

A revision of the lichen genus *Platismatia* (Parmeliaceae) in Russia, with a key to the species

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Abstract. The paper presents the results of the study on *Platismatia* species in Russia. The genus *Platismatia* counts 11 species, distributed mainly in the Pacific region, with some endemics of western North America and northeastern Asia. Six species were known from Russia by the beginning of our studies, but a revision of the herbarium collections showed that three species (*P. erosa*, *P. herrei*, and *P. lacunosa*) were reported erroneously. Based on morphological and chemotaxonomical (HPTLC) examination of the herbarium collections and our own material, as well as the study of relevant literature, four species of *Platismatia* are here accepted for Russia: *P. glauca*, *P. interrupta*, *P. lacunosa*, and *P. norvegica*. *Platismatia lacunosa* is reported here as a new for Russia from the Commander Islands. The distribution of *P. glauca* and *P. interrupta* is clarified. A key to all species of the genus reported from Russia and brief descriptions of the Russian species are presented.

Keywords: *Platismatia lacunosa*, foliose lichens, herbarium, Commander Islands Nature and Biosphere Reserve, Russian Far East.

Ревизия лишайников рода *Platismatia* (Parmeliaceae) в России с ключом для определения видов

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Резюме. В статье представлены результаты исследования рода *Platismatia* в России. Род *Platismatia* насчитывает 11 видов, распространенных в основном в Тихоокеанском регионе, некоторые виды являются эндемиками западной части Северной Америки и Северо-Восточной Азии. До настоящего момента для территории России было приведено 6 видов рода *Platismatia*, однако ревизия гербарных коллекций показала, что имеющиеся в литературе указания трех

видов (*P. erosa*, *P. herrei* и *P. lacunosa*) являются ошибочными. По результатам морфологического и хемотаксономического анализа гербарных материалов, коллекций авторов и данных литературы для территории России приведены четыре вида рода *Platismatia*: *P. glauca*, *P. interrupta*, *P. lacunosa* и *P. norvegica*. *Platismatia lacunosa* найдена впервые на территории России на Командорских островах. Уточнены сведения о распространении двух видов — *P. glauca* и *P. interrupta*. В статье приведен ключ для определения видов рода *Platismatia*, встречающихся в России и ранее опубликованных для ее территории, а также дано краткое описание российских видов.

Ключевые слова: *Platismatia lacunosa*, гербарий, листоватые лишайники, Командорский заповедник, Российский Дальний Восток.

The biodiversity of the parmelioid lichens is still far from completely understood in many regions of Russia. One of the problematic genera is *Platismatia* (L.) W. L. Culb. et C. F. Culb. Although all the *Platismatia* species are of significant size and easy to notice, the identification of the taxa is still a complicated task.

Platismatia is a genus including large, mainly epiphytic species. It was described as a separate genus of cetrarioid lichens by William L. Culberson and Chicita F. Culberson in 1968 based on morphological and chemical characters, with the presence of caperatic acid in the medulla being the main distinguishing feature (Culberson, Culberson 1968; Obermayer, Randlane, 2012). However, the chemical delimitation of the genus is quite universal, but not exhaustive: e. g., one chemotype of *Platismatia erosa* W. L. Culb. et C. F. Culb. lacks caperatic acid (Obermayer, Randlane, 2012). Phylogenetically, *Platismatia* does not fall into any of the major clades of Parmeliaceae and remains a genus with “uncertain affinities” within the family (Thell et al., 2012; Divakar et al., 2017).

Platismatia species are characterized by usually foliose thalli with broad, loosely attached, ascending lobes. Upper surface gray, sometimes brown in exposed localities, with more or less developed (sometimes lacking) pseudocyphellae, often wrinkled. Isidia (and, more rarely, soredia) present in some species, mostly marginal, can be also laminal. Lower surface black at the center and often brown or white at the margins, speckled in some species, with a few rhizines. Cortex paraplectenchymatous. Apothecia marginal or submarginal, commonly perforate. Asci of *Lecanora*-type, 8-spored. Spores simple, colorless, ellipsoid or subglobose, 3.5–10.0 µm in size. Pycnidia rare, immersed, marginal (Culberson, Culberson, 1968; Thell, 2011), conidia sublageniform.

The lichen substances found in *Platismatia* spp. comprise atranorin, caperatic acid, in some species also fumarprotocetraric acid (Thell, 2011), additionally chloroatranorin, jackinic, pannaric, and pseudoplacodiolic acids, and rarely yellow pigment(s?) (Culberson, Culberson, 1968; Obermayer, Randlane, 2012).

