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ADDITIONS TO THE LICHEN BIOTA OF ALTAI MOUNTAINS (SIBERIA). III

ДОПОЛНЕНИЯ К ВИДОВОМУ СОСТАВУ ЛИШАЙНИКОВ
АЛТАЙСКОЙ ГОРНОЙ СТРАНЫ. III

Summary. Based on field trips between 1995–2007, rare and noteworthy lichens from the Altai Mountains in southern Siberia are described. Of the 20 species reported here, *Mycoblastus alpinus* is new for the West Siberia, 4 species – *Catinaria atropurpurea*, *Lecanora subcarpineae*, *Ochrolechia arborea*, *Physcia alnophila* and *Rhizoplaca subdiscrepans* are new for Altai Mts., *Umbilicaria lyngei* is new for Tyva Republic, and *Caloplaca chrysophthalma*, *Heterodermia japonica*, *Ochrolechia androgyna*, *O. turneri* and *Pilophorus cereolus* are new for Altaisky krai (West Altai). The presence in Altai Mts. of *Lecanora symmicta*, *Ochrolechia pallescens*, *Pertusaria alpina*, *P. amara*, *P. sommerfeltii* and *Placynthiella icmalea* was confirmed using TLC. The secondary chemistry seems to be very useful to distinguish *Umbilicaria decussata* and *U. lyngei* in Altai. Whereas gyrophoric and lecanoric were revealed for *U. decussata* by TLC, specimens of *U. lyngei* represent two chemotypes: without lichen substances and containing norstictic acid.

Key words: new records, lichen, Russia, Siberia, Altaisky krai, Altai Republic, *Ochrolechia*, *Pertusaria*, *Umbilicaria decussata*, *U. lyngei*.

Аннотация. В статье обсуждаются редкие и интересные находки лишайников, собранных авторами в 1995–2007 гг. на Алтае (Южная Сибирь). Из 20 видов один – *Mycoblastus alpinus* – новый для Западной Сибири, пять – *Catinaria atropurpurea*, *Lecanora subcarpineae*, *Ochrolechia arborea*, *Physcia alnophila* и *Rhizoplaca subdiscrepans* – новые для Алтая, *Caloplaca chrysophthalma*, *Heterodermia japonica*, *Ochrolechia androgyna*, *O. turneri* и *Pilophorus cereolus* – новые для Алтайского края (Западный Алтай). Обитание на Алтае *Lecanora symmicta*, *Ochrolechia pallescens*, *Pertusaria alpina*, *P. amara*, *P. sommerfeltii* и *Placynthiella icmalea* подтверждено с использованием данных тонкослойной хроматографии. Показано, что состав вторичных метаболитов надежно отличает морфологически близкие *Umbilicaria decussata* и *U. lyngei* в пределах Алтая. В талломах *U. decussata* методом ТСХ выявляется гирофоровая и леканоровая кислоты, в то время как *U. lyngei* представлена двумя хемотипами: без лишайниковых кислот и с норстиктовой кислотой.

Ключевые слова: новые находки, лишайники, Россия, Сибирь, Алтайский край, Республика Алтай, *Ochrolechia*, *Pertusaria*, *Umbilicaria decussata*, *U. lyngei*.

MATERIAL & METHODS

This paper continues the series of publications started by E.A. Davydov (2004) and Davydov & al. (2007, 2012) on the lichen flora of the Altai Mts. Only the Russian part of this area is considered in this paper. Our main focus was on groups that require secondary metabolite chemistry for identification. Some of them were previously reported from the Altai Mts. by Sedelnikova (1990) and Davydov (2001), but were identified only based on morphology and results of spots tests.

Morphological and anatomical characters were analyzed by applying standard light microscopical methods. Secondary metabolites were identified with standard thin-layer chromatography techniques (Culberson & Kristinsson, 1970). Abbreviated collection data of examined specimens are provided for every species. Altitudes are indicated in meters above the sea level. Names of collectors were reduced to ED and CP respectively. Voucher specimens are deposited in the herbaria ALTB and FR.

