DE GRUYTER
OPEN

© 2018 W. Szafer Institute of Botany
Polish Academy of Sciences

Plant and Fungal Systematics 63(1): 11–21, 2018
DOI: 10.2478/pfs-2018-0003

ISSN 2544-7459 (print)

New species and records of saxicolous lichens from the Kodar Range (Trans-Baikal Territory, Russia)

Sergey Chesnokov[1,2*], Liudmila Konoreva[2,3,4] & Alexander Paukov[5]

Article info
Received: 30 Oct. 2017
Revision received: 12 June 2018
Accepted: 15 June 2018
Published: 12 July 2018

Corresponding Editor
Martin Kukwa

Abstract. Fifty-six species of saxicolous lichens are reported for the first time from the Kodar Range. *Circinaria scyphulifera* is described as new to science. *Aspicilia nikrapensis* and *Fuscidea submollis* are new for Russia; *Aspicilia sublapponica*, *Lepra monogona* and *Thelignya lignyota* are new for southern Siberia; and 35 species of saxicolous lichens are reported for the first time for the Stanovoye Nagor'e highlands. *Fuscopannaria ahlneri* alredy appears in the Red Data Book of the Trans-Baikal Territory.

Key words: Kodar Range, Trans-Baikal Territory, saxicolous lichens, new records.

Introduction

The Kodar Range is the highest range of the Stanovoye Nagor'e highlands. It is located in the southeastern part of those highlands on the border of the Irkutsk Region and the Trans-Baikal Territory in southern Siberia (Fig. 1). The first studies of the lichen biota of the Kodar Range were initiated by V. M. Burkova in the 1960s. Widespread terricolous lichens are given in a monograph on the Stanovoye Nagor'e highlands (Vodopyanova et al. 1972), but saxicolous lichens were not studied in that work. Determination of Burkova's collections was continued by T. V. Makryi at the end of the 20th century. She investigated part of a collection and published more than 200 species, mainly of saxicolous lichens (Makryi 1999, 2002a, 2005, 2012, 2013, 2014a, b).

Part of the northern macroslope of the Kodar Range is included in the Vitim Reserve which was established in 1982. The staff of the reserve began to actively study the biodiversity of the Vitim Reserve, including the lichens. Mostly this was geobotanical work which mentioned the lichens growing on soil (Budajeva & Anisimova 1992; Budajeva 1995). A. V. Lishtva focused on the lichens of the Kodar Range (Lishtva 1998, 2000, 2001, 2003; Makryi & Lishtva 2005; Lishtva et al. 2013). In the literature for the Kodar Range, 372 species and 3 varieties of lichens were known at the beginning of our research; about half of those species occur on rock.

The predominate type of stony substrate in the Kodar Range is siliceous rock (e.g., granite, crystalline schist, quartzite); calcareous rock is rare and scattered. The variety of rock types and microclimatic conditions are factors driving the biodiversity of saxicolous lichens in the region. Their biodiversity in the Kodar Range has been studied for more than 15 years but about two-thirds of the Kodar territory has not yet been studied (Fig. 1); 251 species of lichens growing on rock are currently known from this territory (Makryi 2002a, 2005, 2012, 2013, 2014a, b; Makryi & Lishtva 2005; Davydov et al. 2011; Konoreva & Andreev 2013a, b; Chesnokov & Konoreva 2015; Chesnokov et al. 2015, 2017; Chesnokov & Lishtva 2016; Vondrák et al. 2016; Zhurbenko et al. 2016). All localities are in the central part of Kodar Range (Fig. 1).

This paper continues the series of publications describing new records of lichens and allied fungi of the Kodar Range in the Trans-Baikal Territory of southern Siberia (Gerasimova et al. 2014; Chesnokov & Konoreva 2015; Chesnokov et al. 2015, 2017; Chesnokov & Lishtva 2016; Konoreva & Chesnokov 2016; Konoreva et al. 2016; Vondrák et al. 2016; Zhurbenko et al. 2016). Here we report new records of saxicolous species of the region.

Material and methods

Lichens were collected at 56 sites, which are listed in Appendix 1 along with their GPS coordinates. The majority of specimens are deposited in the lichen herbarium of

[1] Sakhalin Branch of Botanical Garden-Institute of the Far Eastern Branch of Russian Academy of Sciences, Gorkogo St. 25, mailbox 34, 693023 Yuzhno-Sakhalinsk, Russia
[2] Komarov Botanical Institute, Prof. Popov Str. 2, St. Petersburg, 197376, Russia
[3] Botanical Garden-Institute FEB RAS, Makovskogo St., 142, Vladivostok, 690024, Russia
[4] Polar-Alpine Botanical Garden and Institute, Kirovsk, 184256, Russia
[5] Department of Biodiversity and Bioecology, Institute of Natural Sciences and Mathematics, Ural Federal University, Lenin Ave. 51, Ekaterinburg, 620000, Russia
* Corresponding author e-mail: lukinbrat@mail.ru

This work is licensed under the Creative Commons BY-NC-ND 4.0 License

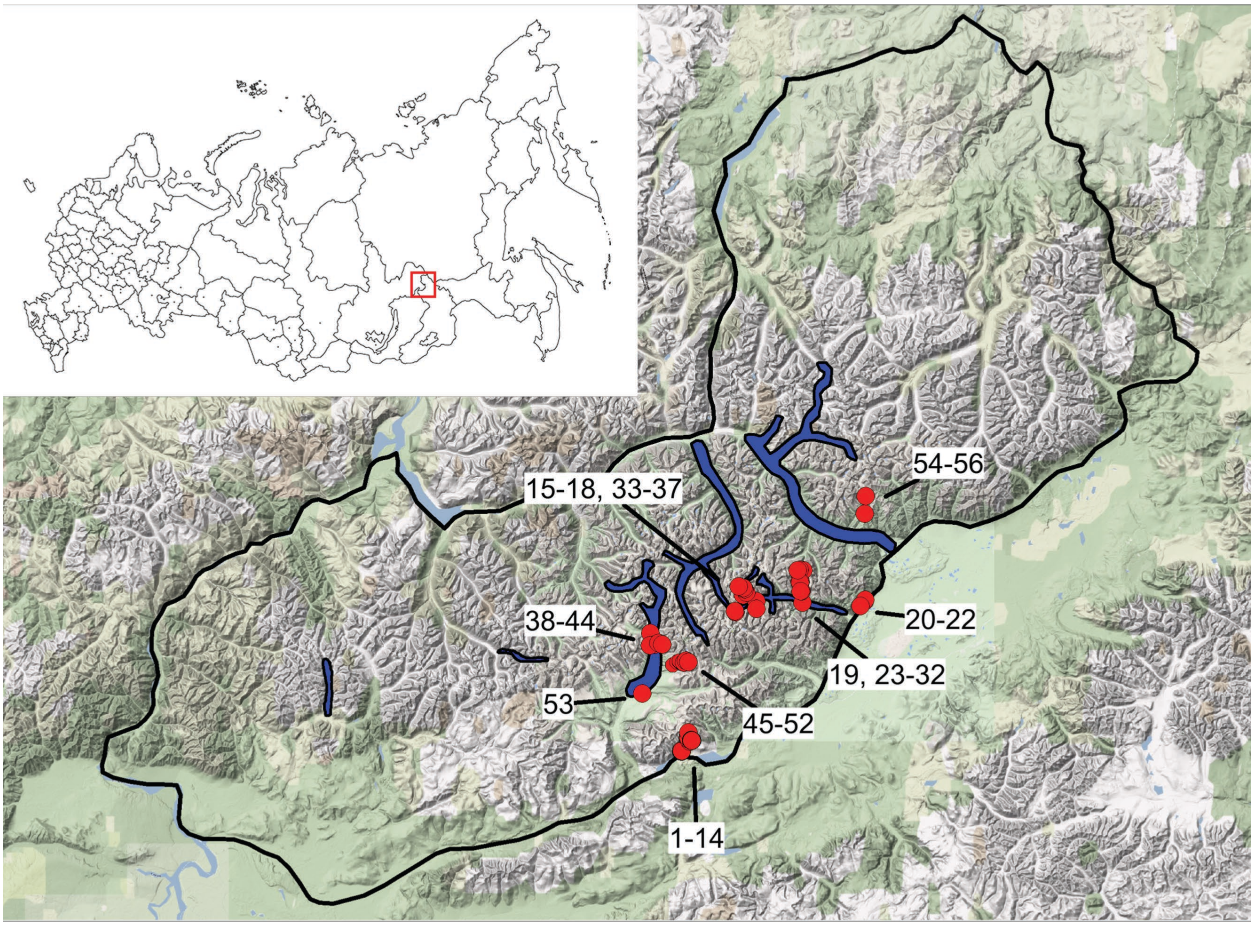

Figure 1. Investigated area. Blue area – examined parts of the Kodar Range according to the literature data; red dots – localities studied for this paper.

the Komarov Botanical Institute in Saint-Petersburg (LE). Duplicates were sent to the herbarium of the Institute of Botany, Academy of Sciences of the Czech Republic, Pruhonice (PRA); the Institute of Experimental Botany, V. F. Kuprevich National Academy of Sciences of Belarus (MSK); and Altay State University (ALTB). Paratypes of *Circinaria scyphulifera* are stored in the herbarium of the Museum of Evolution in Sweden, Uppsala (UPS); the Conservatory and Botanical Garden of the City of Geneva, Switzerland (G); and Botanische Staatssammlung München, Germany (M). Additional specimens from H, H-Nyl, S, UPS and WU were also studied for comparison.

