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Plant and Fungal Systematics 64(2): 345–366, 2019
DOI: 10.2478/pfs-2019-0023

ISSN 2544-7459 (print)
ISSN 2657-5000 (online)

A first synopsis of lichenicolous fungi of Mongolia, with the description of five new species

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Article info

Received: 29 Apr. 2019
Revision received: 3 Aug. 2019
Accepted: 4 Aug. 2019
Published: 2 Dec. 2019

Associate Editor

Paul Diederich

Abstract. A first synopsis of lichenicolous fungi of Mongolia based on new collections and literature data is provided, including 114 species. Five new species are described: *Capronia cogtii* (on *Vahliella leucophaea*), *Echinothecium hypogymniae* (on *Hypogymnia bitteri*), *Feltgeniomyces mongolicus* (on *H. bitteri*), *Phacopsis vulpicidae* (on *Vulpicida juniperina*) and *Roselliniella javkhlanae* (on *Rinodina turfacea* var. *ecrustacea*). Two new combinations are proposed: *Endococcus hafellneri* (≡ *Stigmidium hafellneri*) and *Sphaerellothecium taimyricum* (≡ *Sphaerellothecium thamnoliae* var. *taimyricum*). Unidentified specimens of *Acremonium* (on *Mycoblastus sanguinarioides*), *Cercidospora* (on *Rhizoplaca chrysoleuca* s.lat.), *Didymocyrtis* (on *Rhizoplaca chrysoleuca* s.lat.), *Lichenochora* (on *Physcia alnophila*), *Lichenostigma* (on species of *Xanthoparmelia*), *Phoma* (on *Vulpicida juniperina*) and a leotialean fungus (on *Cetraria laevigata*) are characterized and discussed. Taxonomic notes are provided for *Cercidospora macrospora* s.lat., *Didymocyrtis* cf. *melanelixiae*, *Minutoexcipula* cf. *beaglei*, *Nesolechia cetrariicola*, *Sphaerellothecium* cf. *parmeliae* and *Stigmidium* cf. *psorae*. *Sphaeropezia intermedia* is newly reported for Eurasia. *Didymocyrtis grumantiana* is newly reported for Asia. Additionally, 71 species of lichenicolous fungi and five species of lichenicolous lichens are documented in Mongolia for the first time. *Allocetraria* is reported as a new host genus for *Abrothallus peyritschii*, *Vulpicida* for *Arthonia triebeliae*, and *Anamylopsora* for *Muellerella pygmaea*.

Key words: lichen parasites, taxonomy, biodiversity, Asia, *Capronia*, *Echinothecium*, *Feltgeniomyces*, *Phacopsis*, *Roselliniella*

Introduction

Mongolia is a landlocked country of Central Asia, situated between China and Russia, mostly within 41−52°N (1260 km) and 87−120°E (2400 km) on the Mongolian Plateau at 900−1500 m a.s.l. A number of mountain ranges and ridges tower over the country. The climate of Mongolia is sharply continental, which leads to dominance of steppe and desert zonal vegetation (Vostokova et al. 1995). About 10% of the total land area is occupied by forests, mainly growing on the mountains.

The lichen flora of Mongolia is comparatively well studied. According to Biazrov (2013) it includes 1056 documented taxa. However, the lichenicolous fungi of this region have never received special attention.

The aims of this paper are to: (i) present a first checklist of lichenicolous fungi of Mongolia based on new and literature records, (ii) describe five new species of lichenicolous fungi and propose two new combinations, and (iii) provide new information on the taxonomy, geographic distribution and host preferences of some of the examined species of lichenicolous fungi.

Material and methods

Taxon sampling and morphological studies

The study is based on 282 specimens of lichenized and non-lichenized fungi inhabiting lichens collected by the authors from 8 to 26 July 2018 in Mongolia (mainly in Khuvsugul Aimag; aimag = province). Specimens were examined using a Stemi 2000-CS dissecting microscope and a Zeiss Axio Imager A1 compound microscope with interference contrast, fitted with an AxioCam MRc5 digital camera. CombineZP free software was used to create extended depth in some digital images. Hand-made sections of fruit bodies and thallus were studied in water, 10% KOH (K) and Lugol's iodine, directly (I) or after KOH pre-treatment (K/I), or stained with brilliant cresyl

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blue (BCr). For identification of host lichens, commercial bleach (C) and a solution of paraphenylenediamine in ethanol (P) were used. The length and breadth of asci, ascospores and conidia are given (where n > 10) as (min−) {X−SD}−{X+SD}(−max), where 'min' and 'max' are the extreme observed values, X the arithmetic mean and SD the corresponding standard deviation, followed by the number of measurements (n). The length/breadth ratio is indicated as L/B and given in the same way. Measurements were taken from water mounts unless otherwise indicated. Turing estimator (Chao & Shen 2003) was used for estimation of the true diversity of lichenicolous fungi in the study area, based on the proportion of species that were collected only once (singletons) in the sample $C = 1 - f/S$, where f − number of singletons, S − number of species found. Voucher specimens are housed mainly in the mycological herbarium of the V. L. Komarov Botanical Institute in St. Petersburg, Russia (LE), and also in GZU, TSB, TU, UPS and the private herbarium of P. Diederich (herb. Diederich). Data for the twenty collection localities inspected by the authors in July 2018 are summarized below. Geographical names mainly follow Enhbayaryn (2004). All known literature data on the lichenicolous fungi of Mongolia were taken into account and are included in the synopsis.

Collection localities in Mongolia

Localities are referenced in the checklist by bolded numbers.

1: Khuvsugul Aimag, Bayan-Zurkh Sum, vicinity of Bayan-Zurkh settlement, near bridge over Beltes gol River, 50°10′10″N, 98°58′32″E, elev. 1600 m, sparse *Larix sibirica* forest.

2: Khuvsugul Aimag, Bayan-Zurkh Sum, N of Bayan-Zurkh settlement, Altargana gol River, 50°17′32″N, 98°57′13″E, elev. 1760 m, sparse *Larix sibirica* forest.

3: Khuvsugul Aimag, Bayan-Zurkh Sum, 30 km SW of Ulaan-Uul, 50°30′14″N, 99°06′31″E, elev. 1870 m, limestone in steppe.

4: Khuvsugul Aimag, Bayan-Zurkh Sum, 23 km SW of Ulaan-Uul, S slope of Tsagaan Asga Uul Mt., 50°32′19″N, 99°08′02″E, elev. 2030 m, sparse *Larix sibirica* forest.

5: Khuvsugul Aimag, Ulaan-Uul Sum, S of Ulaan-Uul, N slope of Khuderengiin Nuruu Range, Tsokh gol River, 50°35′42″N, 99°13′19″E, elev. 1890 m, *Larix sibirica* forest.

6: Khuvsugul Aimag, Ulaan-Uul Sum, S of Ulaan-Uul, N slope of Khuderengiin Nuruu Range, 50°35′N, 99°13–16′E, elev. 2000–2330 m, *Larix sibirica* forest.

7: Khuvsugul Aimag, Ulaan-Uul Sum, S of Ulaan-Uul, N slope of Khuderengiin Nuruu Range, Tsokh gol River, 50°35′N, 99°13′E, elev. 2000 m, *Larix sibirica* forest.

8: Khuvsugul Aimag, Ulaan-Uul Sum, Khugiin gol River, S slope of Berkhtaarkh Uul Mt., 50°59′31″N, 99°04′55″E, elev. 1650 m, rocks in steppe.

9: Khuvsugul Aimag, Ulaan-Uul Sum, Khugiin gol River, S slope of Khara-Khabo Mt., 50°59′15″N, 99°01′37″E, elev. 1650 m, boulders in steppe.

10: Khuvsugul Aimag, Renchinlkhumbe Sum, Ar Khordolyn gol River, NE slope of Khordolyn Sardig Nuruu Range, 50°56′28″N, 99°49′10″E, elev. 1800 m, *Larix sibirica* forest.

11: Khuvsugul Aimag, Renchinlkhumbe Sum, headwaters of Ar Khordolyn gol River, NE slope of Khordolyn Sardig Nuruu Range, 50°53′32″N, 99°56′50″E, elev. 2050 m, pebble along riverbed in *Larix sibirica-Pinus sibirica* forest.

12: Khuvsugul Aimag, Renchinlkhumbe Sum, headwaters of Ar Khordolyn gol River, NE slope of Khordolyn Sardig Nuruu Range, 50°53′24″N, 99°56′56″E, elev. 2050–2250 m, *Larix sibirica-Pinus sibirica* forest.

13: Khuvsugul Aimag, Renchinlkhumbe Sum, Khordolyn Sardig Nuruu Range, Khordolyn Davaa Pass, 50°52′47″N, 99°56′24″E, elev. 2200 m, mountain tundra with scattered *Larix sibirica* trees.

14: Khuvsugul Aimag, Renchinlkhumbe Sum, Khordolyn Sardig Nuruu Range, Uver Khordolyn gol River, 50°52′06″N, 99°56′20″E, elev. 2260 m, mountain tundra with scattered *Larix sibirica* trees.

15: Khuvsugul Aimag, Renchinlkhumbe Sum, Khordolyn Sardig Nuruu Range, Yalaatyn gol River, E slope of Temeen Sult Uul Mt., 50°48′09″N, 100°00′20″E, elev. 2120 m, sparse *Larix sibirica* forest.

16: Khuvsugul Aimag, Renchinlkhumbe Sum, Khordolyn Sardig Nuruu Range, E slope of Ulkhani Ekh Uul Mt., 50°37′38″N, 100°02′30″E, elev. 1950 m, *Larix sibirica* forest.

17: Khuvsugul Aimag, Khatgal Sum, SW coast of Hubsugul Lake, E slope of Ikh Uul Mt., 50°46′45″N, 100°14′11″E, elev. 1660 m, sparse *Larix sibirica* forest.

