ADDITIIONS TO THE LICHEN BIOTA OF THE ALTAI MOUNTAINS (SIBERIA). IV

DOПОЛНЕНИЯ К ВИДОВОМУ СОСТАВУ ЛИШАЙНИКОВ
АЛТАЙСКОЙ ГОРНОЙ СТРАНЫ. IV

Summary. Based on the results of field trips in 1994–2012, new data on distribution of 30 rare and noteworthy lichens from the Altai Mountains in southern Siberia, East Kazakhstan and North-West China are presented. The following species are new for certain regions which follow them in parenthesis: Protoparmelia cupreobadia (Russia and Kazakhstan), Rhizocarpon effiguratum, Rh. pusillum, Rinodina parasitica, and Sporastatia polyspora (Kazakhstan and the Altai Mts.), Alectoria sarmentosa, Rhizocarpon subgeminatum, Rimularia insularis, and Umbilicaria cinereoafuscescens (Kazakhstan), Miriquidica lulensis and M. plumbeoatra (West and South Siberia), Miriquidica deusta, Rhizocarpon effiguratum, and Toninia alutacea (West Siberia), Pilophorus dovensis and Catillaria erysiboide (South Siberia), Arthonia apatetica, Lecanora cadubriae, L. phaeostigma, Micarea peliocarpa, and M. turfosa (Altai Mts.), Arthrorhaphis citrinella, Bacidia beckhausii, Chrysorthrix chlorina, Epilichen scabrosus, and Lecanora fuscescens (Altaiisky krai), Cladonia foliacea (Altai Republic), and Sticta limbata (Xinjiang). New localities for the protected species, Graphis scripta and Sticta limbata, are presented. Species from the genera Aspicilia, Miriquidica, and Lecidea were recognized as a possible “host”-species for the parasitic lichen Rhizocarpon pusillum.

Key words: new records, lichen, Russia, Kazakhstan, China, Asia, Altai, parasitic lichens, Miriquidica, Micarea, Rhizocarpon, Lecanora.

Anнотация. В работе представлены флористические находки лишайников Алтая в пределах Южной Сибири, Восточного Казахстана и Северо-Западного Китая, сделанные во время полевых исследований в 1994–2012 годах. Из 30 включенных в сообщение видов, в 30 отмеченных в сообщение видов, Protoparmelia cupreobadia впервые приводится для России и Казахстана; Rhizocarpon effiguratum, Rh. pusillum, Rinodina parasitica и Sporastatia polyspora – для Казахстана и Алтая в целом; Alectoria sarmentosa, Rhizocarpon subgeminatum, Rimularia insularis и Umbilicaria cinereoafuscescens – для Казахстана; Miriquidica lulensis и M. plumbeoatra – для Западной и Южной Сибири; Miriquidica deusta, Rhizocarpon effiguratum и Toninia alutacea – для Западной Сибири; Pilophorus dovensis и Catillaria erysiboide – для Южной Сибири; Arthonia apatetica, Lecanora cadubriae, L. phaeostigma, Micarea peliocarpa и M. turfosa – для Алтая в целом; Arthrorhaphis citrinella, Bacidia beckhausii, Chrysorthrix chlorina, Epilichen scabrosus и Lecanora fuscescens – для Алтайского края; Cladonia foliacea – для Республики Алтай; Sticta limbata – для Синьцзяна. Даются новые местонахождения охраняемых видов Graphis scripta и Sticta limbata. Виды из родов Aspicilia, Miriquidica и Lecidea выявлены как возможные хозяева паразитического лишайника Rhizocarpon pusillum.

Ключевые слова: флористические находки, лишайники, Россия, Казахстан, Китай, Азия, Алтай, паразитические лишайники, Miriquidica, Micarea, Rhizocarpon, Lecanora.

This paper continues the series of publications started by E.A. Davydov (2004), Davydov et al. (2007), and Davydov & Printzen (2012a, b) on the lichen flora of the Altai Mts. Herbarium speci-
mens collected by the first author during 1994–2012 composed the material for this study. There was no special focus on any systematical or ecological group of lichens, and all epilithic, epiphytic, epigeic and parasitic lichens not recorded previously for the Altai Mts. or its administrative subdivisions are included. Morphological and anatomical characters were analyzed by applying standard light microscopical methods. Full label data of the examined specimens are provided for every species. Altitudes are indicated in meters above sea level. The name of the collector E.A. Davydov is contracted to ED. Voucher specimens are deposited in the herbaria ALTB, LE, FR and PE.

*Alectoria sarmentosa* (Ach.) Ach.

An arctic-alpine species known from many locations in Eurasia, North and South America (Thomson, 1984; Urbanavichus, 2010). It was reported for the Altai Republic by Sedelnikova (1990) and is also known from the Khangai in Mongolia (Biazrov et al., 1989). In the Altai Mts, it grows on wood, twigs of shrubs, or on soiled stones. New for Kazakhstan and Altaiysky krai.

Specimens examined: **Russia**, Altaiysky krai, Zmeinogorsky district, Tigireksky range, headwaters of Bolshoy Tigirek River at 11,5 km N of Tigirek settlement and 3 km SE of Razrabortnaya Mt., 51°02′53″ N, 83°00′27″ E, alt. 1540–1600 m, mountain tundra, on wood, 21 VII 2012, ED 7328 (ALTB); **Kazakhstan**, Vostochno-Kazakhstanskaia oblast’, Katon-Karagaisky district, Katunsky range, ca. 28,5 km E from the Archaty settlement, right bank of the Bukhtarminskoye Reservoir, *Larix sibirica – Pinus sibirica* forest with *Vaccinium vitis-idaea*, 49°16′23″ N, 86°57′08″ E, alt. 2150 m, on soil with rotten wood, 30 VIII 2012, ED 7295 (ALTB); same district, Yuzhny Altay range 21 km NE from the Berlozhia River, 50°57′ N, 83°03′ E, alt. 717 m, vegetation islands (Juniperus crassifolia, *Bergenia crassifolia, Salix sp.*) among stonefield and rocks, 27 VII 2011, ED 7094 (ALTB).