During the laboratory work, sections of apothecia were cut by razor blade and studied in water-mounted preparations. Characters of paraphyses were studied after treatment with 10% KOH. Spore measurements are given as (min.–)M–SE–[M]–M+SE(–max.), rounded to the nearest 0.1 µm, where 'min.' and 'max.' are the extreme values recorded, M is the arithmetic mean and SE the corresponding error of mean. Lichen substances of some species were studied by thin-layer chromatography (TLC) in solvent systems A and B (Orange et al. 2001).

The lichen nomenclature follows Nordin et al. (2011a) and some other works (Darbishire 1909; Oxner 1933; Harada 1993; Moberg 1995; Makarova 2004; Blanco et al. 2004; Sipman 2006; Hafellner & Türk 2016).

Results

56 species of saxicolous lichens are treated in this paper; all of them are reported for the first time from the Kodar Range (Tab. 1). *Aspicilia nikrapensis* and *Fuscidea submollis* are new for Russia; *Aspicilia sublapponica*, *Lepra monogona* and *Thelignya lignyota* are new for southern Siberia; and 35 species of saxicolous lichens are reported for the first time for the Stanovoye Nagor'e highlands. Additionally, *Circinaria scyphulifera* is described as new to science. Data on localities, substrates, collector number and herbariums are provided for each species. TLC data for some species are provided if necessary for correct determination.

Circinaria scyphulifera Paukov, Chesnokov & Konoreva, sp. nov. (Fig. 2)

MycoBank MB 823332

Diagnosis: *Circinaria* with crustose, rimose-areolate, often variegated thallus, "molariform" areoles, crateriform to plate-like pruinose apothecia with a white rim, and norstictic acid as a secondary metabolite.

Type: Russia, Trans-Baikal region: Kalar district, Kodar Range, Alt. 1888 m, 56°47′40.7″N, 117°22′16.7″E, Oleniy rog creek, plateau with lichen tundra, *Rhododendron aureum* and stones on the left bank, on stone, 18 June 2015, S.V. Chesnokov (Pl. 11) (LE L13731 – holotype; UFU – isotype).

Description. Thallus light grey, olive, to olive-blackish. Dark specimens always have some grayish areoles or greyish-colored protuberant parts. Thallus up to 1.5 mm thick, rimose-areolate, without lobes or with slightly lobuliform marginal areoles (Fig. 2B). Areoles very irregular in outline, 0.5–1 mm, slightly to clearly convex, with protuberances looking like surface of molars. Older areoles become squamuliform with blackish lower surface. Cortex paraplectenchymatous, 40–60 μm thick, with cells 7–8 μm in diameter. Epinecral layer c. 5 μm thick. Medulla white, up to 800 μm thick, algal layer 125–200 μm, not forming conspicuous stacks but crossed vertically by opaque lines made of dark, K-soluble granules. Hypothallus distinct, black, up to 0.5 mm wide, pigment unchanged in K and N. Photobiont trebouxoid, cells spherical, 7–15 μm. Apothecia urceolate, initially immersed, later appressed, round to irregular, 0.2–0.9 mm in diameter, 1–2 per areole, old apothecia appressed and becoming plate-like. Thalline margin well developed as whitish rim, partly excluded in older apothecia. Proper margin in young apothecia obscured by thalline margin, later in some apothecia prominent, blackish, surrounded by receding thalline margin. Disc black, smooth, concave to flat, gyrose in some older apothecia. Proper exciple c. 40 μm wide in upper part, narrowing below, cells in upper part slightly elongated, c. 9 × 7 μm long, thick-walled. Epihymenium greenish brown, N+ green, K–. Hymenium hyaline, 80–100 μm tall. Paraphyses moniliform, with 3–5, ± globose apical cells. Asci *Aspicilia*-type, clavate. Ascospores 6(–8) in ascus, usually poorly developed, hyaline, broadly ellipsoidal, (16.6–)19.0–[19.3]–19.7(–23.0) × (9.0–)11.1–[11.3]–11.5(–14.0) μm (n = 30). Hypothecium 40–50 μm thick.

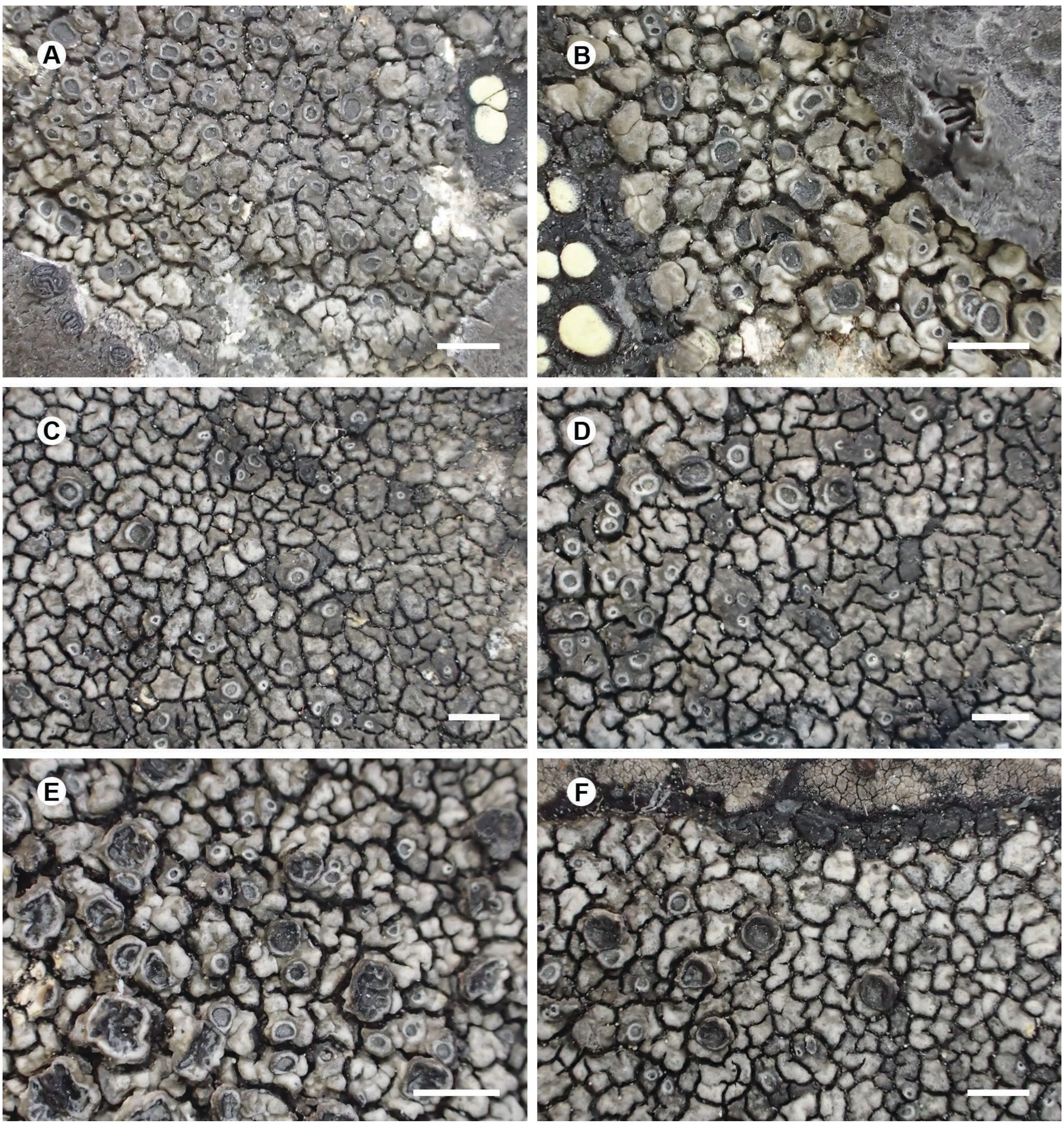

Figure 2. *Circinaria scuphulifera*. A, B – morphology of the holotype; C, D – variegated thallus with molariform areoles and young crateriform apothecia (Chesnokov 109); E, F – thalli with young apothecia and older apothecia with gyrose discs (Chesnokov 230).