18: Khuvsugul Aimag, Khatgal Sum, SW coast of Hubsugul Lake, E slope of Ikh Uul Mt., 50°45′55″N, 100°13′37″E, elev. 1750 m, *Larix sibirica* forest.

19: Khuvsugul Aimag, Khatgal Sum, SW coast of Hubsugul Lake, E slope of Khirbist Uul Mt., near Toilogt campsite, 50°39′30″N, 100°15′22″E, elev. 1650 m, *Larix sibirica* forest with open boulder field.

20: Tuv Aimag, Zuunmod Sum, 15 km S of Ulaanbaatar, Bogd Khan Uul Mt., 47°45′49″N, 106°59′57″E, elev. 1700 m, *Picea obovata* forest with boulders.

Results

The checklist is arranged alphabetically by genus and species, and the supporting voucher specimens and/or published literature citations are provided in each entry. Synonyms are given only when the species was previously cited in the literature under the synonymous name. Taxa newly reported for Mongolia are asterisked (*). Some lichens growing on other lichens are also included and designated 'L'. Notes on the taxonomy, geographic distribution and host preferences of some critical or otherwise noteworthy species are provided.

Checklist

Abrothallus bertianus De Not.

Literature report. MONGOLIA, Tuv Aimag, on *Melanelixia fuliginosa* (Alstrup & Ahti 2007).

****Abrothallus caerulescens*** I. Kotte

Specimens examined. **2**: on *Xanthoparmelia stenophylla* (thallus), 9 July 2018, O. Enkhtuya (LE 309789b); M. Zhurbenko 18155 (LE 309844); on *X. conspersa* (thallus), 9 July 2018, M. Zhurbenko 18157b (LE 309841b); **9**: 13 July 2018, M. Zhurbenko 18156a (LE 309838a); **19**: on *X. stenophylla* (thallus), 21 July 2018, O. Enkhtuya (LE 309787); **20**: on *X. stenophylla* (thallus), 26 July 2018, M. Zhurbenko 18172a (LE 309837a).

Abrothallus parmeliarum (Sommerf.) Arnold

Specimens examined. **9**: on *Parmelia omphalodes* (thallus), 13 July 2018, M. Zhurbenko 18180a (LE 309817a); **17**: on

P. sulcata (thallus), 19 July 2018, M. Zhurbenko 18182a (LE 309815a); **18**: on *P. sulcata* (thallus), 20 July 2018, O. Enkhtuya (LE 309791b); **19**: on *P. sulcata* (thallus), 21 July 2018, M. Zhurbenko 18175a (LE 309816a); **20**: on *P. saxatilis* (thallus), 26 July 2018, O. Enkhtuya (LE 309793).

Literature report. MONGOLIA, Tuv Aimag, on *Parmelia saxatilis* (Alstrup & Ahti 2007).

* ***Abrothallus peyritschii*** (Stein) I. Kotte

DNA sequences obtained from the specimen by Ave Suija (pers. comm.) fall in the clade of *A. peyritschii*.

According to Diederich et al. (2018), *Allocetraria* is a new host genus.

Specimen examined. **13**: on *Allocetraria madreporiformis* (thallus), 17 July 2018, O. Enkhtuya (TU86531).

* ***Acremonium* sp.**

The examined material is similar to the description of *Acremonium lichenicola* (Hawksworth 1979) but the conidia are larger, viz. (4.8–)7.2–12.4(–14.1) × (1.8–)2.4–3.0(–3.2) µm, L/B = (2.3–)2.9–4.1(–4.8) (n = 35) vs. 5–9.5 × 1.5–2(–2.5) µm, L/B = 3–4.4.

Specimen examined. **12**: on *Mycoblastus sanguinarioides* (thallus), 16 July 2018, O. Enkhtuya & S. Javkhlan (LE 309682).

* ***Arthonia*** cf. ***biatoricola*** Ihlen & Owe-Larss.

The identification is somewhat uncertain since the ascospores are not verrucose and lack a perispore, and as the host of the type is *Biatora efflorescens* (Ihlen et al. 2004).

Specimen examined. **17**: on *Mycobilimbia carneoalbida* (thallus), 19 July 2018, M. Zhurbenko 1832 (LE 309656).

* ***Arthonia clemens*** (Tul.) Th. Fr.

Specimens examined. All specimens on apothecial discs of *Rhizoplaca chrysoleuca* s.lat. **2**: 8 July 2018, M. Zhurbenko 18147 (LE 309865); 9 July 2018, M. Zhurbenko 18151a (LE 309866a); **9**: 13 July 2018, M. Zhurbenko 18146 (LE 309864).

Arthonia digitatae Hafellner

Specimens examined. **7**: on *Cladonia amaurocraea* (podetia), 11 July 2018, O. Enkhtuya (LE 309757); **10**: on *C. arbuscula* (podetia), 15 July 2018, O. Enkhtuya (LE 309753a); **12**: on *C. cenotea* (podetia), 16 July 2018, O. Enkhtuya (LE 309733); **17**: on *C. pyxidata* (basal squamules), 19 July 2018, M. Zhurbenko 18130 (LE 309779); **20**: on *C. pocillum* (basal squamules), 26 July 2018, M. Zhurbenko 18111 (LE 309732).

Literature reports. MONGOLIA, Arkhangai Aimag, Zavkhan Aimag and Uvs Aimag, on *Cladonia chlorophaea* s.lat., *C. digitata*, *C. pleurota* and *Cladonia* sp. (Zhurbenko & Pino-Bodas 2017).

* ***Arthonia lecanorina*** (Almq.) R. Sant.

Specimens examined. All specimens on apothecial discs of *Lecanora crustacea*. **2**: 8 July 2018, M. Zhurbenko 18149 (LE 309871); 9 July 2018, M. Zhurbenko 1857 (LE 309662); **9**: 13 July 2018, O. Enkhtuya & S. Javkhlan (LE 309683a); **19**: 21 July 2018, M. Zhurbenko 1854 (LE 309663); **20**: 26 July 2018, M. Zhurbenko 1856 (LE 309661).

* ***Arthonia peltigerina*** (Almq.) H. Olivier

Specimen examined. **12**: on *Solorina saccata* (thallus), 16 July 2018, M. Zhurbenko 1881 (LE 309695).

* ***Arthonia triebeliae*** Zhurb.

The species was previously known only from the Lena River delta in the Asian Arctic, growing on *Dactylina arctica* (type) and *Flavocetraria cucullata* (Zhurbenko 2002). *Vulpicida* is a new host genus.

Specimen examined. **14**: on *Vulpicida juniperina* (thallus), 17 July 2018, M. Zhurbenko 1891 (LE 309708).

Bachmanniomyces punctum (A. Massal.) Diederich & Pino-Bodas

Syn. *Phaeopyxis punctum* (A. Massal.) Rambold, Triebel & Coppins

Specimens examined. **5**: on *Cladonia coniocraea* (podetia), 10 July 2018, M. Zhurbenko 18127 (LE 309766); **10**: on *C. amaurocraea* (podetia), 15 July 2018, M. Zhurbenko 18128 (LE 309767); **12**: on *C. pocillum* (basal squamules), 16 July 2018, O. Enkhtuya (LE 309736); **17**: on *C. coniocraea* (basal squamules), 19 July 2018, M. Zhurbenko 18113 (LE 309739); **18**: on *Cladonia* sp. (basal squamules) growing on wood, 20 July 2018, O. Enkhtuya (LE 309738); on *C. coniocraea* (basal squamules), 20 July 2018, O. Enkhtuya (LE 309765a).

Literature reports. MONGOLIA, Arkhangai Aimag and Bulgan Aimag, on *Cladonia chlorophaea* s.lat., *C. coniocraea* and *C. subulata* (Zhurbenko & Pino-Bodas 2017).

* ***Biatoropsis minuta*** Millanes, Diederich, M. Westb. & Wedin

Previously the species was known only from *Usnea barbata* and *U. lapponica* (Millanes et al. 2016).

Specimen examined. **20**: on *Usnea perplexans* (thallus), 26 July 2018, M. Zhurbenko 18107c (LE 309727c).

Biatoropsis usnearum Räsänen s.lat.

Literature report. MONGOLIA, without locality, on unspecified species of *Usnea* (Diederich & Christiansen 1994).

Caeruleoconidia biazrovii Zhurb.

Literature reports. MONGOLIA, Arkhangai Aimag and Zavkhan Aimag, on *Cladonia stellaris* (Zhurbenko & Pino-Bodas 2017).

* ***Capronia cogtii*** Zhurb., sp. nov. (Fig. 1)

MycoBank MB 831721

Diagnosis: Differs from *Capronia amylacea* mainly by its smaller ascomata, 90–150 µm vs. 170–250 µm diam., hyaline, (1–)3(–5)-transseptate, longer ascospores, 17.5–28.5 × 5–8 µm, as compared to light brown, submuriform ascospores with longitudinal septum, 18–23 × 6–8 µm, and a different host genus, *Vahliella* (*Vahliellaceae*) vs. *Peltigera* (*Peltigeraceae*).

Type: Mongolia, Khuvsugul Aimak, Khatgal Somon, SW coast of Hubsugul Lake, E slope of Ikh Uul Mt., 50°45′55″N, 100°13′37″E, elev. 1750 m, *Larix sibirica* forest, on *Vahliella leucophaea* (thallus) growing on mossy soil and occasionally adjacent decaying mosses, 20 July 2018, S. Javkhlan (LE 309785 – holotype).

Description. Vegetative hyphae pale brown, 2–3.5 µm wide, septate, ramifying from lower parts of exciple. Ascomata perithecial, blackish, ±glossy, subglobose to ovoid, occasionally shortly papillate at apex, setose above, ostiolate, 90–150 µm diam., with rough surface, erumpent, more or less immersed to sessile, dispersed.

