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New lichen records from the mountain forests of Southern Siberia

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Summary. Based on the results of field works mainly in 2009–2017, new data on new and noteworthy lichen species from Southern Siberia are presented. The lichen specimens were collected predominantly by the first author in the mountain dark coniferous forests with *Abies sibirica*, *Pinus sibirica*, *Populus suaveolens*, *Sorbus sibirica* and *Padus avium* in Baikal State Nature Biosphere Reserve (Khamar-Daban Range, Republic of Buryatia) and Ergaki Nature Park (Western Sayan Mts, Krasnoyarsk Territory). In the present paper, 14 species are reported as new for the lichen flora of study areas, among them: *Biatorella flavella* is reported for the first time for Russia, *Ropalospora viridis* is new to Asia, 5 species – *Bryoria vrangiana, Dictyocatenulata alba, Elixia flexella, Lecanora compallens* and *Micarea soralifera* – are new for Siberia, *Chaenotheca subroscida* and *Fuscidea arboricola* are new for Southern Siberia, 4 species – *Absconditella annexa*, *Caloplaca sorocarpa, Bryobilimbia sanguineoatra* and *Protothelenella sphinctrinoidella* are new for Baikal Siberia, *Caloplaca sorocarpa* is new for Krasnoyarsk Territory, *Pilophorus strumaticus* is new for Republic of Buryatia. A full text of herbarium labels, some comments and comparisons with similar species are given. The information about distribution of all mentioned species in Russia and world is also presented. Our records considerably extend the ranges or fill gaps in the formerly disjunctive distributions of these species.

Новые находки лишайников из горно-таежных лесов Южной Сибири

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Ключевые слова: Байкальский заповедник, Западный Саян, лишайники, новые находки, Россия, Хамар-Дабан, *Biatorella flavella*.

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Аннотация. Несмотря на многолетнее изучение видового разнообразия лишайников Южной Сибири и Прибайкалья, видовой состав лихенофлоры этих регионов ежегодно пополняется новыми видами, выявленными при проведении экспедиционных лихенологических исследований. Представленное дополнение к лихенофлоре Байкальского заповедника (хр. Хамар-Дабан, Республика Бурятия) и Природного парка «Ергаки» (Западный Саян, Красноярский край) включает виды, новые как для Республики Бурятии или Красноярского края, так и для более крупных регионов. *Biatorella flavella* впервые приводится для России, *Ropalospora viridis* – для Азии, *Bryoria vrangiana, Dictyocatenulata alba, Elixia flexella, Lecanora compallens, Micarea soralifera* – новые для Сибири, *Chaenotheca subroscida, Fuscidea arboricola* – для Южной Сибири, *Absconditella annexa*, *Caloplaca sorocarpa, Bryobilimbia sanguineoatra* и *Protothelenella sphinctrinoidella* – для Байкальской Сибири, *Caloplaca sorocarpa* – для Красноярского края, *Pilophorus strumaticus* – для Бурятии. Все лишайники собраны в горно-лесных местообитаниях, в условиях влажного, мягкого климата, где главным типом растительности являются бореальные леса, а именно, горная тайга в ее южном варианте – темнохвойные леса с *Abies sibirica*, *Pinus sibirica* и участием *Sorbus sibirica, Populus suaveolens* и *Padus avium*.

The lichen flora of the Southern Baikal region (the Khamar-Daban Range and Baikal State Nature Biosphere Reserve) has been actively studied during the last 30 years (Trass et al., 1988; Pärn, Trass, 1990; Randlane, Saag, 1991; Urbanavichene, 1996, 1998, 2001, 2015; Urbanavichene, Urbanavichus, 1998, 1999a, b, c; Urbanavichus, Urbanavichene, 2003; Urbanavichus, 2007; Urbanavichus et al., 2007; Urbanavichene, Palice, 2016). But, the lichen species diversity of this region and of the Baikal State Nature Reserve is still not fully revealed, as suggested by additions to the species list resulted from annual expeditions.