The genus *Platismatia* counts 11 species which have mainly Amphi-Pacific distribution with the center of diversity located in the Northern Hemisphere. Only *P. glauca* (L.) W. L. Culb. et C. F. Culb., the type species of the genus, occurs on all continents except Australia (Culberson, Culberson, 1968; Lumbsch et al., 2011; Allen et al., 2012; Obermayer, Randlane, 2012).

Until now, 6 taxa have been reported from Russia (Spisok..., 2010): *Platismatia erosa*, *P. glauca*, *P. herrei* (Imshaug) W. L. Culb. et C. F. Culb., *P. interrupta* W. L. Culb. et C. F. Culb., *P. lacunosa* (Ach.) W. L. Culb. et C. F. Culb., and *P. norvegica* (Lynge) W. L. Culb. et C. F. Culb. However, the revision of herbarium collections and study of relevant literature have shown that the records of three species are probably erroneous: these are *P. herrei* and *P. erosa* reported from the south of the Russian Far East (Skirina, 1995; Tchabanenko, 2002; Skirin, Skirina, 2012; Yakovchenko *et al.*, 2013); moreover, the specimens of *P. lacunosa* from the Russian Arctic (Elenkin, 1907; Spisok..., 2010) in LE appeared to be misidentified as well.

Morphologically closest to the genus *Platismatia* are *Cetrelia* W. L. Culb. et C. F. Culb., *Asahinea* W. L. Culb. et C. F. Culb., *Esslingeriana* Hale et M. J. Lai, in part also *Tuckermannopsis* Gyeln. and *Punctelia* Krog. The species of *Cetrelia* are chemically variable, but they always lack caperatic acid. Other distinguishing characters are not exclusive, however, they can help in identification: the majority of *Cetrelia* occurring in Russia have marginal soredia and distinct whitish pseudocyphellae on the lower surface; the lobes of *Cetrelia* are not reticulate; some species have C+ red medullar reaction or medulla UV+ white (Randlane, Saag, 1991). Some *Cetrelia* are superficially very similar to *Platismatia*, and chromatography is needed for certain identification of the species. For example, the isidiate *Cetrelia braunsiana* (Müll. Arg.) W. L. Culb. et C. F. Culb., occurring in Asia, can be confused with *Platismatia interrupta*, but differs from the latter by KC+ red medullary reaction; *C. braunsiana* produces atranorin in the cortex, and alectoronic, α -collatolic, 4-O-methylphysodic and physodic acids in the medulla (Luo *et al.*, 2007). Most of *Tuckermannopsis* species are smaller in size, have narrower lobes with no isidia, and are greenish-brown, not gray. Other distinguishing features of *Tuckermannopsis* spp. are the absence of pseudocyphellae or whitish spots on the upper surface; also *Tuckermannopsis* never contains caperatic acid in medulla and rarely has lichen compounds in the cortex (Ahti, Thell, 2011). *Esslingeriana idahoensis* (Essl.) Hale et M. J. Lai (North American monotypic genus, at the moment not known in Eurasia) is very close to *Platismatia* in morphology, but its medulla lacks caperatic acid and contains endocrocin, and also, in contrast to *Platismatia*, *E. idahoensis* usually has abundant pycnidia (see Goward *et al.*, 1994). *Asahinea* can be distinguished by the absence of rhizines and the presence of alectoronic and α -collatolic acids in the medulla instead of caperatic acid. *Punctelia* spp. are usually more attached to the substrate, lack isidia, and contain lecanoric or gyrophoric acid (C+ red) in the medulla. Some lichens containing usnic acid, e. g. *Nephromopsis laureri* (Kremp.) Kurok., can also resemble *Platismatia*, but they can be easily distinguished by the chemistry and yellowish color of the thallus.

Material and Methods

The treatment is based on published data, studies of own material deposited in LE and LECB, and herbarium collections in H, INEP, LE, MSK, VBG, VGEO. Specimens in TU were checked by Professor Tiina Randlane. About 40 samples were

subjected to chemical studies based on standard high-performance thin-layer chromatography (HPTLC) using solvent systems A and C (Culberson, 1972; Orange *et al.*, 2001). We used standard color reactions detected with 10% potassium hydroxide (K), sodium hypochlorite (C), K followed by C on the same fragment (KC), para-phenylenediamine (P), and operated long-wave (365 nm) UV lamp (CAMAG UV Cabinet 4) (Smith *et al.*, 2009). More than 150 herbarium specimens from the study area were examined, but only selected ones are listed in detail.