Pycnidia rare, with dark pigmented ostiole region. Conidia bacilliform, (6.0–)7.3–[7.4]–7.6(–10.0) × 1 µm (n = 80).

Chemistry. Thallus K+ red, C–, Pd+ yellow-orange; norstictic acid present.

Etymology. The species epithet refers to the crateriform to plate-like apothecia.

Distribution and ecology. *Circinaria scyphulifera* is known from three localities in the Trans-Baikal region and one locality in the Republic of Sakha (Yakutia) at 1347–1888 m a.s.l. It grows on granite boulders in tundra habitats dominated by *Pinus pumila* and *Rhododendron aureum*. Associated species are *Fuscidea mollis*, *Rhizocarpon geographicum* and *Umbilicaria proboscidea*.

Notes. We did not manage to obtain satisfactory ITS sequences from the specimens to confirm the placement of this species within *Circinaria*, but asci with reduced number of spores and short conidia agree with the characters of this genus. *Circinaria gibbosa* is also a norstictic acid-containing species which differs by having grey, rounded, strongly convex areoles, larger ascospores, a flat disc, higher hymenium and non-pruinose apothecia (Nordin et al. 2010). *Circinaria cupreogrisea* is another *Circinaria* species containing norstictic acid which differs from *C. scyphulifera* by having brown angulate areoles with a whitish reticulate pattern, flat, non-pruinose apothecia, a higher hymenium and larger spores.

By their form, white rim and white pruina, the urceolate apothecia of *Circinaria scyphulifera* are similar to those of *Aspicilia fluviatilis* (Nordin et al. 2011b). The latter has a distinctly radiate thallus, contains norstictic acid also in the epihymenium, and has larger ascospores (20–26 × 11–14 µm) and longer conidia (11–17 µm). *Aspicilia epiglypta*, which has gyrose discs and produces norstictic acid, has much longer conidia (16–23 µm) (H-Nyl 25457a!). Sterile tissue crossing the discs in *A. epiglypta* appears in early stages of apothecia development. Blackish parts of the thalli of *Circinaria scyphulifera* may look very similar to the norstictic acid-containing *Aspicilia subradians*, which differs by having short but clearly visible lobes, smaller, non-pruinose apothecia and longer conidia (16.5–23 µm; the type of *Lecanora subradiascens* Nyl., examined; S L-1928!).

Additional specimens examined (paratype). RUSSIA. Trans-Baikal region, Kalar district, Kodar Range, 1698 m, 56°39′26.8″N, 117°25′33.6″E, Leprindinskoye plateau, stony placers with large boulders, on stone, 14 Aug. 2012, L. A. Konoreva 42 (collecting site 1) (LE); ibid., 1674 m, 56°47′57″N, 117°21′59″E, Oleniy rog creek, right bank, stone rubble on slope with *Pinus pumila* and outlet of spring, on stone, 18 June 2015, S. V. Chesnokov 230 (collecting site 50) (UPS); Republic of Sakha (Yakutia), Aldan district, 1347 m, 57°44′00.6″N, 125°16′31.4″E, Golyi bare mountain, stone rubble with *Pinus pumila*, on stone, 9 July 2015, S. V. Chesnokov 109 (LE) and 110 (G-00261031); ibid., Aldan neighborhood, 709 m, 58°32′28.2″N, 125°29′07.1″E, bank of Bol'shoy Kuranakh river, small hill, slope with stone rubble, *Larix gmelinii* and *Pinus sibirica*, on stone, 5 July 2015, S. V. Chesnokov 64 (M).

Discussion

Here we report 56 previously unrecorded saxicolous lichen species from the Kodar Range, including taxa new for Russia, southern Siberia and the Stanovoye Nagor'e highlands (Tab. 1). Some rare and taxonomically difficult taxa are briefly characterized below.

Aspicilia nikrapensis is reported here as new for Russia. The collected specimen has a whitish continuous thallus with poorly visible marginal lobules on its border, a plicate margin and appressed apothecia. The main secondary metabolite is stictic acid. The ascospores measure 20–24 × 15–20 µm. Conidia were not found. There is much uncertainty in determining whitish mealy *Aspicilia* species. Most lobulate Eurasian specimens with a mealy thallus are usually labeled *Aspicilia candida*, but the type specimens distributed in Anzi's exsiccate (Lichenes rariores Langobardi exsiccati 325, UPS!, WU!) contain substictic acid and have considerably smaller ascospores (13–17 µm) and subimmersed apothecia. The type of *Aspicilia nikrapensis* (Simmons 2676, H!) contains stictic acid and has larger ascospores, so we suppose that *A. nikrapensis* is the correct name for specimens with whitish, radiate, mealy thalli and stictic acid that previously have been referred to *A. candida*. The species is known from Canada as *A. nikrapensis* (Darbishire 1909) or as *Lecanora candida* var. *nikrapensis* (Barrett & Thomson 1975), from Greenland as *A. nikrapensis* (Alstrup et al. 2000), and from Novaya Zemlya (Savicz, Lichenotheca Rossica, No. 114) as *A. candida*.

Fuscidea submollis is also new for Russia. It was previously reported only from Japan (Ohmura & Kashiwadani 1997; Shimizu 2004).

Lepra monogona was previously reported from the Southern Urals (Paukov et al. 2017). The present report is the second record of this species in Russia, and it is new for southern Siberia. Most known localities are restricted to islands and coastal areas of Europe (Sipman 2006; Smith et al. 2009; Sipman & Raus 2015; Ravera et al. 2016), Northern Africa (Llimona 1982; Egea 1996; Seaward 1996) and mountain territories of Asia (Zhao et al. 2004). In Russia the species is chemically similar to *L. excludens* (Nyl.) Hafellner but differs in having abundant apothecia with a single ascospore in the ascus and the absence of soralia.

Most known localities of *Melanelixia villosella* are known from North America (Bates et al. 2010; Esslinger 2002) and from Asia: Pakistan (Aptroot & Iqbal 2012), India (Goni et al. 2015; Rai et al. 2015), Nepal (Esslinger 2002) and China (Wang et al. 2009). In Russia the species was previously reported from Buryatia (Urbanavichene & Urbanavichus 2009). This is the second record of this species in Russia.

Aspicilia sublapponica is new for southern Siberia. This species is very much like dark specimens of *A. perradiata* but has no secondary metabolites and belongs to the group of *Aspicilia* species with long conidia which usually exceed 30 µm in length. The species has an arctic-alpine distribution and is known from Sweden (Nordin et al. 2011a), Novaya Zemlya (Kopaczevskaja

Table 1. List of species reported as new from the study area. Asterisked taxa (*) are new for the Stanovoye Nagor’e highlands, taxa with “#” are new for southern Siberia, and species with “!” are new for Russia.