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RESULTS AND DISCUSSION

Caloplaca chrysophthalma Degel. [TLC: emodin, parietin, fragillin]

The investigated specimen was sterile. This sorediate circumboreal species has a scattered distribution in Europe, Asia and North America (Kondratyuk et al., 2004). In Asia it is already known from Taiwan (Aptroot & Sparrius, 2003), Russia (see Urbanavichus, 2010), North China (Wetmore, 2004) and Mongolia (Hauck & Javkhlan, 2006). It was recorded for Altai by Kondratyuk et al. (2004) and is reported as new for the West Altai (Altaisky krai) here. The single specimen was collected on bark of *Populus tremula* in *Abies sibirica* – *Betula pendula* fern – tall forb forest.

Specimens examined: Altaisky krai, Zmeinogorsky district, western part of Tigireksky range, 51°06'49" N, 83°01'01" E, alt. 1000 m, 12.VII.2006, ED 6716 (ALTB).

Catinaria atropurpurea (Schaer.) Vězda & Poelt

A widespread circumboreal species (Kotlov, 2003) reported here as new for the Altai Mts. where it was collected on *Salix* shrub in swamp in humid wood pasture with *Larix sibirica*, *Pinus sibirica*, *Picea obovata* and a lot of dead wood.

Altai Republic, Ust'-Kansky district, W of Mt. Chugunka and S of river Tarkhata, 50°43'49.7" N, 85°24'15.8" E, alt. 1680 m, 1.VII.2003, CP 8766 (FR).

Lecanora subcarpinea Szatala [TLC: atranorin, psoromic a.]

The species is widespread in Europe (Lumbsch et al., 1997; Aptroot et al., 2005) and the Caucasus (Novruzov, 1990; Blinkova et al., 2003) and has recently been recorded for South Siberia from the Sayan Mts. (Sedelnikova, 2001). New for the Altai Mts. where it was collected along creeks on bark of *Salix* sp. in forest of *Picea obovata*, *Betula* and *Salix* along creek, and on trunk of *Picea obovata* in *P. obovata* forest. It seems more widely distributed in Siberia than previously assumed.

Specimens examined: Altaisky krai, Soloneshensky district, Bashchelaksky range, along the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'43.6" N, 83°35'20.4" E, alt. 910 m, 28.VI.2003, CP 8521 (FR); **Altai Republic, Ust'-Kansky district**, between the villages Tog-Altai and Cherny Anuy, 51°21'24.0" N, 83°34'06.0" E, alt. 670 m, 29.VI.2003, CP 8602 (FR).

Lecanora symmicta (Ach.) Ach. [TLC: usnic a., terpenoids (incl. zeorin)]

A common circumboreal and temperate species known from a wide range of substrata. The *L. symmicta* complex includes several related and morphologically variable species that differ by their anatomy and chemistry, e.g. *L. filamentosa* (Stirt.) Elix & Palice and *L. schizochromatica* Pérez.-Ortega, T. Sprib. & Printzen, which are morphologically very similar but does not seem to be very closely related (Palice et al. 2011, Pérez-Ortega et al., 2010; Printzen & May, 2002). All investigated specimens from the Altai Mts., however, belong to *Lecanora symmicta* s. str. Common within the area on bark of *Abies sibirica*, *Sorbus sibirica*, *Populus tremula*, *Pinus sibirica*, *Picea obovata*, *Betula pendula*, *Salix caprea* and other trees in the forest belt, e.g. tall forb *Abies sibirica* forest, forest of *Picea obovata*, *Betula* and *Salix* along creek and taiga forest (*Abies sibirica*, *Larix sibirica*, *Pinus sibirica*).

Specimens examined: Altaisky krai, Zmeinogorsky district, Tigireksky range, valley of Bolshaya Uskuchevka River between the communities of Bugryshikha and Andreevsky, 51°11'19.3" N, 82°48'30.6" E, alt. 450 m, 25.VI.2003, CP 8297 (FR); same range, valley of Bolshaya Uskuchevka River between Bugryshikha and Andreevsky, 51°11'19.3" N, 82°48'30.6" E, alt. 450 m, 25.VI.2003, CP 8334 (FR); same range, ca. 4 km S of Andreevsky, valley of the Malaya Amelikha River near the confluence with Zagornaya Amelikha River, 51°04'40.4" N, 82°49'57.9" E, alt. 850 m, 26.VI.2003, CP 8361 (FR); Soloneshensky district, Bashchelaksky range, along the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'43.6" N, 83°35'20.4" E, alt. 910 m, 28.VI.2003, CP 8515 (FR); same locality, CP 8519, 8523, 8536, 8542 (FR), along the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'42.5" N, 84°34'53.1" E, 870 m, 28.VI.2003, CP 8556, 8630 (FR). **Altai Republic, Ust'-Koksinsky district**, Katunsky range, SW bank of Tal'menie Lake, left bank of Khariuzovka River, 49°49' N, 85°48' E, alt. 1516-1800 m, 14.VII.2000, ED 6802 (FR).