*Arthrorhaphis citrinella* (Ach.) Poelt

An almost cosmopolitan species reported for Russia from the Arctic (Vrangel I., Yamal, Taimyr, yakutia, Novosibirskie Is.), Murmansk region, Karelia, Komi Republic, Leningrad region, Central Russia, Urals, Siberia (Baikal, Pribaikalie, Krasnoyarsk territory), Chukotka, Far East (Andreev et al., 1996; Fadeeva et al., 2007; Handbook …, 2008; Kuznetsova et al., 2007; Urbanavichus, Urbanavichene, 2004; Urbanavichus, 2010; Urbanavichus et al., 2008).

The species is characterized by a granular-areolate, sorediate, greenish gray-yellow to lemon-yellow thallus, flat black apothecia, as well as needle-shaped spores of 7–12 cells, with an elongate tail. It grows on sandy soil, sometimes parasitic on *Baeomyces rufus*.

It was reported for the Altai Mts. from Mongolia, and also occurs in Khangai (Golubkova, 1981; Schubert, Klement, 1971). New for Russian Altai (Altaiysky krai).

Specimens examined: **Russia**, Altaiysky krai, Zmeinogorsky district, Tigireksky range, headwaters of Bolshoy Tigirek River at 11,5 km N of Tigirek settlement and 3 km SE of Razrabortnaya Mt., 51°02′53″ N, 83°00′27″ E, alt. 1540–1600 m, mountain tundra, on wood, 21 VII 2012, ED 7328 (ALTB); same district, Yuzhny Altay range 21 km S from Uryl’ settlement, near the headwaters of the Irkutka River, 51°02′24″ N, 83°01′12″ E, alt. 1675 m, vegetation islands (*Juniperus sp.*, *Bergenia crassifolia, Salix sp.*) among stonefield and rocks, 27 VII 2011, ED 7094 (ALTB).

*Bacidia beckhausii* Körb.

This inconspicuous species, widespread in the boreal and temperate zone and recently reported by Davydov & Printzen (2012a) from the Altai Mts. (Altai Republic, Ust’-Kansk district) was also found in Altaiysky krai.

Specimens examined: **Russia**, Altaiysky krai, Zmeinogorsky district, Tigireksky range, right bank of the Belaya River, 7 km upstream to the mouth of the Berlozhia River, 50°57′ N, 83°03′ E, alt. 717 m,
Abies sibirica — high grasses forest, on lignum, 7 VII 2006, ED 6982 (ALTB), Altai Republic, Ust'-Kansky district, Katunsky range, E bank of Nizhne-Multinskoe Lake near the headwater of Multa River, 50°01’ N, 85°51’ E, alt. 1627 m, Pinus sibirica – Larix sibirica forest, on bark of Lonicera altaica, 2 VII 2000, ED 7063 (ALTB).

Catillaria erysiboides (Nyl.) Th. Fr.

This boreal Holarctic species with a scattered distribution was found in Russia in Karelia, Komi Republic, Ural, West Siberia (Tyumen Region) and South of the Far East (Fadeeva et al., 2007; Handboook ..., 1998; Paukov, Mikhailova, 2011; Urbanavichus, 2010), growing on wood and bark of coniferous trees. It seems more widely distributed within the boreal zone, but may have been overlooked due to its small size. This species different from the closely related Catillaria nigroclavata (Nyl.) Schuler by its light-coloured apothecia, as well as by the morphology of the spores, one cell always being larger than the other. Puttea exsequens (Nyl.) Printz & Davydov is also externally similar but is characterized by unicellular ascospores. New for South Siberia.

Specimens examined: Russia, Altaisky krai, Zmeinogorsky district, Tigireksky range, 5 km upstream to the mouth of the Berlozhia River, 50°57’ N, 83°03’ E, alt. 717 m, Abies sibirica – high grasses forest, on wood, 7 VII 2006, ED 6983 (ALTB).

Chrysothrix chlorina (Ach.) J.R. Laundon

[TLC: vulpinic a., calicin & zeorin]

This bipolar species is characterized by a thick, bright yellow, often areolate, powdery thallus. It grows mainly on siliceous rocks. The presence of vulpinic acid and zeorin distinguishes it from other species of the genus Chrysothrix and from sterile thalli of Psiloelchia lucida (Ach.) M. Choisy. The species was reported for the Russian and Mongolian Altai (Golubkova, 1981; Sedelnikova, 1990). It is a widespread species which, in the Altai Mts., occurs both on rock (common) and bark (rare). It is reported here as new for the West Altai (Altaisky krai).

Specimens examined: Russia, Altaisky krai, Soloneshensky district, Bashchelalksky 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 sp., Sorbus sibirica, Populus tremula, and Pinus sibirica), on a cliff near the River, 29 VI 2003, ED 6096 (ALTB); same locality, on bark of Picea obovata, 29 VI 2003, ED 6097 (ALTB).

Cladonia foliacea (Huds.) Schae.

The species is known from Europe, Macaronesia, South and West Asia and North Africa, but in Russia it is restricted to the European part and South Ural (Urbanavichus, 2010). It was also reported from Kazakhstan including Kazakhstanian Altai (Andreeva, 1978) and Mongolia (Khangai: Biazrov, 1989). More recently, it was recorded from Siberia (Davydov, 2001) and included to the Red Data Book of the Altaisky krai (Davydov, Skatchko, 2006). It was difficult to differentiate this species from the closely related C. convoluta (Lam.) Anders, which has recently been synonymized with C. foliacea (Pino-Bodas et al., 2010). G.P. Urbanavichus (2010) points out that all records of C. foliacea from Siberia may probably been erroneous. However, T. Ahti has revised our material from the Altai and reports it also from southern Yakutia based on his unpublished records. New for Altai Republic.

Specimens examined: Russia, Altaisky krai, Kur’insky district, Kolyvansky range at 2 km W of the community of Podpalattsy, 51°14’ N, 82°45’ E, alt. 500–600 m, 16 VI 1994, ED 1399 (ALTB); Charyshsky district, 5 km upstream of Tulata River from the community of Ust-Tulatinka, Mochnataya mountain, [51°24’ N, 83°25’ E, alt. 500 m], pine forest, among stones and mosses, on soil, 17 VI 2002, Tsareva E.N., Tsareva T.V. (ALTB No. 179); Altai Republic, Ongudaysky district, right bank of Chuya River at 15 km upstream from its junction to the Katun’ River, 50°24’31’’ N, 86°52’35’’ E, alt. 850 m, on soil in mountain steppe, 9 VII 2012, ED 7329 (ALTB).

