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# Rarely recorded lichens and lichen-allied fungi from the territory of the Baikal Reserve – additions for lichen flora of Russia

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***Key words***: lichen, forest, South Baikal area, Khamar-Daban Range.

***Summary***. The paper presents findings of 15 lichenized and lichen-allied species rarely recorded in southern Siberia and in Russia in general. All of them were collected for the first time on the territory of the Baikal Reserve (Southern Pribaikal'e, Mts. Khamar-Daban). *Absconditella celata* is new to Asia. *Bacidia pycnidiata* and *Micarea micrococca* are novelties to Siberia. *Sarea resinae* is new to South Siberia. New records for the southern Baikal region include *Arthonia helvola*, *A. vinosa*, *Biatora helvola*, *B. ocelliformis* and *Gyalideopsis piceicola*. *Cladonia acuminata* and *Lepraria finkii* are additions to the lichen flora of the Khamar-Daban range. The respective species are briefly discussed, mainly with regard to their distribution on the territory of Russia.

# Редкие виды с территории Байкальского заповедника – дополнения к лихенофлоре России

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***Ключевые слова***: лишайники, лес, Южное Прибайкалье, хребет Хамар-Дабан.

***Аннотация***. В работе приводятся находки 15 видов, редких для лихенофлоры России и Южной Сибири. Все они впервые собраны на территории Байкальского заповедника (Южное Прибайкалье, хр. Хамар-Дабан). В основном это эпифитные и эпиксильные виды, произрастающие на *Abies sibirica* и *Pinus sibirica*. Впервые для Азии приводится *Absconditella celata*, для Сибири – *Bacidia pycnidiata*, *Micarea micrococca*; для Южной Сибири – *Sarea resinae*. Новые для Южного Прибайкалья – *Arthonia helvola, A. vinosa, Biatora helvola, B. ocelliformis, Gyalideopsis piceicola*. Для Хамар-Дабана новыми являются *Cladonia acuminata, Lepraria finkii*. Представлены краткие сведения о местонахождении видов и распространении их по территории России.

## Introduction

This species list continues the series of publications dealing with interesting lichen records from the Baikal Reserve (Southern Siberia, Khamar-Daban ridge) (Urbanavichene, Urbanavichus, 1998; Urbanavichus, Urbanavichene, 2004; Urbanavichene, 2010, 2015a, b). Our results are based on investigations from the field trips made

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by I. N. Urbanavichene between 2006–2015 in the Khamar-Daban region.

## Material and methods

We present the most interesting floristic findings of corticolous and lignicolous lichen species from coniferous and mixed forests with *Abies sibirica, Pinus sibirica, Populus suaveolens, Betula pubescens, Sorbus sibirica* and *Salix rorida*. All species are described for the first time for the Baikal Reserve and are new or rarely recorded in Siberia.

Most species were identified using a stereomicroscope or compound microscope, and with the help of chemical spot reactions (para-phenylenediamine-ethanol solution, sodium hypochlorite, 10 % potassium hydroxide and Lugol's iodine). Lichen substances were analyzed by standard TLC (Orange et al., 2001). Specimen number, storage location and collector are given for each studied sample in addition to label data characterizing the features of the habitat and the species localities. The latitude, longitude and elevation range were measured with a GPS device (WGS 84). The major part of the collected specimens is deposited in LE and ALTB.

## List of species

***Abscondidella celata*** Döbbeler et Poelt

This ephemeral species was until now only reported from Europe and North America (Spribille et al., 2009). There exists only one record from Russia, Tver' Region (Notov et al., 2011). Here it is reported as new for Asia.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., left bank of the Pereemnaya River, on decomposed wood of *Abies sibirica* in shaded habitats of wet forest, alt. 815 m. N51.3941°, E105.2730°. 05 VIII 2014. I. N. Urbanavichene (LE № L-12686)".

***Arthonia helvola*** (Nyl.) Nyl.

It is very local and sporadic in undisturbed mixed forests in Russia. In Central Europe it was recorded also in partly disturbed lowland alluvial woods (Palice, 1999) and managed mixed forests (Guttová, Palice, 1999). Spot-like red apothecia are easily mistaken for subepidermal colonies of free-living trentepohlioid algae. Its distribution in Russia requires additional investigations. New for Baikal Siberia and southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., valley Podosinovka River, on solid wood stump of *Pinus sibirica,* alt. 472 m. N51.3700°, E105.9746°. 04 VIII 2010. I. N. Urbanavichene (LE № L-12687, dub. ALTB)".