The current list includes 14 species collected from the mountain forest territories of Southern Siberia – Baikal State Nature Biosphere Reserve (Republic of Buryatia) and Ergaki Nature Park (Krasnoyarsk Territory). Studied nature protected areas are situated in the southern part of Siberia in the forest zone of Western Sayan Mts and Khamar-Daban Range. The climate of both regions is very humid and mild, with an annual precipitation about 1000 mm and a mean annual temperature of 0.7 °C. The studied territories lie 670–1600 m above sea level. The main vegetation type is boreal forests (taiga), namely mountain taiga in its southern variant: with *Abies sibirica* Ledeb., *Pinus sibirica* Du Tour, *Populus suaveolens* Fisch., *Sorbus sibirica* Hedl. and *Padus avium* Mill. All forests are old-growth and have never been cut down.

The specimens for the present study were collected by I. Urbanavichene (August 2013, 2016, 2017 – in Baikal Reserve; August 2009 and July 2010 – in Ergaki Nature Park) and by G. Urbanavichus (August 2002 – in Baikal Reserve).

Sorediate specimens were studied for chemistry by TLC following the procedure by Orange et al. (2010) and spot-tests with K (10 % potassium hydroxide in water), C (saturated solution of calcium hypochlorite) and Pd (paraphenylendiamine).

Absconditella annexa (Arnold) Vězda: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, upper course of the Osinovka River (Mishikhinskoe lesnichestvo), subalpine belt, 1420 m, 51°31'07.0"N, 105°24'34.5"E, on soil and mosses over boulder (on the path of *Ochotona alpine* Pallas). 17 VIII 2017. I. N. Urbanavichene" (LE L14949).

Note: Species is new to Baikal Siberia. In Russia, it was previously known from the European North and the Altai Mts (Melekhin, 2009; Sedelnikova, 2017). Until recently, this relatively rare species was known only from Europe (Coppins, 2009).

Biatorella flavella (Nyl.) Lettau: "Russia, Krasnoyarsk Territory, Ermakovskiy distr., Western Sayan Mts, Ergaki Nature Park, 0.5 km above the Bagazul' River, the slope of the east exposition, *Pinus sibirica* and *Abies sibirica* forest, 53°01'16.7"N, 93°13'27.8"E, on the wood of *Pinus sibirica*. 17 VII 2010. I. N. Urbanavichene" (LE L14950).

Note: Species is new to Russia. This is poorly known lichen, recorded only few times in Central Europe mainly on decaying *Sphagnum* sp. (Poelt, Vězda, 1977), but originally described from wood of *Larix* trunk (Nylander, 1885).

Its brightly yellow-green pruinose ascomata resemble those of *Thelocarpon* Nyl., but they are more flat in *Biatorella flavella*, and examined asci were referable to the *Strangospora*-type sensu Hafellner (1995). Asci polyspored (to ~100 ascospores), *Strangospora*-type (38–50 × 15–20 µ), paraphyses simple, ascospores globose, up to 2.5 µ diam.

Bryobilimbia sanguineoatra (Wulfen) Fryday et al.: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 670 m, 51°33'44.8"N, 105°23'44.7"E, on the bark of the

dead *Abies sibirica*. 18 VIII 2017. I. N. Urbanavichene" (LE L14962).

Note: Species is new to Baikal Siberia. Probably it is a circumboreal species. The distribution of this species in Russia requires additional investigations because it was previously treated as a synonym of *Mycobilimbia hypnorum* (Lib.) Kalb et Hafellner. *B. sanguineoatra* has recently been reported from Republic of Mordovia (Urbanavichene, Urbanavichus, 2015), Republic of Adygea (Otte, 2001, as *Mycobilimbia sanguineoatra* (Wulfen) Kalb et Hafellner). The species *Lecidea sanguineoatra* auct. previously reported from some localities in Russia, e. g. Leningrad and Moscow Regions (Tomin, 1956), Magadan Region (Korolev, Tolpysheva, 1980), Altai Territory (Davydov, Printzen, 2012) might also belong to *Bryobilimbia sanguineoatra* (Wulfen) Fryday et al.

Paraphyses 1.7 mm wide, simple, ascospores simple, with finely warted perispore, 8–10 × 3.3–5 μ (in a close species *Bryobilimbia hypnorum* (Lib.) Fryday et al. ascospores often 1-septate and wide, to 6–7 μ) (Fryday et al., 2014).

