographic provinces: Lps – Lapponia petsamoënsis, Lt – Lapponia tulomensis, Lm – Lapponia murmanica, Lim – Lapponia imandrae, Lv – Lapponia varsugae, Lp – Lapponia ponojensis, Kk – Karelia keretina.

(Urbanavichus et al., 2008), and Kuusamo, with the total area of ca. 5000 km^2, is the second smallest among them. The former Finnish Kuusamo (Koillismaa, Ks) biogeographic province was divided between the USSR and Finland after World War II. In the USSR, the northeastern part of this biogeographic province became part of the Murmansk Region, and the southeastern part became part of the Republic of Karelia. Murmansk part of Ks is the most well-preserved territory in comparison with other areas of the Murmansk Region; there is no manufacturing, therefore the region has a very low level of air pollution (Ershov et al., 2020). Various hills (finn. *vaara*) and fells (finn. *tunturi*) are located in the Murmansk part of Ks. The highest hills are Rakhmojva (658 m), Sallatunturi (636 m), Vuosnatunturi (625 m), Sotkojva (591 m) and Akhventunturi (577 m). Ninety percent of the land area is forested. The area is characterized by meandering rivers, lakes, gorges, calcareous bedrock, pine and spruce forests and aapa mires. A wide variety of habitats provides numerous niches for lichen biota and vascular plant flora. Altogether, 477 lichen species are known to occur in the Murmansk part of Ks (Urbanavichus et al., 2008). Our study yielded large and diverse collection of lichens and allied fungi, including species new for the country and noteworthy records at the regional level that are presented here. All reported taxa are new for the Murmansk Region. The lichen *Scytinium aquale* and lichenicolous fungus *Roselliniella nephromatis* are reported for the

first time for Russia, *Arthonia granitophila* – for European Russia, and *Sclerophora amabilis* – for North European Russia.

MATERIAL AND METHODS

The study is based on specimens collected in July-August 2020 by Gennadii Urbanavichus during a short field trip in south-westernmost part of the Murmansk Region, Kandalaksha District, Kuusamo biogeographic province (Fig. 1). The specimens were morphologically examined by standard microscopic techniques. Hand-cut sections and squash preparations were examined in water, a 10% aqueous solution of KOH, and Lugol's solution. Measurements of well-developed free ascospores lying outside the asci were measured in water at ×1000 magnification. Lichen substances were identified by thin layer chromatography (in solvents A, B and C) in the Laboratory of Lichenology and Bryology of Komarov Botanical Institute of RAS according to the methods of Orange et al. (2001). The geographic coordinates (WGS84) and altitudes of each locality were measured by GPS. The nomenclature of the cited taxa follows Nordin et al. (2011). The specimens are deposited in the lichen herbarium of Institute of North Industrial Ecology Problems, Kola Science Centre RAS in Apatity (INEP). Lichenicolous fungi are marked with # in the following list.

THE SPECIES

Arthonia granitophila Th. Fr. – The left bank of Ontonyoki River, 27 km SW of Alakurtti settlement, 66°49'53.5"N, 29°50'30.3"E, alt. c. 310 m, old growth mixed spruce-birch forest, on rocks, 03.08.2020 (INEP 0416). – This species has rounded to elongated apothecia, 0.1–0.3 mm in diam., ascospores small, (10–)11–14(–17) × (3.5–)4.5–5(–6.8) µm, colorless, becoming browner with age (Sanderson et al., 2009). It was found on vertical surfaces of slate and mica-schist rocks under an overhang, along with *Chaenotheca gracillima* (Vain.) Tibell, *Chrysothrix chlorina* (Ach.) J. R. Laundon, *Gyalecta biformis* (Körb.) H. Olivier and *Lepraria* sp. New for European Russia. This species was previously known in Russia only from the Southern Siberia (Sedelnikova, 2013). It is a widely distributed species in Europe but rarely collected or reported. The nearest known locality is in the neighboring territory of the biogeographic province Kuusamo in Finland (Nordin et al., 2011).