Heterodermia japonica (M. Satô) Swinscow & Krog [TLC: atranorin, zeorin]

All investigated specimens belong to chemotype I according to Kurokawa (1962) and Trass (2000). The species was previously reported from the Altai by Trass (2000). It is reported here as new for the West Altai (Altaisky krai).

Specimens examined: Altaisky krai, Soloneshensky district, Bashchelaksky range, along the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'43.6" N, 83°35'20.4" E, alt. 910 m, forest of *Picea obovata*, *Betula* and *Salix* along creek, on bark of *Salix* sp. 28.VI.2003, CP

8517 (FR); **Altai Republic**, Ust'-Koksinsky district, Katunsky range, at the junction of the Khazinikha and Ioldo Rivers, 49°53' N, 86°04' E, alt. 1800 m, *Abies sibirica* – *Pinus sibirica* – *Picea obovata* forest, on bark of *Sorbus sibirica*, 22.VII.2000, ED 6767 (ALTB); Ongudaysky district, at 10 km E of Ust'-Kan at left bank of Yabagan River, 50°56' N, 84°54' E, alt. 1057 m, marginal part of the bog, on bark of *Salix* sp. 30.VI.2003, ED 6768 (ALTB); some km N of the Seminsky pass along the road between the villages Topuchaja and Sarlyk, 51°05'39.7" N, 85°38'17.1" E, alt. 1270 m, open forest of *Picea obovata*, *Pinus sibirica*, *Larix sibirica* and *Betula*, on bark of *Salix* sp. 2.VII.2003, CP 8857 (FR).

Mycoblastus alpinus (Fr.) Th. Fr. ex Hellb. [TLC: planaic, usnic & isousnic a., atranorin]

A circumboreal species reported from Europe, Asia (Biazrov et al., 1989) and North America (Tønsberg, 1993). In Russia it was reported from the European part, the Ural Mts., East Siberia (Baikal territory, Pärn & Trass, 1990) and the Far East (Urbanavichus, 2010). New for West Siberia and the Altai.

Specimens examined: **Altai Republic**, Ust'-Kansky district, W of Mt. Chugunka and S of river Tarkhata, 50°43'49.7" N, 85°24'15.8" E, alt. 1680 m, humid wood pasture with *Larix sibirica*, *Pinus sibirica*, *Picea obovata* and a lot of dead wood, on wood, 1.VII.2003, CP 8785 (FR).

Ochrolechia androgyna (Hoffm.) Arnold

A morphologically and chemically variable species widespread in Russia (Urbanavichus, 2010) including the Altai Mts. (Sedelnikova, 1990). Tønsberg (1992) distinguishes several chemotypes, of which the following two were found by us. The records confirm the presence of this species in the Altai and extend the known occurrence to the West Altai (Altaysky krai).

Chemotype A [TLC: lecanoric & gyrophoric a.]

Specimens examined: **Altaysky krai**, Zmeinogorsky district, Tigireksky range, right bank of the Belaya River, 7 km upstream of the mouth of the Berlozhia river, 50°57'34" N, 83°02'59" E, alt. 717 m, *Abies sibirica* – tall forb forest, on *Betula pendula*, 7.VII.2006, ED 6738 (ALTB).

Chemotype D

Specimens examined: **Altai Republic**, Ust'-Kansky district, W of Mt. Chugunka and S of river Tarkhata, wood pasture with *Larix sibirica*, trunk of giant *Larix sibirica*, 50°43'55.4" N, 85°24'21.9" E, alt. 1680 m, 2.VII.2003, CP 8819 (FR); [TLC: thallus: variolaric & lecanoric a.; apothecia: variolaric,

lecanoric, gyrophoric & hiassic(?) a.]; same locality, on trunk of giant *Larix sibirica*, CP 8820 (FR) [TLC: variolaric a.].