Bryoria vrangiana (Gyeln.) Brodo et D. Hawksw.: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, upper course of the Osinovka River (Mishikhinskoe lesnichestvo), *Abies sibirica–Pinus sibirica* forest, 1230 m, 51°31'42.4"N, 105°24'45.9"E, on branches in the upper part of the crown of *Abies sibirica*. 17 VIII 2017. I. N. Urbanavichene" (LE L14951, ALTB).

Note: Species is new to Siberia. Most likely it is a circumboreal species. The distribution of this species in the world and Russia requires additional investigations because it was previously treated as a synonym of *Bryoria implexa* (Hoffm.) Brodo et D. Hawksw. In Russia, *Bryoria vrangiana* has recently been reported from the Republic of Karelia and Arkhangelsk Region (Tarasova et al., 2015, 2016) and Moscow Region (Czernyadjeva et al., 2018).

Branches are often with a few blackened fragmentation areas, usually slightly shiny, mainly even, may become twisted and compressed. Pseudocyphellae inconspicuous, brownish white, mainly elongate fusiform, mostly plane. Thallus K–, C+ red, KC+ red, PD–; TLC: gyrophoric acid (Chemotype 1) (Velmala et al., 2014).

Caloplaca sorocarpa (Vain.) Zahlbr.: "Russia, Krasnoyarsk Territory, Ermakovskiy distr., Western Sayan Mts, Ergaki Nature Park, *Pinus sibirica* and *Abies sibirica* forest near Oiskoe Lake, 53°50'07.0"N, 93°14'38.0"E, on the bark of *Lonicera altaica*. 02 VIII 2009. I. N. Urbanavichene"; "Russia, Republic of Buryatia, Baikal Reserve, Khamar-Daban Range, upper course of the Osinovka River (Mishikhinskoe lesnichestvo), 1480 m, 51°31'40.0"N, 105°25'11.0"E, on the bark of *Lonicera turczaninowii*. 17 VIII 2017. I. N. Urbanavichene" (LE L14952, ALTB).

Note: Species is new to Baikal Siberia and Krasnoyarsk Territory. The species was previously known in Southern Siberia from the Altai Mts (Davydov, Printzen, 2012). In Russia it was reported from Murmansk Region (Frolov, Konoreva, 2016), Republic of Komi (Pystina, 2003), Kamchatka Peninsula (Khodosovtsev et al., 2004). This relatively rare species has been reported from Europe, North America and Asia (Davydov, Printzen, 2012). It is known from Europe, Asia and North America (Khodosovtsev et al., 2004).

Brownish-tinged external soredia and not excavate greenish-gray circular soralia, distinctly elevated above the thallus are diagnostic for *Caloplaca sorocarpa* (in a close species *C. ulcerosa* Coppins et P. James and *C. obscurella* (Lahm ex Körber) Th. Fr. soralia are excavate, not circular and distinctly elevated above the thallus).

Chaenotheca subroscida (Eitner) Zahlbr.: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, upper course of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 1230 m, 51°31'42.4"N, 105°24'45.9"E, on the wood of the tree *Abies sibirica*. 13 VIII 2013. I. N. Urbanavichene" (LE L14953).

Note: Species is new to Southern Siberia. This sub-circumboreal species with a scattered distribution was recorded in Russia from the European North and Centre, Ural Mts and Western Siberia (Urbanavichus, 2010). This species occurs in Europe, Asia and North America (Tibell, Beck, 2002).

This species can be identified by its yellowish excipulum and upper stalk of the apothecium, greyish, minutely granular thallus, platy-cracked, globose spores and slender stalk. It is very closely related to *C. phaocephala* (Turner) Th. Fr. The two species are nearly identical in appearance, but in contrast to the slender stalk and pale gray granular thallus of *C. subroscida*, the apothecium in *C. phaocephala* has a more robust stalk, the total length of the apothecium is 6–15 times greater than the central stalk width, and the thallus is brownish-green and scale-like or squamulose (Tibell, Beck, 2002).