Epilichen scabrosus (Ach.) Clem. ex Hafellner

This arctic-alpine species is known in Eurasia and North America as a parasite on the thallus of Baeomyces sp. It is characterized by small, areolate, green or greenish-yellow thalli, black, plane apothecia and 2-celled brown spores. The species was recorded for the West Siberia by Davydov (2004), based on a collection from the Katunsky range (Altai Republic). It is reported here as new for West Altai (Altaisky krai).

Specimens examined: Russia, Altaisky krai, Zmeinogorsky district, Tigireksky range, 12 km S from the community of Tigirek, watershed of the Bol’shoy Tigirek and Malyi Tigirek Rivers, subal-
pine meadow, rocks, 51°02′24″ N, 83°01′12″ E, alt. 1675 m, on *Baeomyces placophyllus*, 27 IX 2011, ED 7097 (ALTB).

**Graphis scripta** (L.) Ach.

*Graphis scripta* is widespread throughout the temperate zone of the Northern Hemisphere (Staiger, 2002). It is distributed in Russia throughout the forest zone and in the forest belt of mountains (Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). Nevertheless, the species is rare in West Altai and is the only crustose species included to the Red Data Book of the Altaiisky krai (Davydov, Skatchko, 2006). The second locality in Altaiisky krai is formally reported here. At both localities, the species was observed on few tree trunks only. In contrast, it is common in the taiga forest near the Teletsksoye Lake.

Specimens examined: **Russia**, Altaiisky krai, Krasnoschchokovsky district, Tigireksky range at 1,5 S from the settlement of Tigirek, Chainaya Mt., 51°07′28″ N, 83°01′45″ E, alt. 637 m, *Abies sibirica* – *Populus tremula* oldgrown forest, on *Abies sibirica*, 8 III 2009, ED 7116; same place, on *Sorbus sibirica*, ED 7117 (ALTB); Charyshsky district, Bashchelaksky range at 6 km NE of the community of Bol’shoi Bashchelak, Grebnyukha Mt., 51°35′ N, 84°01′ E, alt. 900 m, on *Abies sibirica*, 14 VII 2000, ED 7791 (ALTB).

**Lecanora fuscescens** (Sommerf.) Nyl.

This circumboreal biatorine species is characterized by broadly ellipsoid ascospores and the presence of fumarprotocetraric and lobaric acids. It may be confused with *L. boligera* (Norman ex Th. Fr.) Hedl. and *L. cadubriae*. The former is chemically identical to *L. fuscescens*, but differs by its broadly ellipsoid ascospores, capitate paraphyses and often biatorine appearance of the apothecia. The latter is readily distinguished by the presence of the norstictic acid chemosyndrome and narrowly ellipsoid ascospores (Edwards et al., 2009; Lichen ... , 2004). *Lecanora fuscescens* is widely distributed in arctic and boreal regions of Russia (Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004), is known from Mongolia (Khangai: Biazrov et al., 1989) and was reported for the Altai by Sedelnikova (1990). New for the West Altai (Altaiisky krai).

Specimens examined: **Russia**, Altaiisky krai, Zmeinogorsky district, Tigireksky range, left bank of Belaya River opposite the mouth of the Irkutka River, 50°56′49″ N, 82°57′50″ E, alt. 1043 m, *Abies sibirica* dominated mountain taiga relict forest (Chern’), on bark of *Sorbus sibirica*, 15 VII 2005, ED 7051 (ALTB).

**Lecanora phaeostigma** (Körb.) Almb.

This Eurasian boreal species has been reported for Russia from the Murmansk region, Karelia, Komi Republic, Moscow and Samara regions, Ural, Tatarstan, Siberia (Baikal, Tyumen region) (Fadeeva et al., 2007; Kataeva et al., 2005; Kortschikov, 2006; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004; Vasykov, Kaneev, 2006). It has also been reported for Mongolia (Khangai: Biazrov et al., 1989). The species has whitish-gray thallus with brownish to brownish-black apothecia (0.8 mm in diameter), ellipsoidal spores 8–15×3–5 μm; the thallus is K+ yellow changing to brown. New for the Altai Mts.

Specimens examined: **Russia**, Altai Republic, Ust’-Koksinsky Katunsky range, SW bank of Tal’menie Lake, left bank of Khariuzovka River,
taiga forest (*Abies sibirica*, *Larix sibirica*, and *Pinus sibirica*), on bark of *Abies sibirica*, 49°49’ N, 85°48’E, alt. 1516–1800 m, 14 VII 2000, ED 7792 (ALTB).

*Micarea denigrata* (Fr.) Hedl.
[TLC: gyrophoric a.]

This species occurs in Europe, Asia, North America and Australia (Czarnota, 2007). In Russia it is widespread in the forest zone and in the forest belt of the mountains, where it grows on bark and wood of deciduous and coniferous trees (Handbook …, 1998; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). The species is characterized by numerous convex variously coloured apothecia, 1–2 celled spores, and by the presence of gyrophoric acid. Common in forest belt of the Altai Mts. (Davydov, 2001; Sedelnikova, 1990).

Specimens examined: *Russia*, 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, *Pinus sibirica* – *Vaccinium* forest, on lignum of stump, 29 VI 2000, ED 7064 (ALTB).

*Micarea melaena* (Nyl.) Hedl.

Common in the boreal zone of the Holarctic and often found in Europe, Asia, North America, Australia, Antarctica (Czarnota, 2007). In Russia, it is distributed from Arctic to steppe areas in the plains and mountains (Andreev et al., 1996; Handbook …, 1998; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). Reported for Mongolia (Biazrov et al., 1989; Golubkova, 1981; Schubert, Klement, 1971), Kazakhstan (Andreeva, 1983) and China (Xinjiang: Abbas et al., 2001). It was reported for the Altai Mts. by Sedelnikova (1990) as very rare, but seems to be more common in the region.

Specimens examined: *Russia*, 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, *Pinus sibirica* – *Vaccinium* forest, on lignum of stump, 29 VI 2000, ED 7064 (ALTB).