Ochrolechia arborea (Kreyer) Almb. [TLC: gyrophoric a., lichexanthone (+ lecanoric or hiassic a.)]

This circumboreal species of *Ochrolechia* is characterized by the content of lichexanthone and is known in Russia from the European part, the Ural Mts., Siberia and the Far East (Urbanavichus, 2010). It was also reported from Mongolia (Golubkova, 1981). New for Altai Mts. where it is quite common in the forest belt on bark of *Abies sibirica* and *Picea obovata*, more rarely on *Sorbus sibirica* and *Betula pendula*.

Specimens examined: **Altaysky krai**, Zmeinogorsky district, Tigireksky range, right bank of the Belaya River, 7 km upstream of the mouth of the Berlozhia river, 50°57'34" N, 83°02'59" E, alt. 717 m, 7.VII.2006, ED 6736 (ALTB); same range, c. 4 km S of Andreevsky, valley of the Malaya Amelikha River near the confluence with Zagornaya Amelikha River, 51°04'40.4" N, 82°49'57.9" E, alt. 850 m, 26.VI.2003, CP (8364); same range, near the headwaters of Batalikha River, 51°03.0' N, 82°53.1' E, alt. 1525 m, 10.VIII.2003, ED 6737 (ALTB); Soloneshensky district, Bashchelaksky range, along the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'42.5" N, 83°34'53.1" E, alt. 870 m, 28.VI.2003, CP 8552 (FR); **Altai Republic**, Ust'-Kansky district, between the villages Tog-Altai and Cherny Anuy, 51°21'24.0" N, 83°34'06.0" E, alt. 670 m, forest of *Picea obovata* along creek, 29.VI.2003, CP 8616, 8635 (FR); same locality, CP 8618 (FR); same locality, CP 8601, 8604, 8609, 8611 (FR); Ust'-Koksinsky district, Katunsky range, at the junction of the Khazinikha and Ioldo Rivers, 49°53' N, 86°04' E, alt. 1800 m, 22.VII.2000, ED 6735, 6756 (ALTB).

Ochrolechia pallescens (L.) A. Massal. [TLC: variolaric a. in thallus, variolaric, gyrophoric & lecanoric a. in apothecia]

Most reports of this species are from Europe (including the European part of Russia), the Ural Mts., South Siberia and the Far East, but it has also been reported from Israel and India (Kukwa, 2009). According to Kukwa (ibid.) its occurrence in South America is dubious. The records confirm the presence of this species in the Altai (Sedelnikova, 1990), where it was found on bark of *Salix* and *Populus tremula* in *Abies sibirica* – *Populus tremula* mountain relict forest.

Specimens examined: **Altaysky krai**, Zmeinogorsky district, Kolyvansky range, left

bank of Belaya River at 1,5 km NW of Stanovaya Mt. (796 m), 51°00' N, 82°44' E, alt. 600 m, 12.VI.1999, ED 1732 (ALTB); western part of the Tigireksky range at 5 km S of the community of Andreevsky, near the mid section of the Zagornaya Amelikha River, 51°03.37' N, 82°51.12' E, alt. 986 m, 26.VI.2003, ED 5537 (ALTB); same range, left bank of Glukharikha River 0.5 km up of junction with Belaya River, 51°00.1' N, 82°45.7' E, alt. 560 m, 12.VIII.2003, ED 5576 (ALTB).

Ochrolechia turneri (Sw.) Hasselrot [TLC: variolaric a.]

Common and widespread in the Northern Hemisphere. In Russia reported from the European North, the Caucasus, South Siberia and South Primorye (Urbanavichus, 2010). The records confirm the presence of this species in the Altai (Sedelnikova, 1990) and extend its known range to the West Altai (Altaisky krai). The specimens were collected on wood or bark of *Abies sibirica* and *Pinus sibirica* in *Pinus sibirica* – *Abies sibirica* forest, and humid wood pasture with *Larix sibirica*, *Pinus sibirica* and *Picea obovata*.