Species	Collecting site	Collection number (Herbarium)	Substrate	TLC
* ***Adelolecia kolaënsis*** (Nyl.) Hertel & Rambold	4, 6, 23, 43	Chesnokov Pl. 1, 190; Konoreva 79, 117, 121 (LE)	on siliceous boulders	N/A
* ***Allantoparmelia alpicola*** (Th. Fr.) Essl.	6, 33	Konoreva 114, 127 (LE, MSK)	on siliceous rocks	alectorialic, barbatolic and unidentified fatty acids
* ***Aspicilia dendroplaca*** (H. Magn.) Oxner	43, 48	Chesnokov 190, 222 (LE)	on siliceous boulders	N/A
* ***A. dudinensis*** (H. Magn.) Oxner	29	Chesnokov 55 (LE)	on siliceous boulders	N/A
! ***A. nikrapensis*** Darb.	47	Chesnokov 213 (LE)	on calcareous rocks	N/A
* ***A. pergibbosa*** (H. Magn.) Räsänen	30	Chesnokov 60 (LE)	on siliceous boulders	N/A
* ***A. permutata*** (Zahlbr.) Clauzade & Rondon	30	Chesnokov 60 (LE)	on siliceous boulders	N/A
#***A. sublapponica*** (Zahlbr.) Oxner	26	Chesnokov 41 (LE)	on siliceous stones	N/A
* ***A. supertegens*** Arnold	34	Konoreva 120 (LE)	on siliceous stone	N/A
A. transbaicalica Oxner	13, 21	Andreev Kodar-15, Leprindo-14 (LE)	on siliceous shady rocks near stream	N/A
* ***Bryodina rhypariza*** (Nyl.) Hafellner	11, 15, 25, 28, 32, 37, 44	Andreev Kodar-6; Chesnokov 50, 68, 116, 194; Konoreva 162, GPS-152 (LE)	on siliceous boulders and mosses	N/A
* ***Candelariella aurella*** (Hoffm.) Zahlbr.	53	Chesnokov 249 (PRA)	on siliceous stone	N/A
Chaenotheca furfuracea (L.) Tibell	54, 55	Chesnokov 286; Konoreva 29, 31 (LE)	on siliceous stone	N/A
* ***Circinaria caesiocinerea*** (Nyl. ex Malbr.) A. Nordin et al.	5	Andreev Leprindo-3(LE)	on siliceous stone	N/A
* ***C. hoffmanniana*** (S. Ekman & Fröberg ex R. Sant) A. Nordin	13	Andreev Leprindo-14 (LE)	on siliceous stone	no lichen substances
Collema undulatum var. ***granulosum*** Degel.	13	Andreev Leprindo-14 (LE)	on siliceous rocks	N/A
* ***Dermatocarpon luridum*** (With.) J. R. Laundon	52	Chesnokov 238 (LE)	on siliceous waterside stone	N/A
D. miniatum var. ***complicatum*** (Lightf.) Th. Fr.	21, 51	Andreev Kodar 15; Chesnokov 235 (LE)	siliceous rocks in wet conditions	N/A
D. miniatum var. ***miniatum*** (L.) W. Mann	13, 20, 21	Andreev Kodar 15, Leprindo-14; Konoreva 173 (LE)	on waterside rocks	N/A
* ***D. vellereum*** Zschacke	20	Konoreva 177 (ALTB)	on siliceous rocks	N/A
* ***Diploschistes gypsaceus*** (Ach.) Zahlbr.	20	Konoreva 204 (LE)	on calcareous stone	lecanoric acid
* ***Eiglera flavida*** (Hepp) Hafellner	24, 47	Chesnokov 20, 213 (LE)	on siliceous stones	no lichen substances
! ***Fuscidea submollis*** Mas. Inoue	35	Chesnokov 105 (LE)	on siliceous stone	divaricatic acid
Fuscopannaria ahlneri (P. M. Jørg.) P. M. Jørg.	19	Andreev Kodar-14(LE)	on mossy siliceous stone	N/A
Hypogymnia austerodes (Nyl.) Räsänen	1, 2, 23, 36, 44	Andreev Leprindo-1; Chesnokov 13, 194; Konoreva 56, 149 (LE)	on siliceous boulders	N/A
Lathagrium cristatum (L.) Otálora et al.	42	Chesnokov 185 (LE)	on soil in rock crevice	N/A
* ***Lecanora rupicola*** (L.) Zahlbr.	1, 45, 50	Chesnokov 208, 230; Konoreva 48 (LE)	on siliceous stones	N/A
#***Lepra monogona*** (Nyl.) Hafellner	21, 22	Andreev Kodar-15, 17 (LE)	on siliceous rocks	norstictic and salazinic acids
* ***Leproplaca cirrochroa*** (Ach.) Arup et al.	11	Konoreva 182 (LE)	on calcareous rocks	N/A
Leptogium cyanescens (Rabenh.) Körb.	11, 12, 14	Andreev Leprindo-13, 15; Konoreva 165, 166, 169 (LE)	on mossy siliceous rocks	N/A
* ***Lithographa tesserata*** (DC.) Nyl.	18	Konoreva 127 (LE)	on siliceous rocks	N/A
* ***Massalongia carnosa*** (Dicks.) Körb.	3, 7, 9, 10, 12, 43, 50	Andreev Leprindo-9, 12, 13; Chesnokov 190, 228; Konoreva 66, 71, 135, 162 (LE)	on mosses and soil on stones	N/A
* ***Melanelixia villosella*** (Essl.) O. Blanco et al.	20	Konoreva 168 (LE)	on mossy siliceous boulders	N/A
Pannaria conoplea (Ach.) Bory	11, 21	Andreev Kodar-15; Konoreva 176 (LE)	on mossy siliceous rocks	N/A
* ***Pertusaria digrediens*** Nyl.	31	Chesnokov 64 (LE)	on siliceous stones	protocetraric acid
* ***P. flavicans*** Lamy	11	Konoreva 180 (LE)	on siliceous stone	thiophaninic acid and unidentified substances
Phaeophyscia primaria (Poelt) Trass	11, 13, 14, 20, 21, 32	Andreev Kodar-15, Leprindo-14,15; Chesnokov 70; Konoreva 166, 217, 220 (LE)	on mossy rocks	N/A
* ***Placopsis gelida*** (L.) Linds.	55	Chesnokov 286 (LE)	on siliceous stones	N/A

Table 1. Continued.

Species	Collecting site	Collection number (Herbarium)	Substrate	TLC
Polycauliona candelaria (L.) Frödén et al.	4, 11	Konoreva 78, 168 (LE)	on siliceous stones	N/A
Polychidium muscicola (Sw.) Gray	11, 42, 46	Chesnokov 185; Konoreva 161, 164 (LE)	on siliceous stones and mosses	N/A
* ***Protoblastenia rupestris*** (Scop.) J. Steiner	20, 39, 48, 49, 52, 53	Chesnokov 164, 220, 223, 238, 249; Konoreva 202 (LE)	on siliceous and calcareous rocks	N/A
* ***Protoparmeliopsis muralis*** (Schreb.) M. Choisy	11	Konoreva 171 (LE)	on mossy siliceous rocks	N/A
* ***Psilolechia lucida*** (Ach.) M.Choisy	55, 56	Chesnokov 287; Konoreva 46 (LE)	on siliceous rocks	N/A
Rhizocarpon eupetraeum (Nyl.) Arnold	2, 16, 50	Andreev Kodar-7, Leprindo-1; Chesnokov 230 (LE)	on siliceous rocks	N/A
* ***R. norvegicum*** Räsänen	41	Chesnokov 174 (LE)	on thallus of *Acarospora sinopica* and stones containing iron oxides	N/A
* ***R. polycarpum*** (Hepp) Th. Fr.	23, 44	Chesnokov Pl. 1, 194 (LE)	on siliceous rocks	N/A
* ***Rimularia badioatra*** (Kremp.) Hertel & Rambold	8	Andreev Leprindo-10 (LE)	on siliceous stone	N/A
Rinodina milvina (Wahlenb.) Th. Fr.	3	Konoreva 69 (LE)	on siliceous stone and thallus of *Rhizocarpon* sp.	N/A
* ***Sporodictyon cruentum*** (Körb.) Körb.	17, 27, 42	Chesnokov 186; Konoreva 42, 96 (LE)	on siliceous rocks with waterfall	N/A
* ***Stereocaulon nanodes*** Tuck.	20	Konoreva 170 (LE)	on siliceous stone	N/A
* ***Tetramelas concinnus*** (Th. Fr.) Giralt	40	Chesnokov 173 (LE)	on siliceous stones	N/A
#***Thelignya lignyota*** (Wahlenb.) P. M. Jørg. & Henssen	52	Chesnokov 238 (LE)	on siliceous stone in spray zone of stream	N/A
* ***Toninia diffracta*** (A.Massal.) Zahlbr.	49	Chesnokov 223 (LE)	on calcareous soil in rock crevice	N/A
* ***T. squalida*** (Ach.) A. Massal.	50	Chesnokov 228 (LE)	on fine soil above stones	N/A
* ***Verrucaria muralis*** Ach.	53	Chesnokov 249 (PRA)	on siliceous stones	N/A

et al. 1971; Nordin et al. 2011b), the Taimyr Peninsula, Severnaya Zemlya and Beringian Chukotka (Andreev et al. 1996; Zhurbenko 1996; Kristinsson et al. 2010).

Thelignya lignyota is new for southern Siberia. It is widespread but scattered in northern parts of the Northern Hemisphere, reaching as far south as Honshu in Japan (Jørgensen 2007). Within Russia it was previously reported from the Murmansk Region (Urbanavichus et al. 2008). This is the second record of this species in Russia.

Six species are reported as new for the Stanovoye Nagor'e highlands. *Aspicilia dendroplaca* is known from Sweden, Finland, northern Russia (Novaya Zemlya) (Magnusson 1939) and southern Siberia (Sedelnikova 2013). It can be recognised by its thin, radially cracked, brownish thallus surrounded by a black prothallus, small crateriform apothecia and the presence of substictic acid (Nordin et al. 2011b).

Aspicilia dudinensis has a wide but scattered distribution in Eurasia. It is known from Sweden (Magnusson 1952; Nordin et al. 2008), the Taymyr Peninsula (Kristinsson et al. 2010), Northern Urals (Paukov et al. 2014), Altay (Davydov 2014) and the Magadan Region (Kotlov 1995). The studied specimen looks intermediate between *Aspicilia verrucigera* and the holotype of *A. dudinensis* (Brenner, S!), with more or less convex areoles and appressed apothecia; however, it has long conidia (18–25 µm) which agree with *A. dudinensis*.