Results

The species

Platismatia glauca (L.) W. L. Culb. et C. F. Culb., 1968, Contr. U. S. Natl. Herb. 34(7): 530.

≡ *Lichen glaucus* L., 1753, Sp. Pl. 2: 1148. ≡ *Lobaria glauca* (L.) Hoffm., 1796, Deutschlands Flora oder botanisches Taschenbuch. Zweiter Theil für das Jahr 1795. Cryptogamie: 149. ≡ *Certaria glauca* (L.) Ach., 1803, Method. Lich.: 296. ≡ *Physcia glauca* (L.) DC., 1805, Flore française 2: 401. ≡ *Platysma glaucum* (L.) Frege, 1812, Deutsches Botanisches Taschenbuch für Liebhaber der deutschen Pflanzenkunde 2: 167. ≡ *Parmelia glauca* (L.) Hepp, 1824, Lichenen-Flora von Würzburg: 23. — Lectotype: Europe, LINN 1273.139.

Platismatia glauca is a highly variable lichen recognized by weakly attached thallus with broad ascending lobes with simple or coralloid isidia, and sometimes with granular soredia on the lobe margins or rarely on the upper surface. Some lobes can become nearly fruticulose and coralloid. Upper surface smooth or slightly reticulate-wrinkled, gray, brown or blackish, without distinct pseudocyphellae but often somewhat maculate, lower surface brown to black, paler to even white close to the margins. Apothecia rare, to 10 mm diam., submarginal, disc brown, sometimes perforate; asci IKI+ blue/blue-green, subhymenium IKI+ purple; spores ellipsoid to ovoid, 3–4 × 5–8 μm. Pycnidia marginal, immersed, very rare.

Chemistry. Upper cortex contains atranorin, K+ yellow, KC, C, and P–, IKI+ purple. Medulla contains caperatic acid, K, KC, C, and P–, UV–. Some authors report the presence of pseudoplacodiolic acid and chloroatranorin (Obermayer, Randle, 2012), but in our material only atranorin and caperatic acid were revealed by HPTLC.

Ecology. Corticolous on conifers, birch and other deciduous trees, sometimes on wood, soil, and rocks, inhabits various biotopes, especially common in taiga zone, also can be found in deciduous forests and tundras (including mountain tundras).

Distribution. *Platismatia glauca* is a cosmopolitan species, recorded on all continents except Australia (Culberson, Culberson, 1968; Lumbsch *et al.*, 2011; Allen *et al.*, 2012; Obermayer, Randle, 2012). It has been reported throughout almost all regions of the forest belt of Russia (e. g., Tchabanenko, 2002; Blinkova, 2004; Poryadina, 2005; Fadeeva *et al.*, 2007; Skirina, 2007, 2016; Korchikov, 2011; Davydov, 2014; Selivanov *et al.*, 2015). The species has repeatedly been cited for the south of the Russian Far

East (Tchabanenko, 2002; Tchabanenko *et al.*, 2002; Skirina, 2007, 2016). However, in course of active studies in recent years many specimens of the genus *Platismatia* were collected in Primorye Territory, Sakhalin, and the Kuril Islands (LE, H), and they all belong to *P. interrupta*. In addition, all the revised herbarium specimens from these regions previously assigned to *P. glauca* (LE, VGEO, VBG) we also re-identified as *P. interrupta*. There are no certain records of *P. glauca* in Japan and Southeast Asia (Culberson, Culberson, 1968; Buaruang *et al.*, 2017; Ohmura, Kashiwadani, 2018), but it has been recorded in China (Wei, 1991). In Siberia the species has been recorded from Khanty-Mansi Autonomous Area (LE), Sverdlovsk Region (LE), Tomsk Region (Kovaleva, 2006), Chelyabinsk Region (Urbanavichene, 2011), Novosibirsk Region (Romanova, Sedelnikova, 2010), Altai Territory (Davydov, 2014; LE), Kemerovo Region (Sedelnikova, 1990), republics of Altai (LE), Khakassia (Sedelnikova, 2001), Tyva (Sedelnikova, 1985), Buryatia (Sedelnikova, 2001; TU), and Krasnoyarsk Territory (Sedelnikova, 2001). All records of *P. glauca* from Yakutia (Fesko, 1990; Poryadina, 2005, 2007) are erroneous and refer to *Cetrelia cetrarioides* (Delise et Duby) W. L. Culb. et C. F. Culb. (L. N. Poryadina, pers. comm.).