Chaenothecopsis epithallina Tibell (Fig. 2). – The nameless gorge in north-western foot of Mt. Sallatunturi, 66°55'36.8"N, 29°11'35.3"E, alt. c. 260 m, old growth pine-spruce forest at the bottom of the gorge, on wood of spruce, 29.07.2020 (INEP 0419). – *Chaenothecopsis epithallina* differs from the similar species *C. nigra* Tibell by its association with *Chaenotheca trichialis*, darker ascospores with less contrasting septum and dark green hypothecium (Tibell, 1999). This species was found in rather shaded conditions, on *Chaenotheca trichialis* as a parasymbiont/parasite, on the wood of very old spruce tree, along with *Chaenotheca chrysocephala* (Turner ex Ach.) Th. Fr., *C. xyloxena* Nádv. and *Lepraria* sp. It is a rather widely distributed species in Northern Hemisphere (Tibell, 1999). The nearest known localities are in the neighboring territory of the biogeographic provinces Kuusamo in Finland (Nordin et al., 2011) and Karelia Keretina, Republic of Karelia, Russia (Fadeeva et al., 2007).

Fig. 2. Ascomata of *Chaenothecopsis epithallina* on thallus of *Chaenotheca trichialis*. Scale bar = 1 mm.

Lichenoconium erodens M. S. Christ. & D. Hawksw. – The Isokumpu place, 22 km W of Alakurtti settlement, 66°56'20.8"N, 29°51'14.5"E, alt. c. 360 m, old growth spruce

forest, on thallus of *Hypogymnia physodes* (L.) Nyl. on spruce branches, 01.08.2020 (INEP 0420). – The species is distinguishable from all other members of the genus due to the smaller dimensions of its pycnidia (20–45 µm in diam.) and conidia (2.5–3.3 µm in diam.) (Diederich, 2004). This is a very common lichenicolous species widely distributed in both hemispheres (Brackel, 2014). In Russia, it is known from many regions (Tsurykau & Korchikov, 2017).

Ochrolechia bahusiensis H. Magn. – The Isokumpu place, 22 km W of Alakurtti settlement, 66°56'20.8"N, 29°51'14.5"E, alt. c. 360 m, old growth spruce forest, on bark of spruce, 01.08.2020 (INEP 0422). Soralia C+ red (TLC: gyrophoric/lecanoric acids and fatty acids of murolic acid complex). – *O. bahusiensis* can be easily distinguished from similar taxa by the production of the murolic acid complex. Morphologically the species resembles *O. androgyna* (Hoffm.) Arnold, which has often a much thicker thallus and bullate areoles, and contains unidentified substances called 'androgyna unknowns' (Kukwa, 2011). It is a rather widely distributed species in Europe (Kukwa, 2011). In Russia, this species is known from several regions in European part of Russia (Stepanchikova et al., 2010; Kukwa, 2011; Tagirdzhanova et al., 2014; Tarasova & Stepanchikova, 2016; Urbanavichene & Urbanavichus, 2016; Tarasova et al., 2019), and has been recorded from Northern Caucasus (Urbanavichus & Urbanavichene, 2014). The nearest known localities are in the biogeographic province Ostrobottnia borealis (Perä-Pohjanmaa) in Northern Finland (Nordin et al., 2011).

Roselliniella nephromatis (Crouan) Matzer & Hafellner (Fig. 3). – The nameless gorge in 10.5 km S of Kajraly village, 66°49'38.6"N, 29°32'07.0"E, alt. c. 320 m, rock walls of E exposure with single trees of willows and pines, on thallus of *Nephroma bellum* (Spreng.) Tuck. on mossy rocks, 30.08.2020 (INEP 0415). – This species is characterized by its black, large perithecioid ascomata, 400–700 µm in width, first immersed in the thallus, erumpent through the cortex of the host lichen and later almost sessile, arising singly or in groups of 2–3; elongate-clavate to subcylindrical asci, 90–115 × 11–14 µm, 4(–6)-spored; simple elongate ascospores, 17–25 × 8–14 µm, at first colorless, then medium brown, without a distinct halo, with microguttulate walls (Matzer & Hafellner, 1990). *Roselliniella nephromatis* is recorded here for the first time for Russia. This rare lichenicolous fungus, confined to the species of *Nephroma* and *Pseudocyphellaria*, is known so far from Western Europe, North America and Macaronesia (Martínez, 2002). In Northern Europe it is known from Finland (Pykälä et al., 2019).