The species occurs in Europe, Asia, Africa, North America, Australia and New Zealand (Czarnota, 2007). In Russia it has a scattered distribution and occurs in the arctic, boreal and nemoral zones, as well as in the mountains; it inhabits bark and wood, rarely soil, mosses and rocks (Handbook …, 1998; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). It is reported for Mongolia from Khentey (Hauck, Javkhlan, 2006). The species characterized by flat to strongly convex, variously coloured, but mostly gray-black or light gray apothecia, sometimes gathered into a bunch, with an olive or blue-green epithecium and oblong-fusiform, mostly 4-celled, but sometimes 2–6-celled spores; it has two types of pycnidia and the thallus reacts C+ red. It is a new record for the Altai Mts. and is probably common in South Siberia, but has been overlooked by researchers.

Specimens examined: *Russia*, Altai Republic, Ust’-Kansky district, Katunsky range, E bank of Nizhne-Multinskoe Lake near the headwater of Multa River, 50°01’ N, 85°51’ E, alt. 1627 m, margin of the forest, on lignum, 2 VII 2000, ED 7068 (ALTB); same range, between the villages Tog-Altai and Cherny Anuy, 51°21’21.4” N, 84°33’50.2” E, alt. 1020 m, on base of *Salix*, Ch. Printzen 8657 (FR).

*Micarea turfosa* (A. Massal.) Du Rietz

This arctic-alpine species with a bipolar distribution (Europe, Asia, North America, South America, Antarctica) (Czarnota, 2007) occurs in Russia in the Arctic, Murmansk, Leningrad, Tver and Ni-
zhnyi Novgorod regions, Komi Republic, Nenetsky territory, Ural, West and East Siberia, Chukotka, Magadan region (Handbook …, 1998; Kuznetsova et al., 2007; Notov et al., 2011; Sharapova, 2001; Urbanavichus, 2010; Urbanavichus et al., 2008; Urbanavichus, Urbanavichene, 2004). It grows on peat cushions. It has numerous black apothecia, often confluent in bunches and bulging, with red-brown spots present in the hypothecium; spores are oblong-oval, 1–4-celled. New for the Altai Mts.

Specimens examined: Russia, Altai Republic, Ust'-Koksinsky district, Katunsky range, right bank of Multa River near it’s flows into Sredne-Multinskoe Lake, 49°57.5’ N, 85°51’ E, alt. 1700 m, moss-yernik bog, on mosses and soil, 3 VII 2000, Multinskoe Lake, 49°57.5’ N, 85°51’ E, alt. 1700 m, moss-yernik bog, on mosses and soil, 3 VII 2000, ED 7073 (ALTB).

**Miriquidica deusta** (Stenh.) Hertel & Rambold

A bipolar, mainly arctic-alpine species which occurs on silicates in open habitats, also found on boulders and rocks in the lowlands of mountainous regions. It was known previously in Arctic (Kola Peninsula, Novaya Zemlya, Taimyr, Chukotka, Alaska, Canada and Greenland), Fennoscandia, Leningrad Region, Estonia, in the mountains of Central and Southern Europe, Central Asia (Kazakhstan Altai, Mongolia, Nepal) and North (Nevada, Mexico) and South America (Venezuela); in the Southern Hemisphere it is known in Australia and New Zealand (Andreev, 2004). The taxon is probably rather widely distributed in mountain areas of South Siberia and Central Asia, but is not mentioned because of the poor investigation of the region. The species is characterized by a dark-grey thallus, darker in places of iron granule concentration, by the completely immersed apothecia, a colourless hypothecium and rather small spores. It can be distinguished from *Miriquidica garovaglilii* (Schae.) Hertel & Rambold by the flatter, thinner and more dispersed areoles on a black hypothallus, by the negative reactions with K and P, and by the smaller ascospores. It is distinguished from *Lecidea atrobrunnea* (Ramond ex Lam. & DC.) Schae. by the negative medullary reaction with I, and from *L. paupercula* Th. Fr. by the colourless hypothecium and negative reaction with P.

The species was found in the alpine belt of the Altai Mts. in stone fields on rocks. New for West Siberia.

Specimens examined: Russia, Altai Republic, Ust'-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, 50°05’15.6” N, 86°37’39.3” E, alt. 2482 m, 7 VIII 2009, ED 7191 (ALTB); same place, 50°04’08.9” N, 86°40’37.2” E, alt. 2718 m, 8 VIII 2009, ED 7213 (ALTB); same place, 50°01’58.9” N, 86°26’05.8” E, alt. 2381 m, 14 VIII 2009, ED 7192 (ALTB); same place, 50°00’01.1” N, 86°28’32.9” E, alt. 2764 m, 16 VIII 2009, ED 7194, 7197, 7202, 7799 (ALTB); same place, 50°00’28.9” N, 86°27’52.4” E, alt. 2621 m, 19 VIII 2009, ED 7196 (ALTB); same place, 50°01’04.6” N, 86°27’02.8” E, alt. 2627 m, 20 VIII 2009, ED 7198 (ALTB).

**Miriquidica lulensis** (Helb.) Hertel & Rambold

A widespread in the Arctic (Iceland, Jan Mayen I, Spitsbergen, Franz Josef Land, Kola Peninsula, Novaya Zemlya, Taimyr, Severnaya Zemlya, Chukotka, Arctic Canada, Greenland) occurring in exposed habitats on hard siliceous rocks and boulders enriched in iron. It also occurs in the mountains of North, Central and Eastern Europe (Andreev, 2004). In Russia it has been collected in the Arctic and in Karelia. It is characterized by very small [ca. 0.5–1(1.5) cm diam.], rounded, light-grey thallus edged by a black hypothallus, small plane apothecia with a thin evanescent margin, and a K+ red reaction (norstictic acid). Hence it could be confused with *Lecidea lapicida* (Ach.) Ach. var. *pantherina* Ach., but this has more flat and angular areolae and an amyloid medulla. The species was found in alpine belt of the Altai Mts. in stone fields on rocks. New for West and South Siberia.