***Arthonia vinosa*** Leight.

The species is more or less common in wet coniferous and mixed forests in the Northern Hemisphere. In Russia reported from Northern and Central parts of European Russia, the northern part of the Ural Mountains and Southern Siberia (Urbanavichus, 2010). It is reported here as new for Baikal Siberia and the southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., near the headwaters Pereemnaya River, right bank of the Bol'shoy Klyuch River, mixed forest (*Abies sibirica, Pinus sibirica, Populus suaveolens, Sorbus sibirica, Betula pubescens*), on stump of *Abies sibirica*, alt. 850 m. N51.4131°, E105.5008°. 09 VIII 2015. I. N. Urbanavichene (LE № L-12689)".

***Bacidia pycnidiata*** Czarnota & Coppins

This species is an early pioneer species usually growing on terricolous and epiphytic bryophytes both in managed and native forests, and occasionally in anthropogenic habitats, switching also to other lichens or shaded bark of trees (Czarnota, Hernik, 2014). In Russia it has mostly been recorded in old-growth humid forests with a closed canopy or near water streams (Urbanavichene, Urbanavichus, 2014). In Asia it has been previously recorded only in the North Caucasus (Urbanavichus, Urbanavichene, 2013).

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., basin of the Pereemnaya River, right bank of the Bol'shoy Klyuch River, mixed forest (*Abies sibirica, Pinus sibirica, Populus suaveolens, Sorbus sibirica, Betula pubescens*), on bark of the deadwood of *Abies sibirica*, alt. 850 m. N51.4131°, E105.5008°. 09 VIII 2015. I. N. Urbanavichene (LE № L-12951)".

***Biatora helvola*** Körb. ex Hellb.

According to Printzen (1995), the species' range reflects the distribution of *Picea abies* in Europe. Its eastern distributional limit in Russia is not well known. Well separated from superficially similar species due to the presence of gyrophoric acid in apothecium (C+ rose-red). New to the southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., on a steep slope, coniferous forest with *Abies sibirica* and

*Pinus sibirica*, on bark of *Abies sibirica,* alt. 1369 m. N51.5285°, E105.4191°. 14 VIII 2013. I. N. Urbanavichene (LE № L-12952)".

***Biatora ocelliformis*** (Nyl.) Arnold

The species is much rarer than *Biatora helvola* in the boreal forests of the Holarctic (Printzen, 1995). In the Asian part of Russia it preferably grows on broad-leaved and small-leaved tree species. New to Khamar-Daban Mts. and the Baikal Reserve.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., right bank of the Vydrinaya River, mixed forest (*Abies sibirica, Pinus sibirica, Sorbus sibirica, Betula pubescens*), on bark of ashberry, alt. 515 m. N51.4261°, E104.9072°. 29 VII 2008. I. N. Urbanavichene (LE № L-12953)".

***Caloplaca obscurella*** (J. Lahm ex Körb.) Th. Fr.

This is a widespread but inconspicuous species, most frequent on nutrient-enriched bark of deciduous trees. *C. obscurella* shows more continental distribution than superficially similar *C. ulcerosa*, which however contains anthraquinones in its apothecia when fertile (Vondrák et al., 2009). In Russia it was reported from all regions of European Russia, Caucasus, Ural, Siberia and Far East (Urbanavichus, 2010). New to the southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., basin of Osinovka Mishinskaya River, on bark of the deadwood at the base of the tree *Abies sibirica*, alt. 1360 m. N51.5288°, E105.4191°. 09 VIII 2015. I. N. Urbanavichene (LE № L-692)".

***Cladonia acuminata*** (Ach.) Norrl.

This is a terricolous species growing preferably on basic or weakly acidic bare mineral soil or humus. It is widespread but scattered, more frequent only in calcareous areas (Ahti et al., 2013). New to Khamar-Daban Mts. and the Baikal Reserve.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., poplar forest in the floodplain of a stream, shore of the Chernoe Lake, on the sand, mossy surface of fallen *Populus suaveolens*, alt. 1086 m. N51.3765°, E105.2251°. 04 VIII 2014. leg. I. N. Urbanavichene, det. T. Ahti (LE № L-12693)".

***Cresponea chloroconia*** (Tuck.) Egea & Torrente

The species is confined to broad-leaved and small-leaved trees, but it is rare in coniferous and mixed forests. This finding is a rare exception. New for Baikal Siberia and the southern part of the Lake Baikal region. In Russia it has been reported from Northen and Central part of European Russia, Southern Ural, Western and Southern Siberia (Urbanavichus, 2010).