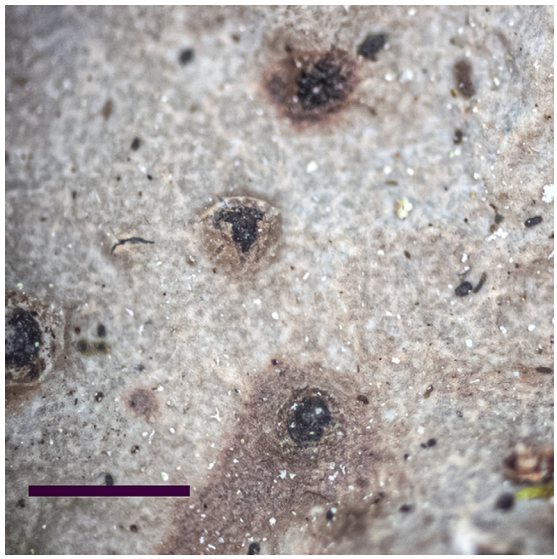

Fig. 3. Ascomata of *Roselliniella nephromatis* on thallus of *Nephroma bellum*. Scale bar = 1 mm.

Sclerophora amabilis (Tibell) Tibell (Fig. 4) – The southern edge of Lake Kuolajärvi in 4 km S of Kajraly village, 66°53'37.4"N, 29°37'38.9"E, alt. c. 240 m, old growth spruce forest on the bank of a small, nameless stream, on bark of old spruce, 30.08.2020 (INEP 0414). – *Sclerophora amabilis* is similar to *S. pallida* (Pers.) Y. J. Yao & Spooner and *S. peronella* (Ach.) Tibell, but differs in its mean ascospore size (5–6 µm in diam.) and taller ascomata (Tibell, 1999). This is the second record for European Russia, and new for North European Russia. In Russia, this species has been reported earlier from the Ryazan Region (Muchnik & Konoreva, 2017), Republic of Adygea (Urbanavichus et al., 2020) and Primorskiy Territory (Tibell, 1979). It is the northernmost locality in the world. Its closest known locality is in the southern part of Nordland province, Norway (Nordin et al., 2011). This species was originally described from New Zealand, but has also been discovered in North America and

several countries in Europe (Tibell, 1999; Diederich et al., 2012; Malíček et al., 2014; Vondrák et al., 2015; Oja et al., 2016; Schultz & Steindl, 2018; Yatsyna et al., 2020).

Fig. 4. Ascomata of *Sclerophora amabilis* on bark of spruce. Scale bar = 1 mm.

Scytinium aquale (Arnold) Otálora, P. M. Jørg. & Wedin (Fig. 5) – The southern edge of Lake Kuolajärvi in 4 km S of Kajraly village, 66°53'38.6"N, 29°38'21.6"E, alt. c. 210 m, willow thickets on the lake shore, on willow branches, periodically submerged in water, 30.07.2020 (INEP 0417). – A minute species, somewhat resembling *S. biatorinum* (Nyl.) Otálora et al., with a blackish-brown, mainly crustose-granular thallus, the granules paraplectenchymatous throughout, apothecia frequent (to 0.5 mm in diam.), sessile, with concave to flat, pale brown discs, and occasionally with a crenulate thalline collar, in section with a proper exciple, with submuriform to muriform, relatively large ascospores, (25–)30–45(–50) × 10–14 µm (Jørgensen, 2007). *Scytinium aquale* is recorded here for the first time for Russia. Its closest known localities are known from the northern provinces of Sweden (Nordin et al., 2011). An extremely rare minute lichen, probably largely overlooked and could be more widespread, previously known from several European countries – Austria, Norway, Sweden and Switzerland (Jørgensen, 1994; Nordin, 2002; Holien et al., 2016), and also recorded from North America (Jørgensen & Tønsberg, 1999).

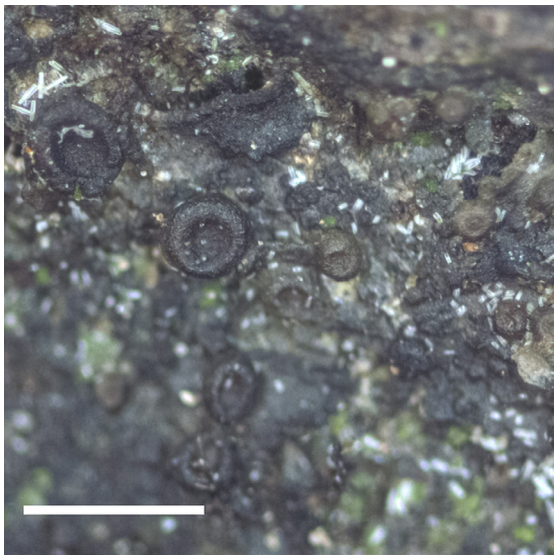

Fig. 5. Apothecia of *Scytinium aquale* on willow branch. Scale bar = 1 mm.