Specimens examined: Russia, Altai Republic, Ust'-Koksinsky district, Katunsky range, watershed between the Ak-Kem and Kucherla Rivers, 50°03’33.5” N, 86°27’09.4” E, alt. 2381 m, 14 VIII 2009, ED 7191 (ALTB); same place, 50°04’08.9” N, 86°40’37.2” E, alt. 2718 m, 8 VIII 2009, ED 7213 (ALTB); same place, 50°01’58.9” N, 86°26’05.8” E, alt. 2381 m, 14 VIII 2009, ED 7192 (ALTB); same place, 50°00’01.1” N, 86°28’32.9” E, alt. 2764 m, 16 VIII 2009, ED 7194, 7197, 7202, 7799 (ALTB); same place, 50°00’28.9” N, 86°27’52.4” E, alt. 2621 m, 19 VIII 2009, ED 7196 (ALTB); same place, 50°01’04.6” N, 86°27’02.8” E, alt. 2627 m, 20 VIII 2009, ED 7198 (ALTB).

**Miriquidica plumbeoatra** (Vain.) Schwab & Rambold

Probably a boreal-montane circumpolar species. It grows in the temperate zone on siliceous rocks in more or less moist habitats near rivers and waterfalls. It is known from Fennoscandia including the Kola Peninsula and Karelia, and from North America. In Russia it has also been collected in Kamchatka, and was erroneously reported for Buryatia (Andreev, 2004; Urbanavichene, 1998). It is characterized by a dark-grey thallus, darker in places of iron granule concentration, by the completely immersed and adpressed apothecia with a very thin or evanescent margin, an excipulum with a dark-brown
inner part, a reddish-brown hypothecium and by the absence of lichen substances. The species was found in the alpine belt of the Altai Mts. in stone fields on rocks. New for West and South Siberia.

Specimens examined: **Russia**, Altai Republic, Ust'-Kokinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, 50°05'15.6'' N, 86°37'39.3'' E, alt. 2482 m, 7 VIII 2009, ED 7200 (ALTB).

**Pilophorus dovrensis** (Nyl.) Timdal

This arctic-alpine species grows on the siliceous rocks in Svalbard, North Europe, North America (incl. Greenland) (Foucard, 2001; Øvstedal et al., 2009). It was reported for Russia from the Arctic (Novaya Zemlya, Severnaya Zemlya, Chukotka), Murmansk region (Melekhin, 2011) and North of Siberia (Putorana Plateau) (Zhurbenko, Triebel, 2005). The species is distinguished by the absence of pseudopodetia, the presence of cephalodia with *Nostoc* or *Stigonema*, the pale greenish-gray areolate thallus, black, convex to hemispherical apothecia, and simple colourless spores (15–17×5–7 μm). New for South Siberia.

Specimens examined: **Russia**, Altai Republic, Ust'-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, 49°59'15.6'' N, 86°35'09.3'' E, alt. 2686 m, stone fields and rocks, on stone, 9 VIII 2009, ED 6997 (ALTB).

**Protoparmelia cupreobadia** (Nyl.) Poelt

This alpine species was previously reported from Europe, Mongolia, Pakistan and North America (Cogt, 1995; Poelt, Grube, 1992; Poelt, Leuckert, 1991). The record of *Protoparmelia atriseda* (Fr.) R. Sant. et V. Wirth for the Altai Mts. (Davydov, 2001) refers to *P. cupreobadia* (Zhdanov, 2011). Both *Protoparmelia atriseda* and *P. cupreobadia* belong to the section *Phaeonora*, which includes species with curved and thread-like conidia, containing of norstictic acid and associating with crustose lichens at least at young stages. Both species initially grow on thalli of *Rhizocarpon*. Nevertheless, thallus morphology of the species is significantly different. *Protoparmelia cupreobadia* is characterized by a large thallus up to 10 cm diam., with a distinct margin, plane, contiguous areoles with a black fringe of prothallus, radially elongated marginal areoles, and large apothecia up to 3 mm diam (Fig. 1); in contrast, *P. atriseda* is recognized by the smaller thallus up to 4 cm in diameter with a rather indistinct margin, strongly convex to hemispherical, rather scattered areoles that are not radially elongate at the margin, and small, up to 1 mm diam. apothecia. The information on two specimens of *Protoparmelia cupreobadia* collected in 1990 in the Altai Mts. (Russia) by P.L. Nimis are entered into the herbarial database of TSB (No 15817, 17877) and it is on this data that the species was reported by G.P. Urbanavichus (2010) for Russia. This material has not been examined. The species is common within the study area on stones, boulders in stonefields in alpine belt and near the timberline. New for Russia and Kazakhstan.

Specimens examined: **Russia**, Altai Republic, Ust'-Koksinsky district, Katunsky range, watershed between the Ak-Kem and Kucherla Rivers, stone fields and rocks, 50°01'59'' N, 86°26'06'' E, alt. 2381 m, 14 VIII 2009, ED 7288 (ALTB, LE); same place, 50°00'01'' N, 86°28'33'' E, alt. 2764 m, 16 VIII 2009, ED 7289 (LE); same place, 50°00'38'' N, 86°27'44'' E, alt. 2699 m, 18 VIII 2009, ED 7290 (LE); **Kazakhstan**, Vostochno-Kazakhstanskaja oblast’, Katon-Karagaisky district, headwaters of the Bukhtarma River, right bank, SE slope of the Muzdy-Bulak Mt. (3050 m), high mountain tundra, stones, 49°14'13'' N, 87°14'42'' E, alt. 2710 m, 1 IX 2012, ED 7286 (ALTB).

**Rhizocarpon effiguratum** (Anzi) Th. Fr.

This species is known from Europe, Asia and North America (incl. Greenland) (Øvstedal et al., 2009). In Russia it occurs in the Subpolar and North Ural, Buryatia (Dzherginsky district), Za-
Rhizocarpon effiguratum is characterized by small thalli, up to 3 cm diam., with plane to strongly convex, yellow to yellowish-green areoles, and brown, 2-celled ascospores. The species is locally common in the alpine belt of the Altai Mts in open communities on stones near the upper limit of lichen vegetation and occurs on siliceous rocks. It was reported for the Mongolian Altai (Golubkova, 1981; Schubert, Klement, 1971) but is new for West Siberia and Kazakhstan.

