



# Lichens collected in the Sakhalin Botanical Garden: new records to Russia, the Russian Far East and Sakhalin Island

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## ABSTRACT

During the lichenological survey conducted in the Sakhalin Branch of Botanical Garden-Institute FEB RAS, a number of interesting findings were made. Among the identified species, *Tbelotrema bicinctulum* is new for Russia; *Agonimia flabelliformis*, *Peridiothelia fuliguncta*, and *Strigula jamesii* were recorded for the Russian Far East for the first time; *Arthonia helvola*, *A. spadicea* and *Ionaspis epulotica* are new to the South of the Russian Far East and five species to Sakhalin Island.

**Key words:** lichens, Far East, Sakhalin, new records, Asia

## РЕЗЮМЕ

**Чабаненко С.И., Конорева Л.А., Чесноков С.В. Находки лишайников на территории Сахалинского ботанического сада: новые виды для России, Дальнего Востока и острова Сахалин.** При проведении лишайниковых исследований на территории Сахалинского филиала Ботанического сада-института ДВО РАН был сделан ряд интересных находок. Среди выявленных видов *Tbelotrema bicinctulum* является новым для России, *Agonimia flabelliformis*, *Peridiothelia fuliguncta* и *Strigula jamesii* впервые приведены для Российского Дальнего Востока, *Arthonia helvola*, *A. spadicea* и *Ionaspis epulotica* – для юга российского Дальнего Востока, 5 видов впервые указаны для острова Сахалин.

**Ключевые слова:** лишайники, Дальний Восток, Сахалин, новые находки, Азия

Sakhalin Branch of the Botanical Garden-Institute of the Far Eastern Branch of Russian Academy of Sciences (Sakhalin Botanical Garden) is located in the southeast of Yuzhno-Sakhalinsk at the foothills of the Susunai Mountain Range. The garden covers an area of 40 hectares in the upper parts of two small streams at elevation of 52–128 m above sea level.

The natural vegetation is represented by secondary *Betula* forest with *Sorbus commixta* Hedl. and *Salix hulteni* Flod. remained after felling conifer trees in a primary mixed forest, riverine *Alnus* and *Salix* forest with *Fraxinus manshurica* Rupr., meadow and meadow-marsh communities, fragments of wastelands. Small areas are occupied by artificial plantations of 60–80 years old *Larix leptolepis* (Siebold & Zucc.) Gord., as well as plant expositions and nurseries of tree species (25–30 years old).

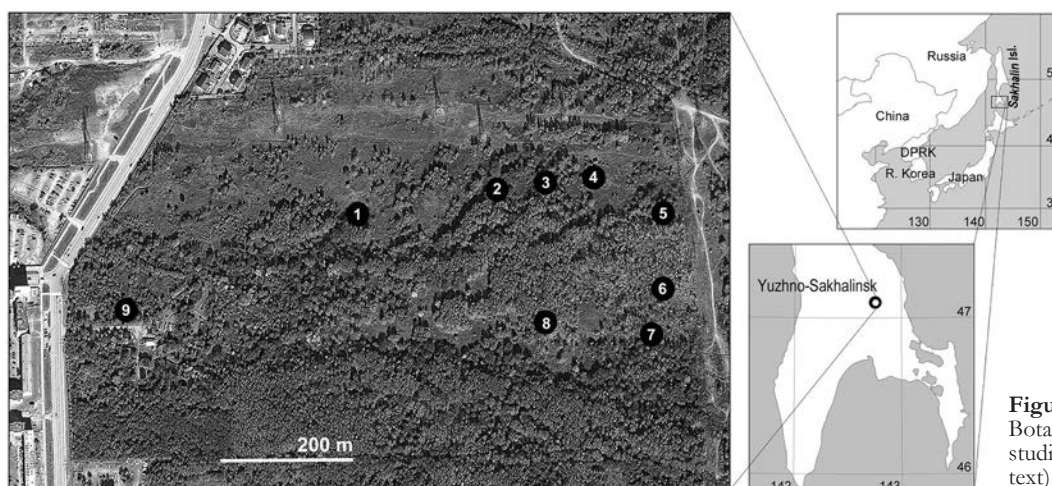
The first studies of lichens in the garden were carried out in 1993–1995, and a list of 40 macrolichen species was compiled (Tchabanenko 1999). In 2017, we repeated lichenological studies on the territory of this experimental forest with special focus on microlichens. Here, we present the information on lichen species, new to Sakhalin Island, the Russian Far East and Asian continent.

## MATERIAL AND METHODS

This study is based on lichen specimens collected in the Sakhalin Botanical Garden by L. Konoreva and S. Chesnokov in 07.05.2017 (Fig. 1). The material was collected in all types of natural and artificial communities in the garden territory. Various substrates: different tree species, mossy trunks, stones and soil, were examined. Specimens were deposited in the herbarium of Sakhalin Branch of Botanical Garden-Institute FEB RAS (SAKH). Material was examined using standard microscopic techniques with light microscopes MBS-10 and LOMO Mikmed 2. Photos of the lichen specimens were taken through the stereomicroscope MG 23.

The main studied localities (Fig. 1) are:

1. 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest with *Larix* sp.
2. 46°56'40.7"N, 142°45'53.9" E, alt. 103 m, stream bank with *Alnus hirsuta* (Spach) Rupr., *Betula platyphylla* Sukaczew, *Salix sachalinensis* Fr. Schmidt, *S. rorida* Lacksch.
3. 46°56'41.2"N, 142°45'56.0"E, alt. 108 m, birch forest.
4. 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall.
5. 46°56'40.6"N, 142°46'01.8"E, alt. 128 m, *Larix* sp. windfall.



**Figure 1** Map of Sakhalin Botanical Garden with plots studied (1–9, bolded in the text)

6. 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus maximowiczii* A. Henry.

7. 46°56'34.4"N, 142°46'01.7"E, alt. 90 m, forest near stream with *Betula*, *Alnus* and *Salix* spp.

8. 46°56'34.5"N, 142°45'56.3"E, alt. 94 m, forest with *Betula* sp., *Alnus hirsuta* and *Abies sachalinensis* (Fr. Schmidt) Mast.

9. 46°56'35.1"N, 142°45'27.3"E, alt. 62 m, laboratory building, wooden parts.

## RESULTS AND DISCUSSION

Secondary lichenological survey of the Sakhalin Botanical Garden resulted in significant enrichment of the list of lichens with species new to the areas of different scales. We provide information on the main diagnostic features for poorly understood taxa, its ecology.