Usnea wasmuthii Räsänen – The nameless gorge in north-western foot of the Mt Sallatunturi, 66°55'36.8"N, 29°11'35.3"E, alt. c. 260 m, old growth pine-spruce forest at the bottom of the gorge, on spruce branches, 29.07.2020 (INEP 0418). Soralia and medulla K+ yellow→red, Pd+ yellow→orange (TLC: usnic, salazinic and barbatic acids). – This is a shrubby species characterized by mainly isotomic-dichotomic branching pattern, tapering terminal branches, blackened base, usually verrucose papillae, and at least partly isidiate soralia (check young specimens). *Usnea wasmuthii* is close to *U. subfloridana* Stirt, but the former has more often longitudinal cracks at the base and its soralia become more frequently slightly excavate and elongated (Clerc, 2011). Furthermore, *U. subfloridana* has a different chemistry with squamatic and/or thamnolic acids as main substance(s) (Clerc, 2011). *Usnea wasmuthii* has a rather wide but scattered distribution in Northern Hemisphere in boreal and montane areas. This species is known from almost all regions of Russia within the forest zone (Urbanavichus, 2010). The nearest known localities are in the neighboring territory of the biogeographic province Kuusamo in Finland (Nordin et al., 2011).

ACKNOWLEDGEMENTS

The work of G. P. Urbanavichus was carried out within the framework of the State Research Program of the Kola Science Centre of RAS no. AAAA-A18-118021490070-5. The work of I. N. Urbanavichene was carried out within the framework of the State Research Program of the Komarov Botanical Institute of RAS no. 121021600184-6 «Flora and taxonomy of algae, lichens and bryophytes in Russia and phytogeographically important regions of the world» and RFBR grant (no. 18-05-60093_Arctic). We are grateful to Polina Degtjarenko and Tiina Randlane for valuable corrections and comments.

REFERENCES

Brackel, W. v. 2014. Kommentierter Katalog der flechtenbewohnenden Pilze Bayerns. *Bibliotheca Lichenologica* 109: 1–476.

Clerc, P. 2011. *Usnea*. *Nordic Lichen Flora* 4: 107–127.

Diederich, P. 2004. *Lichenoconium*. In: Nash, T. H. III, Ryan, B. D., Diederich, P., Gries, C. & Bungartz, F. (eds). *Lichen Flora of the Greater Sonoran Desert Region, Vol. 2*. Lichens Unlimited, Arizona State University, Tempe, Arizona. Pp. 659–661.

Diederich, P., Ertz, D., Eichler, M., Cezanne, R., van den Boom, P., Fischer, E., Killmann, D., van den Broeck, D. & Sérusiaux, E. 2012. New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. XIV. *Bulletin de la Société des naturalistes luxembourgeois* 113: 95–115.

Ershov, V. V., Lukina, N. V., Danilova, M. A., Isaeva, L. G., Sukhareva, T. A. & Smirnov, V. E. 2020. Assessment of the Composition of Rain Deposition in Coniferous Forests at the Northern Tree Line Subject to Air Pollution. *Russian Journal of Ecology* 51(4): 319–328. https://doi.org/10.1134/S1067413620040050

Fadeeva, M. A., Golubkova, N. S., Vitikainen, O. & Ahti, T. 2007. *Conspectus of lichens and lichenicolous fungi of the Republic of Karelia*. Petrozavodsk. 194 pp. (In Russian, English summary).

Holien, H., Frisch, A., Jonsson, F., Klepsland, J. T., Millanes, A. M., Motiejūnaitė, J., Prieto, M., Pykälä, J., Suija, A., Tsurykau, A., Westberg, M. & Bendiksby, M. 2016. Interesting lichenized and lichenicolous fungi found during the Nordic Lichen Society excursion in Nord-Trøndelag, Norway 2015. *Graphis Scripta* 28(1–2): 40–49.