Selected specimens examined: Russia, Altai Republic Ust’-Koksinsky district, Katunsky range upper reaches of the Ak-Kem River, right bank, stone fields and rocks, 50°05′15.6″ N, 86°37′39.3″ E, alt. 2482 m, 7 VIII 2009, ED 7042, 7050 (ALTB); same place, 50°04′08.9″ N, 86°40′37.2″ E, alt. 2718 m, 8 VIII 2009, ED 7015 (ALTB); same place, 49°59′08.3″ N, 86°34′55.5″ E, alt. 2687 m, 9 VIII 2009, ED 7013, 7014, 7043 (ALTB); same range, watershed between the Ak-Kem and Kucherla Rivers, stone fields and rocks, 49°58′15.2″ N, 86°28′58.4″ E, alt. 2850 m, 13 VIII 2009, ED 6964, 6970, 7012 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, 15 VIII 2009 ED 7047 (ALTB); same place, 50°00′57.2″ N, 86°27′09.8″ E, alt. 2605 m, 15 VIII 2009, ED 7040, 7046, 7048 (ALTB); same place, 50°00′01.1″ N, 86°28′32.9″ E, alt. 2764 m, 16 VIII 2009, ED 6960 (ALTB); same place, 50°02′37.1″ N, 86°27′34.9″ E, alt. 2720 m, 18 VIII 2009, ED 7045 (ALTB); same place, 50°00′37.8″ N, 86°27′44.2″ E, alt. 2699 m, 18 VIII 2009 ED 6973, 7044, 7049 (ALTB); same place, 50°01′04.6″ N, 86°27′02.8″ E, alt. 2627 m, 20 VIII 2009, ED 6965 (ALTB). Kazakhstan, Vostochno-Kazakhstanskaia oblast’, Katon-Kara-gaisky district, Tarbagatai range (Altai) 49°14′00.4″ N, 86°29′37.4″ E, alt. 2324 m, 15 IX 2011, ED 7059 (ALTB); same district, Yuzhnyi Altai range, 49°03′50.5″ N, 86°21′54.7″ E, alt. 2735 m, 10 IX 2011, ED 7058 (ALTB).

Rhizocarpon pusillum Runemark

A small parasitic lichen with a bipolar distribution (Eurasia, North America, New Zealand) (Foucard, 2001; Øvstedal et al., 2009), known in Russia from the Arctic (Polar Ural, Novosibirskiiye Is., Vanigall Is.) and East Siberia (Handbook ..., 2003; Urbanavichus, 2010). In the Altai, the species is locally common on non-calciferous rocks in the alpine zone as a parasite on Sporostatia testudinea (Fig. 2) and S. polyspora (Fig. 3). These species were also mentioned as “host”-species in other regions (Poelt, 1990; Rambold, Triebeel, 1992). In addition, well-developed thalli of Rhizocarpon pusillum were also collected once by us on Aspicilia cf. mashiginensis (Fig. 4), Miriquidica deusta (Fig. 5) and Lecidea sp. Several species of parasitic Rhizocarpon have been described from different “host”-species (see Poelt, 1990). However, it is known that lichenicolous species of lichens are less host specific than lichenicolous fungi; only about 1/3 of parasitic lichen species in Russia have their “host”-species belonging to only a single genus, whereas 2/3 can parasitise lichens from different genera (Zhurbenko, 2008). The specimens from Aspicilia, Miriquidica and Lecidea all have the morphology, ascospore number, size and septation, as well as spot reactions typical for Rhizocarpon pusillum. Freely living thalli have never been observed in the Altai. New for West and South Siberia and Kazakhstan.
Specimens examined: **Russia**, Altai Republic, Ust’-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, on *Sporostatia polyspora*, 49°57′23.3″ N, 86°29′14.5″ E, alt. 2895 m, 12 VIII 2009, ED 7146 (ALTB); same range, watershed between the Ak-Kem and Kucherla Rivers, on *Sporostatia testudinea*, 49°58′15.2″ N, 86°28′58.4″ E, alt. 2850 m, 13 VIII 2009, ED 7160 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, 15 VIII 2009, ED 6962 (ALTB); same place, 50°00′01.1″ N, 86°28′32.9″ E, alt. 2764 m, 16 VIII 2009, ED 7157 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, stone fields and rocks on *Sporostatia polyspora*, 49°51′52.4″ N, 86°05′36.9″ E, alt. 1629 m, 24 VIII 2008, ED 7157 (ALTB); same range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, 49°59′15.6″ N, 86°27′44.2″ E, alt. 2699, on *Aspicilia cf. mashiginensis*, 16 VIII 2009 ED 7261 (ALTB); same place, 50°00′37.8″ N, 86°27′44.2″ E, alt. 2687 m, 9 VIII 2009 ED 7188, 7189 (ALTB); same place, 50°02′22″ N, 86°27′00.2″ E, alt. 2484 m, on *Aspicilia cf. mashiginensis*, 16 VIII 2009, ED 7261 (ALTB); same place, 50°00′01.1″ N, 86°28′32.9″ E, alt. 2764 m, 16 VIII 2009, ED 7159 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, stone fields and rocks on *Sporostatia testudinea*, 50°00′01.1″ N, 86°28′32.9″ E, alt. 2764 m, 16 VIII 2009, ED 7159 (ALTB); same place, 50°02′22″ N, 86°27′00.2″ E, alt. 2484 m, on *Aspicilia cf. mashiginensis*, 16 VIII 2009, ED 7261 (ALTB); same place, 50°00′37.8″ N, 86°27′44.2″ E, alt. 2699, on *Sporostatia polyspora*, 50°01′11″ N, 86°26′16.5″ E, alt. 2497 m, 20 VIII 2009, ED 7158 (ALTB). **Kazakhstan** Vostochno-Kazakhstanskaia oblast’, Katon-Kara-gisky district, Yuzhnyi Altai range, 49°03′50.5″ N, 86°21′54.7″ E, alt. 2735 m, on *Sporostatia polyspora*, 10 IX 2011, ED 7057 (ALTB); same range, 49°01′25.5″ N, 86°08′36.1″ E, alt. 2572 m, on *Sporostatia polyspora*, 13 IX 2011, ED 7056 (ALTB); same district, headwaters of the Bukhtarma River, right bank, SE slope of the Muzdy-Bulak Mt. (3050 m), high mountain tundra, stones, 49°13′53″ N, 87°14′10″ E, alt. 2680 m, on *Sporostatia testudinea*, 31 VIII 2012, ED 7280 (ALTB).