### Species new to Russia

*Thelotrema bicinctulum* Nyl. (Fig. 2A) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.5"N, 142°45'56.3"E, alt. 94 m, forest of *Betula* sp., *Alnus hirsuta* and *Abies sachalinensis* (Fr. Schmidt) Mast., on bark of *Abies sachalinensis*, 7 May 2017, coll. S.V. Chesnokov 11: **8** (SAKH 3518).

Thallus variable in color, pale grayish-green to pale yellowish-gray. Vegetative propagules not seen in the studied specimens. Ascromata roundish, apothecia, predominantly solitary, rarely slightly fused. Disc often becomes partly visible, grayish, coarsely pruinose. Apothecial pores small, up to c. 120  $\mu\text{m}$  in diam., roundish to somewhat irregular, apical to upper proper exciple visible from surface, free. Proper exciple free in the upper parts, thin, internal parts hyaline, external parts pale yellowish to dark yellowish-brown. Epiphyllum usually thick, hyaline, with grayish granules. Hymenium up to c. 100  $\mu\text{m}$  high, paraphyses unbranched with slightly thickened tips. Ascospores transversely septate, hyaline, with roundish to subacute ends, loci roundish to angular, predominantly oblong to lentiform or rectangular, with hemispherical to conical end cells, 20–35 $\times$ 5–7  $\mu\text{m}$  with 8–11 loci, septa moderately thin, regular. Currently two *Thelotrema* species are known from Russia – *T. bicinctulum* and *T. lepadinum*. *T. bicinctulum* distinguished from more widespread *T. lepadinum* (Ach.) Ach. by the presence of

transversely septate multicellular spores. Similar taxa in the world with transversely septate ascospores and stictic acid are *T. capetribulense*, *T. porinoides* and *T. triseptatum*. They can be distinguished by size of ascospores (up to 50  $\mu\text{m}$  with up to 14 loci in *T. capetribulense*, up to 35  $\mu\text{m}$  with up to 11 loci in *T. bicinctulum*, up to 140  $\mu\text{m}$  with up to 30 loci in *T. porinoides* and up to 20  $\mu\text{m}$  with 4 loci in *T. triseptatum*). Two morphologically similar, stictic acid containing species are *T. cupulare* and *T. leucophthalmum*, which are easily distinguished by muriform, non-amyloid ascospores.

It is distributed in Australia, New Caledonia (Mangold 2008), Africa (Frisch 2005), India, Sri Lanka (Hale 1981) and Andaman Islands (Nagarkar et al. 1988) (Fig. 3A).

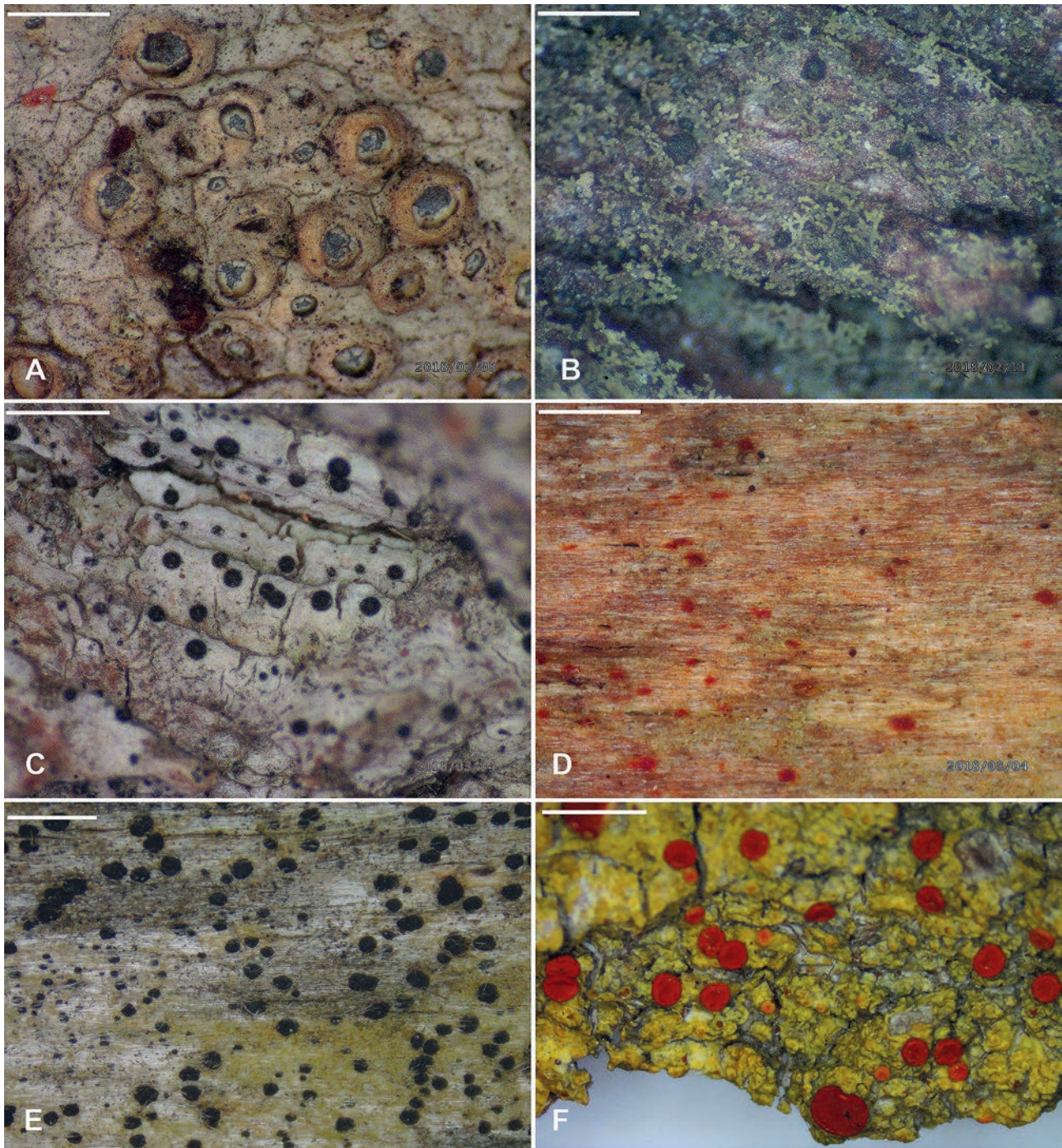
### Species new to the Russian Far East

*Agonimia flabelliformis* J. Halda, Czarnota & Guz.-Krzemiń. (Fig. 2B) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.4"N, 142°46'01.7"E, alt. 90 m, forest near stream with *Betula*, *Alnus* and *Salix* spp., on rotten wood of birch and mosses on stump, 7 May 2017, coll. S.V. Chesnokov 7: **7** (SAKH 3519).