Notes. *Platismatia wheeleri* Goward, Altermann et Björk segregated from *P. glauca* in 2011 (Lumbsch *et al.*, 2011) is distinguished by strongly undulate marginal soralia, erumpent from the medulla, and absence of isidia. Currently known only from North America and Slovakia (Lumbsch *et al.*, 2011; Allen *et al.*, 2012), probably can be found in Russia as well.

Selected specimens examined. **Murmansk Region:** Khibiny Mountains, NE slope of the Yukspor Mountain, forest belt, dry branches of *Picea* sp., 1930, *Rassadina*, LE L-15404. **Nenets Autonomous Area:** NE part of Malozemelskaya Tundra, N end of Nenetskaya Gryada, yernik (*Betula* shrubs) on the slope, branches of *Betula nana* L., 15 VIII 1998, *Lavrinenko*, LE L-15397. **Kostroma Region:** vicinity of Kologriv, spruce forest, dry *Picea* sp., 26 VIII 1929, *Ladyzhenskaya*, LE L-15406. **Krasnodar Territory:** Lagonaki Upland, left bank of the Molochka River, bark of *Abies* sp., 23 VII 1980, *Krivorotov*, LE L-15412. **Crimea:** Crimean Nature Park, Chyornaya Mountain, 18 km N of Alushta, bark of *Fagus* sp., 28 VII 1953, *Vasil'kov*, LE L-15399. **Sverdlovsk Region:** Severouralsk District, vicinity of Vsevolodo-Blagodatskoe, branches of *Picea* sp., 20 VIII 1962, *Savicz*, LE L-15396.

Platismatia interrupta W. L. Culb. et C. F. Culb., 1968, *Contr. U. S. Natl. Herb.* 34(7): 539. — Holotype: Japan, Prov. Shinano (Pref. Nagano), 1952, *Asahina*, TNS.

The species can be easily distinguished from other *Platismatia* species by the presence of abundant large conspicuous pseudocyphellae on the smooth or weakly reticulate-wrinkled gray upper surface. Lower surface of *P. interrupta* lacks pseudocyphellae, in contrast to *P. erosa* which has plenty of punctiform pseudocyphellae on the lower side of the thallus. Isidia simple, cylindrical or globose, sometimes disintegrating into soredia. *Apothecia* and *pycnidia* unknown.

Chemistry. Upper cortex contains atranorin, K+ yellow, KC, C, and P–, IKI– or pale purple. Medulla contains caperatic acid and unidentified yellow pigment (the latter not seen in the revised specimens), K, KC, C, and P–, UV–.

Ecology. Corticolous on bark of coniferous and deciduous trees, lignicolous, rarely terricolous, inhabits various forest biotopes.

Distribution. Outside of Russia *P. interrupta* is known only from Japan (Ohmura, Kashiwadani, 2018). It is a widespread and common species in the southern Russian Far East. It has been confirmed from Khabarovsk Territory (H, LECB), Amur Region (LE), Jewish Autonomous Region (VGEO), Sakhalin Region (LE), and Primorye Territory (Tchabanenko *et al.*, 2002; Skirina, 2016; LE). There are also several records of the species for Irkutsk Region and Republic of Buryatia (Pärn, Trass, 1990; Krasnaya..., 2010; TU).