*Rhizocarpon subgeminatum* Eitner

This circumpolar species (Øvstedal et al., 2009) was reported for Russia from the Arctic, the Murmansk region, Karelia, Komi Republic, Ural, Siberia (Saiany Mts, Stanovoye Nagorye Uplands, Baikal and Pribaikalie), Buryatia, Far East (Bastak preserve) (Fadeeva et al., 2007; Handbook ..., 2003; Makryi, 2002; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). In Mongolia it was reported from Khubusugul and Khangai (Golubkova, 1981). The species grows on the siliceous rocks in the open places. It was reported for the Altai by Sedelnikova (1990) as a rare species. It seems more widely distributed in the Altai than previously assumed. New for Kazakhstan.

Specimens examined: **Russia**, Altai Republic, Ust’-Koksinsky district, Katunsky range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, 49°57′23.3″ N, 86°29′14.5″ E, alt. 2895 m, 12 VIII 2009, ED 7146 (ALTB); same range, watershed between the Ak-Kem and Kucherla Rivers, on *Sporostatia testudinea*, 49°58′15.2″ N, 86°28′58.4″ E, alt. 2850 m, 13 VIII 2009, ED 7160 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, stone fields and rocks on *Sporostatia polyspora*, 49°51′52.4″ N, 86°05′36.9″ E, alt. 1629 m, 24 VIII 2008, ED 7157 (ALTB); same range, upper reaches of the Ak-Kem River, right bank, stone fields and rocks, 49°59′15.6″ N, 86°35′09.3″ E, alt. 2686 m, 9 VIII 2009, ED 7188, 7189 (ALTB); same place, 50°01′16.9″ N, 86°26′55.4″ E, alt. 2650 m, stone fields and rocks on *Sporostatia testudinea*, 50°00′01.1″ N, 86°28′32.9″ E, alt. 2764 m, 16 VIII 2009, ED 7159 (ALTB); same place, 50°02′22″ N, 86°27′00.2″ E, alt. 2484 m, on *Aspicilia cf. mashiginensis*, 16 VIII 2009, ED 7261 (ALTB); same place, 50°00′37.8″ N, 86°27′44.2″ E, alt. 2699, on *Sporostatia polyspora*, 50°01′11″ N, 86°26′16.5″ E, alt. 2497 m, 20 VIII 2009, ED 7158 (ALTB). **Kazakhstan** Vostochno-Kazakhstanskaia oblast’, Katon-Kara-

*Rimularia insularis* (Nyl.) Rambold & Hertel

This is a suboceanic, almost cosmopolitan, parasitic lichen species that forms patches on the thalli of species of the “*Lecanora rupicola*”-group and *L. bicincta* (Andreev, 2008; Hertel, Rambold, 1990; Rambold, Triebel, 1992). In Russia it occurs in the Murmansk Region (Khibiny Mts.), Karelia, Leningrad Region (Hogland I.), Caucasus, Polar Ural, Altai, South Baikal, Yakutia, and Chukotka.
(Andreev, 2008; Zhurbenko, 2009). It was reported for the Altai from the Altaiisky krai by Davydov (2001). It is common on Lecanora bicincta (Fig. 6) in stonefields above timberline. New for Kazakhstan.

Specimens examined: Kazakhstan, Vostochno-Kazakhstanskaia oblast’, Katon-Karagaisy district, Tarbagatai (Yuzhnyi Altai), to the south of Uryl’, 49°09’02.1” N, 86°11’24.8” E, alt. 2614 m, southern slope near the top, stones scatterings among the mountain tundra, on lichens, 14 IX 2011, ED 7011 (ALTB).

Sporastatia polyspora (Nyl.) Grummann

This arctic-alpine species occurs in Europe, Asia and North and South America, and was reported in Russia from the Arctic, Caucasus, South Siberia, and Far East (Golubkova, 1988; Urbanavichus, 2010). It is reported here as new for the Altai Mts. and Kazakhstan where it is common in high mountains on boulders in stonefields or on rocks.

Selected specimens examined: Russia, Altai Republic, Ust’-Koksinsky district, Katunsky range, upper reaches of the Ioldo River, stonefields and rocks, 49°49’30” N, 86°12’18.5” E, alt. 2112 m, 17 VIII 2008, ED 7163 (ALTB); same range, the watershed between the Ak-Kem and Kucherla Rivers, stone fields and rocks, 50°01’16.9” N, 86°26’55.4” E, alt. 2650 m, 15 VIII 2009, ED 7164 (ALTB); same locality, 50°00’01.1” N, 86°28’32.9” E, alt. 2764 m, 16 VIII 2009, ED 7162; Kazakhstan, Vostochno-Kazakhstanskaia oblast’ Katon-Karagaisy district, Yuzhny Altai range, headwaters of the Kara-Kaba River, mountain tundra, stonefields, 49°03’50.5” N, 86°21’54.7” E, alt. 2735 m, 10 IX 2011, ED 7075a (ALTB); same locality, 49°01’25.5” N, 86°08’36.1” E, alt. 2572 m, 13 IX 2011, ED 7056a (ALTB).

Sticta limbata (Sm.) Ach.

This species has a scattered distribution in Europe, Asia, Africa, North America, Australia and Oceania (Galloway, 2001). In Russia it is occurs in South Siberia (Altai Mts., Khararovsk territory, Sakhalin I. (Urba
navichus, 2010; Urbanavichus, Urbanavichene, 2004). It was recently reported for the Altaisky krai (Davydov, 2004) where it is included in the Red Data Book (Davydov, Skatchko, 2010), and represented by only 5–10 small suppressed thalli, 1–3 cm in diameter. It has also been reported for Hubei Prov. in China (Chen et al., 1989). New for Xinjiang (Chinese Altai).

Specimens examined: Russia, Altaisky krai, Charyshsky district, western part of Korgonsky range, the valley of Sentelek River at 8 km up-
stream from the Pokrovka settlement, 51°04'46" N, 83°39'31" E, alt. 1020 m, *Abies sibirica* – *Betula pendula* mountain forest, on bark of *Salix* sp. 23 VI 2007. **China**, Xinjiang, Mongol’sky Altai range, west part of Korumtytau Mts, valley of right tributary of Yelt-gol from the mountain situated in 5 km of the Barytumsuktau peak to the mouth, 47°56’15” N, 88°58’03” E, alt. 1550 m, 29 VII 2003, ED 6925 (ALTB); same range, west part of Korumtytau Mts, valley of right tributary of Yelt-gol from the mountain situated in 5 km of the Barytumsuktau peak to the mouth, * Larix sibirica* – *Picea obovata* forest on a steep slope (granitoids), 47°52’11” N, 88°56’50” E, alt. 1465 m, 25 VII 2007, ED 6631 (ALTB, PE).