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., basin of the Pereemnaya River, right bank of the Bol'shoy Klyuch River, mixed forest (*Abies sibirica, Pinus sibirica, Populus suaveolens, Sorbus sibirica, Betula pubescens*), on bark of of *Pinus sibirica*, alt. 850 m. N51.4131°, E105.5008°. 09 VIII 2015. I. N. Urbanavichene (LE № L-12694)".

***Gyalideopsis piceicola*** (Nyl.) Vězda & Poelt

This distinctive species is widespread in the boreal and temperate zone of the Holarctic, mainly in montane forests (Wirth et al., 2013). New to Baikal Siberia and southern part of the Lake Baikal region. In Russia known from Northern Ural (Hermansson et al., 2006) and Southern Siberia (Urbanavichene, 2012).

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., near the headwaters Pereemnaya River, right bank of the Bol'shoy Klyuch River, mixed forest (*Abies sibirica, Pinus sibirica, Populus suaveolens, Sorbus sibirica, Betula pubescens*), on bark of the stump of *Abies sibirica*, alt. 850 m. N51.4131°, E105.5008°. 09 VIII 2015. I. N. Urbanavichene (LE № L-12695, dub. ALTB)".

***Lepraria finkii*** (B. de Lesd.) R. C. Harris

A common and widespread species in the Northern Hemisphere (Lendemer, 2010, 2013). The type specimen of *L. lobificans* was examined by the author. The taxon turned out to be conspecific with a rare, recently described Mediterranean taxon *L. santosii* (Tretiach et al., 2009) and should have priority over the latter name. *L. finkii* was taken up for the species previously referred to as *L. lobificans* by most authors. In Southern Siberia *L. finkii* was recently reported from Dzherginskyi Reserve by Kharpukhaeva and Khanin (2012, as *Lepraria lobificans*). New to the Khamar-Daban Mts. and the Baikal Reserve.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., valley Podosinovka River, mixed forest (*Abies sibirica, Pinus sibirica, Populus suaveolens, Betula pubescens*), on rotten stump of *Pinus sibirica*, alt. 472 m. N51.3700°, E104.9744°. 04 VIII 2010, I. N. Ur-

banavichene (LE № L-12696)".

***Micarea micrococca*** (Körb.) Gams ex Coppins

Only recently published from Russia (Urbanavichene et al., 2013), although it is a widespread and frequent species in the temperate and boreal zone. Nevertheless, until recently it was not distinguished from *M. prasina* (see e.g. Czarnota, 2007). We follow here the morphospecies concept by Czarnota and Guzow-Krzemińska (2010), who distinguish *M. micrococca* s. str. (small, white-cream, convex non-adnate apothecia) from the chemically concordant *M. byssacea* (with adnate and usually grey, pale-rimmed apothecia). However, more taxa exist within this species complex containing methoxymicareic acid according to molecular phylogeny based on mitochondrial sequences (Czarnota, Guzow-Krzemińska, 2010; A. Launis pers. comm.). Further taxonomic and molecular phylogenetic studies are necessary to elucidate taxonomy of this group. New for Siberia.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., left bank of the Pereemnaya River, on decaying wood of *Abies sibirica* in shaded habitats of wet forests, alt. 815 m. N51.3941°, E105.2730°. 05 VIII 2014. I. N. Urbanavichene (LE № L-12697)".

***Protothelenella leucothelia*** (Nyl.) H. Mayrhofer & Poelt

An arctic-alpine species, rare in Siberia (Makryi, Lishtva, 2005) and new for the southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., subgolets (sub-alpine) belt, on plant debris, alt. 1421 m. N51.5186°, E105.4094°. 18 VII 2009. I. N. Urbanavichene (LE № L-12698)".

***Rinodina efflorescens*** Malme

*R. efflorescens* is characterized by discrete, mostly scattered yellowish-brownish soralia with farinose soredia, the presence of pannarin (Pd+ red) and the *Physcia*-type spores. The species is known from north-west and central Europe, the Pyrenees, and North America (Mayrhofer, Moberg, 2002), and is also widespread in Russia (Urbanavichus, 2010). In the Asian part of Russia it was reported for the Kodar area (Makryi, Lishtva, 2005). The present collection is fertile and is new to the Khamar-Daban Mts. and the southern part of the Lake Baikal region.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., left bank of Pereemnaya River, on bark of *Salix rorida*, alt. 485 m. N51.5133°, E105.2078°. 01 X 2006. I. N. Urbanavichene (LE № L-12699)".