Selected specimens examined. **Amur Region:** Zeysky Strict Nature Reserve, the main watershed of the ridge in the upper Bolshaya Erakinga River, 54°07'12.7"N, 126°56'02.4"E, spruce forest, bark of *Betula ermanii* Cham. subsp. *lanata* (Regel) A. K. Skvortsov, 6 IX 2016, *Dudov*, LE L-15380. **Khabarovsk Territory:** Ulchsky District, vicinity of Mariinsky Reid, 51°42'N, 140°12'E, relict dunes, on soil, VIII 2012, *Tugi*, LE L-15409; *ibid.*, Chikhaeva Bay, Davydova Cape, spruce forest, bark of coniferous tree, 9 IX 2001, *Skirina*, VGEO 13970 (det. *Skirina* sub *P. glauca*); Komsomolsk District, 20 km SSW from Boktor village, Gorin River basin, interfluvium of the Muolgu and Koldka rivers, 50°58'00.4"N, 137°18'04.0"E, 202 m a. s. l., coniferous forest with birch, bark of *Pinus* sp., 18 VIII 2011, *Yakovchenko*, VBGi Fs17; Bikin District, Kukansky Ridge, 950 m a. s. l., coniferous forest, bark of *Abies* sp., 23 VIII 2012, *Galanina*, INEP (det. *Galanina* sub *P. herrei*). **Jewish Autonomous Region:** Bastak Strict Nature Reserve, Bogdyr Mountain, 800–1150 m a. s. l., coniferous forest, bark of *Abies* sp., 18 VII 2003, *Skirina*, *Skirin*, VGEO 15847 (det. *Skirina* sub *P. glauca*); *ibid.*, 800–1100 m a. s. l., coniferous forest, on bark of *Abies* sp., *Picea* sp., and wood of fallen trunks, 18 VII 2003, *Skirina*, *Skirin*, VGEO 15887 (det. *Skirina* sub *P. norvegica*); *ibid.*, 800–1000 m a. s. l., coniferous forest, on wood of fallen trunks, 18 VII 2003, *Skirina*, *Skirin*, VGEO 15889 (det. *Skirina* sub *P. erosa*). **Primorye Territory:** Shkotovsky District, Ussuriysky Strict Nature Reserve, watershed of Koryavaya Pad' and the Suvorovka River, fir-spruce forest, deadwood, 1975, *Efimova*, VGEO 9414 (det. *Guseva* sub *P. erosa*); Terney District, Sikhote-Alinsky Strict Nature Reserve, Lysaya Mountain, 1000 m a. s. l., shrubs of Siberian dwarf pine, bark of *Pinus pumila* (Pallas) Regel, 23 VI 1977, *Skirina*, VGEO 5924 [det. *Guseva* sub *P. erosa* and published in Skirina (1995)], 9415 [det. *Guseva*, *Skirina* sub *P. norvegica* and published in Skirina (1995)]; *ibid.*, Sikhote-Alin, 45°42'16.5"N, 136°40'00.6"E, pine forest on the slope, dead *Pinus koraiensis* Siebold et Zucc., 13 VIII 2010, *Kuznetsova*, LE L-15374; Dalnegorsk District, valley of the Rudnaya River, oak forest, bark of *Betula* sp., 1981, *Skirina*, VGEO 5924 (det. *Guseva*, *Skirina* sub *P. erosa*); Partizansky District, pass between Golets and Lasovaya mountains, 1130 m a. s. l., coniferous forest, bark of *Abies* sp., 18 VIII 2009, *Skirina*, VGEO 26098 (det. *Skirina* sub *P. norvegica*), 26125 (det. *Skirina* sub *P. glauca*). **Sakhalin Region:** Sakhalin Island, Dolinsky District, 106 km of the Federal Highway, larch forest with alder, 13 VII 2008, *Bogacheva*, *Tsarenko*, VBGi (det. *Galanina* sub *P. glauca*); Korsakovsky District, Prigorodnoe settlement, larch forest, bark, 22 VI 2008, *Tsarenko*, *Chervonnaya*, VBGi; *ibid.*, Protected Area "Laguna Busse", vicinity of Lake Vyselkovoye, 46°33'57.1"N, 143°16'54.7"E, 26 m a. s. l., fir-spruce forest, on rotten wood of stump, 24 V 2017, *Konoreva* 229, VBGi 79339; *ibid.*, between Lake Vyselkovoye and Laguna Busse, 46°33'31.1"N, 143°16'55.5"E, 12 m a. s. l., swamp fir-larch-spruce forest, 26 V 2017, *Chesnokov* 125, LE, MSK; vicinity of Yuzhno-Sakhalinsk, 47°11'N, 142°35'E, larch forest with bamboo, bark of *Abies* sp., 15 IX 2005, *Galanin*, VBGi; Makarovsky District, Poreche settlement, coniferous forest, bark, 19 VII 2008, *Tsarenko*, *Bogachova*, VBGi; Tomarinsky District, Krasnogorsky Protected Area, road between Lake Ajnskoe and Okhotsk Sea, 48°27'29.1"N, 142°03'06.2"E, 4 m a. s. l., grassy seashore, on bark of *Betula* sp., 13 V 2017, *Chesnokov* 25, LE; *ibid.*, 48°27'34.2"N, 142°03'12.5"E, 7 m a. s. l., fir forest, on bark of *Abies sachalinensis* (F. Schmidt) Mast., 13 V 2017, *Konoreva* 78, VBGi 79614; *ibid.*, vicinity of Lake Uglovoe, 48°33'39.9"N, 141°58'15.0"E, 37 m a. s. l., fir forest with mosses, on