It differs from closely related *A. allobata* (Stizenb.) P. James by coralliform thallus. Sterile thalli can be confused with *Placynthiella icmalea* (Ach.) Coppins & P. James, which differs by darker, red-brown thalli. Fertile thalli easily distinguishable from the latter species by presence of perithecia instead of apothecia.

The species occurs on mossy bases of tree trunks and tree roots, stumps, fallen trees, also on soil, stones and plant debris in predominantly moist, shaded broad-leaved and dark coniferous-broad-leaved forests along rivers (Urbanavichus 2013). In Russia it is common in the European part: Mari-El Republic, Voronezh region (Urbanavichus 2013, Urbanavichus & Urbanavichene 2014, Muchnik 2015), Daghestan (Ismailov et al. 2017). In the world it is known from Europe: Czech Republic, Great Britain, Germany (Guzow-Krzemińska et al. 2012), Lithuania (Motiejūnaitė & Grochowski 2014) and Poland (Łubek 2012) (Fig. 3B).

*Peridiothelia fuliginecta* (Norman) D. Hawksw. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.2"N, 142°45'56.0"E, alt. 108 m, birch forest, on bark of *Betula* sp., 7 May 2017, coll. S.V. Chesnokov 4: **3** (SAKH 3520).

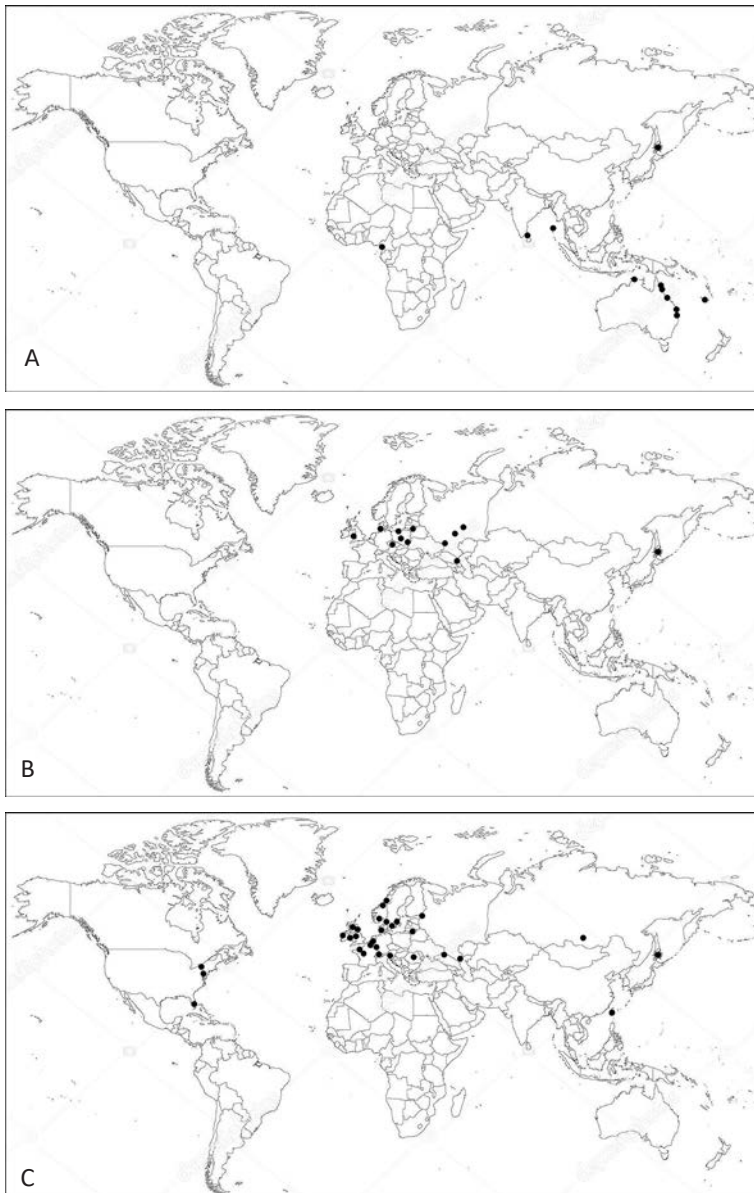


**Figure 2** Some morphological traits of species: A – urceolate apothecia of *Thelotrema bicinctulum*, scalebar 1 mm; B – perithecia and coralliform thallus of *Agonimia flabelliformis*, scalebar 1 mm; C – perithecia of *Strigula jamesii*, scalebar 1 mm; D – apothecia-like ascomata of *Arthonia beivola*, scalebar 1 mm; E – apothecia of *A. spadicea*, scalebar 2 mm; F – thallus and apothecia of *Caloplaca gordejewii*, scalebar 2 mm

New to the Far East. Non-lichenized saprotrophic fungus. Main feature is absence of perithecia wall under hamathecium. In Russia sporadically occurs from the north of the European part to the Southern Siberia. Probably widespread but overlooked by researchers.

***Strigula jamesii*** (Swinscow) R.C. Harris (Fig. 2C) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest of *Larix* sp., on bark of rotten *Salix* sp., 7 May 2017, coll. S.V. Chesnokov 3: 1 (SAKH 3521).

It differs from closely related *Strigula affinis* (A. Massal.) R.C. Harris by smaller perithecia (0.1–0.2 mm in diam.), spores and some other characteristics (Urbanavichus 2016). New to the Russian Far East. In Russia it is known from Saint-Petersburg (Stepanchikova et al. 2015), Caucasus (Urbanavichus 2016) and Buryatia Republic (Makryi 2007). In the world: Europe – Austria, Belgium, Denmark, France, Germany, Luxembourg, Netherlands, Switzerland (Roux & Sérusiaux 2004), Lithuania (Motiejūnaitė et al. 2012), Nor-



**Figure 3** Distribution of *Thelotrema bicinctulum* (A), *Agonimia flabelliformis* (B) and *Strigula jamesii* (C)

way, Sweden (Nordin et al. 2011), Romania (Ardelean et al. 2013); Asia – Taiwan (Aptroot 2003); North America (Harris 1995, 2004, Lendemer 2008) (Fig. 3C).

#### New to the South of the Russian Far East

***Arthonia helvola*** (Nyl.) Nyl. (Fig. 2D) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest of *Larix* sp., on wood, 7 May 2017, coll. L.A. Konoreva 4: 1 (SAKH); Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 18: 6 (SAKH 3524).