***Sarea resinae*** (Fr.) Kuntze

A non-lichenized fungus growing on old resin of coniferous trees. Characterized by the flat to concave, orange apothecia (0.5–1.3 mm in diam.) and polysporic asci with rounded spores 2–3 μm. New for Siberia.

**Specimens examined**: "Republic of Buryatia, Kabanskiy district, Khamar-Daban Mts., basin of the Osinovka River, coniferous forest (*Abies sibirica, Pinus sibirica*), on bark of *Pinus sibirica*, alt. 535 m. N51.5368°, E105.1196°. 22 VIII 2015. I. N. Urbanavichene (LE № L-12691, dub. ALTB)".

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## REFERENCES

***Ahti T., Stenroos S.*** (2013) *Cladonia* // *Nordic Lichen Flora*. Ahti T., Stenroos S., Moberg R. (eds.) 5: 8–87.

***Czarnota P***. (2007) The lichen genus *Micarea* (Lecanorales, Ascomycota) in Poland // *Polish Botanical Studies. W. Szafer Institute of Botany, Polish Academy of Sciences* 23: 1–199.

***Czarnota P., Guzow-Krzemińska B.*** (2010) A phylogenetic study of the *Micarea prasina* group shows that *Micarea micrococca* includes three distinct lineages // *Lichenologist* 42: 7–21.

***Czarnota P., Hernik E.*** (2014) Some peltigericolous microlichens from southern Poland // *Acta Botanica Croatica* 73: 159–170.

***Guttová A., Palice Z.*** (1999) Lichens of the Muránska Planina National Park I. The Hrdzavá dolina valley // *Výzkum a Ochrana Prírody Muránskej Planiny [Research and nature protection in Muránská planina (plateau)]* 2: 35–47 [In Slovakian]. (***Guttová A., Palice Z.*** Lišajníky Národného parku Muráňská planina I – Hrdzavá dolina // Výzkum a ochrana prírody Muránskej planiny, 1999. 2: 35–47).

***Kharpukhaeva T. M., Khanin V. A***. (2012) New for Republic of Buryatia species of *Lepraria* identified by HPLC // *Turczaninowia* 15, 4: 44–47 [In Russian]. (***Харпухаева Т. М., Ханин В. А.*** Новые для Республики Бурятия виды рода *Lepraria* по данным HPLC // Turczaninowia, 2012. Т. 15, вып. 4. С. 44–47).

***Lendemer J. C.*** (2010) Notes on the genus *Lepraria* s. l. (lichenized ascomycetes) in North America: new species, new reports, and preliminary keys // *Brittonia* 62: 267–292.

***Lendemer J. C.*** (2013) A monograph of the crustose members of the genus *Lepraria* Ach. s. str. Stereocaulaceae, Lichenized Ascomycetes) in North America north of Mexico // *Opuscula Philolichenum* 12: 27–141.

***Makryi T. V., Lishtva A. V.*** (2005) Lichens // *Biota Vitimskogo zapovednika [The biota of the Vitim Reserve]*. Geo, Novosibirsk, pp. 115–175 [In Russian]. (***Макрый Т. В., Лиштва А. В.*** Лишайники // Биота Витимского заповедника. Новосибирск: Гео, 2005. С. 115–175).

***Mayrhofer H., Moberg R.*** (2002) *Rinodina* // *Nordic Lichen Flora*. *Vol. 2*. Ahti T., Jørgensen P. M., Kristinsson H., Moberg R., Søchting U., Thor G. (eds.), pp. 41–69.

***Notov A. A., Himelbrant D. E., Urbanavichus G. P.*** (2011) Annotirovannyy spisok lichenoflory Tverskoy oblasti *[The list of lichens and allied fungi of Tver' Region]*. Tverskoy gosudarstvennyy universitet, Tver, 124 p. [In Russian]. (***Нотов А. А., Гимельбрант Д. Е., Урбанавичюс Г. П.*** Аннотированный список лихенофлоры Тверской области. Тверь: Тверской гос. ун-т, 2011. 124 с.).