Specimens examined: Altaisky krai, Zmeinogorsky district, Tigireksky range, near the headwaters of the Bol'shoi Tigirek River, right bank of Babyi Kluch spring, 51°03'05" N, 82°58'37" E, alt. 1490 m, 9.IX.2005, ED 6746 (ALTB); Altai Republic, Ust'-Kansky district, W of Mt. Chugunka and S of river Tarkhata, 50°43'49.7" N, 85°24'15.8" E, alt. 1680 m, 1.VII.2003, CP 8741, 8786 (FR); Ust'-Koksinsky district, Katunsky range, S bank of Tal'menie Lake, left bank of Ozyornaia River, slope with NW exposition, 49°48' N, 85°49' E, alt. 1516–1700 m, 15.VII.2000, ED 6745 (ALTB).

Pertusaria albescens (Huds.) M. Choisy et Werner [TLC: no substances or undetermined fatty acid]

This species is also widespread and common in Russia (Urbanavichus, 2010). The records confirm its presence in the Altai Mts. (Davydov, 2001; Sedelnikova, 1990). Reports of *P. hemisphaerica* (Flörke) Eriksen from Siberia lacking TLC data probably belong to this species.

Specimens examined: Altaisky krai, Charyshsky district, Korgonsky range, right bank of Gorelyi Korgon River 9 km upstream from its mouth. N slopes, 51°01' N, 83°45' E, alt. 1400 m, *Pinus sibirica* – *Abies sibirica* forest, on bark of *Sorbus sibirica*, 29.VII.1998, ED 5981 (ALTB); Zmeinogorsky district, Tigireksky range, left bank of Belaya River opposite the mouth of the Irkutka River, 50°57'20" N, 82°58'27" E, alt. 700–800 m,

Abies sibirica dominated mountain taiga relict forest (Chern'), on *Sorbus sibirica*, 14.VII.2005, ED 6732 (ALTB); Altai Republic, Ust'-Kansky district, between the villages Tog-Altai and Cherny Anuy, 51°21'24.0" N, 83°34'06.0" E, alt. 670 m, forest of *Picea obovata* along creek, on *Picea obovata*, 29.VI.2003, CP 8599, 8612 (FR).

Pertusaria alpina Hepp [TLC: stictic & constictic a.]

The species is common in wet forests within the area on smooth bark of *Abies sibirica* and *Sorbus sibirica*. The records confirm its presence in the Altai (Davydov, 2001; Sedelnikova, 1990). It was collected on bark of *Padus avium*, as well as on twigs of *Caragana arborescens* and *Spiraea* sp.

Specimens examined: Altaisky krai, Zmeinogorsky district, Kolyvansky range, left bank of Belaya River at 1,5 km NW of Stanovaya Mt. (796 m), 51°00' N, 82°44' E, alt. 600 m, 12.VI.1999, ED 1746 (ALTB); Tigireksky range, basin of Belaya River, N slope of Mokhnato-Gladkaya Mt. (1077 m), 50°56' N, 82°43' E, alt. 800–900 m, 9.VI.1999, ED 6765 (ALTB); same range, valley of Bolshaya Uskuchevka River between communities of Buryshikha and Andreevsky, 51°11.2' N, 82°48.3' E, alt. 560 m, 25.VI.2003, ED 6784 (ALTB); same locality, 51°11'19.3" N, 82°48'30.6" E, alt. 450 m, 25.VI.2003, CP 8305 (FR); same range, at 5 km S of the community of Andreevsky, near the mid section of the Zagornaya Amelikha River, 51°03.37' N, 82°51.12' E, alt. 986 m, 26.VI.2003, ED 6782 (ALTB); same range, left bank of Belaya River uper of junction with Glukharikha River, 51°00.3' N, 82°45.8' E, alt. 540 m, 7.VIII.2003, ED 6763, 6783 (ALTB); same range, left bank of Belaya River 2 km upstream of junction with Glukharikha River, 50°59.7' N, 82°47.8' E, alt. 550 m, 7.VIII.2003, ED 5540 (ALTB); same range, left bank of Glukharikha River 0.5 km up of junction with Belaya River, 51°00.1' N, 82°45.7' E, alt. 560 m, 12.VIII.2003, ED 5542 (ALTB); same range, right bank of the Belaya River 7 km upstream of the mouth of the Berlozhia river, 50°57'34" N, 83°02'59" E, alt. 717 m, 7.VII.2006, ED 6762 (ALTB); same locality, 7.VII.2006, ED 6764 (ALTB).

Pertusaria amara (Ach.) Nyl. [TLC: picrolichenic a.]