rotten wood, 14 V 2017, *Chesnokov* 33, *Konoreva* 85, LE; *ibid.*, 48°34'30.6"N, 141°58'57.3"E, 21 m a. s. l., fir forest, on bark of *Abies sachalinensis*, 14 V 2017, *Chesnokov* 40, LE; *ibid.*, 48°34'55.1"N, 141°58'38.0"E, 48 m a. s. l., fir forest with birch and yew, on bark of *Taxus cuspidata* Siebold et Zucc., 14 V 2017, *Chesnokov* 43, 45, LE; *ibid.*, 48°34'51.5"N, 141°57'48.7"E, 16 m a. s. l., fir forest with mosses forest along road, on bark of *Abies sachalinensis*, 14 V 2017, *Chesnokov* 47, *Konoreva* 120, LE; *ibid.*, 48°34'45.5"N, 141°56'34.7"E, 12 m a. s. l., larch forest with lichens and mosses, 16 V 2017, *Chesnokov* 67, LE; *ibid.*, Lake Baklanie, 48°32'08.0"N, 141°59'04.2"E, 10 m a. s. l., larch forest, on bark of *Larix* sp., *Chesnokov* 51, LE; Shikotan Island, neighborhood of Tserkovnaya Bay, 43°44'17"N, 146°41'02"E, 38 m a. s. l., yew grove with ferns, on deadwood *Taxus cuspidata*, 15 VI 2017, *Konoreva* 379, LE; Iturup Island, Ostrovnoy Protected Area, vicinity of Lesozavodskoy, 44°46'02.1"N, 147°11'41.5"E, 21 m a. s. l., fir forest with bamboo, bark of *Sorbus* sp., 14 VIII 2017, *Chesnokov* 275, LE L-15395; *ibid.*, 44°46'07.7"N, 147°11'47.9"E, 18 m a. s. l., fir forest with bamboo and maple, 14 VIII 2017, *Chesnokov* 276, LE, *Konoreva* 597, VBG 79363; *ibid.*, neighborhood of Iodny Cape, 44°43'40.3"N, 147°19'41.2"E, 67 m a. s. l., willow-birch forest with bamboo along the old road, on bark of *Salix* sp., 16 VIII 2017, *Chesnokov* 298, LE; Kunashir Island, Kurilsky Strict Nature Reserve, neighborhood of the Saratovsky cordon, left bank of the Saratovskaya River, fir-spruce forest, on bark of *Abies sachalinensis*, 4 VI 2018, *Chesnokov* 24, LE.

Platismatia lacunosa (Ach.) W. L. Culb. et C. F. Culb., 1968, *Contr. U. S. Natl. Herb.* 34(7): 541. (Fig. 1)

≡ *Cetraria lacunosa* Ach., 1803, *Method Lich.*: 295. ≡ *Platysma lacunosum* (Ach.) Nyl., 1855, *Bot. Not.*: 137. — Neotype: North America, Herb. Swartz, S.

= *Cetraria lacunosa* f. *cavernosa* (Menzies) G. Merr., 1910, *Bryologist* 13: 20, tab. II, fig. 4.

Platismatia lacunosa is characterized by gray or whitish-gray upper surface, strongly reticulate and ridged up to the margins. Pseudocyphellae sometimes present on the ridges, but poorly visible on a whitish thallus. Soredia and isidia absent. Lower surface black at the center and brown or white at the margins with scarce or abundant rhizines. Apothecia relatively common, submarginal. Spores ellipsoid 7.0–10.0 × 3.0–4.5 μm. Pycnidia marginal to submarginal or even superficial (on the crests of the reticulations).

Chemistry. Upper cortex contains atranorin, K+ yellow, KC, C, and P–. Medulla contains caperatic and fumarprotocetraric acids, K, KC, C, and IKI–, P+ orange-red, UV–.

Ecology. Saxicolous in lichen and dwarf shrub tundra. In western North America the species inhabits different substrates (bark, wood, stones, mosses) in coastal rainforests.

Distribution. Pacific coast of North America (Brodo *et al.*, 2001) and the Aleutian Islands, including the westernmost Attu Island (Talbot *et al.*, 1991). In Russia, it is known only from Medny Island (Commander Islands, Kamchatka Territory).