The specimens of *Aspicilia pergibbosa* are very tiny and surrounded by other species but can be recognized by the olive-gray moderately convex to bullate areoles and immersed apothecia with concave discs surrounded by a thin, wavy, thalline margin. Secondary metabolites are absent, ascospore length exceeds 20 µm, and pycnoconidia were not found. *Aspicilia pergibbosa* is known from Finland, Norway and Sweden (Nordin et al. 2011a), northwestern Russia (Kristinsson et al. 2010; Urbanavichus et al. 2008) and southern Siberia (Sedelnikova 2013).

Aspicilia supertegens is a widely distributed arctic-alpine species known from many localities in Europe and North America (Thomson 1997; Hansen 2003; Clerc 2004; Wirth et al. 2013; Hafellner & Türk 2016), Russia (Paukov & Trapeznikova 2005; Kristinsson et al. 2010; Sedelnikova 2013) and Mongolia (Schubert & Klement 1971). *Aspicilia supertegens* is very variable in thallus character and color but can be recognized by the non-lobate thallus, wide crateriform apothecia, variable conidia (17–40 µm) and the absence of secondary metabolites.

Pertusaria digrediens was previously reported from Italy (Rizzi et al. 2011), France (Roux 2012) and the Iberian Peninsula (Terrón 1997). In Russia it is known from southern Siberia without locality references (Urbanavichus 2010); the records are based on specimens stored in the herbarium of the University of Trieste, Italy (TSB).

Within Russia, *Rimularia badioatra* was previously reported from the European part (Leningrad region, Hogland Island) as *Lecidea umbonatula* (Brenner 1886) and from southern Siberia (Urbanavichus 2010).

Aspicilia transbaicalica and *Fuscopannaria ahlneri* are new for the Kodar Range. The first species is widely distributed in southern Siberia (Sedelnikova 2013; Davydov 2014), Middle Asia (Oxner 1933) and the Urals (Merkulova 2005; Paukov & Trapeznikova 2005). It was described from the Trans-Baikal Territory (Nerchinsk district) (Oxner 1933).

Fuscopannaria ahlneri sporadically occurs in southern Siberia and Russian Far East and is red-listed for the Trans-Baikal Territory (Makryi 2002b).

After our revision of previously published records, three taxa are excluded from the list of lichen biota of the Kodar Range. *Protoblastenia calva* and *P. incrustans* were incorrectly reported for the Kodar Range (Chesnokov & Konoreva 2015). Revision of the corresponding material showed that the specimens belong to *P. rupestris*. *Rinodina tephraspis* was incorrectly reported for the Kodar Range (Chesnokov et al. 2015); the specimens belong to *R. milvina*.

Conclusions

The saxicolous lichens of the mountain systems of Siberia are species-rich and diverse. The Kodar Range is currently the most thoroughly studied mountain system of the Stanovoye Nagor'e highlands, where saxicolous lichens constitute 49.4% of the lichen biota. The location and elevation of this range determine the floristic diversity of the region. The Kodar Range is far from large bodies of water. This affects the lichen biota, which is very different from that of other mountain systems of Siberia.

The Khamar-Daban, Barguzin and Baikal ranges are among the most thoroughly studied mountain systems of southern Siberia (e.g., Titov 1985; Budajeva 1989, 2001, 2002; Makryi 1990, 1999, 2012, 2013, 2014a, b; Urbanavichene & Urbanavichus 1998a, b, 1999, 2001; Urbanavichus & Urbanavichene 2004; Kharpukhaeva 2010, 2011, 2013; Urbanavichene 2010, 2015a, b; Kharpukhaeva & Urbanavichus 2015; Urbanavichene & Palice 2016). Research on these mountain systems is uneven, so we do not give exact numbers of species. Here we note the features of the lichen biota of the Siberian mountain ranges. The Khamar-Daban, Barguzin and Baikal Ranges are affected by Lake Baikal. Mountain systems near Baikal, where hardwood forest (with spruce and fir) predominate, show greater diversity of corticolous and lignicolous lichens. In the larch (*Larix gmelinii*) forests that dominate the Kodar Range, the epiphytic lichen flora is much poorer.

Further studies of the western and eastern parts of the Kodar Range will no doubt add to the list of epilithic species and expand our knowledge of the lichen diversity of the region.

Acknowledgements

We thank Evgeny Davydov (Barnaul, Russia), Dmitry Himelbrant (St. Petersburg, Russia) and Alexandr Ezhkin (Yuzhno-Sakhalinsk, Russia) for identifying some specimens, and the reviewers for valuable help. The study was financially supported by the Russian Foundation for Basic Research (grants 14-04-01411, 15-04-05971, 16-04-01346) and by an institutional research project ("The lichen flora of the Russian Federation", no. AAAA-A18-118031590042-0) of the Komarov Botanical Institute of the Russian Academy of Sciences.

References

Alstrup, V., Hansen, E. S. & Daniels, F. J. A. 2000. Lichenized, lichenicolous and other fungi from North and North-East Greenland. *Folia Cryptogamica Estonica* 37: 1–20.

Andreev, M. P., Kotlov, Y. & Makarova, I. 1996. Checklist of lichens and lichenicolous fungi of the Russian Arctic. *Bryologist* 99: 137–169.

Aptroot, A. & Iqbal, S. H. 2012. Annotated checklist of the lichens of Pakistan, with reports of new records. *Herzogia* 25: 211–229.

Barrett, P. E. & Thomson, J. W. 1975. Lichens from a High Arctic Coastal Lowland, Devon Island, N.W.T. *Bryologist* 78: 160–167.

Bates, S. T., Barber, A., Gilbert, E., Schroder, R. T. & Nash, III T. H. 2010. A revised catalog of Arizona lichens. *Canotia* 6: 26–43.

Blanco, O., Crespo, A., Divakar, P. K., Esslinger, T. L., Hawksworth, D. L. & Lumbsch, H. T. 2004. *Melanelixia* and *Melanohalea*, two new genera segregated from *Melanelia* (*Parmeliaceae*) based on molecular and morphological data. *Mycological Research* 108: 873–884.

Brenner, M. 1886. Bidrag till kännedom af Finska vikens övegetation. IV. Hoglands lafvar. *Meddelanden af Societas pro Fauna et Flora Fennica* 13: 1–143.

Budajeva, S. E. 1989. *Lichens of Transbaikalian forests*. Publishing House "Nauka", Novosibirsk.

Budajeva, S. E. 1995. Lichens of the Vitim State Reserve. *Problems of studying the vegetation cover of Siberia*, pp. 24–25. Publishing house of Tomsk State University, Tomsk.

Budajeva, S. E. 2001. Rare lichen species of Buryatia. *Novosti sistematiki nizshikh rastenii* 34: 96–101.

Budajeva, S. E. 2002. Lichens of the Zabaikalsky Natural National Park. *Botanicheskiy Zhurnal* 87: 55–62.

Budajeva, S. E. & Anisimova, N. V. 1992. Lichens of the highlands of the Vitim Reserve. In: Krasnoborov, I. M., Krasnikov, A. A. (eds), *X All-Union Conference on the Study of Flora and Vegetation of Highlands*, p. 51. Central Siberian Botanical Garden of Siberian Department of Russian Academy of Science, Novosibirsk.

Chesnokov, S. & Konoreva, L. 2015. Additions to the lichen biota of SE Siberia: records from the Stanovoye Nagor'e Highlands (Trans-Baikal Region, Russia). *Polish Botanical Journal* 60: 203–216.

Chesnokov, S. & Lishtva, A. 2016. Lichens of Kodar Range: addition to the lichen flora of the Visimsky Reserve. *The Bulletin of Irkutsk State University* 15: 37–46.

Chesnokov, S. V., Konoreva, L. A. & Andreev, M. P. 2015. The lichens of Leprindinskoe Plateau (Kodar Range, Zabaikal'skiy Region). In: Ephimov, P. G. (ed.), *Proceedings of III(XI) International Botanical Conference of Young Scientists in Saint-Petersburg 4–9 October 2015*, p. 42. Komarov Botanical Institute, St. Petersburg.

Chesnokov, S. V., Konoreva, L. A. & Andreev, M. P. 2017. New records of rare and protected species of lichens on Kodar Range (Kalarsky District, Trans-Baikal Territory). *Turczaninowia* 20: 80–98.

Clerc, P. 2004. Les champignons lichénisés de Suisse. Catalogue bibliographique complété par des données sur la distribution et l'écologie des espèces. *Cryptogamica Helvetica* 19: 1–320.