Jørgensen, P. M. 1994. Further notes on European taxa of the lichen genus *Leptogium*, with emphasis on the small species. *Lichenologist* 26(1): 1–29. https://doi.org/10.1006/lich.1994.1001

Jørgensen, P. M. 2007. *Collemataceae*. *Nordic Lichen Flora* 3: 14–42.

Jørgensen, P. M. & Tønsberg, T. 1999. Notes on some small species of *Leptogium* from Pacific North America. *The Bryologist* 102(3): 412–417. https://doi.org/10.2307/3244229

Kukwa, M. 2011. The lichen genus *Ochrolechia* in Europe. Fundacja Rozwoju Uniwersytetu Gdańskiego, Gdańsk. 309 pp.

Malíček, J., Palice, Z. & Vondrák, J. 2014. New lichen records and rediscoveries from the Czech Republic and Slovakia. *Herzogia* 27: 257–284. https://doi.org/10.13158/heia.27.2.2014.257

Martínez, I. 2002. Lichenicolous fungi from the Iberian Peninsula and the Macaronesian area. *Nova Hedwigia* 74: 51–67. https://doi.org/10.1127/0029-5035/2002/0074-0051

Matzer, M. & Hafellner, J. 1990. Eine Revision der lichenicolen Arten der Sammelgattung *Rosellinia* (Ascomycetes). *Bibliotheca Lichenologica* 37: 1–138.

Muchnik, E. & Konoreva, L. 2017. New and noteworthy records of lichens and allied fungi from central European Russia. *Herzogia* 30: 509–514. https://doi.org/10.13158/heia.30.2.2017.509

Nordin, A. 2002. Du Rietz's lichen collections 1956–1965 from riverbanks and shores of lakes in connection with planned water regulations. *Thunbergia* 32: 1–26.

Nordin, A., Moberg, R., Tønsberg, T., Vitikainen, O., Dalsätt, Å., Myrdal, M., Snitting, D. & Ekman, S. 2011. *Santesson's Checklist of Fennoscandian Lichen-forming and Lichenicolous Fungi*. Ver. April 29, 2011. http://130.238.83.220/santesson/home.php (30 January 2021).

Oja, E., Gerasimova, J., Suija, A., Lõhmus, P. & Randlane, T. 2016. New Estonian records and amendments: Lichenized fungi. *Folia Cryptogamica Estonica* 53: 123–126. https://doi.org/10.12697/fce.2016.53.14

Orange, A., James, P. W. & White, F. J. 2001. *Microchemical methods for the identification of lichens*. London, British Lichen Society. 101 pp.

Pykälä, J., Jääskeläinen, K., Rämä, H., Launis, A., Vitikainen, O. & Puolasmaa, A. 2019. Lichens. In: Hyvärinen, E., Juslén, A., Kemppainen, E., Uddström, A. & Liukko, U.-M. (eds). *The 2019 Red List of Finnish Species*. Helsinki, Ministry of the Environment & Finnish Environment Institute. Pp. 263–312.

Sanderson, N. A., Hawksworth, D. L. & Aptroot, A. 2009. *Melaspilea* Nyl. (1857). In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds). *The lichens of Great Britain and Ireland*. London, British Lichen Society. Pp. 576–579.

Schultz, M. & Steindl, P. 2018. First record of *Sclerophora amabilis* in Germany. *Herzogia* 31: 317–321. https://doi.org/10.13158/099.031.0126

Sedelnikova, N. V. 2013. Species diversity of lichen biota of the Altai-Sayan ecological region. *Plant Life of Asian Russia* 2: 12–54. (In Russian, English summary).

Stepanchikova, I., Kukwa, M., Kuznetsova, E., Motiejūnaitė, J. & Himelbrant, D. 2010. New records of lichens and allied fungi from the Leningrad Region, Russia. *Folia Cryptogamica Estonica* 47: 77–84.

Tagirdzhanova, G. M., Kataeva, O. A. & Stepanhcikova, I. S. 2014. New lichen records from the Novgorod Region, Russia. *Folia Cryptogamica Estonica* 51: 103–108. https://doi.org/10.12697/fce.2014.51.11

Tarasova, V. N., Pystina, T. N., Androsova, V. I., Sonina, A. V., Valekzhanin, A. A. & Konoreva, L. A. 2019. New records of lichens and allied fungi from Vodlozersky National Park within Arkhangelsk Region (NW Russia). *Folia Cryptogamica Estonica* 56: 87–98. https://doi.org/10.12697/fce.2019.56.09

Tarasova, V. N. & Stepanchikova, I. S. 2016. New lichens in the Republic of Karelia. *Proceedings of Petrozavodsk State University* 4(157): 78–81. (In Russian, English summary).