Notes. *Platismatia lacunosa* is distinguished from all other *Platismatia* species by its positive (red) medullary reaction with P (fumarprotocetraric acid). It differs from the morphologically closest *P. norvegica* by the absence of isidia, and by chemistry



Fig. 1. *Platismatia lacunosa* (thallus with apothecium), Medny Island, Commander Islands.
Scale bar: 1 cm.

Photo by I. Stepanchikova.

(presence of fumarprotocetraric acid). Before 1926 (Savicz, 1926) the species was erroneously recorded for Eurasia, being confused with *Asahinea chrysantha* (Tuck.) W. L. Culb. et C. F. Culb. (= *Cetraria chrysantha* Tuck.) (e. g., Mattiolo, Belli, 1903; Elenkin, 1907). All further reports of *Platismatia lacunosa* from the Russian Arctic, namely Novaya Zemlya, Franz Josef Land, and Taimyr Peninsula (Kristinsson *et al.*, 2010; Spisok..., 2010) are based on incorrect identifications or citing of previous erroneous publications and refer to *Asahinea chrysantha* (LE). Hence, *Platismatia lacunosa* is reported here as new for Russia.

Selected specimens examined. **Kamchatka Territory:** Aleut District, Komandorsky Strict Nature Reserve, Commander Islands, Medny Island, top of the SE spur of the Mt. Sen'kina, 54°43'40.4"N, 167°38'53.2"E, 210 m a. s. l., rocky outcrops in lichen-dwarf shrub tundra, on rock, 22 VIII 2019, *Himelbrant, Stepanchikova*, LE L-15387; *ibid.*, slope of the hill W of Lake Gladkovskoe, 54°44'08.7"N, 167°42'17.9"E, 146 m a. s. l., rocky outcrops in lichen-dwarf shrub tundra, on rock, 20 VIII 2019, *Himelbrant, Stepanchikova*, LECB.

Platismatia norvegica (Lynge) W. L. Culb. et C. F. Culb., 1968, Contr. U. S. Natl. Herb. 34(7): 543.

≡ *Cetraria lacunosa* f. *norvegica* Lynge, 1921, Vidensk. Selsk. Skr., Math. Naturvid. Kl. [Kristiania] 1921(7): 196. ≡ *Cetraria norvegica* (Lynge) Du Rietz, 1924, Bot. Not.: 59. — Lectotype: Norway, Hordaland, Store Kalsø, 1920, *Lynge*, O.

= *Cetraria norvegica* f. *sorediata* Degel., 1935, Acta Phytogeogr. Suec. 7: 52. = *Cetraria tuckermanii* var. *sorediata* (Degel.) Räsänen, 1952, Kuopion Luonnon Ystävään Yhdistyksen Julkaisua, ser. B, II, no. 6: 31, 46.

The diagnostic characters of *P. norvegica* are gray, strongly ridged reticulate upper surface, small pseudocyphellae of irregular shape confined to the crests of the ridges, and simple or coralloid isidia, usually associated with the pseudocyphellae and abundant along the margins of the ridges. Lower surface is also reticulate, brown or black at the center and brown or white at the margins with scarce black rhizines. *Apothecia* uncommon, submarginal. Spores ellipsoid $6.0\text{--}8.5 \times 3.0\text{--}4.0 \mu\text{m}$. *Pycnidia* rare, immersed, marginal.

Chemistry. Upper cortex contains atranorin, K⁺ yellow, KC, C, and P⁻. Medulla contains caperatic acid, K, KC, C, and P⁻, IKI⁻ or + purple, UV⁻.

Ecology. Oceanic species, inhabiting rocks and bark of spruces in coniferous and mixed forests in humid conditions.

Distribution. The species is distributed in Europe and North America (Culberson, Culberson, 1968; Obermayer, Randle, 2012). In Russia, it is known with certainty only from Ologora Mountain in Arkhangelsk Region (Tarasova, 2014). The species was also reported from most regions of southern Far East (Khabarovsk Territory, Jewish Autonomous Region, Sakhalin Region, and Primorye Territory) (Tolpysheva, 1990; Tchabanenko, 2002; Tchabanenko *et al.*, 2002; Skirina, 2007, 2016), but all these records are doubtful. All available samples (VGEO) collected in the Far East and previously identified as *P. norvegica* belong to *P. interrupta*.