Darbishire, O. V. 1909. Lichens. *Report 2nd Norweg. arctic Exped. "Fram", 1898–1902* 21: 3–68.

Davydov, E. A. 2014. The first checklist of lichens, lichenicolous, and allied fungi of Altaisky krai (Siberia, Russia). *Mycotaxon* 127: 1–67. [September 2017]. http://ssbg.asu.ru/lichens/docs.

Davydov, E. A., Tchabanenko, S. I., Makryi, T. V. & Khanin, V. A. 2011. The second confirmed record of *Umbilicaria pulvinaria* (lichenized

Ascomycota) since its original description in 1914. *Turczaninowia* 14: 119–122.

Egea, J. M. 1996. Catalogue of lichenized and lichenicolous fungi of Morocco. *Bocconea* 6: 19–114.

Esslinger, T. L. 2002. *Melanelia*. In: Nash, T. H., Ryan, B. D., Gries, C. & Bungartz, F. (eds.). *Lichen Flora of the Greater Sonoran Desert Region*. Vol. I. pp. 274–286. Tempe: Lichens Unlimited, Arizona State University.

Gerasimova, Yu. V., Konoreva, L. A. & Chesnokov, S. V. 2014. The first record of *Bacidia reagens* (*Ramalinaceae*) for Eurasia. *Novosti Sistematiki Nizshikh Rastenii* 48: 230–232.

Goni, R., Raina, A. K. P., Magotra, R. & Sharma, N. 2015. Lichen flora of Jammu and Kashmir State, India: an updated checklist. *Tropical Plant Research* 2: 64–71.

Hafellner, J. & Türk, R. 2016. The lichenized fungi of Austria – a new checklist of the taxa so far recorded, with data to distribution and substrate ecology. *Stapfia* 104: 1–216.

Hansen, E. S. 2003. New or interesting Greenland lichens and lichenicolous fungi V. *Mycotaxon* 86: 149–155.

Harada, H. 1993. A taxonomic study on *Dermatocarpon* and its allied genera (Lichenes, *Verrucariaceae*) in Japan. *Natural History Research* 2: 113–152.

Jørgensen, P. M. 2007. *Lichinaceae*. In: Ahti, T., Jørgensen, P. M., Kristinsson, H., Moberg, R., Søchting, U. & Thor, G. (eds.) *Nordic Lichen Flora 3*. *Cyanolichens*, pp. 46–76. Nordic Lichen Society, Uppsala University, Uddevalla.

Kharpukhaeva, T. M. 2010. *Lichens of Dzherginskiy State Nature Reserve*. Publishing house of Buryat Scientific Center of the Siberian Branch of the Russian Academy of Sciences, Ulan-Ude.

Kharpukhaeva, T. M. 2011. Species of the genus *Usnea* (*Parmeliaceae*) in Republic of Buryatia. *Novosti sistematiki nizshikh rastenii* 45: 257–266.

Kharpukhaeva, T. M. 2013. Findings of new and rare lichens in Republic of Buryatia. *Botanicheskiy Zhurnal* 98: 364–371.

Kharpukhaeva, T. M. & Urbanavichus, G. P. 2015. Findings of new and rare lichen for Republic of Buryatia. *Botanicheskiy Zhurnal* 100: 850–854.

Konoreva, L. A. & Andreev, M. P. 2013a. Lichens of mountain tundra of the Kodar Range. In: Kulyugina, E. E. (ed.), *Modern botany in Russia. Proceedings of the XIII Congress of Russian Botanical Society and the conference* "*Scientific basis for the protection and management of vegetation cover of the Volga basin.*" *V. 1: Embryology. Structural botany. Algologia. Mycology. Lichenology. Muscology. Paleobotany. Biosystematics. September 16–22, 2013*, pp. 194–195. Tol'yatti, Cassandra.

Konoreva, L. A. & Andreev, M. P. 2013b. New lichen species in flora of Eastern part of Stanovoye upland (Transbaikalian region, Russia). In: Degteva, S. V. (ed.), *Biodiversity of the far north ecosystems: inventory, monitoring, protection: Reports of the II Russian scientific conference* (*Syktyvkar*, *June 3–7*, *2013*), pp. 191–200. Syktyvkar: Institute of Biology, Komi Scientific Centre.

Konoreva, L. & Chesnokov, S. 2016. *Micarea submilliaria* (Nyl.) Coppins new to Russia and Asia from Transbaikal Region. In: Suija, A. (ed.), *The 8th IAL Symposium Lichens in Deep Time August 1–5, 2016*, p. 145. Helsinki, Finland.

Konoreva, L. A., Chesnokov, S. V. & Davydov, E. A. 2016. *Stictis* and *Schizoxylon* (*Stictidaceae*, *Ostropales*) in Russia. *Herzogia* 29(2) Teil 2: 706–711.

Kopaczevskaja, E. G., Makarevicz, M. F., Oxner, A. N. & Rassadina, K. A. 1971. *Handbook of the Lichens of the U.S.S.R. 1. Pertusariaceae*, *Lecanoraceae*, *and Parmeliaceae.* Publishing House "Nauka", Leningrad.

Kotlov, Yu. V. 1995. The data on lichen flora of Verkhnekolymskoe Highland. *Novosti sistematiki nizshikh rastenii* 30: 66–72.

Kristinsson, H., Zhurbenko, M. & Hansen, E. S. 2010. Panarctic checklist of lichens and lichenicolous fungi. *CAFF Technical Report* 20. CAFF International Secretariat, Akureyri, Iceland.

Lishtva, A. V. 1998. *Parmelia shinanoana* (*Parmeliaceae*, Lichenes), a new species for Central Siberia. *Botanicheskiy Zhurnal* 83: 133–135.

Lishtva, A. V. 2000. Epiphytic lichens of Vitimsky Reserve. In: Zarubin, A. M. (ed.), *Problems of ecology*, *biodiversity and protection of natural ecosystems of the Baikal region*, pp. 185–195. Publishing house of Irkutsk State University, Irkutsk.

Lishtva, A. V. 2001. Nemorose element lichens in highlands of Kodar ridge ecological and genetical aspect. In: Zavarzin, A. A., Petrova, O. V., Sonina A. V., Tarasova V. N. (eds), *Proceedings of the Lichenological Field Meeting*, pp. 86–93. Publishing house of Petrozavodsk State University, Petrozavodsk.

Lishtva, A. V. 2003. Amphiberingian species in lichenoflora of the Kodar Range (Stanovoye Highlands). In: Zarubin, A. M. (ed.), *The vegetation cover of Baikal Siberia*, pp. 90–93. Publishing house of Irkutsk State University, Irkutak.

Lishtva, A. V., Himelbrant, D. E. & Stepanchikova, I. S. 2013. *Parmelia asiatica* (*Parmeliaceae*): the first record for the lichen flora of Russia. *Novosti sistematiki nizshikh rastenii* 47: 225–229.

Llimona, X. 1982. Lichens of the arid Mediterranean area and North Africa. *Journal of the Hattori Botanical Laboratory* 53: 345–349.

Magnusson, A. H. 1939. Studies in species of *Lecanora*, mainly the *Aspicilia gibbosa* group. *Kungliga Svenska Vetenskaps-Akademiens Handlingar*, *ser.* III 17: 1–182.

Magnusson, A. H. 1952. Lichens from Torne Lappmark. *Arkiv för botanik*, *ser. 2* 2: 45–249.

Makarova, I. I. 2004. *Fuscideaceae* Haffelner. In: Golubkova, N. S. (ed.), *Handbook of the lichens of Russia 9. Fuscideaceae*, *Teloschistaceae*, pp. 10–36. Publishing House "Nauka", St. Petersburg.

Makryi, T. V. 1990. *Lichens of the Baikal Range*. Publishing House "Nauka", Novosibirsk.

Makryi, T. 1999. Lichenes from Baikal Region (Siberia) new to Russia. *Cryptogamie*, *Mycologie* 20: 329–334.

Makryi, T. 2002a. Addition to the lichen flora of the Stanovoye Nagorye Uplands (Baikalian Siberia). I. The epilithic lichens of the Kodar Range. *Turczaninowia* 5: 47–67.

Makryi, T. V. 2002b. *Fuscopannaria ahlneri* (P. M. Jørg.) P. M. Jørg. In: Ostrovckiy, A. P. (ed.), *The Red Data Book of the Chita Region and the Agin-Buryat Autonomous Okrug. Plants*, p. 227. Publishing house "Stil", Chita.

Makryi, T. 2005. To the Lichen Flora of the Stanovoye Nagorye Uplands (Baikalian Siberia). II. The additions to the flora of epilithic lichens of the Kodar Range. *Turczaninowia* 8: 60–66.