Thallus thin, rugose, fine-grained to smooth, grayish, brownish, to buffy-yellow. Apothecia numerous, flat, immersed in a thallus, rusty-red. Hymenium yellow-orange to red, KOH + purple-violet. Spores are elongated-ellipsoidal, straight, constricted to the lower end, colorless, 3-celled,

with  $\pm$  identical cells. Closely related *A. incarnata* distinguished by convex apothecia, hymenium KOH-, and 3-celled spores with unequal ends, with a larger, almost spherical upper cell (Redinger 1937). Sporadically distributed in Russia. New to the South of the Russian Far East. The nearest locations are on Kamchatka (Neshataeva et al. 2005) and Buryatia (Baikal State reserve) (Urbanavichene & Palice 2016).

***A. spadicea*** Leight. (Fig. 2E) – Russia, Far East, Sakhalin, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.5"N, 142°45'56.3"E, alt. 94 m, forest with *Betula* sp., *Alnus hirsuta* and *Abies sachalinensis* (Fr. Schmidt) Mast., on bark of *Abies sachalinensis*, 7 May 2017, coll. L.A. Konoreva 28: 8 (SAKH 3525).

Thallus immersed or thin, more or less smooth, shiny, yellowish or greenish-gray to olive. Apothecia numerous, resembling flat to slightly convex, rounded or irregularly shaped spots. Disk black, sometimes brownish, red-brown when wet. Hymenium yellow-brown, KOH+ purple-red, J + reddish-brownish. Spores are elongate, colorless, 1-septate, 7–11×3–4  $\mu$ m, with wider rounded upper and narrowed lower cells. Closely related species are *A. didyma* and *A. vinosa*. *A. didyma* distinguished by larger 1-septate spores and hymenium J+ blue reaction. *A. vinosa* is characterized by larger spores – 11–15×4–5  $\mu$ m (Redinger 1937). In Russia widely distributed in boreal forests. New to the South of the Russian Far East. The nearest known localities on Kamchatka (Himmelbrant & Kuznetsova 2004), Krasnoyarsk Territory, Republics of Tyva and Khakassia (Sedelnikova 2013).

***Ionaspis epulotica*** (Ach.) Arnold – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall, on stone, 7 May 2017, coll. L.A. Konoreva 14: 4 (SAKH 3526).

Thallus immersed or thin, wrinkled, not cracked-areolated, yellowish to pink-gray. Apothecia concave to flat, pink to pale brown, excipulum white, hardly apparent. Morphologically similar with *I. rhodopis* and *Hymenelia prevostii*. *I. rhodopis* distinguished by thick cracked-areolated thallus and larger apothecia (0.4–0.6 mm diam.), *H. prevostii* – by trebouxoid photobiont (Smith et al. 2009). In Russia it occurs in Arctic and northern regions (Kristinsson et al. 2010). The nearest localities are on Kamchatka (Mikulín 1999) and Chukotka (Kristinsson et al. 2010). New to the South of the Russian Far East.

#### New to Sakhalin Island

***Cladonia phyllophora*** Hoffm. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.7"N, 142°45'53.9"E, alt. 103 m, stream bank with *Alnus hirsuta* (Spach) Rupr., *Betula platyphylla* Sukaczew, *Salix sachalinensis* Fr. Schmidt, *S. rorida* Lacksch., on bark of *Betula* sp., 7 May 2017, coll. L.A. Konoreva 11: 2 (SAKH 3528).

For the Russian Far East it is known from Jewish autonomous Region, Primorsky and Khabarovsk Territories, Kamchatka (Tchabanenko 2002, Neshataeva et al. 2007, Skirina 2015a,b). It is widely distributed in the world, including Russia.

*Porpidia cinereoatra* (Ach.) Hertel & Knoph (Fig. 4A) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall, on stone, 7 May 2017, coll. L.A. Konoreva 13: 4 (SAKH 3599).

It is characterized by thick thallus, presence of confluent acid and small spores (13–18×6–9 µm). For the South of the Russian Far East it is known from Magadan (Zheludeva 2017), Khabarovsk (Randlane 1984) and Primorsky Territories (Rodnikova 2011, Skirina 2015a) and Jewish Autonomous Region (Skirina 2015b).

*P. crustulata* (Ach.) Hertel & Knoph (Fig. 4B) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall, on stone, 7 May 2017, coll. L.A. Konoreva 14: 4 (SAKH 3530).

Often confused with *P. macrocarpa*. From that species differs by smaller apothecia and less massive proper margin that is < 0.05 mm wide (up to 0.2 mm in *P. macrocarpa*). For the South of the Russian Far East it is known from Jew-

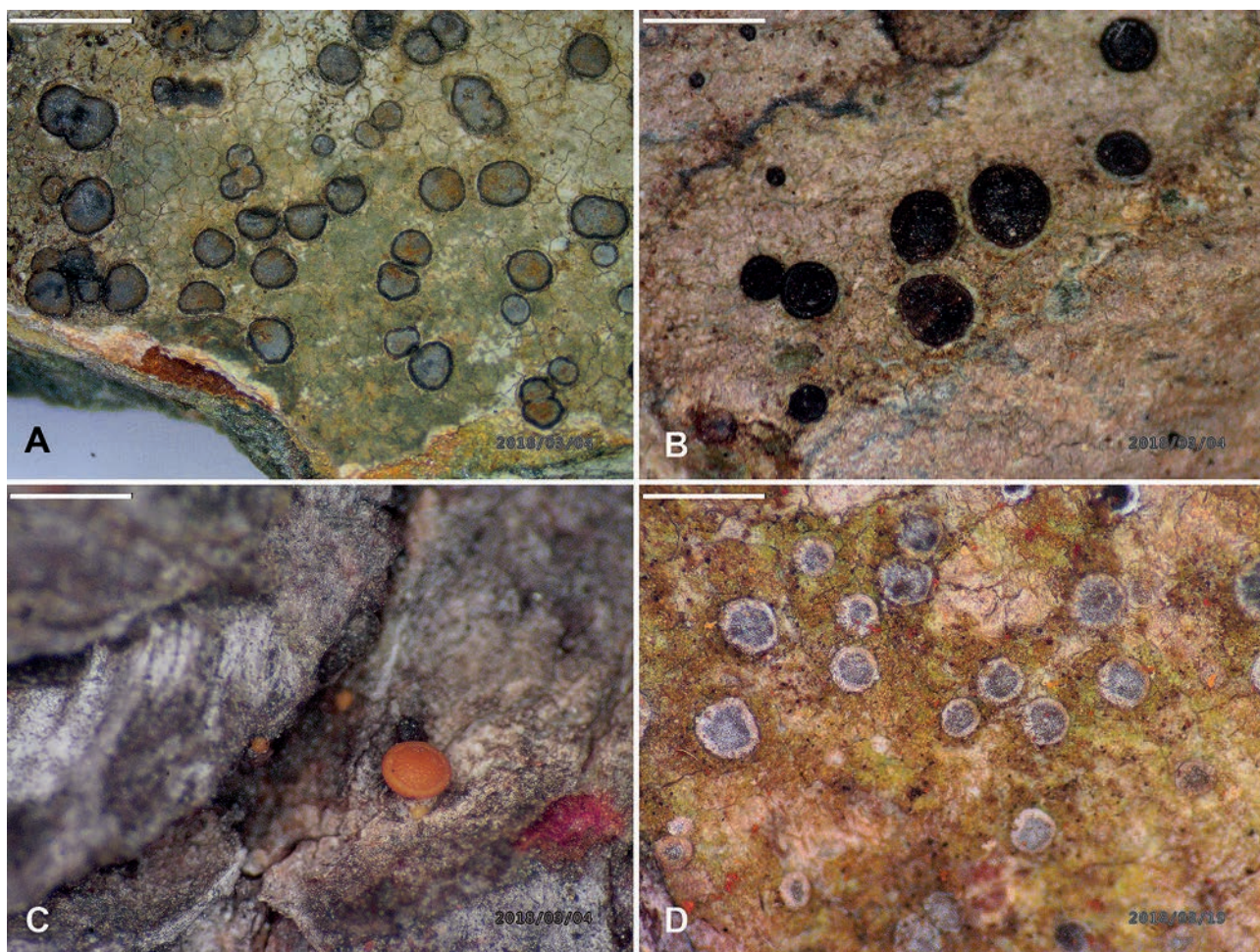
ish Autonomous Region (Skirina 2015b) and Khabarovsk Territories (Randlane 1984).