Notes. *Platismatia norvegica* is similar to *P. glauca*, but differs by the distinct reticulation and more distinct pseudocyphellae usually associated with the ridges. *P. interrupta* also can be slightly reticulate, but far not as explicitly as *P. norvegica*, and also the pseudocyphellae of *P. interrupta* are much more abundant and conspicuous.

Key to *Platismatia* species published for Russia

(the species erroneously reported from Russia are in square brackets)

1. Lower surface of the thallus covered with distinct punctiform pseudocyphellae. Lobes usually wide, rounded, reticulate, and isidiate.....[*P. erosa*]
– Pseudocyphellae present only on the upper surface or absent.....2
2. Thallus consists of two types of lobes simultaneously: first, broad and rounded, and second, lacerate, elongated, thin and richly branched, often heavily isidiate*P. glauca*
– All lobes of thallus are morphologically more or less equal, rounded or elongated3
3. Lobes broad and rounded4
– Lobes narrow (5 mm wide or less), elongated to ribbon-shaped, branched, margins isidiate[*P. herrei*]
4. Soredia and/or isidia present5
– Soredia and isidia totally absent.....9
5. Soredia present (often together with isidia).....6

- Soredia absent, isidia present7
- 6. Pseudocyphellae on the upper surface are distinct, round to irregular,
 elongate or confluent..... *P. interrupta*
- Pseudocyphellae absent or indistinct.....*P. glauca*
- 7. Thallus highly reticulate (check lower surface as well!) *P. norvegica*
- Thallus surface smooth or weakly reticulate.....8
- 8. Pseudocyphellae abundant on the upper surface..... *P. interrupta*
- Pseudocyphellae absent or indistinct.....*P. glauca*
- 9. Upper surface strikingly lacunose, prominently ridged by strong reticulations rising at right
 angles to the surface, spaces between ridges very deep, medulla P+ orange-red.....*P. lacunosa*
- Upper surface without strong reticulations or interspaces remain shallow, medulla P–7

Discussion

In the course of our study, we encountered that many *Platismatia* records in eastern Siberia and the south of the Russian Far East are not confirmed by herbarium specimens. Thus, we draw conclusions about the distribution of the species based on the revision of available herbarium materials, consultations with colleagues, and analysis of the global ranges of species.

All available specimens previously identified as *Platismatia erosa* and *P. herrei* (LE, VGEO) we re-identified as *P. interrupta*. *Platismatia herrei* inhabits the western coast of North America (Brodo et al., 2001). The range of *P. erosa* is limited by the southern part of Asia: China, India, Indonesia, Japan, Nepal, Taiwan, Philippines, and Vietnam (Culberson, Culberson, 1968; Poelt, 1990; Wei, 1991; Awasthi, 2007; Obermayer, Randlane, 2012).

Finally, four species of *Platismatia* are known to occur in Russia, namely *P. glauca*, *P. interrupta*, *P. lacunosa*, and *P. norvegica*. *Platismatia glauca* is distributed throughout the European part of Russia, Ural, and Siberia. *Platismatia interrupta* is a widespread and common species in the southern Russian Far East and quite rare in Eastern Siberia. Unfortunately, the revision of Russian specimens in the lichen Herbarium of the University of Tartu (TU, Estonia) is currently impossible due to the Covid-19 pandemic. However, thanks to the kind assistance of Professor Tiina Randlane, we made sure that both species (*P. glauca* and *P. interrupta*) are present in the Khamar-Daban Range (T. Randlane, pers. comm.). There are numerous (some pretty rich) samples of *P. glauca* and three samples of *P. interrupta* from this area in TU. All three *P. interrupta* specimens are from the right shore of the Solzan River. They are not very healthy, but definitely have pseudocyphellae. Thus, the contact zone of the two most common *Platismatia* species in Russia is Eastern Siberia.

Platismatia norvegica shows a disjunct distribution pattern, being present in Russia only in the Archangelsk Region; the records from the Russian Far East are not supported by specimens. *P. lacunosa* is reported here for the first time from a single island at the easternmost limit of the Russian Far East.

In some cases, the revised herbarium specimens were previously misidentified as members of the genus *Platismatia*, for example, *Asahinea chrysantha*, *Cetrelia braunsiana*, *C. cetrarioides*, *C. olivetorum*, *Nephromopsis laureeri*, etc. However, these species have a different set of secondary metabolites from *Platismatia* and can be identified using spot-tests and chromatography methods even in old herbarium material.

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