Tibell, L. 1979. *Caliciales Exsiccatae. Fasc. II (No. 26–50).* 4: 1–9.

Tibell, L. 1999. *Calicioid lichens and fungi. Nordic Lichen Flora* 1: 20–71.

Tsurykau, A. & Korchikov, E. S. 2017. Lichenicolous fungi from the Samara Region, southern part of European Russia. *Folia Cryptogamica Estonica* 54: 1–8. https://doi.org/10.12697/fce.2017.54.01

Urbanavichene, I. N. & Urbanavichus, G. P. 2016. The lichen flora of the Mordovskii Reserve (an annotated species list). *Flora and fauna of Reserves* 126: 1–41. (In Russian).

Urbanavichus, G. P. 2010. *A checklist of the lichen flora of Russia.* St. Petersburg. 194 pp. (In Russian & English).

Urbanavichus, G. P. 2015. Lichens and lichenicolous fungi new for Russia and Murmansk Province from Pasvik Reserve. *Bulletin of Moscow Society of Naturalists. Biological series* 120(3): 74–75.

Urbanavichus, G. 2016. Additions to the lichens and lichenicolous fungi of Pasvik Reserve, Murmansk region, Russia. *Graphis Scripta* 28(1–2): 8–10.

Urbanavichus, G. P. 2020. Contribution to the lichen flora of the Nature Park Korablekk (Murmansk Region). *Transactions of Karelian Research Centre of RAS* 8: 81–89. (In Russian, English summary). http://dx.doi.org/10.17076/bg1179

Urbanavichus, G., Ahti, T. & Urbanavichene, I. 2008. Catalogue of lichens and allied fungi of Murmansk Region, Russia. *Norrlinia* 17: 1–80.

Urbanavichus, G. P. & Fadeeva M. A. 2018. *The lichen flora of the Pasvik Reserve: diversity, distribution, ecology, protection.* Petrozavodsk. 173 pp. (In Russian, English summary).

Urbanavichus, G. & Urbanavichene, I. 2014. An inventory of the lichen flora of Lagonaki Highland (NW Caucasus, Russia). *Herzogia* 27: 285–319. https://doi.org/10.13158/heia.27.2.2014.285

Urbanavichus, G. & Urbanavichene, I. 2017. New records and noteworthy lichens and lichenicolous fungi from Pasvik Reserve, Murmansk Region, Russia. *Folia Cryptogamica Estonica* 54: 31–36. https://doi.org/10.12697/fce.2017.54.06

Urbanavichus, G. & Urbanavichene, I. 2018. New records of lichens and allied fungi from Lapponia petsamoënsis, Murmansk Region, Russia. *Folia Cryptogamica Estonica* 55: 1–5. https://doi.org/10.12697/fce.2018.55.01

Urbanavichus, G. P. & Urbanavichene, I. N. 2020. New records for the lichen flora of Murmansk region. *Botanicheskii Zhurnal* 105(12): 1221–1225. (In Russian, English summary). https://doi.org/10.31857/S0006813620120182

Urbanavichus, G., Vondrák, J., Urbanavichene, I., Palice, Z. & Malíček J. 2020. Lichens and allied non-lichenized fungi of virgin forests in the Caucasus State Nature Biosphere Reserve (Western Caucasus, Russia). *Herzogia* 33: 90–138. https://doi.org/10.13158/heia.33.1.2020.90

Vondrák, J., Malíček, J., Šoun, J. & Pouska, V. 2015. Epiphytic lichens of Stužica (E Slovakia) in the context of Central European old-growth forests. *Herzogia* 28: 104–126. https://doi.org/10.13158/heia.28.1.2015.104

Yatsyna, A., Stukonis, V. & Gliwa, B. 2020. Lichens and allied fungi from the Praviršulio Tyrelis State Nature Reserve (Central Lithuania). *Botanica* 26(2): 160–169. https://doi.org/10.2478/botlit-2020-0017