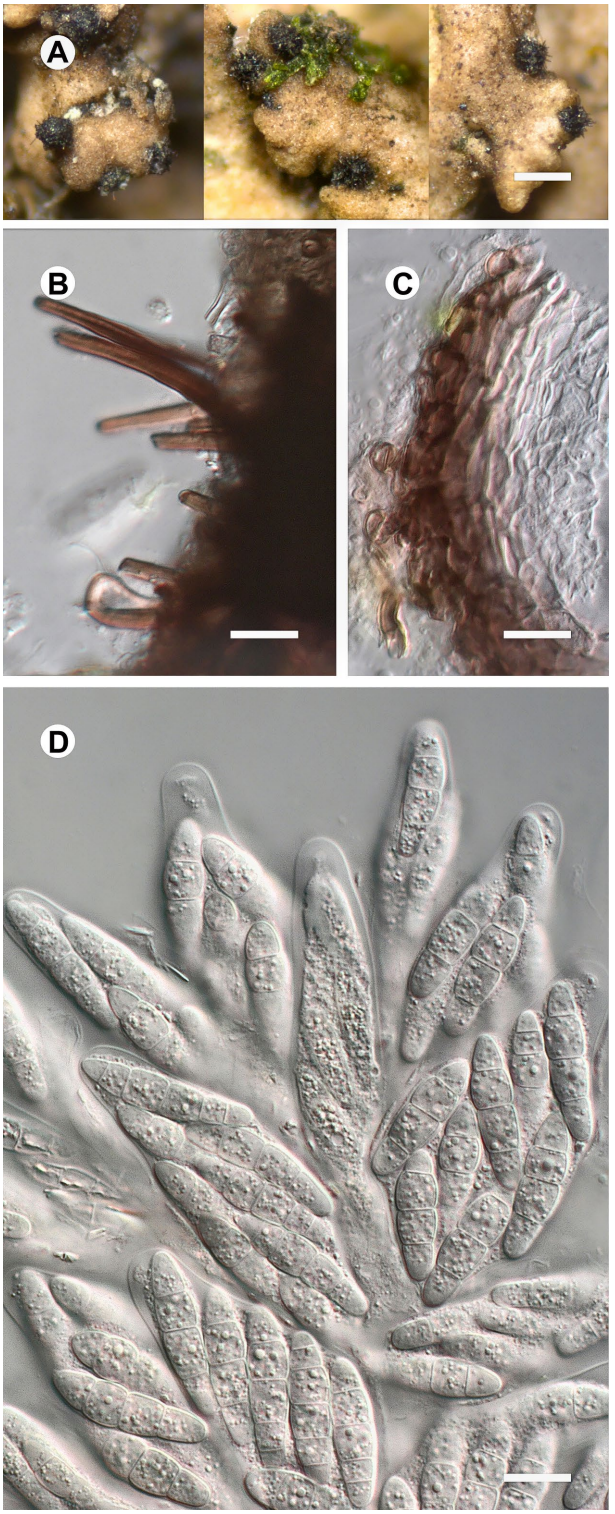

Figure 1. *Capronia cogtii* growing on thallus of *Vahliella leucophaea* (holotype). A – ascomata; B – setae, in water; C – ascomatal wall section, in water; D – asci and ascospores, in water. Scales: A = 200 µm; B–D = 10 µm.

Setae dark brown, straight, not branched, 15–60 µm tall, 4–5 µm wide at base, sometimes slightly tapering towards rounded to rather acute apex 2–3 µm wide, non-septate, wall ~1 µm thick, smooth, arising from discrete dark foot-cell. Exciple in surface view pseudoparenchymatous, in section 15–20 µm thick, outwardly composed of 3–5 layers of medium to dark brown (darkest near ostiole), K–, angular to rounded pseudoparenchymatous or tangentially elongated cells with walls 1–2 µm thick, inwardly composed of 1–3 layers of subhyaline, strongly elongated, radially compressed cells with walls 0.5–1 µm thick. Periphyses distinct, hyaline, 10–20 × 2–3 µm, septate, branching not observed. Interascal filaments absent. Interascal gel I+ red, K/I+ blue. Asci very narrowly ellipsoid to obclavate, thickened in middle or lower half, wall apically thickened up to 10 µm, penetrated by internal apical beak, foot short, 70–95 × 12–18 µm, 8-spored, I– and K/I–. Ascospores hyaline, clavate to very narrowly obovoid (slightly broader in upper half) or sometimes fusiform, the apices rounded to rather acute, (17.7–)20.7–25.3(–28.5) × (4.8–)5.8–6.8(–7.8) µm, L/B = (2.7–)3.3–4.1(–5.2) (n = 110), with (1–)3(–5) transverse septa, usually constricted at septa, smooth-walled, usually with many conspicuous guttules, rarely with gelatinous sheath ~1 µm thick, overlappingly crowded in ascus. Asexual morph not observed.

Notes. By its hyaline ascospores, the new species differs from most species of *Capronia* characterized by ascospores that are hyaline at first but usually become light brown, olivaceous brown or grayish brown (Barr 1991). However, for instance, they remain hyaline in the generic type *Capronia sexdecimspora* (Barr 1991). Compared to the lichenicolous species of *Capronia* keyed out in Halici et al. (2010) and the subsequently described species of the genus (Flakus & Kukwa 2012; Zhurbenko 2012; Etayo et al. 2013; Zhurbenko et al. 2016; Etayo 2017; Tsurykau & Etayo 2017), the new species is most similar to *C. amylacea*, *C. hypotrachynae*, *C. normandinae* and *C. pseudonormandinae*. However, all these species are quite distinct in their ascospores, which are pigmented, submuriform and of another size: in *C. amylacea* they are shorter, 18–23 × 6–8 µm; in *C. hypotrachynae* and *C. pseudonormandinae* they are smaller, 12–19 × 5.5–7.5 µm and 12.5–16 × 6–7.5 µm respectively; and in *C. normandinae* they are broader, 7.5–9 µm wide (Hawksworth 1990; Aptroot et al. 1997; Etayo & Diederich 1998; Etayo 2017). In some respects, *Capronia cogtii* is also similar to *C. andina* and *C. solitaria*. The former can be distinguished by its septate setae and smaller ascospores, 13–19 × 4.5–6 µm (Etayo 2003), the latter by its much smaller ascomata, up to 100 µm diam., and smaller ascospores, 13–16 × 4–6 µm (Etayo 2017).

No species of *Capronia* was previously known to grow on members of *Vahliellaceae*, where the host lichen *Vahliella leucophaea* belongs. The host is morphologically similar to some species of *Pannariaceae* and has long been placed in this family. Two *Capronia* species are known to grow on *Pannariaceae* hosts, viz. *C. magellanica* growing on species of *Fuscopannaria*, and *C. paranectrioides* growing on species of *Erioderma*. The former differs from *Capronia cogtii* by its smaller ascospores, (11–)13–16(–17.5) × 4–6 µm, (Etayo & Sancho 2008), and the latter by its bicaudate, submuriform ascospores (Etayo et al. 2013).

As the new species also occurs on decaying mosses adjacent to the host lichen, it should be compared with non-lichenicolous species of *Capronia* keyed out in

Barr (1991) and Friebes (2012). Among them it is most similar to *Capronia borealis* growing on dwarf shrubs and *C. montana* growing on conifer wood. Both species have pigmented ascospores, additionally, the former has narrower ascospores up to 6 µm wide, and the latter has (1–)3–4(–7)-septate, smaller ascospores, 15.5–21 × 5.5–6.5(–8) µm (Barr 1991).

Etymology. The species is named in honor of the late Prof. Ulzii Cogt, the founding father of Mongolian lichenology.

Host and distribution. The new species is so far known only from the holotype, collected on the thallus (often around its edge) of *Vahliella leucophaea* and occasionally on adjacent decaying mosses in sparse *Larix sibirica* mountain forest in northern Mongolia. Visible damage to the host lichen not observed.

* ***Capronia triseptata*** (Diederich) Etayo

Specimens examined. **13**: on *Caloplaca* sp. (apothecia and thallus), 17 July 2018, M. Zhurbenko 1862 (LE 309679); **18**: on *Physcia phaea* (thallus), 20 July 2018, O. Enkhtuya (LE 309784a).

Catillaria stereocaulorum (Th. Fr.) H. Olivier

Literature report. MONGOLIA, Uvs Aimag, on *Stereocaulon* sp. (Zhurbenko 2010a).

* ***Cercidospora macrospora*** (Uloth) Hafellner & Nav.-Ros. s.lat.

The examined material differs from the species description in Calatayud et al. (2013) in having somewhat larger ascospores, viz. (21.4–)24.4–28.6(–29.9) × (5.7–)6.3–7.3(–7.7) µm, L/B = (3.2–)3.4–4.4(–4.8) (n = 25) vs. (19–)20–25(–30) × 4–6(–7) µm, L/B = (3.0–)3.8–5.4(–6.7).

Specimen examined. **9**: on *Lecanora crustacea* (thallus), 13 July 2018, O. Enkhtuya & S. Javkhlan (LE 309683b).

Cercidospora verrucosaria (Linds.) Arnold

Specimen examined. **13**: on *Megaspora verrucosa* (thallus), 17 July 2018, M. Zhurbenko 1880 (LE 309693).

Literature report. MONGOLIA, Uvs Aimag, on *Megaspora verrucosa* (Zhurbenko 2009b).

* ***Cercidospora* sp.**

Ascomata perithecial, subglobose, 200–360 µm diam., slightly protruding above, exposed part black. Exciple dark vinaceous or reddish brown, 80–90 µm thick above, medium to pale greyish brown, ~30 µm thick below. Paraphysoids abundant, straight, scarcely septate, occasionally branched, apical cell not swollen, 1.5–3 µm thick. Asci cylindrical, 90–120 × 10–12 µm, 4(–6)-spored. Ascospores hyaline, heteropolar, very narrowly obovate, upper cell markedly broader and up to twice longer than lower one, (19.1–)22.3–26.7(–28.5) × (6.0–)6.6–7.8(–8.6) µm, L/B = (2.6–)2.9–3.8(–4.3) µm, smooth-walled, 1(rarely 2–3)-septate, often somewhat constricted at median septum, guttulate, sometimes with halo 0.5–1.5 µm thick, diagonally uniseriate in ascus. Visible damage to host not observed.