Dictyocatenulata alba Finley et E. F. Morris: "Russia, Republic of Buryatia, Kabanskiy distr., Bai-

kal Reserve, Khamar-Daban Range, lower course of the Anosovka River, *Pinus sibirica* and *Abies sibirica* forest, 533 m, 51°29'15.0"N, 105°00'48.0"E, on mossy bark of *Sorbus sibirica*. 29 VIII 2017. I. N. Urbanavichene" (LE L14954, ALTB).

Note: Species is new to Siberia. This is the third finding of the species for the lichen biota of Russia, being previously recorded in the Far East – Primorye Territory (Diederich et al., 2008) and in Leningrad Region (Stepanchikova et al., 2010). *D. alba* is rather widespread in tropical, subtropical, broad-leaved zones and known from Central and Eastern Europe, Asia, North and Central America.

Ascomata unknown. Conidiomata are synnematous, pale, sessile to long stipitate up to 1.5 mm tall; stipe cream coloured, smooth, 25–175 µ in diam.; upper zone forming muriform conidia is purely white. Photobiont is trentepohlioid (Diederich et al., 2008). The species grows usually at shaded basal parts of deciduous trees in more humid microsites.

Elixia flexella (Ach.) Lumbsch: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 1370 m, 51°31'42.5"N, 105°25'01.1"E, on the lignum of *Abies sibirica*. 16 VIII 2016. I. N. Urbanavichene" (LE L14960).

Note: Species is new to Siberia. *Elixia flexella* is temperate-boreal species; it is known from scattered records in Europe, Asia and North America (Spribille, Björk, 2008). In Russia, the species has scattered distribution in the European North and Centre (e.g. Fadeeva et al., 2007; Notov et al., 2011), Northern and Subpolar Ural Mts (Hermansson et al., 2006; Sedelnikova, 2017), Northern Caucasus (Urbanavichus, Ismailov, 2013) and Far East (Chabanenko, 2002).

Habitually it resembles some non-lichenized genera with hysterothecioid ascomata (e.g. *Durella*, *Hysterium*). *Elixia flexella* is characterized by prolonged to almost orbicular apothecia with jet black margin elevated above the disc level, often appearing gyrose and inrolled. The disc becomes more open with age, unlike the similar species *Ptychographa xylographoides* Nyl. which has permanently slit-like discs. Both species grow in hard conifer wood and form inapparent thallus composed of dispersed tiny brownish granules among wood fibers, best visible when the substrate is moistened.

Fuscidea arboricola Coppins et Tønsberg: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 670 m, 51°33'44.8"N, 105°23'44.7"E, on the bark of *Abies sibirica*. 18 VIII 2017. I. N. Urbanavichene" (LE L14955, ALTB).

Note: Species is new to Southern Siberia. It is widespread in Europe and Eastern North America, but rare reported from Asia. In Russia, the species is widespread in the European North and Centre, Ural Mts (Urbanavichus, 2010), and was reported from Western Siberia (Paukov, Mikhailova, 2011), Eastern Siberia (Zhdanov, 2012) and from Caucasus (Urbanavichus, Urbanavichene, 2014).

It is characterized by having small grayish/greenish circular sorediate thalli (with a yellowish tint) up to 5 cm in diam., surrounded by a distinct brown prothallus which may give an overall brown appearance (Tønsberg, 1992). KOH+ brownish-yellow, Pd+ rust red, UV–; TLC: fumarprotocetraric acid.

Lecanora compallens Herk et Aptroot: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 670 m, 51°33'44.8"N, 105°23'44.7"E, on the bark of *Abies sibirica*. 18 VIII 2017. I. N. Urbanavichene" (LE L14956).

Note: Species is new to Siberia. This poorly known sterile sorediate species is widespread in Europe (Van Herk, Aptroot, 1999; Tsurykau et al., 2014) and once was reported from the South-Western Asia – Turkey (Yazıcı, Aptroot, 2008). In Russia it was reported only from the European part – Leningrad, Yaroslavl and Ryazan Regions (Stepanchikova et al., 2011; Muchnik, Śliwa, 2013).