Makryi, T. V. 2012. *Leptogium saxatile* (*Collemataceae*), a new lichen species from Baikal Siberia, and two *Leptogium* species new for Mongolia. *Novosti sistematiki nizshikh rastenii* 46: 164–173.

Makryi, T. V. 2013. *Collema texanum* (*Collemataceae*), a new lichen to Russia, and other saxicolous *Collema* species from Stanovoye Upland (Baikal Siberian Region). *Novosti sistematiki nizshikh rastenii* 47: 230–236.

Makryi, T. V. 2014a. A review of the sect. Mallotium of the genus *Leptogium* (*Collemataceae*) in Russia and *L. pseudopapillosum* and *L. hirsutum* new records for Russia. *Novosti sistematiki nizshikh rastenii* 48: 264–290.

Makryi, T. V. 2014b. Lichen species *Collema pulcellum* and *C. ryssoleum* (*Collemataceae*) in Baikal Siberia and Russia. *Plant Life of Asian Russia* 2: 9–18.

Makryi, T. V. & Lishtva, A. V. 2005. Chapter 5. Lichens. In: Bardunov, L. V., Chechetcina, L. G., Makryi, T. V., Malysheva, L. I., Petrov, A. N., Lishtva, A. V., Lopatovskaya, O. G. & Maksimova, E. N. *The biota of the Vitimsky Reserve*: *Flora*: 115–175. Academic Publishing House "Geo", Novosibirsk.

Merkulova, O. S. 2005. Lichenological investigations in Orenburg region. *Novosti sistematiki nizshikh rastenii* 38: 237–251.

Moberg, R. 1995. The lichen genus *Phaeophyscia* in China and Russian Far East. *Nordic Journal of Botany* 15: 319–335.

Nordin, A., Owe-Larsson, B. & Tibell, L. 2011b. Two new *Aspicilia* species from Fennoscandia and Russia. *The Lichenologist* 43: 27–37.

Nordin, A., Savić, S. & Tibell, L. 2010. Phylogeny and taxonomy of *Aspicilia* and *Megasporaceae*. *Mycologia* 102: 1339–1349.

Nordin, A., Tibell, L. & Owe-Larsson, B. 2008. *Aspicilia berntii*, a new name for a poorly known species. *The Lichenologist* 40: 127–133.

Nordin, A., Moberg, R., Tønsberg, T., Vitikainen, O., Dalsätt, Å., Myrdal, M., Snitting, D. & Ekman, S. 2011a. Santesson's Checklist of lichen-forming and lichenicolous fungi. Version 29.04.2011. [September 2017]. http://130.238.83.220/santesson/home.php.

Ohmura, Y. & Kashiwadani, H. 1997. Lichens of Mt. O-akan and Its Adjacent Areas, Hokkaido, Japan. *Bulletin of the National Science Museum*, *Series B* 23: 1–24.

Orange, A., James, P. W. & White, F. J. 2001. *Microchemical Methods for the Identification of Lichen*. London.

Oxner, A. N. 1933. New species of lichens from Asia. *Zhurnal Bio-Botanichnogo Tsyklu Vseukraïns'koi Akademii Nauk* 7–8: 167–172.

Paukov, A. G. & Trapeznikova, S. N. 2005. Lithophilous lichens of Middle Urals. *Folia Cryptogamica Estonica* 41: 81–88.

Paukov, A., Frolov, I. & Vondrakova, O. 2014. New records of lichen genus *Aspicilia* in the Urals. *Bulletin Kant Baltic Federal University* 7: 102–109.

Paukov, A. G., Gagarina, L. V. & Frolov, I. V. 2017. New and interesting lichen records from the Ural Mountains, Russia. *Folia Cryptogamica Estonica* 54: 25–30.

Rai, H., Khare, R., Baniya, C. B., Upreti, D. K. & Gupta, R. K. 2015. Elevational gradients of terricolous lichen species richness in the Western Himalaya. *Biodiversity and Conservation* 24: 1155–1174.

Ravera, S., Cogoni, A., Brackel, W., Filippino, G., Isocrono, D., Matteucci, E., Morando, M., Prosser, F. & Puntillo, D. 2016. Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 1. *Italian Botanist* 1: 55–60.

Rizzi, G., Incerti, G., Ginaldi, F., Kodnik, D., Viglione, S. & Giordani, P. 2011. A contribution to the lichen flora of Sardinia. *Mycotaxon* 115: 535.

Roux, C. 2012. Liste des lichens et champignons lichénicoles de France. *Bulletin de la Société linnéenne de Provence* 16: 3–220.

Schubert, R. & Klement, O. 1971. Beitrag zur Flechtenflora der Mongolischen Volksrepublik. *Feddes Repertorium* 82(3–4): 187–262.

Seaward, M. R. D. 1996. Checklist of Tunisian lichens. *Bocconea* 6: 115–148.

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

Shimizu, A. 2004. Community Structure of Lichens in the Volcanic Highlands of Mt. Tokachi, Hokkaido, Japan. *Bryologist* 107: 141–151.

Sipman, H. J. M. 2006. Compiled identification key to the genus *Pertusaria* and some confusible taxa in Europe and the Mediterranean. [June 2017]. http://www.bgbm.org/sipman/keys/Perteuro.htm.

Sipman, H. J. M. & Raus, T. 2015. Lichens and lichenicolous fungi from the Island of Chios (Aegean Sea, Greece). *Herzogia* 28: 496–519.

Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds). 2009. *The Lichen Flora of Great Britain and Ireland*. British Lichen Society, London.

Terrón, A. 1997. Líquenes silicícolas interesantes de los Montes de León (noroeste de la Península Ibérica). *Collectanea Botanica* (*Barcelona*) 23: 47–52.

Thomson, J. W. 1997. *American Arctic Lichens 2. The Microlichens*. Madison: University of Wisconsin Press.

Titov, A. N. 1985. Calicioid lichens of Barguzinskiy and Baykalsky strict reservs. *Novosti Sistematiki Nizshikh Rastenii* 22: 191–200.

Urbanavichene, I. N. 2010. New and rare species for lichen flora of Siberia. *Novosti Sistematiki Nizshikh Rastenii* 44: 245–249.

Urbanavichene, I. N. 2015a. New and rare findings of lignicolous lichen species for the Southern Siberia from the Baikal nature reserve. *Turczaninowia* 18: 56–59.

Urbanavichene, I. N. 2015b. The first record of *Gyalideopsis helvetica* (*Graphidaceae*, lichenized Ascomycota) for Russia from the southern part of Lake Baikal Region. *Novosti Sistematiki Nizshikh Rastenii* 49: 282–288.

Urbanavichene, I. N. & Palice, Z. 2016. Rarely recorded lichens and lichen-allied fungi from the territory of the Baikal Reserve – additions for lichen flora of Russia. *Turczaninowia* 19: 42–46.

Urbanavichene, I. N. & Urbanavichus, G. P. 1998a. *Melanelia albertana* (Lichenes) – a new for Russia species from the Southern Baikal region. *Botanicheskiy Zhurnal* 83: 130–131.

Urbanavichene, I. N. & Urbanavichus, G. P. 1998b. Lichens of the Baikal Reserve (annotated list). *Flora and Fauna of Reserves*. 68: 1–55.

Urbanavichene, I. N. & Urbanavichus, G. P. 1999. To flora of lichens of Khamar-Daban range (Southern Baikal region). *Novosti Sistematiki Nizshikh Rastenii* 33: 161–171.

Urbanavichene, I. N. & Urbanavichus, G. P. 2001. Addition to the flora of lichens of the Baikal Nature Reserve. II. *Novosti Sistematiki Nizshikh Rastenii* 35: 205–208.

Urbanavichene, I. N. & Urbanavichus, G. P. 2009. To the lichen flora of Oka Plateau (Eastern Sayan, Republic of Buryatia). *Novosti Sistematiki Nizshikh Rastenii* 43: 229–260.

Urbanavichus, G. P. 2010. *A checklist of the lichen flora of Russia*. Publishing House "Nauka", St. Petersburg.

Urbanavichus, G. & Urbanavichene, I. 2004. New and rare lichens species for Buryatiya from Baikalsky zapovednik. In: Shmakov, A. I. (ed.), *Problems of botany of South-Siberia and Mongolia. Materials of the III International Scientific Conference*, pp. 138–140. Publishing house "Azbuka", Barnaul.

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

Vodopyanova, N. S., Ivanova, M. M., Krogulevich, R. E., Malyshev, L. I. & Petrochenko, Yu. N. 1972. *Alpine flora of the Stanovoye Nagorye Uplands*. Publishing House "Nauka", Novosibirsk.