Thirty-five of 39 obligately lichenicolous species of *Cercidospora* are associated with one host genus (Diederich et al. 2018), including two species exclusively known from *Rhizoplaca*, viz. *C. barrenoana* on *R. peltata* and *C. melanophthalmae* on *R. melanophthalma.* Both clearly differ from the examined species: the former by its (0–)1-septate, larger ascospores, (27–)30–38(–40) × (5–)6–8 µm, and the latter by its blue-green exciple, (4–)8-spored asci, and (0–)1-septate, smaller ascospores (16–)18–22(–24) × (4–)5–6.5(–7) µm (Calatayud et al. 2013). The material examined probably represents an undescribed species but is too scant to be formally described.

Specimen examined. **9**: on *Rhizoplaca chrysoleuca* s.lat. (apothecia, thallus), 13 July 2018, M. Zhurbenko 18145 (LE 309872).

* ***Clypeococcum bisporum*** Zhurb.

The species was previously known only from two Arctic localities: Lena River delta, Russia, and Kotzebue, Alaska, USA (Zhurbenko 2009a).

Specimen examined. **14**: on *Flavocetraria cucullata* (thallus), 17 July 2018, M. Zhurbenko 1872 (LE 309718).

* ***Clypeococcum cetrariae*** Hafellner

Specimen examined. **5**: on *Cetraria laevigata* (thallus), 10 July 2018, M. Zhurbenko 1845 (LE 309644).

* ***Corticifraga peltigerae*** (Fuckel) D. Hawksw. & R. Sant.

Specimens examined. **6**: on *Peltigera kristinssonii* (thallus), 11 July 2018, M. Zhurbenko 18195 (LE 309847); **11**: on *P. rufescens* (thallus), 15 July 2018, M. Zhurbenko 18205 (LE 309848); **18**: on *P. elisabethae* (thallus), 20 July 2018, S. Javkhlan (LE 309808); **19**: on *P. elisabethae* (thallus), 21 July 2018, M. Zhurbenko 18201 (LE 309849).

* ***Cryptodiscus cladoniicola*** (D. Hawksw. & R. Sant.) Pino-Bodas, Zhurb. & S. Stenroos

Specimen examined. **10**: on *Cladonia rangiferina* (podetia), 15 July 2018, M. Zhurbenko 18117a (LE 309748a).

* ***Cryptodiscus epicladonia*** Zhurb. & Pino-Bodas

Specimen examined. **10**: on *Cladonia amaurocraea* (podetia), 15 July 2018, M. Zhurbenko 18112 (LE 309737).

*L ***Dacampia hookeri*** (Borrer) A. Massal.

According to Henssen (1995) this is a lichen often starting its life cycle on species of *Solorina* and subsequently developing its own thallus. It is included in the recent world checklist of lichenicolous fungi as a lichenicolous lichen on *Solorina* (Diederich et al. 2018).

Specimen examined. **13**: on organic soil, 17 July 2018, M. Zhurbenko 1860 (LE 309677).

* ***Dacampia rufescentis*** (Vouaux) D. Hawksw.

Specimen examined. **11**: on *Peltigera rufescens* (thallus), 15 July 2018, M. Zhurbenko 18203 (LE 309849).

Didymocyrtis bryonthae (Arnold) Hafellner

Specimen examined. **5**: on *Lecanora epibryon* (apothecial discs), 10 July 2018, M. Zhurbenko 1850 (LE 309665).

Literature report. MONGOLIA, Khuvsgul Aimag, on *Lecanora epibryon* (Ertz et al. 2015).

Didymocyrtis cladoniicola (Diederich, Kocourk. & Etayo) Ertz & Diederich

Literature report. MONGOLIA, Khentii Aimag, on *Cladonia pyxidata* (Zhurbenko & Pino-Bodas 2017).

****Didymocyrtis consimilis*** Vain.

Specimens examined. **11**: on *Parvoplaca tiroliensis* (apothecial discs), 15 July 2018, M. Zhurbenko 1840 (LE 309648); **17**: on *Caloplaca stillicidiorum* (apothecial discs), 19 July 2018, M. Zhurbenko 1835 (LE 309649).

****Didymocyrtis*** cf. ***consimilis*** Vain.

The examined material perfectly fits *Polycoccum laursenii*, a species previously reported from two localities in Alaska, USA, and the Khabarovsk Territory of Russia growing on *Cladonia pocillum* and *Cladonia* sp. (Zhurbenko & Alstrup 2004; Zhurbenko & Pino-Bodas 2017). Due to its narrowly cylindrical asci, medium brown, thin-walled, ±uniseriate ascospores and the absence of gall formation, this species should be placed within *Didymocyrtis* (Ertz et al. 2015; Hafellner 2015). Based on molecular results of a specimen on *Cladonia* cf. *pocillum* from Luxembourg referred to as *Didymocyrtis* aff. *consimilis*, Ertz et al. (2015) suggested that *Polycoccum laursenii* and *Didymocyrtis consimilis* may be conspecific.

Specimen examined. **5**: on *Cladonia pyxidata* (basal squamules), 10 July 2018, M. Zhurbenko 18134 (LE 309755).

****Didymocyrtis grumantiana*** (Zhurb. & Diederich) Zhurb. & Diederich

The species has been reported from Europe (Luxembourg, Russia, Svalbard) and North America (USA) (Diederich et al. 2007, 2009; Tsurykau & Korchikov 2017) and is here newly documented for Asia.

Specimen examined. **5**: on *Cladonia* sp. (bleached podetia), 10 July 2018, M. Zhurbenko 18136 (LE 309813).

****Didymocyrtis*** cf. ***melanelixiae*** (Brackel) Diederich, Harris & Etayo

Pycnidia 50–60 µm diam. Conidia broadly ellipsoid to broadly oblong with widely rounded ends, occasionally orbicular, (3.6–)4.3–5.3(–6.2) × (3.1–)3.4–3.8(–4.2) µm, L/B = (1.0–)1.2–1.4(–1.8) (n = 100). Conidiogenous cells ampulliform, 6.7 × 5.5 µm. Causes slight discoloration of the host lobes.

The examined specimens perfectly fit the description of the asexual stage (Ertz et al. 2015). However, due to the lack of specimens representing the sexual stage, and in the absence of molecular data, the identification remains somewhat uncertain. So far the species was reported only on members of *Parmeliaceae*. *Flavocetraria*, *Flavopunctelia*, *Hypogymnia*, *Vulpicida* and, surprisingly, *Lecanora* (*Lecanoraceae*), are new host genera (Ertz et al. 2015).

Specimens examined. **4**: on *Flavocetraria cucullata* (thallus), 10 July 2018, M. Zhurbenko 1876a (LE 309716a); **7**: on *Vulpicida juniperina* (thallus), 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309705); **9**: on *Lecanora crustacea* (apothecia, thallus), 13 July 2018, M. Zhurbenko 1855a (LE 309667a); **12**: on *Parmelia saxatilis* (thallus), 16 July 2018, O. Enkhtuya (LE 309794); **18**: on *Hypogymnia physodes* (thallus), 20 July 2018, O. Enkhtuya (LE 309805); **20**: on *Flavopunctelia soredica* (thallus), 26 July 2018, M. Zhurbenko 18168b (LE 309825).

****Didymocyrtis* sp.** (Fig. 2)

Asci narrowly cylindrical, 80–90 × 9 µm. Ascospores pale to medium brown, narrowly obovate/soleiform, usually with broader upper cell, apices mostly rounded, 1(rarely 2–3)-septate, constricted at septum, (7.5–)10.2–14.2(–17.0) × (4.7–)5.0–6.0(–6.6) µm, L/B = (1.6–)1.8–2.6(–3.5) (n = 50), distinctly verruculose, diagonally uniseriate in ascus. Conidiomata *Phoma*-like. Conidia hyaline, orbicular, broadly oblong or broadly ellipsoid, (4.1–)4.9–7.3(–9.2) × (3.7–)4.1–5.3(–6.5) µm, L/B = (1.0–)1.1–1.5(–2.1) (n = 60), smooth-walled, usually with one large guttule.

The examined fungus morphologically recalls *Didymocyrtis bryonthae* and *D. consimilis* (Ertz et al. 2015). However, none of them has been reported on *Rhizoplaca*. Additionally, the former species is characterized by somewhat narrower ascospores and conidia, 4–5 µm and 3–4 µm wide respectively; the latter has indistinctly verruculose ascospores and conidia of different sizes, 4.5–6.5 × 2.5–4.5 µm and (4–)5–6(–7) µm diam. (Ertz et al. 2015).

Specimens examined. Both specimens on apothecia and thalli of *Rhizoplaca chrysoleuca* s.lat. **2**: 9 July 2018, M. Zhurbenko

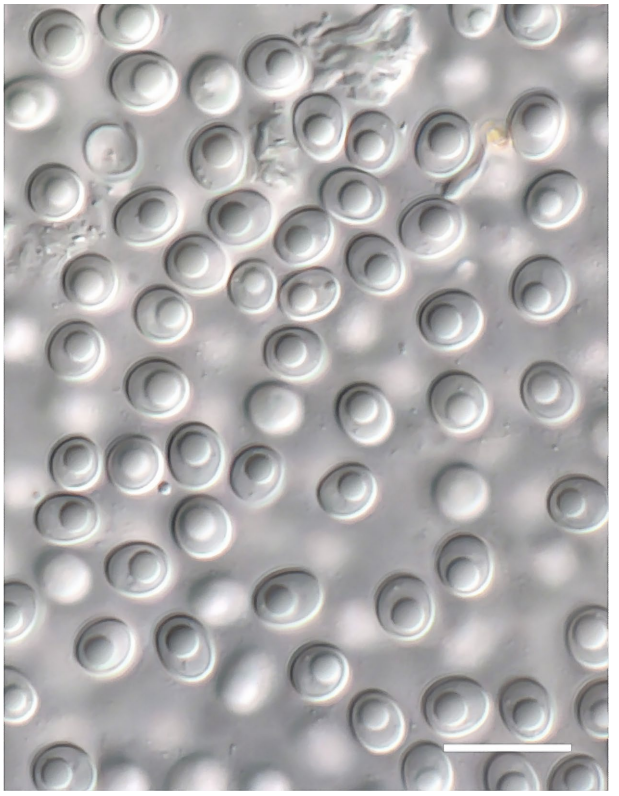

Figure 2. *Didymocyrtis* sp. growing on apothecia and thallus of *Rhizoplaca chrysoleuca* s.lat. (LE 309869). Conidia, in water. Scale bar = 10 µm.