Soralia punctiform, 0.1–0.3 mm, soredia granular, 15–30 µ diam., K+ yellow to yellow-brown, UV± pale orange; TLC: usnic acid, zeorin. *L. compallens* is very similar to *L. expallens* Ach., which differs by the presence of xanthones (van Herk, Aptroot, 1999).

Micarea soralifera Guzow-Krzem. et al.: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, the middle course of the Anosovka River, *Pinus sibirica* and *Abies sibirica* forest on the slope, 590 м, 51°26'16.0"N, 105°02'45.0"E, on wood of deciduous trees. 29 VIII 2017. I. N. Urbanavichene" (LE L14957).

Note: Species is new to Siberia. It is the second finding for the lichen flora of Russia, formerly the species was found only in the Northern Caucasus

(Urbanavichus, Urbanavichene, 2017). A newly described species has been known from Poland and the Czech Republic (Guzow-Krzemińska et al., 2016) and has been recently reported from Sweden (Svensson et al., 2017).

Sorediate species belonging to the *M. prasina*-group is characterized by initially delimited soralia developing directly from the endoxylic thallus or small external areoles, as well as the presence of micareic acid (Guzow-Krzemińska et al., 2016).

Pilophorus strumaticus Nyl. ex Cromb.: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Pereemnaya River, the mouth of Nemsky Klyuch River, the left bank, c. 680 m, 51°25'00.0"N, 105°17'38.0"E, on above-water surface of boulders. 11 VIII 2002. G. P. Urbanavichus" (LE L14961).

Note: Species is new to Republic of Buryatia. It was reported for Russia from North-Western part (Ahti, Stenroos, 2013), Republic of Sakha (Yakutia) and Trans-Baikal Territory (Chesnokov et al., 2017). The world distribution: British Isles, Northern Europe, Siberia (Ahti, Stenroos, 2013).

It is characterized by the pin-shaped pseudopodetia with terminal, black, ± spherical apothecia.

Protothelenella sphinctrinoidella (Nyl.) H. Mayrhofer et Poelt: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, upper course of the Osinovka River (Mishikhinskoe lesnichestvo), subalpine belt, 1420 m, 51°31'07.0"N, 105°24'34.5"E, on soil and mosses over boulder (on the path of pika – *Ochotona alpina*). 17 VIII 2017. I. N. Urbanavichene" (LE L14959).

Note: Species is new to Baikal Siberia. This arctic-alpine to boreal-montane bryophilous species is known in Russia from Arctic, European North and Centre, Siberia and Far East (Urbanavichus, 2010). World distribution: arctic zone and mountains of Europe, Asia, North America (Mayrhofer, 2002). It was also reported from Antarctic (Øvstedal, Smith, 2001).

This species is characterized by an indistinct thallus, small sessile black perithecia with a dull greenish exciple and elongate submuriform ascospores. Another species known from Southern Siberia is *P. sphinctrinoides* (Nyl.) H. Mayrhofer et Poelt, which is distinguished by larger partly immersed perithecia and larger muriform ascospores (Mayrhofer, 2002).

Ropalospora viridis (Tønsberg) Tønsberg: "Russia, Republic of Buryatia, Kabanskiy distr., Baikal Reserve, Khamar-Daban Range, basin of the Osinovka River (Mishikhinskoe lesnichestvo), *Pinus sibirica* and *Abies sibirica* forest, 670 m, N51°33'44.8"N, 105°23'44.7"E, on the bark of *Abies sibirica*. 18 VIII 2017. I. N. Urbanavichene" (LE L14958).

Note: Species is new to Asia. In Russia, the species has a scattered distribution in European part from Kaliningrad Region to Ural Mts (Urbanavichus, 2010). *R. viridis* is common and widely distributed throughout Europe and North America (e.g. Tønsberg, 1992; Lendemer, 2011).

This species forms a grayish-green areolate thallus with bright green, usually confluent soralia arising from the apices of the areoles. Thallus and soralia C–, K–, Pd–, UV+ white; TLC: perlatolic acid. *R. viridis* can be confused with sterile *Fuscidea arboricola* and *F. pusilla* Tønsberg, but they differ chemically in containing fumarprotocetraric acid and divaricatic acid, respectively.

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