*Pyrenula dermatodes* (Borrer) Schaer. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 22: 6 (SAKH 3522).

It is characterized by acuminate spores and perithecia partially covered with thallus (Aptroot 2012). In Russia it is known only from Primorsky Territory (Tchabanenko 2002).

*Rhizocarpon reductum* Th. Fr. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall, on stone, 7 May 2017, coll. L.A. Konoreva 14: 4 (SAKH 3531).

Characterized by a brownish thallus consisting of small granules, small apothecia (up to 0.8 mm in diam.) with a well-developed exciple and a flat and coarse disc. *R. reductum* is distinguished from the closely related species (*R. amphibium*, *R. anaperum*, *R. lavatum*, *R. sublavatum*) by presence of stictic acid. From *R. lavatum* it differs by a more subtle excipulum and relatively small spores: 20–35×10–15 µm (*R. lavatum*: 30–40×14–18 µm) (Ihlen 2004). For the South of the Russian Far East it is known from Jewish Autonomous Region (Skirina 2015b) and Primorsky Territory (Cherdantseva et al. 2013). Widespread in Russia and in the world.



**Figure 4** Some morphological traits of species: A – verrucose-areolate thallus and apothecia of *Porpidia cinereoatra*, scalebar 2 mm; B – apothecia of *P. crustulata*, scalebar 2 mm; C – apothecia of *Sarea resiniae*, scalebar 1 mm; D – apothecia and thallus patches of *Lecanographa amylicea* among the free-living *Trentepolia* sp., scalebar 1 mm

**Sarea resinæ** (Fr.: Fr.) Kuntze (Fig. 4C) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest of *Larix* sp., on resin of *Larix* sp., 7 May 2017, coll. S.V. Chesnokov 1: 1 (SAKH 3532).

Non-lichenized fungus, lives on resin of coniferous trees. From *S. diffomis* it is distinguished by large red-brown or pale yellow apothecia up to 1.5 mm in diam. with well-developed, thick, exciple. For the South of the Russian Far East it is known from Jewish Autonomous Region and Primorsky Territory (Insarov & Pchelkin 1984, Tchabanenko 2002, Skirina 2015a,b).

#### Rare species to Sakhalin Island

**Arthonia ruana** A. Massal. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest of *Larix* sp., on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 5: 1 (SAKH); Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 22: 6 (SAKH); Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.4"N, 142°46'01.7"E, alt. 90 m, forest near stream with *Betula*, *Alnus* and *Salix* spp., on bark of *Alnus hirsuta* and fallen trees, 7 May 2017, coll. L.A. Konoreva 24, S.V. Chesnokov 6: 7 (SAKH 3533).

The second records for Sakhalin Island. The species was mentioned for the first time by Ezhkin & Schumm (in print).

**Bryobilimbia hypnorum** (Lib.) Fryday et al. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.4"N, 142°46'01.7"E, alt. 90 m, forest near stream with *Betula*, *Alnus* and *Salix* spp., on rotten birch stump, 7 May 2017, coll. S.V. Chesnokov 7: 7 (SAKH 3534).

The second record for Sakhalin Island. The species was mentioned for the first time by Ezhkin & Schumm (in print).

**Caloplaca gordejvii** (Tomin) Oxner (Fig. 2F) – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest of *Larix* sp., on the bark of rotten *Salix* sp., 7 May 2017, coll. S.V. Chesnokov 3: 1 (SAKH 3527).

The species is closely related to *C. flavorubescens*, from which it differs by short bacilliform conidia (2.0–2.5×0.5–0.8 µm), dark-orange to ferruginous-red apothecia with concolorous proper margin. It was found in Sakhalin by Ezhkin & Galanina (2016). In Russia it is known only from the Far East – Primorsky and Khabarovsk Territories (Tchabanenko 2002, Galanina 2010) and Kamchatka (Khosovtsev et al. 2004).

**Cliostomum corrugatum** (Ach.: Fr.) Fr. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'41.6"N, 142°45'58.2"E, alt. 115 m, *Larix* sp. windfall, on bark of *Betula* sp., 7 May 2017, coll. S.V. Chesnokov 4: 3 (SAKH 3535).

Third location for Sakhalin Island. The species was mentioned for the first time from the Korsakovsky district and Yuzhno-Sakhalinsk city (Konoreva et al. in print).

**Lecanographa amylicæ** (Ehrh. ex Pers.) Egea & Torrente (Fig. 4D) – Russia, Far East, Sakhalin Island, Yuzh-

no-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 22: 6 (SAKH); Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.4"N, 142°46'01.7"E, alt. 90 m, forest near stream with *Betula*, *Alnus* and *Salix* spp., on bark of *Alnus hirsuta*, 7 May 2017, coll. S.V. Chesnokov 8: 7 (SAKH); Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'34.5"N, 142°45'56.3"E, alt. 94 m, forest with *Betula* sp., *Alnus hirsuta* and *Abies sachalinensis* (Fr. Schmidt) Mast., on bark of *Abies sachalinensis*, 7 May 2017, coll. L.A. Konoreva 28, S.V. Chesnokov 11: 8 (SAKH 3536).