The species is widespread in Russia (Urbanavichus, 2010) and rather common in the Altai Mts. (Davydov, 2001; Sedelnikova, 1990), however, its identification without TLC data may be ambiguous. The records confirm the presence of *P. amara* in the Altai.

Specimens examined: Altaysky krai, Charyshsky district, Korgonsky range, right bank of Kumir River near its lower section, 50°59' N, 84°18' E, alt. 800 m, taiga forest (*Abies sibirica*, *Picea obovata*, *Betula pendula*, *Sorbus sibirica*), on bark of *Abies sibirica*, 2.VIII.1995, ED 540 (ALTB); Zmeinogorsky district, Tigireksky range, right bank of the Belaya River, 7 km upstream of the mouth of the Berlozhia river, 50°57'34" N, 83°02'59" E, alt. 717 m, *Abies sibirica* – tall forb forest, on *Betula pendula*, 7.VII.2006, ED 6733 (ALTB); same locality, on *Abies sibirica* ED 6734 (ALTB).

Pertusaria sommerfeltii Florke [TLC: stictic & constictic a., lichexanthone in apothecia]

A circumboreal species reported from many regions in Russia (Urbanavichus, 2010). The records confirm its presence in the Altai (Davydov, 2001; Sedelnikova, 1990), where it is relatively rare and was collected by us in *Abies sibirica* – tall forb forest, on wood, on bark of *Lonicera altaica* in humid wood pasture with *Larix sibirica*, *Pinus sibirica*, *Picea obovata* and a lot of dead wood, and on bark of *Sorbus sibirica* in *Pinus sibirica* – *Picea obovata* forest.

Specimens examined: Altaysky krai, Zmeinogorsky district, Tigireksky range, right bank of the Belaya River, 7 km upstream of the mouth of the Berlozhia river, 50°57'34" N, 83°02'59" E, alt. 717 m, 7.VII.2006, ED 6761 (ALTB); Altai Republic, Ust'-Kansky district, W of Mt. Chugunka and S of river Tarkhata, 50°43'49.7" N, 85°24'15.8" E, alt. 1680 m, 1.VII.2003, CP 8800 (FR); Ust'-Kok-sinsky district, Katunsky range, S coast of Tal'menie Lake, left bank of Ozyornaia River, slope with NW exposition, 49°48' N, 85°49' E, alt. 1516–1700 m, 15.VII.2000, ED 6760 (ALTB).

Physcia alnophila (Vain.) Loht., Moberg, Myllys & Tehler

This taxon was recently elevated to species level using molecular phylogenetic data (Lohtander et al., 2009). Its distribution is not clear because it was previously treated as a variety of *P. aipolia* (Ehrh. ex Humb.) Föhrn. Common within the Altai Mts. on bark of *Salix* growing along rivers. New for the Altai Mts.

Specimens examined: Altaysky krai, Zmeinogorsky district, Tigireksky range, valley of Bolshaya Uskuchevka River between the communities of Bugryshikha and Andreevsky, 51°11'19.3" N, 82°48'30.6" E, alt. 450 m, tall forb community along forest road with *Abies sibirica*, *Betula pendula* and *Salix caprea*, on *Spiraea*, 25.VI.2003, CP; Soloneshensky district, Bashchelaksky range, along

the river Shinok between the villages Tog-Altai and Cherny Anuy, 51°21'43.6" N, 83°35'20.4" E, alt. 910 m, forest of *Picea obovata*, *Betula* and *Salix* along creek, on bark of *Salix* sp. 28.VI.2003, CP 8516 (FR).

Pilophorus cereolus (Ach.) Th. Fr. [TLC: atranorin]

An arctic-alpine species reported from Europe, the European and Asian parts of Russia, North America, Greenland and Svalbard (Dombrovskaya, 1996; Skirina, Skirin, 2011). Rare in the Altai Mts. (Sedelnikova, 1990) and new for the Western Altai (Altaysky krai).

Specimens examined: Altaysky krai, Soloneshensky district, Bashchelaksky range, valley of Shinok River, downstream of the waterfall, 51°21.27' N, 84°34.06' E, alt. 1035 m, mixed forest (*Picea obovata*, *Abies sibirica*, *Betula pendula*, *Salix* spp., *Sorbus sibirica*, *Populus tremula*, *Pinus sibirica*), on rock at the base of a talus slope, 29.VI.2003, ED 6755 (ALTB).