18152 (LE 309868). **9**: 13 July 2018, M. Zhurbenko 18150 (LE 309869).

* ***Echinothecium hypogymniae*** Zhurb., sp. nov. (Fig. 3)

MycoBank MB 831722

Diagnosis: Lichenicolous fungus. Differs from *Echinothecium reticulatum* mainly by the less developed, shorter hyphal outgrowths up to 40 µm long, less superficial ascomata, possibly somewhat larger ascospores, 9.5–13.5 × 4–6 µm vs. 8.5–11 × 3.5–4.5 µm, a distinct pathogenicity, and a different parmelioid host genus, *Hypogymnia* vs. *Parmelia* s.str.

Type: Mongolia, Khuvsugul Aimag, Renchinlkhumbe Sum, Khordolyn Sardig Nuruu Range, E slope of Ulkhani Ekh Uul Mt., 50°37′38″N, 100°02′30″E, elev. 1950 m, *Larix sibirica* forest, on *Hypogymnia bitteri* (thallus), 18 July 2018, M. P. Zhurbenko 18184 (LE 309832 – holotype).

Description. Vegetative hyphae well developed, superficial, conspicuous, black, branched, often at right angles, forming distinct reticulate net on host thallus surface; in squash preparations medium to dark brown (with a K+ olivaceous tinge), 4–8(–12) µm diam., constricted at septa and torulose, consisting of one row of often longitudinally compressed cells with rough, cracked-areolate surface. Ascomata perithecial, black, glossy, subglobose, 40–70 µm diam., with ostiole ~10 µm wide, superficial to sometimes slightly immersed at base, dispersed, with ±straight, not branched outgrowths of septate, brown, rough hyphae, 10–40 × 4–8 µm, sparsely scattered all over its surface and well visible only in microscopic squash preparations. Exciple in surface view entirely medium brown, with olivaceous tinge in K, rough, composed of rounded or polygonal cells 3–12 µm wide, with walls ~1 µm thick; in section 5–8 µm thick, composed of 1–3 layers of tangentially elongated cells. External ostiolar filaments framing the ostiole brown, not branched, aseptate, 5–9 × 2–4 µm, sometimes rudimentary. Internal ostiolar filaments not distinctly observed but possibly present, hyaline, not branched, 0–1-septate, 5–9 × 2.5–4 µm. Interascal filaments absent. Interascal gel I– and K/I–. Asci bitunicate, broadly ellpsoid, ovoid or narrowly pyriform, foot and apical beak indistinct, wall apically somewhat thickened, (19–)23–33(–40) × (11–)12–16(–20) µm (n = 47), 8-spored, I– and K/I–, BCr–. Ascospores hyaline (in squash preparations we occasionally observed outside the asci brown), 1(–2)-septate ascospores of similar size, but it is not clear whether they belong to this species or not, narrowly obovoid with broader upper cell (obskittle-shaped/soleiform), ends rounded, (9.4–)10.6–12.4(–13.6) × (4.0–)4.7–5.3(–5.8) µm, L/B = (2.0–)2.2–2.4(–2.6) (n = 137), with one median septum, constricted at septum, sometime markedly so, occasionally splitting into semi-spores in squash preparations, smooth-walled, rarely with gelatinous sheath 0.5–1 µm thick, usually with conspicuous large and small guttules, BCr–, overlappingly 2–3-seriate or irregularly crowded in ascus. Asexual morph not observed.

Notes. By its ascomata with scattered hyphal outgrowths and the other ascomatal characters, the new species is very similar to the type species of *Echinothecium*, *E. reticulatum* growing on species of *Parmelia* s.str. and doubtfully reported from other parmelioid hosts, though never on *Hypogymnia* (Diederich et al. 2018). This species differs from the examined material of *E. hypogymniae* by its better developed, macroscopically conspicuous, longer hyphal outgrowths up to 60 µm long, generally more superficial ascomata, sometimes even slightly elevated on the hyphal net above the host thallus surface, possibly somewhat smaller ascospores, (8.5–)9.2–10.6(–11.0) × (3.5–)3.7–4.3(–4.6) µm (n = 66, from LE 233319) vs. (9.4–)10.6–12.4(–13.6) × (4.0–)4.7–5.3(–5.8) µm, and the absence of discoloration of the infected host parts. So far the only other accepted species of *Echinothecium* is *E. aerophilum* growing on species of *Alectoria* (Diederich et al. 2018). It clearly differs from *E. hypogymniae* by having ascomata completely free from the substrate, developing on almost free hyphae with few connections

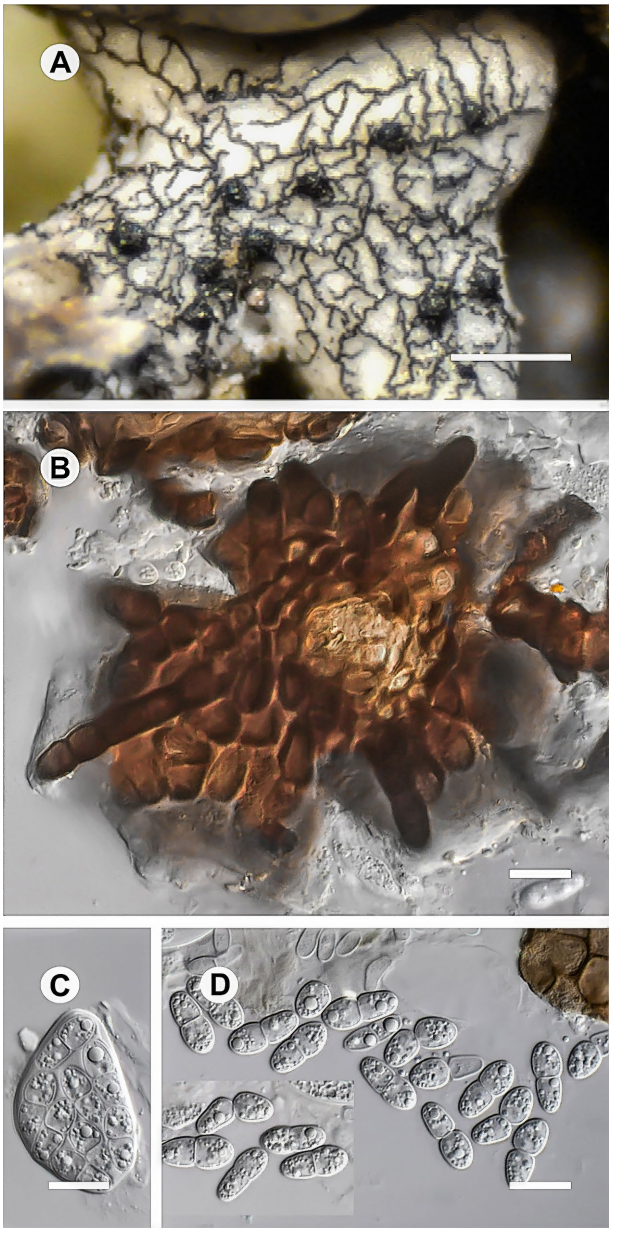

Figure 3. *Echinothecium hypogymniae* growing on thallus of *Hypogymnia bitteri* (holotype). A – ascomata, note strong discoloration of the host thallus; B – squashed ascoma with hyphal outgrowths, in water; C – ascus, in water; D – ascospores, in water. Scales: A = 200 µm; B–D = 10 µm.

to the host, the absence of ascomatal hyphal outgrowths, 4-spored asci, and much larger, pigmented ascospores, 27–32(–37) × 7–9 µm (Alstrup & Cole 1998).

The new species is morphologically also very similar to species of *Sphaerellothecium*, a lichenicolous genus that mainly differs from *Echinothecium* by the absence of the ascomatal hyphal outgrowths/hyphoid appendices (Cáceres & Triebel 2004). So far the genus includes 34 species, 30 of which are associated with one host lichen genus (Diederich et al. 2018). Six species of *Sphaerellothecium* have been known to grow on members of *Parmeliaceae*: *Sphaerellothecium aculeatae* (on *Cetraria*), *S. contextum* (on *Protoparmelia*), *S. leratianum* (on *Brodoa*), *S. parmeliae* (on *Parmelia* s.str.), *S. parmotrematis* (on *Parmotrema*) and *S. usneicola* (on *Usnea*) (Diederich et al. 2018). All these species differ from *Echinothecium hypogymniae* by the absence of ascomatal hyphal outgrowths and a different host selection. Additionally, *S. aculeatae* can be distinguished by it pigmented ascospores; *S. contextum* is distinct in having vegetative hyphae growing inside the epinecral layer of the host apothecia and thallus, and pigmented ascospores; *S. leratianum* is morphologically almost identical but possibly has slightly larger ascomata, 60–70 µm diam.; *S. parmeliae* has smaller ascomata, mainly 20–40 µm diam., arising from black necrotic areas of the host thallus, smaller asci, 19–23 × 9–12.5 µm, and smaller ascospores, 8.5–10 × 3–4 µm; *S. parmotrematis* clearly differs by its immersed to semi-immersed vegetative hyphae and ascomata, and much smaller ascospores, 8–10 × 2.5–3 µm; and *S. usneicola* is characterized by its distinctly halonate ascospores (Triebel 1989; Etayo & Diederich 1998; Gardiennet & Roux 2013; Khodosovtsev et al. 2016; van den Boom 2016; Etayo 2017).