Vondrák, J., Frolov, I., Davydov, E. A., Urbanavichene, I., Chesnokov, S., Zhdanov, I., Muchnik, E., Konoreva, L., Himelbrant, D. & Tchabanenko, S. 2016. The extensive geographical range of several species of *Teloschistaceae*: evidence from Russia. *The Lichenologist* 48: 171–189.

Wang, H. Y., Chen, J. B. & Wei, J. C. 2009. A phylogenetic analysis of *Melanelia tominii* and four new records of brown parmelioid lichens from China. *Mycotaxon* 107: 163–173.

Wirth, V., Hauck, M. & Schultz, M. 2013. Die Flechten Deutschlands. Band 1, 2. Stuttgart: Ulmer, E.

Zhao, Z.-T., Ren, Q. & Aptroot, A. 2004. An annotated key to the lichen genus *Pertusaria* in China. *Bryologist* 107: 531–541.

Zhurbenko, M. P. 1996. Lichens and lichenicolous fungi of the northern Krasnoyarsk Territory, Central Siberia. *Mycotaxon* 58: 185–232.

Zhurbenko, M. P., Chesnokov, S. V. & Konoreva, L. A. 2016. Lichenicolous fungi from Kodar Range, Trans-Baikal Territory of Russia. *Folia Cryptogamica Estonica* 53: 9–22.

Appendix 1. List of collecting sites in the Kodar Range.

No.	Locality	Coordinates	Altitude	Community	Collection date
1	Leprindinskoye Plateau	56°39′26.8″N, 117°25′33.6″E	1698 m	stone rubble with large boulders	14 Aug. 2012
2		56°39′19″N, 117°25′33″E	1660 m	shrub-lichen tundra with disintegrated granite boulders on southern slope	
3		56°39′35.5″N, 117°25′20.0″E	1721 m	granite boulders, thicket of *Salix* sp. and *Pinus pumila* near creek	
4		56°39′41.0″N, 117°25′12.3″E	1784 m	stone rubble with large boulders in upper reach of creek	
5		56°39′40″N, 117°25′14″E	1748 m	grass-covered southern rocky slope in upper part of creek	
6		56°40′15.6″N, 117°25′17.6″E	2311 m	mountain tundra	15 Aug. 2012
7		56°39′28.3″N, 117°25′49.4″E	1720 m	western slope with overgrown rocks on ledge	16 Aug. 2012
8		56°39′27″N, 117°25′52″E	1738 m	overgrown stone rubble near creek on western slope	
9		56°39′26.6″N, 117°26′0.8″E	1772 m	left side of valley, top range of rocks	
10		56°39′26″N, 117°25′57″E	1760 m	slope after fire on left bank of stream with rocky-lichen community, *Ledum palustre* and *Betula nana*	
11	near Maloe Leprindo Lake	56°38′12″N, 117°23′48″E	1232 m	deep shady cleft in granite rocks with creek and waterfall, wet mossy rocks on northern slope	17 Aug. 2012
12		56°38′12″N, 117°23′51″E	1217 m		
13		56°38′15″N, 117°23′49″E	1267 m		
14		56°38′13″N, 117°23′52″E	1223 m		
15	Baltiyskoe Gorge	56°55′13″N, 117°39′19″E	1746 m	northern slope, rocks with *Pinus pumila*	2 July 2013
16		56°54′20″N, 117°39′21″E	1903 m	large boulders along creek	
17	Zolotoy creek	56°56′09.1″N, 117°37′18.0″E	1641 m	lichen-shrub tundra on northwestern slope	6 July 2013
18		56°55′54″N, 117°36′37″E	1957 m	shrub-lichen polygonal tundra	
19	Sredniy Sakukan River, left bank opposite mouth of Exa River	56°55′00.9″N, 117°48′57.8″E	1178 m	*Betula platyphylla-Populus suaveolens-Larix gmelinii* forest with large boulders	7 July 2013
20	Anarga River	56°55′10.6″N, 118°01′45.1″E	941 m	rocks on left bank	9 July 2013
21		56°55′19.4″N, 118°01′50.0″E	1071 m		
22	First canyon of creek west of Anarga River	56°54′38.9″N, 118°00′49.4″E	1016 m	narrow gorge in forest with rocks	10 July 2013
23	Shan’go Lake	56°58′41.4″N, 117°47′50.3″E	1908 m	lichen tundra on shore of lake	7 June 2014
24		56°58′44.9″N, 117°48′13.4″E	1944 m	rocky slope overgrown by *Rhododendron aureum*	
25	Headwaters of Shan'go River, hill opposite “60 let USSR” pass	56°58′39.6″N, 117°49′07.4″E	2076 m	slope with large boulders	8 June 2014
26	Shan'go River	56°57′33.9″N, 117°48′14.8″E	1720 m	*Salix* sp. thickets with large boulders on right bank	9 June 2014
27	Shan'go River	56°57′30.4″N, 117°48′19.7″E	1720 m	stones in creek and moss-covered bank of creek on left bank of Shan'go River	9 June 2014
28		56°57′24.0″N, 117°48′27.9″E	1725 m	rocks and friable boulders on left bank	
29		56°57′15.7″N, 117°48′21.4″E	1697 m	*Larix gmelinii*-moss-lichen forest on left bank	
30		56°56′21.5″N, 117°48′43.0″E	1841 m	outcrops of sediment (coal, sandstone) on left bank	10 June 2014
31		56°56′21.3″N, 117°48′41.2″E	1817 m		
32		56°56′21.6″N, 117°48′33.7″E	1710 m	*Betula* sp.-*Larix gmelinii* forest with *Salix* sp. and *Pinus pumila* near creek on left bank	
33	Azarova glacier	56°53′58.1″N, 117°34′59.2″E	2053 m	moraine	13 June 2014
34		56°54′04.6″N, 117°34′54.1″E	2031 m	stone rubble	
35	Confluence of Uglovoy creek and Sredniy Sakukan	56°56′33.0″N, 117°36′50.7″E	1670 m	rocky outcrops	15 June 2014
36	Uglovoy creek	56°56′38.6″N, 117°36′43.7″E	1691 m	slope with *Rhododendron aureum* and *Betula nana* on left bank	16 June 2014
37	Uglovoe Lake	56°56′51.8″N, 117°35′42.7″E	1892 m	bank with boulders and *Salix* sp. thicket	17 June 2014
38	Left bank of Sul'ban River, opposite mouth of Pravyi Sul'ban River	56°51′38.8″N, 117°17′22.4″E	1423 m	granite boulders near the water	11 June 2015
39	Zolotoy creek (left tributary of Sul’ban River)	56°50′19″N, 117°18′24″E	1394 m	moist limestone outcrops on right bank	12 June 2015
40		56°50′27.2″N, 117°19′12.1″E	1518 m	crumbling rock on right bank	
41		56°50′21.1″N, 117°19′50.2″E	1749 m	stone rubble slope on left bank	
42	Sul'ban River, right bank opposite the mouth of Zolotoy creek	56°50′12.1″N, 117°17′25.3″E	1595 m	southern slope with creek, stone rubble, rocks and thickets of *Pinus pumila*	14 June 2015
43		56°50′11.8″N, 117°17′23.0″E	1627 m		
44		56°50′11.9″N, 117°17′21.1″E	1655 m		
45	Headwaters of Oleniy rog	56°48′31.1″N, 117°24′52.7″E	1971 m	mountain tundra with stone rubble	16 June 2015
46		56°48′29″N, 117°24′51″E	1975 m		
48		56°48′19.6″N, 117°25′17.3″E	2020 m	rocks and stone rubble with *Rhododendron adamsii* on northern slope	17 June 2015

Appendix 1. Continued.

No.	Locality	Coordinates	Altitude	Community	Collection date
47	Oleniy rog creek	56°48′13.7″N, 117°24′15.6″E	1860 m	limestone outcrops on right bank	16 June 2015
49		56°48′15.1″N, 117°24′22.4″E	1869 m		17 June 2015
50		56°47′57″N, 117°21′59″E	1674 m	stone rubble with underground creek among *Pinus pumila* thickets on right bank	18 June 2015
51		56°48′21.9″N, 117°23′25.6″E	1874 m	rock with creek and waterfall on right bank	19 June 2015
52		56°48′23.9″N, 117°23′25.9″E	1912 m		
53	Khadytkanda River	56°44′53.3″N, 117°15′54.0″E	1229 m	rocks and *Larix gmelinii* forest on left bank	22 June 2015
54	Mineral'nyi creek	57°04′47.9″N, 118°01′59.1″E	1521 m	boulder in young *Larix gmelinii* forest on left bank	18 June 2016
55		57°04′57.3″N, 118°02′07.7″E	1541 m	stone rubble on left bank	
56	Headwaters of Mu-skunakh River	57°06′13.7″N, 118°02′00.4″E	1594 m	thin forest with *Larix gmelinii*	19 June 2016