Second locality for Sakhalin Island. The species was mentioned for the first time from the Yuzhno-Sakhalinsk city (Konoreva et al. in print).

**Lecidea albobyalina** (Nyl.) Th. Fr. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'40.1"N, 142°45'46.7"E, alt. 135 m, riparian secondary forest with *Larix* sp., on bark of rotten *Salix* sp., 7 May 2017, coll. S.V. Chesnokov 3: 1 (SAKH 3537).

Second location for Sakhalin Island. The species was mentioned for the first time by Ezhkin & Schumm (in print).

**Lecidea berengeriana** (A. Massal.) Th. Fr. – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Betula* sp., 7 May 2017, coll. L.A. Konoreva 20: 6 (SAKH 3538).

Third location for Sakhalin Island. The species was mentioned for the first time from the Korsakovsky district and Yuzhno-Sakhalinsk city (Konoreva et al. in print).

**Stenocybe pullatula** (Ach.) Stein – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus tremula*, on bark of *Alnus hirsuta*, 7 May 2017, coll. L.A. Konoreva 19: 6 (SAKH 3539).

Saprotrophic fungus, lives on bark and branches of *Alnus* sp. It is characterized by small apothecia (0.09–0.1 mm in diam.) on branched stalks and narrow ellipsoid light smooth spores that long remaining unicellular (Titov 2006). Second location for Sakhalin Island. The species was mentioned for the first time by Titov (2006) from Poronaysky reserve.

**Strigula stigmatella** (Ach.) R.C. Harris – Russia, Far East, Sakhalin Island, Yuzhno-Sakhalinsk, Sakhalin Botanical Garden, 46°56'36.3"N, 142°46'01.7"E, alt. 96 m, stream bank with *Alnus hirsuta* and *Populus maximowiczii* A. Henry, on bark of *Populus maximowiczii*, 7 May 2017, coll. L.A. Konoreva 17: 6 (SAKH 3540).

Second location for Sakhalin Island. The species was mentioned for the first time from the Tymovsky district (Konoreva et al. in print).

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## LITERATURE CITED

- Ardelean, I.V., C. Keller & C. Scheidegger 2013. Lichen flora of Rodnei Mountains National Park (Eastern Carpathians, Romania) including new records for the Romanian mycoflora. *Folia Cryptogamica Estonica* 50:101–115.
- Aptroot, A. 2003. Pyrenocarpous lichens and related non-lichenised ascomycetes from Taiwan. *Journal of the Hattori Botanical Laboratory* 93:155–173.
- Aptroot, A. 2012. A world key to the species of *Anthracothecium* and *Pyrenula*. *The Lichenologist* 44(1):5–53.
- Cherdantseva, V.Ya., V.A. Bakalin, L.S. Yakovchenko & S.S. Choi 2013. Bryophyte flora and lichen biota of Litovka Mt. (Livadiysky range, Russian Manchuria). *Komaronskie chteniya* 61:9–49 (in Russian with English summary). [Черданцева В.Я., Бакалин В.А., Яковченко Л.С., Чой С.С. 2013. Бриофлора и лишайнобиота горы Литовка (Ливадийский хребет, российская Маньчжурия) // Комаровские чтения. Вып. 61. С. 9–49].
- Ezhkin, A.K. & I.A. Galanina 2016. Epiphytic lichens of deciduous trees in the city of Yuzhno-Sakhalinsk and specifics of their distribution by sensitivity to the anthropogenic impact. *Vestnik Severo-Vostochnogo nauchnogo tsentra DVO RAN* 4:95–107 (in Russian with English summary). [Ежкин А.К., Галанина И.А. 2016. Эпифитные лишайники лиственных деревьев г. Южно-Сахалинск и особенности их распределения по степени чувствительности к антропогенному воздействию // Вестник Северо-Восточного научного центра ДВО РАН. № 4. С. 95–107].
- Ezhkin, A. & F. Schumm 2018. New and noteworthy lichen and allied fungi records from Sakhalin Island, Far East of Russia II. *Folia Cryptogamica Estonica* (in print).
- Frisch, A. 2005. Contributions towards a new systematics of the lichen family Thelotremales. I. The lichen family Thelotremales in Africa. A revision with special consideration of the taxa from Cameroon and Tanzania. *Bibliotheca Lichenologica* 92:3–370.
- Galanina, I.A. 2010. Geographical distribution and habitats of lichen *Caloplaca gordejovi* (Tomim) Oxner ex Khodos. *Bulleten' Botanicheskogo sada-instituta DVO RAN* 7:121–125 (in Russian with English summary). [Галанина И.А. 2010. Географическое распространение и экологическая приуроченность лишайника *Caloplaca gordejovi* (Tomim) Oxner ex Khodos. // Бюллетень Ботанического сада-института ДВО РАН. Вып. 7. С. 121–125].