Etymology. The epithet refers to the host lichen genus *Hypogymnia*.

Hosts and distribution. The new species is known from three collections in sparse *Larix sibirica* mountain forest in northern Mongolia. It grows on lobes of *Hypogymnia austerodes*, *H. bitteri* and *H. physodes*, and often causes their strong discoloration.

Additional specimens examined. **1**: on *Hypogymnia austerodes* (thallus), 8 July 2018, M. Zhurbenko 18183 (LE 309831); **17**: on *H. physodes* (thallus), 19 July 2018, M. Zhurbenko 18191a (LE 309834a).

Additional specimens of Echinothecium reticulatum examined for comparison. RUSSIA: Karachaevo-Cherkesiya Republic, Caucasus, Teberda, 43°27′N, 41°44′E, elev. 1400 m, on *Parmelia sulcata* (thallus), 28 Aug. 2012, M. Zhurbenko 1229 (LE 261294); Republic of Sakha (Yakutia), Lena River delta, Cape Krest-Tumsa, 72°22′N, 126°42′E, elev. 50 m, on *P. omphalodes* (thallus), 4 Aug. 1998, M. Zhurbenko 98291 (LE 233379); Chukotka Autonomous Area, Lavrentiya Bay, 65°35′N, 171°00′W, on *P. saxatilis* (thallus), 21 July 1973, I. Makarova (LE 233319).

Echinothecium reticulatum Zopf

Specimens examined. Both specimens on thalli of *Parmelia sulcata*. **2**: 9 July 2018, M. Zhurbenko 18179 (LE 309819); **12**: 16 July 2018, M. Zhurbenko 18178 (LE 309818).

Endococcus hafellneri (Zhurb.) Zhurb., comb. nov.

MycoBank MB 831726

Basionym: *Stigmidium hafellneri* Zhurb., Opuscula Philolichenum 6: 110. 2009. [MB 513015]

Type: Russia, Republic of Sakha (Yakutia), lower Lena River, Tit-Ary Island, 71°58′N, 126°18′E, elev. 30 m, *Larix* forest-tundra, on *Flavocetraria cucullata* (thallus), 20 Aug. 1998, M. P. Zhurbenko 9854 (LE 232546 – holotype!; GZU – isotype!).

The species was originally placed in *Stigmidium* s.lat. with some doubt due to its having ascospores colored at maturity, which is not typical for this genus (Zhurbenko 2009a). Examination of additional material confirmed that this feature is constant, and therefore a more appropriate genus is *Endococcus*, the concept of which (Kainz & Triebel 2004) is in better agreement with the characteristics of the species. *Endococcus hafellneri* was previously known from scattered finds in Russia and Estonia (Zhurbenko 2009a; Suija et al. 2015; Zhurbenko & Kobzeva 2016).

Specimens examined. Both specimens on thalli of *Flavocetraria cucullata*. **7**: 12 July 2018, O. Enkhtuya & S. Javkhlan (LE 309688); **10**: 15 July 2018, O. Enkhtuya & S. Javkhlan (LE 309687).

Endococcus nanellus Ohlert

Specimens examined. Both specimens on phyllocladia and stems of *Stereocaulon tomentosum*. **7**: 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309671); **11**: 15 July 2018, M. Zhurbenko 1859 (LE 309670).

Literature report. MONGOLIA, Arkhangai Aimag, on *Stereocaulon tomentosum* (Zhurbenko & Triebel 2008).

Epicladonia sandstedei (Zopf) D. Hawksw.

Specimens examined. **5**: on *Cladonia pyxidata* (podetia), 10 July 2018, M. Zhurbenko 18110 (LE 309730); **11**: on *C. pocillum* (podetia), 15 July 2018, M. Zhurbenko 18109 (LE 309729); **12**: on *C. gracilis* (basal squamules, podetia), 16 July 2018, O. Enkhtuya (LE 309731); on *C. gracilis* (podetia), 16 July 2018, O. Enkhtuya (LE 309735).

Literature reports. MONGOLIA, Arkhangai Aimag, on *Cladonia ochrochlora*, *C. pyxidata*, *C. subfurcata* and *Cladonia* sp. (Zhurbenko 2009a, Zhurbenko & Pino-Bodas 2017).

Epicladonia stenospora (Harmand) D. Hawksw.

Specimen examined. **18**: on *Cladonia coniocraea* (basal squamules), 20 July 2018, O. Enkhtuya (LE 309765b).

Literature report. MONGOLIA, Arkhangai Aimag, on *Cladonia* sp. (Zhurbenko & Pino-Bodas 2017).

Feltgeniomyces mongolicus Zhurb., sp. nov. (Fig. 4)

MycoBank MB 831723

Diagnosis: Lichenicolous fungus. Differs from *Feltgeniomyces uniseptatus* mainly by its smaller conidiomata, 40–95 µm vs. 200–500 µm wide, aseptate vs. 1-septate, smaller conidia, 5.5–9.5 × 4–5.5 µm vs. 10–13 × 7–8.5 µm, and a different parmelioid host genus, *Hypogymnia* vs. *Hypotrachyna*.

Type: Mongolia, Khuvsugul Aimag, Khatgal Sum, SW coast of Hubsugul Lake, E slope of Ikh Uul Mt., 50°46′45″N, 100°14′11″E, elev. 1660 m, sparse *Larix sibirica* forest, on *Hypogymnia bitteri* (bleached parts of thallus), 19 July 2018, M. P. Zhurbenko 18189 (LE 309830 – holotype).

Description. Vegetative hyphae pale to medium brown, immersed, 2–5 µm thick. Conidiomata blackish, stromatic sporodochia, exciple-like wall not observed, submersed to superficial, convex to applanate, irregularly rounded in surface view, (40–)55–85(–95) µm wide (n = 30), 15–40(–60) µm tall, dispersed to aggregated, sometimes confluent; in section composed of medium to dark brown/orange brown, with a K+ olivaceous tinge, polygonal to rounded cells 5.5–11 × 3.5–8 µm, with walls ~1 µm thick. Conidiophores hardly distinct from stromatic cells. Conidiogenous cells medium olivaceous brown, enteroblastic, terminal, discrete, ampulliform to obpyriform, sometimes percurrently proliferating (to two annellations observed), 6–8 × 5–6 µm. Conidia abundant, medium brown, often with olivaceous tinge, K+ more olivaceous, subglobose, ellipsoid, oblong, narrowly obovate, occasionally cuneiform, reniform or irregular in shape, rounded at both ends or sometimes truncated at base, rarely with small basal frill, solitary, dry, (5.4–)6.3–8.1(–9.3) × (4.0–)4.3–5.1(–5.5) µm, L/B = (1.1–)1.3–1.7(–2.1) (n = 50), aseptate, sometimes with several conspicious guttules, wall often rough but not distinctly verruculose, 0.5–1 µm thick.

Notes. The new species is referred to *Feltgeniomyces* with some hesitation because the conidiomata of the generic type *F. luxemburgensis* are described as sporodochial without mentioning any stroma (Diederich 1990). However, conidiomata of *Feltgeniomyces dichotomus* and *F. uniseptatus* are characterized as stromatic sporodochia (Aptroot et al. 1997; Calatayud & Etayo 2001). The new species also resembles species of *Caeruleoconidia*, *Codonmyces*, *Coniambigua*, *Epaphroconidia*, *Katherinomyces*, *Minutoexcipula*, *Nigromacula*, *Nigropuncta*, *Sclerococcum*, *Xanthoriicola* and *Zevadia*. *Caeruleoconidia* mainly differs from the new species by having cupulate conidiomata composed of greenish blue stromatic cells, greenish blue, holoblastic conidiogenous cells, and greenish blue, sometimes indistinctly catenate, 0(–1)-septate, smooth-walled conidia (Zhurbenko et al. 2015; Zhurbenko & Pino-Bodas 2017). *Codonmyces* differs by the absence of a stroma, well developed, branched conidiophores, campanulate conidiogenous cells and 1-septate conidia (Calatayud & Etayo 1999). *Coniambigua* differs by the sporodochial to pseudopycnidial conidiomata with a hyaline wall, hyaline, presumably holoblastic conidiogenous cells of an irregular form, and conidia that are very variable in form, not truncated at the base (Etayo & Diederich 1995; Diederich et al. 2019). *Epaphroconidia* can be distinguished by the pycnidial conidiomata with blue-green walls, blue-green, globose to ellipsoid conidiogenous cells, and hyaline, holoblastic, globose to subcylindrical, probably sometimes catenate conidia (Calatayud & Atienza 1995). *Katherinomyces* is characterized by pycnidia-like conidiomata and holoblastic conidiogenous cells (Khodosovtsev et al. 2016). *Minutoexcipula* differs by having conidiomata with a delimiting exciple-like rim and distinct, branched conidiophores (Atienza & Hawksworth 1994). *Nigromacula* differs by the pycnidial (cupulate) conidiomata, holoblastic conidiogenous cells, and catenate, (0–)1-septate conidia (Hawksworth 1978; Etayo 2002). *Nigropuncta* differs by the pycnidial conidiomata, holothallic conidiogenous cells, and catenate, multicelled conidia (Hawksworth 1981). *Sclerococcum* differs by the integrated, not very distinct, mono- or polyblastic conidiogenous cells, and acropleurogenous, catenate, at least rarely septate conidia (Hawksworth 1975, 1979). *Xanthoriicola* differs by the absence of stromata, well developed, branched conidiophores, and globose, spinulose conidia (Hawksworth & Punithalingam 1973). *Zevadia* differs by the branched conidiophores, not percurrent conidiogenous cells, and 0(–1)-septate conidia in short chains (David & Hawksworth 1995).