**Toninia alutacea** (Anzi) Jatta

This species is widespread on calciferous rocks in the Northern Hemisphere, growing mainly in mountainous areas (Timdal, 1991). In Russia it was reported from the Caucasus, East Siberia ( Yakutia) and South Siberia (Dzhergingsky preserve) (Handbook . . ., 2003; Urbanavichus, 2010; Urbanavichus, Urbanavichene, 2004). Narrowly fusiform, 4-celled ascospores distinguish this species from the closely related *Toninia candida* (Weber) Th. Fr., *T. diffracta* (A. Massal.) Zahlbr. and *T. rosulata* (Anzi) H. Olivier, which have 2-celled, broadly fusiform ascospores. The species has previously been reported for the Mongolian Altai (Schubert, Klement, 1971) but is new to West Siberia.

Specimens examined: **Russia**, Altaiiskiy krai, Soloneshensky district, Bashchelaksky range, valley of Shinok River, downstream of the waterfall, forest with *Picea obovata, Abies sibirica, Betula pendula, Salix* sp., *Sorbus sibirica, Populus tremula,* and *Pinus sibirica*, on stone, 51°21.27’ N, 84°34.06’ E, alt. 1035 m, 29 VI 2003, ED 6925 (ALTB).

**Umbilicaria cinereorufescens** (Schaer.) Frey

Literature reports of this species from Russia must be considered with care because Golubkova & Savicz (1978) did not clearly distinguish the species from *U. vellea* (L.) Hoffm. The latter has long, light-coloured, branched rhizinomorphs in addition to short, black, simple rhizinomorphs bearing multicellular thalloconidia that are characteristic for both species. We are able to confirm the occurrence of this species at a few localities in the Russian Arctic, Kamchatka Peninsula and South Siberia (Davydov, Zhurbenko, 2008; Davydov et al., 2011a, b), but it may have been overlooked elsewhere. For the Russian part of the Altai, the species was reported by Wei & Jiang (1993), based on the herbarium material from COLO. The species was also reported for Mongolia from Khangai (Biazrov, 1986). New for Kazakhstan.

**Russia**, Altai Republic, Kosh-Agachsky district, Ukok tableland, Tyoply Klyuch Pass., *Betula nana* shrubs, stones on boulders, 49°25’ N, 88°02’ E, alt. 2500–2800 m, on boulders, 20 VII 1998, ED 651 (ALTB); same tableland, left bank of Ak-Alakha River at 1 km downstream from its junction with Kalguty River, N and E slopes, rocks not far from river bank, 49°23’ N, 87°38’ E, alt. 2200 m, N exposed rocks, 23 VII 1998, ED 5555 (ALTB); same tableland, left bank of Zhumaly River near its headwaters, on N slopes 49°28’ N, 88°02’ E, 2400–2700 m, mountain tundra, boulders, 30 VII 1998, ED 5275 (ALTB); same district, Juzhno-Chuisky range, Chagan-Usun River basin near headwaters of Akkol River, it’s right bank, mountain slopes with E, NE, N expositions, yernik, on rocks overcrops, 49°50’ N, 87°48’ E, alt. 2800–3000 m, 29 VIII 1995, ED 5365 (ALTB); Ongudaysky district, Seminsky range at 10 km SW of the community of Elo near the upstream of Uluta River, S part of the Karakobek Mt. *Larix sibirica* – *Pinus sibirica* taiga forest, 50°43.39’ N, 85°23.04’ E, alt. 1834 m, 1 VII 2003, ED 5448, 5491 (ALTB). **Kazakhstan**, Vostochno-Kazakhstanskia oblast’, Katon-Karagai district, Katunsky range, ca. 28,5 km E from the Archaty settlement, right bank of the Buhkarminskoye Lake, *Larix sibirica* – *Pinus sibirica* forest, 49°16’23” N, 86°57’08” E, alt. 2150 m, 30 VIII 2012, ED 7270 (ALTB).

**Acknowledgements**

Authors thank Prof. Teuvo Ahti for his valuable comments on the distribution of *Cladonia fo-liacea* and Dr. G.P. Urbanavichus for comments on distribution of some species. Authors are grateful to Dr. G.E. Insarov (Moscow, Russia) and A.K. Sundetpaev (Katon-Karagai, Kazakhstan) for organizing and participating in Central Altai (2008, 2009) and Kazakhstan (2011, 2012) expeditions and to Dr. Chen Wenli (Beijing, China) and Wang Jian (Altai, China) for organizing the fieldtrip to Xinjiang (China). Authors thank directors and staff of Katunsky state nature preserve, Beluksa Nature Park (Russia) and Katon-Karagasisky National park (Kazakhstan) for the great help to the expeditions. Dr. Gintaras Kantvilas (Hobart, Australia) is thanked for correcting the English. The study was supported by the Russian Ministry of Science and Education (project SC № 16.518.11.7071) and the Russian Foun-
dation for Basic Research (RFBR, grant №11-04-00901). The work of E. D. in LE was supported by the RFBR, grant No. 11-04-90704, and by the State contract of the Ministry of Education and Science № 16.518.11.7071, while the work of L. K. in ALTB was funded by RFBR, grant No 11-04-90767.

REFERENCES


Davydov E.A. Annotated list of lichens of Western part of Altai (Russia) // Novit. Syst. Pl. non Vasc. [Academia Scientiarum Rossica], 2001. – Vol. 35. – P. 140–161. [in Russian]


Davydov E.A., Printzen C. Rare and noteworthy boreal lichens in Altai Mountains (South Siberia, Russia) // Bryologist, 2012a. – Vol. 115, № 1. – P. 61–73.


Zhurbenko M., Triebel D. Lasiosphaeriopsis pilophori sp. nov. (Sordariales) and other lichenicolous fungi on Pilophorus // Mycological Progress, 2005. – Vol. 4, № 4. – P. 317–323.