- Galanina, I.A. 2013. Lichens of fir-spruce and larch forests with *Sasa kurilensis* (Rupr.) Makino & Shibata in undergrowth shrub layer on south of Sakhalin Island. *Vestnik Severo-Vostochnogo nauchnogo tsentra DVO RAN* 2(34):86–94 (in Russian). [Галанина И.А. 2013. Лишайники пихтово-елового и лиственничного лесов с подлеском из бамбука курильского на юге острова Сахалин // Вестник Северо-Восточного научного центра ДВО РАН. № 2. Вып. 34. С. 86–94].
- Guzow-Krzemińska, B., J.P. Halda & P. Czarnota 2012. A new *Agonimia* from Europe with a flabelliform thallus. *The Lichenologist* 44(1):55–66.
- Hale, M.E. 1981. A revision of the lichen family Thelotremales in Sri Lanka. *Bulletin of the British Museum (Natural History), Botany* 8:227–332.
- Harris, R.C. 1995. *More Florida lichens, including the 10 et tour of the pyrenolichens*. New York Botanical Garden, Bronx, USA, 180 pp.
- Harris, R.C. 2004. A preliminary list of the lichens of New York. *Opuscula Philolichenum* 1:55–74.
- Himelbrant, D.E. & E.S. Kuznetsova 2004. History of lichen investigations and problems of including species in Red Data Book of Kamchatka region. In: *Reports of the 5th scientific conference «Conservation of biodiversity of Kamchatka and coastal waters»*, pp. 29–32, Petropavlovsk-Kamchatskiy, 22–24 November 2004 (in Russian with English summary). [Гимельбрант Д.Е., Кузнецова Е.С. 2004. История изучения лишайников Камчатки и проблемы включения видов в Красную книгу Камчатской области // Материалы V научной конференции «Сохранение биоразнообразия Камчатки и прилегающих морей». Петропавловск-Камчатский, 22–24 ноября 2004 г. С. 29–32].
- Ihlen, P.G. 2004. Taxonomy of the non-yellow species of *Rhizocarpon* (Rhizocarpaceae, lichenized Ascomycota) in the Nordic countries, with hyaline and muriform ascospores. *Mycological Research* 108(5):533–570.
- Inсаров, G.E. & A.V. Pchelkin 1984. *Quantitative characteristics of the state of epiphytic lichen flora of biosphere reserves. Sibot-Alins nature reserve*, vol. 2. Moscow, 70 pp. (in Russian). [Инсаров Г.Э., Пчелкин А.В. 1984. Количественные характеристики состояния эпифитной лишайнофлоры биосферных заповедников. Сихотэ-Алинский заповедник. М.: Гос. комитет СССР по гидрометеорологии и контролю природной среды. Вып. 2. 70 с].
- Ismailov A., G. Urbanavichus, J. Vondrák & V. Pouska 2017. An old-growth forest at the Caspian Sea coast is similar in epiphytic lichens to lowland deciduous forests in Central Europe. *Herzogia* 30(1):103–125.
- Khodosovtsev, A., E. Kuznetsova & D. Himelbrant 2004. Lichen genus *Caloplaca* on the Kamchatka Peninsula (Russian Far East). *Botanica Lithuanica* 10(3):195–208.
- Konoreva, L., S. Tchabanenko, A. Ezhkin, F. Schumm & S. Chesnokov 2018. New and noteworthy lichen and allied fungi records from Sakhalin Island, Far East of Russia. *Herzogia* 31(1) (in print).
- Kristinsson, H., M. Zhurbenko, & E.S. Hansen 2010. Panarctic checklist of lichens and lichenicolous fungi. *CAFF Technical Report* 20:1–120.
- Lendemer, J. 2008. New and interesting records of lichens and lichenicolous fungi from New Jersey and Pennsylvania. *Evansia* 25(4):102–109.
- Lubek, A. 2012. *Agonimia* species and other rare lichens in Central Poland. *Acta Mycologica* 47(2):203–212.
- Makryi, T.V. 2007. Lichens of *Ulmus japonica* forests in western and eastern Transbaikalia. *Sibirskii ekologicheskii zhurnal* 14(6):951–960 (in Russian with English summary). [Макрый Т.В. 2007. Лишайники ильмовников из *Ulmus japonica* Западного и Восточного Забайкалья // Сибирский экологический журнал. Т. 14, № 6. С. 951–960].
- Mangold, A. 2008. *Taxonomic studies on members of thelotrematoid Ostropales (lichenized Ascomycota) in Australia*. Inaugural-Dissertation zur Erlangung des Doktorgrades Dr. rer. nat. des Fachbereichs Biologie und Geografie an der Universität Duisburg-Essen. Stuttgart. 327 pp.
- Mikulín, A.G. 1999. *A guide to lichens of Kamchatka Peninsula*. Vladivostok, 125 pp. (in Russian). [Микулин А.Г. 1990. Определитель лишайников полуострова Камчатка. Владивосток, 125 с.].
- Motiejūnaitė, J. & P. Grochowski 2014. Miscellaneous new records of lichens and lichenicolous fungi. *Herzogia* 27(1):193–198.
- Motiejūnaitė, J., T. Berglund, P. Czarnota, D. Himelbrant, F. Högnabba, L.A. Konoreva, E.S. Korchikov, D. Kubiak, M. Kukwa, E. Kuznetsova, E. Leppik, P. Löhmus, I.P. Lukošienė, J. Pykälä, D. Stončius, I. Stepanchikova, A. Suija, A. Thell, A. Tsurykau & M. Westberg 2012. Lichens, lichenicolous and allied fungi found in Asveja Regional park (Lithuania). *Botanica Lithuanica* 18(2):85–100.