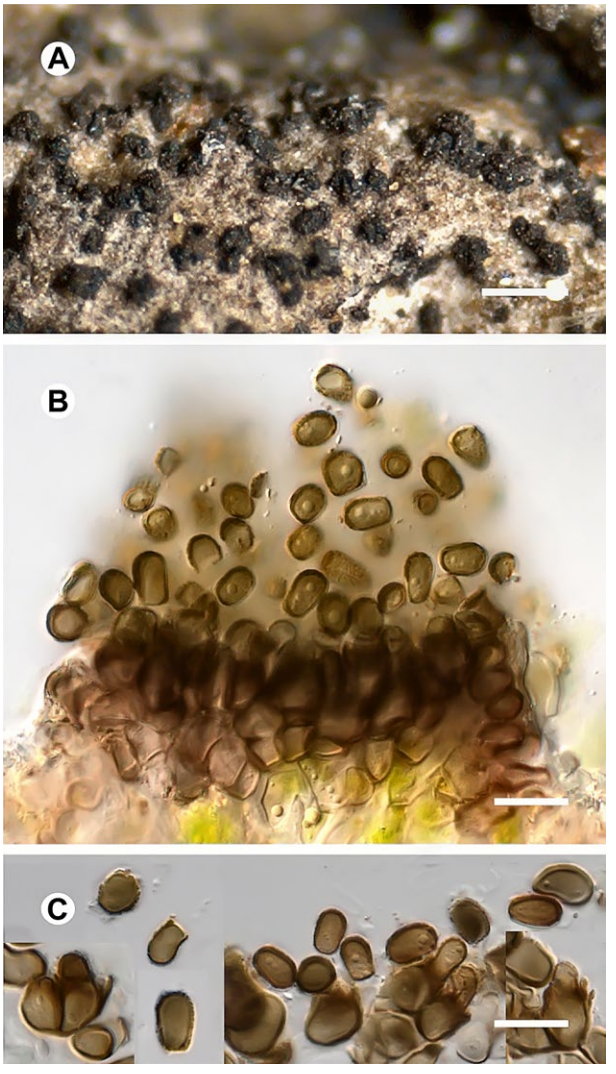

Figure 4. *Feltgeniomyces mongolicus* growing on thallus of *Hypogymnia bitteri* (holotype). A – conidiomata; B – section through conidioma and conidia, in water; C – conidiogenous cells and conidia, in K. Scales: A = 200 µm; B, C = 10 µm.

Compared to the other species of *Feltgeniomyces*, the new species is most similar to *F. uniseptatus*, which is also the only other species of the genus growing on *Parmeliaceae* (Diederich et al. 2018). However, this species clearly differs from *Feltgeniomyces mongolicus* by its larger conidiomata (200–500 µm diam.), 1-septate, larger conidia (10–13 × 7–8.5 µm), and a different host genus (*Hypotrachyna*) (Aptroot et al. 1997).

Etymology. The epithet refers to Mongolia, where the type was collected.

Host and distribution. The new species is yet known only from the holotype collected on the thallus of *Hypogymnia bitteri* (*Parmeliaceae*) in sparse *Larix sibirica* mountain forest in northern Mongolia. Infections are associated with bleached parts of the host lobes.

* ***Graphium aphthosae*** Alstrup & D. Hawksw.

Specimen examined. **5**: on *Peltigera leucophlebia* (moribund basal parts of lobes), 10 July 2018, O. Enkhtuya (LE 309810a).

* ***Heterocephalacria bachmannii*** (Diederich & M. S. Christ.) Millanes & Wedin

Specimen examined. **10**: on *Cladonia amaurocraea* (podetia), 15 July 2018, O. Enkhtuya & S. Javkhlan (LE 309746).

* ***Kalchbrenneriella cyanescens*** (Kalchbr.) Diederich & M. S. Christ.

The species is known from North America, Europe, Asia and Oceania, but probably often overlooked, as it was previously documented in Asia only from India (Diederich 2002; Joshi et al. 2016).

Specimen examined. **17**: on *Usnea perplexans* (stems and branches), 19 July 2018, M. Zhurbenko 18106b (LE 309726b).

* **Leotialean fungus** (Fig. 5)

The examined material is very similar to the fungus described under this name in Spribille et al. (2010: 463) from Alaska (USA) growing on *Cetraria ericetorum*. In both cases ascospores were not found, preventing a confident determination of its genus without molecular data.

Specimen examined. **12**: on *Cetraria laevigata* (thallus), 16 July 2018, M. Zhurbenko 1841 (LE 309883).

* ***Lichenochora*** **sp.**

Ascomata perithecial, immersed, ~300 µm diam. *Asci* 8-spored. Ascospores hyaline, narrowly obovoid (heteropolar) or sometimes ellipsoid (homopolar), (11.9–)14.4–18.0(–20.0) × (7.1–)8.1–9.5(–10.3) µm, L/B = (1.3–)1.6–2.0(–2.4) (n = 50), (0–)1-septate, sometimes slightly constricted at septum, distinctly verruculose, without halo. Infected parts of host lobes somewhat swollen and darkened.

Figure 5. Leotialean fungus growing on thallus of *Cetraria laevigata* (LE 309883). Scale bar = 200 µm.

Five species of *Lichenochora* are known to grow on *Physcia* species (Diederich et al. 2018), none of which correspond to the examined fungus. *Lichenochora aipoliae* differs from the former by its 4-spored asci and homopolar, smaller ascospores, 12–15.5 × 5.5–7.5 µm; *L. galligena* has homopolar, smaller ascospores, 9–11 × 6–8 µm; *L. obscuroides* differs by smooth-walled, narrower ascospores, 15–18 × 5–7 µm; *L. physciicola* differs by shorter ascospores, 11–13(–14) × 7–9 µm, whereas *L. polycoccoides* and *L. weillii* are characterized by shorter ascospores, 12–14 × 8–9 µm and 10–12 × 8–9.5 µm respectively (Werner 1937; Hafellner 1989; Ihlen & Wedin 2005; Etayo & Navarro-Rosinés 2008).

Specimen examined. **12**: on *Physcia alnophila* (thallus), M. Zhurbenko 18139 (LE 309873).

* ***Lichenoconium erodens*** M. S. Christ. & D. Hawksw.

Specimens examined. **4**: on *Flavocetraria cucullata* (thallus), 10 July 2018, M. Zhurbenko 1876b (LE 309716b); **6**: on *F. cucullata* (thallus), 11 July 2018, M. Zhurbenko 1873 (LE 309717); **17**: on *Mycobilimbia carneoalbida* (apothecia), 19 July 2018, M. Zhurbenko 1833 (LE 309655); **18**: on *M. carneoalbida* (apothecia), 20 July 2018, M. Zhurbenko 1831 (LE 309654).

* ***Lichenoconium lecanorae*** (Jaap) D. Hawksw.

Specimens examined. **9**: on *Lecanora crustacea* (apothecial discs), 13 July 2018, M. Zhurbenko 1849 (LE 309660); **20**: on *Rhizoplaca chrysoleuca* s.lat. (apothecial discs), 26 July 2018, M. Zhurbenko 18153 (LE 309870).

* ***Lichenoconium pyxidatae*** (Oudem.) Petr. & Syd.

Specimens examined. All specimens on podetia and basal squamules of *Cladonia pyxidata*. **12**: 16 July 2018, O. Enkhtuya (LE 309763); **18**: 20 July 2018, O. Enkhtuya (LE 309768); **19**: 21 July 2018, O. Enkhtuya (LE 309754).

Lichenoconium usneae (Anzi) D. Hawksw.

Specimens examined. **5**: on *Cladonia pyxidata* (basal squamules, podetia), 10 July 2018, M. Zhurbenko 18135 (LE 309768); **17**: on *Hypogymnia bitteri* (thallus), 19 July 2018, M. Zhurbenko 18192 (LE 309828); **19**: on *H. bitteri* (thallus), 21 July 2018, M. Zhurbenko 18186 (LE 309827); **20**: on *Flavopunctelia soredica* (thallus), 26 July 2018, M. Zhurbenko 18169b (LE 309821).

Literature report. MONGOLIA, Zavkhan Aimag, on *Cladonia chlorophaea* s.lat. (Zhurbenko & Pino-Bodas 2017).

* ***Lichenopeltella cetrariae*** (Bres.) Höhn.

Specimen examined. **13**: on *Cetraria laevigata* (thallus), 17 July 2018, M. Zhurbenko 1842 (LE 309643).

* ***Lichenopeltella cladoniarum*** E. S. Hansen & Alstrup

Specimens examined. All specimens on podetia of *Cladonia rangiferina*. **7**: 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309754b); **10**: 15 July 2018, M. Zhurbenko 18123 (LE 309759), M. Zhurbenko 18124b (LE 309758b).

Lichenosticta alcicorniaria (Linds.) D. Hawksw.

Specimen examined. **12**: on *Cladonia pyxidata* (basal squamules, mostly their underside, occasionally podetia), 16 July 2018, O. Enkhtuya (LE 309734).

Literature reports. MONGOLIA, Arkhangai Aimag and Bulgan Aimag, on *Cladonia chlorophaea* s.lat., *C. cornuta*, *C. macroceras*, *C. pleurota* and *C. pyxidata* (Zhurbenko 2009a; Zhurbenko & Pino-Bodas 2017).

Lichenostigma alpinum (R. Sant., Alstrup & D. Hawksw.) Ertz & Diederich

Specimen examined. **13**: on a terricolous, sterile, C–, K–, P– *Ochrolechia*-like lichen (thallus), 17 July 2018, M. Zhurbenko 1866 (LE 309685).

Literature report. MONGOLIA, Uvs Aimag, on *Cladonia rangiferina* (Zhurbenko & Pino-Bodas 2017).