Placynthiella icmalea (Ach.) Coppins & P. James [TLC: gyrophoric a.]

A common subcosmopolitan species that is widespread in Russia (Makarova, 2003).

Specimens examined: Altaysky krai, Zmeinogorsky district, Tigireksky range, 4–5 km S of the community Andreevsky, ca. 51°04' N, 82°51' E, on rotten stump of *Betula*, 26.VI.2003, CP 8384 (FR).

Rhizoplaca subdiscrepans (Nyl.) R. Sant.

The distribution of this species in Russia requires additional investigations. The species was so far reported from a few localities in the European North, the southern Ural Mts, South and East Siberia (Urbanavichus, 2010). New for the Altai Mts. where it is rather common.

Specimens examined: Altaysky krai, Zmeinogorsky district, Tigireksky range, near the headwaters of the Belaya River, 51°01'16" N, 83°04'10" E, alt. 1488 m, timberline, rocks, on stones, 5.VII.2006, ED 6766 (ALTB).

Umbilicaria decussata (Vill.) Zahlbr. [TLC: gyrophoric and lecanoric acid]

The species is found at high altitudes and latitudes worldwide. In many cases it is tardily distinguished from *U. lyngei* Schol. in sterile condition. The study of Løfall & Timdal (2005) in Norway and Svalbard showed that secondary chemistry may help to distinguish these two species. According to their study based on fertile material, *U. decussata* contains gyrophoric acid, sometimes also norstictic acid, whereas *U. lyngei* lacks lichen substances or

sometimes contains norstictic acid. Because *U. decussata* only very rarely produces apothecia, and *U. lyngei* was never found fertile in the Altai, we used nrITS DNA sequences to verify identifications of our specimens. Based on these results we confirmed the occurrence of gyrophoric and lecanoric acids in *U. decussata* by TLC. and detected two chemotypes of *U. lyngei*: one without lichen substances and one containing norstictic acid. Thus, secondary chemistry seems to be very useful to distinguish the two species in the Altai.

Specimens examined: Altaysky krai, Zmeinogorsky district, Tigireksky range, left bank of the Belaya River, the Chornaya Mt. (elev. 2013 m), rocks on the watershed, on rocks, 51°00'17" N, 83°07'15" E, alt. 1838 m, 11.VII.2006, DE 7100 (ALTB); Altai Republic, Ust'-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, on rocks, 49°59'15.6" N, 86°35'09.3" E, alt. 2686 m, 9.VIII.2009, ED 7108 (ALTB).

***Umbilicaria lyngei* Schol.**

Umbilicaria lyngei is more common than *U. decussata* in the Altai and widely distributed in the alpine zone from the timberline to the summits near the snow line as well as in high mountain steppes. It is reported here as a new for Tyva Republic. The species grow on rock outcrops or on boulders.

Specimens examined:

Chemotype A [TLC: norstictic a.]: Altai Republic, Ust'-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, on rocks, 49°59'08.3" N, 86°34'55.5" E, alt. 2687 m, 09.VIII.2009 ED 7107 (ALTB); same locality, 49°59'15.6" N, 86°35'09.3" E, alt. 2686 m, 09.VIII.2009 ED 7105, 7106 (ALTB); same locality, 50°01'58.9" N, 86°26'05.8" E, alt. 2381 m, 14.VIII.2009 ED 7102 (ALTB); same locality, 50°00'28.9" N, 86°27'52.4" E, alt. 2621 m, 19.VIII.2009 ED 7101 (ALTB).

Chemotype B [TLC: no subst.]: Altai Republic, Kosh-Agachsky district, Juzhno-Chuisky range, Tara River basin near unnamed mountain elev. 3521 m, 49°42'N, 88°14'E, alt. 2200–2500 m, 24.VII.1999, ED 5466 (ALTB); same district, Ukok tableland, left bank of Ak-Alakha River at 1 km downstream from its junction with Kalguty River, 49°23'N, 87°38'E, alt. 2200 m, 23.VII.1998, ED 5556 (ALTB); Tyva Republic, Mugur-Aksynsky district, left bank of Mogen-Buren River near its junction with Bashky-Kara-Sug stream. 50°10'N, 89°46'E, alt. 1800–2100 m, 4.VII.1995, ED 242 (ALTB)

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