- Muchnik, E.E. 2015. Lichens as indicators of forest ecosystems in central European Russia. *Lesotebnicheskii zhurnal* 3:65–76 (in Russian with English summary). [Мучник Е.Э. 2015. Лишайники как индикаторы состояния лесных экосистем центра европейской России // Лесотехнический журнал. Вып. 3. С. 65–76].
- Nagarkar, M.B., P.K. Sethy & P.G. Patwardhan 1988. Lichen genus *Ocellularia* (Family Thelotremaaceae) from India. *Bionomyam* 14:24–43.
- Neshataeva, V.Yu., I.V. Chernyadjeva, D.E. Himelbrant, E.S. Kuznetsova, V.Yu. Neshatayev, O.A. Chernyagina & M.V. Dulin 2005. Pristine riparian forests of southwest Kamchatka (species composition and the community characteristics). In: *Reports of the 5th scientific conference «Conservation of biodiversity of Kamchatka and coastal waters»*, pp. 70–102, Petropavlovsk-Kamchatskiy, 22–24 November 2004. (in Russian with English summary). [Нешатаева В.Ю., Черныадьева И.В., Гимельбрант Д.Е., Кузнецова Е.С., Нешатаев В.Ю., Черныгина О.А., Дулин М.В. 2005. Пойменные леса юго-западной Камчатки (флористическая и фитоценологическая характеристика) // Материалы V научной конференции «Сохранение биоразнообразия Камчатки и прилегающих морей». Петропавловск-Камчатский, 22–24 ноября 2004 г. С. 70–102].
- Neshataeva, V.Yu., M.P. Vyatkina, L.B. Golovneva, D.E. Himelbrant, I.V. Chernyadjeva, A.A. Oskolsky & I.S. Stepanchikova 2007. Poplar woodlands on the volcanic deposits of Tolbachinsky dol in the Kluchevskaya group of volcanoes (Central Kamchatka). In: *Proceedings of 7th international scientific conference «Conservation of biodiversity of Kamchatka and coastal waters»*, Pp. 92–119, Petropavlovsk-Kamchatskiy, 28–29 November 2006 (in Russian with English summary). [Нешатаева В.Ю., Вяткина М.П., Головнева Л.Б., Гимельбрант Д.Е., Черныадьева И.В., Осковский А.А., Степанчикова И.С. 2007. Тополевые редколесья на вулканических отложениях Толбачинского дола в Ключевской группе вулканов (Центральная Камчатка) // Доклады VII международной научной конференции «Сохранение биоразнообразия Камчатки и прилегающих морей». Петропавловск-Камчатский, 28–29 ноября 2006 г. С. 92–119].
- Nordin, A., R. Moberg, T. Tønsberg, O. Vitikainen, Å. Dalsätt, M. Myrdal, D. Snitting & S. Ekman 2011. *Santesson's checklist of lichen-forming and lichenicolous fungi*. Version 29 April 2011. Uppsala, Sweden. Available at <http://130.238.83.220/santesson/home.php>, last accessed 27.04.2018.
- Randlane, T. 1984. About lichens of alpine zone of Badzhals range (Khabarovsk territory). In: *Flora i gruppировки nizshih rastenii v prirodnyh i antropogennyh ekstremalnyh usloviyah sredy*, pp. 120–133. Tallin (in Russian). [Рандлане Т. 1984. О лишайниках гольцового пояса хребта Баджал (Хабаровский край) // Флора и группировки низших растений в природных и антропогенных экстремальных условиях среды. Таллин, 1984. С. 120–133].
- Redinger, K. 1937. Familie Arthoniaceae. *Rabenhorst Kryptogamenflora* 9:1–180.
- Rodnikova, I.M. 2011. Materials to the study of lichens from Russky Island and the near small islands (Peter the Great Bay, Sea of Japan). *Turczaninowia* 14(3):94–99 (in Russian with English summary). [Родникова И.М. 2011. Материалы к изучению лишайников острова Русский и близлежащих малых островов (залив Петра Великого, Японское море) // Turczaninowia. Т. 14, № 3. С. 94–99].
- Roux, C. & E. Sérusiaux 2004. Le genre *Strigula* (Lichens) en Europe et en Macaronésie. *Bibliotheca Lichenologica* 90:3–96.
- Sedelnikova, N.V. 2013. Species diversity of lichen biota of the Altai-Sayan ecological region. *Rastitelnyi mir Aziatskoy Rossii* 2(12):12–54 (in Russian with English summary). [Седельникова Н.В. 2013. Видовое разнообразие лишайников Алтае-Саянского экорегиона // Растительный мир Азиатской России. № 2(12). С. 12–54].
- Skirina, I.F. 2015a. List of lichens of Sikhote-Alin nature reserve (Russia). *Biota i sreda zapovednikov Dal'nego Vostoka* 3:10–102 (in Russian with English summary). [Скирина И.Ф. 2015а. Список лишайников Сихотэ-Алинского заповедника // Биота и среда заповедников Дальнего Востока. № 3. С. 10–102].
- Skirina, I.F. 2015b. Lichen list of “Bastak” nature reserve (Russia). *Biota i sreda zapovednikov Dal'nego Vostoka* 4:28–87 (in Russian with English summary). [Скирина И.Ф. 2015b. Список лишайников заповедника «Бастак» // Биота и среда заповедников Дальнего Востока. № 4. С. 28–87].
- Smith, C.W., A. Aptroot, B.J. Coppins, A. Fletcher, O.L. Gilbert, P.W. James, & P.A. Wolseley 2009. *The lichen flora of Great Britain and Ireland*. British Lichen Society, London. 1046 p.
- Stepanchikova, I.S., D.E. Himelbrant, A.V. Dyomina & G.M. Tagirdzhanova 2015. The lichens and allied fungi of the Zapadny Kotlin Protected Area and its vicinities (Saint Petersburg). *Novosti sistematiki nizshikh rastenii* 49: 265–281. [Степанчикова И.С., Гимельбрант Д.Е., Дёмкина А.В., Тагирджанова Г.М. 2015. Лишенофлора заказника «Западный Котлин» и его окрестностей (Санкт-Петербург) // Новости систематики низших растений. Т. 49. С. 265–281].
- Tchabanenko, S.I. 1999. Epiphytic lichens of the Sakhalin Botanical Garden. *Trudy botanicheskikh sadov DVO RAN* 1: 34–37 (in Russian with English summary). [Чабаненко С.И. 1999. Лишайники-эпифиты Сахалинского ботанического сада ДВО РАН // Труды ботанических садов ДВО РАН. Т.1. С. 34–37].
- Tchabanenko, S.I. 2002. *Checklist of the flora of lichens in the south of the Russian Far East*. Dalnauka, Vladivostok, 232 pp. (in Russian). [Чабаненко С.И. 2002. Конспект флоры лишайников юга Российского Дальнего Востока. Владивосток: Дальнаука. 232 с.].
- Titov, A.N. 2006. *Mycocalicioid fungi (the order Mycocaliciales) of the Holarctic*. КМК Scientific Press, Moscow, 296 pp. (in Russian). [Титов А.Н. 2006. Микокалициевые грибы (порядок Мусокалицiales) Голарктики. М.: Товарищество научных изданий КМК. 296 с.].
- Urbanavichene, I.N. & Z. Palice 2016. Rarely recorded lichens and lichen-allied fungi from the territory of the Baikal Reserve – additions for lichen flora of Russia. *Turczaninowia* 19(1):42–46.
- Urbanavichus, G.P. 2013. Family Verrucariaceae in Russia. I. Genus *Agonimia*. *Novosti sistematiki nizshikh rastenii* 47:279–296 (in Russian with English summary). [Урбанавичюс Г.П. 2013. Семейство Verrucariaceae в России. I. Род Agonimia // Новости систематики низших растений. Т. 47. С. 279–296].
- Urbanavichus, G.P. 2016. The genus *Srtigula* (Strigulaceae, Strigulales) in the lichen flora of the Caucasus. *Botanicheskii Zhurnal* 101(2):154–166 (in Russian with English summary). [Урбанавичюс Г.П. 2016. Род *Srtigula* (Strigulaceae, Strigulales) в лишенофлоре Кавказа // Ботанический журнал. Т. 101, №2. С. 154–166].
- Urbanavichus, G.P. & I.N. Urbanavichene 2014. The first addition to the lichenflora of the Republic of Mordovia and Middle Russia. *Byulleten moskovskogo obschestva ispytatelei prirody. Otdelenie biologii* 119(3):78–81 (in Russian with English summary). [Урбанавичюс Г.П., Урбанавичене И.Н. 2014. Первое дополнение к лишенофлоре Рес-



публики Мордовия и Средней России // Бюллетень  
московского общества испытателей природы. Отде-  
ление биологии. Т. 119. Вып. 3. С. 78–81].  
Zheludeva, E.V. 2017. New records of lichen species from

Magadan region. *Turczaninovia* 20(2):64–74 (in Russian  
with English summary). [Желудева Е.В. 2017. Новинки  
лихенофлоры Магаданской области // *Turczanino-  
wia*. Т. 20, №2. С. 64–74].