***Palice Z.*** (1999) New and noteworthy records of lichens in the Czech Republic // *Preslia* 71: 289–336.

***Printzen C.*** (1995) Die Flechtegattung *Biatora* in Europa // *Bibliotheca Lichenologica* 60: 1–275 [In German].

***Sedelnikova N. V.*** (2001) *Lishainiki Zapadnogo i Vostochnogo Sayana [The Lichens of Western and Eastern Sayan]*. Nauka, Novosibirsk, 190 p. [In Russian]. (***Седельникова Н. В.*** Лишайники Западного и Восточного Саяна. Новосибирск: Наука, 2001. 190 с.).

***Spribille T., Björk C. R., Ekman S., Elix J.A., Goward T., Printzen C., Tønsberg T., Wheeler T.*** (2009) Contributions to an epiphytic lichen flora of northwest North America: I. Eight new species from British Columbia inland rain forests // *Bryologis* 112: 109–137.

***Tretiach M., Muggia L., Baruffo L***. (2009) Species delimitation in the *Lepraria isidiata – L. santosii* group: a population study in the Mediterranean-Macaronesian region // *Lichenologist* 41: 1–15.

***Urbanavichene I. N.*** (2010) New and rare species for lichen flora of Siberia // *Novosti Sist. Nizsh. Rast. [Novit. Syst. Pl. non Vasc.]* 44: 245–249 [In Russian]. (***Урбанавичене И. Н.*** Новые и редкие виды для лихенофлоры Сибири // Новости сист. низш. раст., 2010. Т. 44. С. 245–249).

***Urbanavichene I. N.*** (2015) New and rare findings of lignicolous lichen species for the Southern Siberia from the Baikal nature reserve // *Turczaninowia* 18, 1: 56–59 [In Russian]. (***Урбанавичене И. Н.*** Новые и редкие для Южной Сибири находки эпиксильных видов лишайников с территории Байкальского заповедника // *Turczaninowia,* 2015. Т. 18, вып. 1. С. 56–59).

***Urbanavichene I. N., Urbanavichus G. P.*** (1998) Lichens of the Baikal Nature Reserve // *Flora i fauna zapovednikov [Flora and fauna reserves]* 68: 1–55 [In Russian]. (***Урбанавичене И. Н., Урбанавичюс Г. П.*** Лишайники Байкальского заповедника // Флора и фауна заповедников, 1998. Т. 68. С. 1–55).

***Urbanavichene I., Urbanavichus G., Mežaka A., Palice Z***. (2013) New records of lichens and lichenicolous fungi from the Southern Ural Mountains, Russia. II // *Folia Cryptogamica Estonica* 50: 73–80.

***Urbanavichus G. P.*** (2010) *Spisok lichenoflory Rossii [A checklist of the lichen flora of Russia]*. Science Press, St. Petersburg, 194 p. [In Russian]. (***Урбанавичюс Г. П.*** Список лихенофлоры России. СПб.: Наука, 2010. 194 с.).

***Urbanavichus G. P., Urbanavichene I. N.*** (2004) New and rare species of lichens for the Republic of Buryatia of the Baikal nature reserve // *Problems of botany in South Siberia and Mongolia:* Proceedings of 3th International scientific-practical conference (Barnaul, 25–27 October 2004). Azbuka, Barnaul, pp. 138–140 [In Russian]. **(*Урбанавичюс Г. П., Урбанавичене И. Н.*** Новые и редкие виды лишайников для Бурятии из Байкальского заповедника // *Проблемы ботаники Южной Сибири и Монголии: материалы III Междунар. науч.-практ. конф. (25–27 октября 2004 г., Барнаул). Барнаул: АзБука, 2008*. С. 138–140).

***Urbanavichus G. P., Urbanavichene I. N.*** (2013) Addition to the lichen flora of Russia. II. *Bacidia pycnidiata* // *Novosti Sist. Nizsh. Rast. [Novit. Syst. Pl. non Vasc.]* 47: 297–301 [In Russian]. (***Урбанавичюс Г. П., Урбанавичене И. Н.*** Дополнение к лихенофлоре России. II. *Bacidia pycnidiata* // *Новости сист. низш. раст.*, 2013. Т. 47. С. 297–301).

***Vondrák J., Šoun J., Arup U., Aptroot A., Redchenko O.*** (2009) *Caloplaca ulcerosa* a maritime species in Europe with a remarkable occurrence in the Czech Republic // *Bryonora* 44: 1–7.

***Wirth V., Hauck M., Schultz M***. (2013) *Die Flechten Deutschlands*. Bd. 1. Stuttgart, 513 p. [In German].