***Lichenostigma* sp.**

The species is represented only by the asexual stage, which is morphologically very similar to *Lichenostigma alpinum* s.lat. mainly growing on *Lepra*, *Ochrolechia* and *Varicellaria* (Ertz et al. 2014). Compared with the latter species it has the following values of diagnostic characters: conidiomata (30–)55–120(–165) µm wide (n = 65) vs. (20–)25–100(–150) µm wide in *Lichenostigma alpinum* s.lat.; conidia subspherical, (7.6–)9.8–12.4(–13.5) µm wide (n = 50) vs. (10–)11.2–13.6(–15) µm wide, in optical section composed of 6–10 cells vs. (4–)6–10(–12) cells; cells of conidia (2.5–)3.0–3.9(–4.4) µm (n = 40) vs. (2.9–)3.5–4.9(–5.8) µm.

Specimens examined. **19**: on *Xanthoparmelia conspersa* (eroded parts of thallus), 21 July 2018, O. Enkhtuya (LE 309790b); on *X. stenophylla* (thallus), 21 July 2018, O. Enkhtuya (LE 309788); **20**: on *X. stenophylla* (thallus, mostly its eroded parts), 26 July 2018, M. Zhurbenko 18171 (LE 309875).

Lichenostigma chlaroterae (F. Berger & Brackel) Ertz & Diederich

The species is known from North America, Europe and Asia (Berger & Brackel 2011; Ertz et al. 2014; Zhurbenko 2014), but poorly recorded. It was previously documented in Asia only from two localities in Russia in Krasnodar Territory and the Far East Federal District (Zhurbenko 2014, 2017).

Specimen examined. **9**: on *Lecanora crustacea* (apothecia, thallus), 13 July 2018, M. Zhurbenko 1855b (LE 309667b).

Lichenostigma cosmopolites Hafellner & Calat.

Specimens examined. **9**: on *Xanthoparmelia conspersa* (thallus), 13 July 2018, M. Zhurbenko 18163b (LE 309843b); M. Zhurbenko 18156b (LE 309838b); on *X. stenophylla* (thallus), 13 July 2018, M. Zhurbenko 18164 (LE 309857); **19**: on *X. conspersa* (eroded parts of thallus), 21 July 2018, O. Enkhtuya (LE 309790a); on *X. stenophylla* (thallus), 21 July 2018, M. Zhurbenko 18165 (LE 309855); **20**: on *X. conspersa* (thallus), 26 July 2018, M. Zhurbenko 18212 (LE 309874); on *X. stenophylla* (thallus), 26 July 2018, M. Zhurbenko 18170 (LE 309856); M. Zhurbenko 18210 (LE 309857).

Lichenostigma elongatum Nav.-Ros. & Hafellner

Literature reports. MONGOLIA, Omnogobi Aimag, on unspecified host species (Navarro-Rosinés & Hafellner 1996).

Lichenostigma maureri Hafellner

Specimens examined. **3**: on *Evernia mesomorpha* (thallus), 9 July 2018, M. Zhurbenko 1896 (LE 309714); **6**: on *E. mesomorpha* (thallus), 11 July 2018, M. Zhurbenko 1897 (LE 309712); **10**: on *E. mesomorpha* (thallus), 15 July 2018, O. Enkhtuya & S. Javkhlan (LE 309771); **12**: on *Usnea perplexans* (thallus), 16 July 2018, M. Zhurbenko 18105 (LE 309724); O. Enkhtuya (LE 309722); **16**: on *E. mesomorpha* (thallus), 18 July 2018, M. Zhurbenko 1898 (LE 309713); **17**: on adjacent *E. mesomorpha* and *U. hirta* (thalli), 19 July 2018, M. Zhurbenko 1899 (LE 309711); on *U. perplexans* (thallus), 19 July 2018, M. Zhurbenko 18106a (LE 309726a); **18**: on *U. perplexans* (thallus), 20 July 2018, O. Enkhtuya (LE 309723); **19**: on *U. perplexans* (thallus), 21 July 2018, M. Zhurbenko 18108 (LE 309728); **20**: on *U. perplexans* (thallus), 26 July 2018, M. Zhurbenko 18107a (LE 309727a).

Literature report. MONGOLIA, Arkhangai Aimag, on *Cladonia ochrochlora* (Zhurbenko & Pino-Bodas 2017).

Lichenothelia rugosa (G. Thor) Ertz & Diederich

Syn. *Lichenostigma rugosum* G. Thor

Specimen examined. **20**: on *Diploschistes scruposus* (apothecia, thallus), 26 July 2018, O. Enkhtuya & S. Javkhlan (LE 309668).

Literature report. MONGOLIA, Tuv Aimag, on *Diploschistes muscorum* (Zhurbenko 2009a).

Marchandiomyces corallinus (Roberge) Diederich & D. Hawksw.

Specimens examined. **9**: on *Anamylopsora pulcherrima* and *Montanelia tominii* (thalli), 13 July 2018, M. Zhurbenko 1830c (LE 309653c); on *Parmelia omphalodes* (thallus), 13 July 2018, M. Zhurbenko 18181 (LE 309824).

Merismatium decolorans (Arnold) Triebel

Specimens examined. **11**: on *Bryobilimbia hypnorum* (thallus), 15 July 2018, M. Zhurbenko 1839b (LE 309651a); on *Mycobilimbia berengeriana* (thallus), 15 July 2018, M. Zhurbenko 1838 (LE 309650); **14**: on *M. berengeriana* (thallus), 17 July 2018, M. Zhurbenko 1879 (LE 309692).

Merismatium heterophractum (Nyl.) Vouaux

Specimen examined. **11**: on *Bryoplaca sinapisperma* (thallus), 15 July 2018, M. Zhurbenko 1837 (LE 309647).

Merismatium nigritellum (Nyl.) Vouaux

Specimen examined. **13**: on *Megaspora verrucosa* (thallus) and surrounding plant remnants, 17 July 2018, M. Zhurbenko 1878a (LE 309691a).

Minutoexcipula cf. ***beaglei*** Etayo (Fig. 6)

The examined material differs from the species protologue in having somewhat darker and larger conidia, (4.8–)5.8–7.6(–9.2) × (2.4–)3.3–4.1(–4.6) µm, L/B = (1.2–)1.5–2.1(–2.6) (n = 70) vs. 5–6.5 × 2.5–3 µm, and in the presence of a dark brown, basal, paraplectenchymatous exciple (Etayo & Sancho 2008; J. Etayo, pers. comm.).

Minutoexcipula beaglei was previously known only from southern Chile, growing on *Lecanora* sp. and *L.* aff. *expallens* (Etayo & Sancho 2008).

Specimen examined. **13**: on *Lecanora intumescens* (thallus) growing on bark of deciduous tree, 17 July 2018, M. Zhurbenko 1870 (LE 309884).

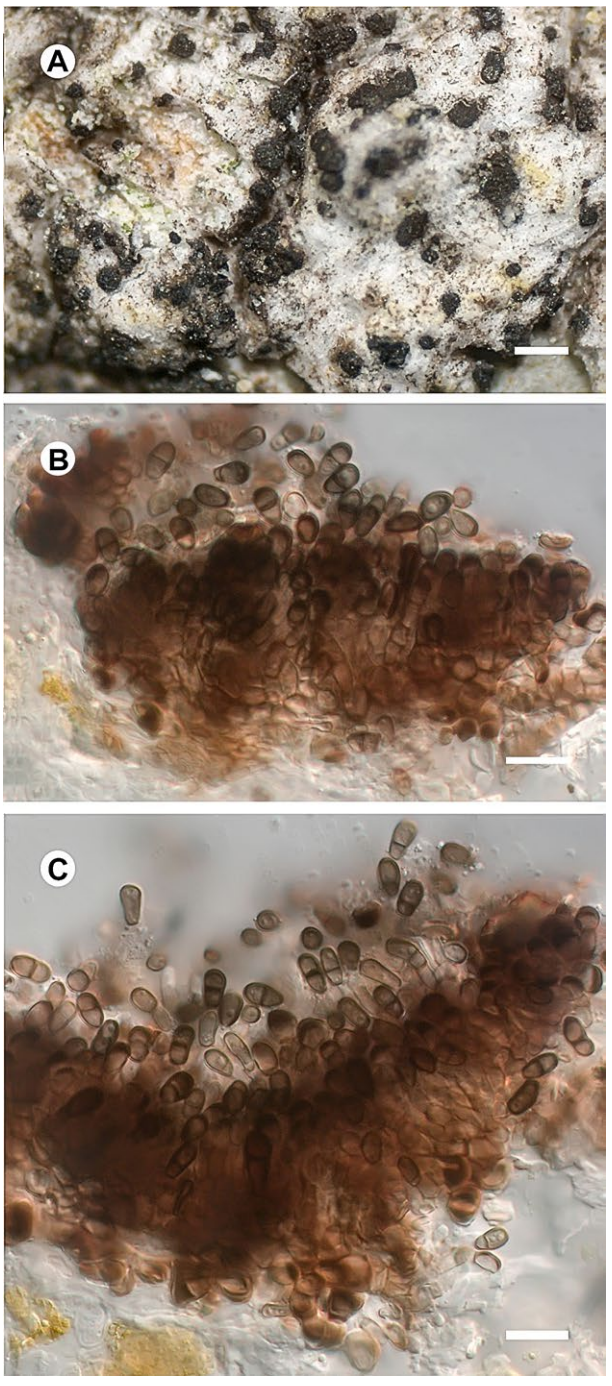

Figure 6. *Minutoexcipula* cf. *beaglei* growing on thallus of *Lecanora intumescens* (LE 309884). A – conidiomata; B, C – section through conidiomata and conidia, in water. Scales: A = 200 µm; B, C = 10 µm.

* ***Minutoexcipula tuerkii*** Hafellner

Specimen examined. **13**: on *Pertusaria glomerata* (thallus), 17 July 2018, M. Zhurbenko 1868a (LE 309703a).

* ***Muellerella erratica*** (A. Massal.) Hafellner & V. John

Specimen examined. **2**: on *Aspicilia* sp. (apothecia, thallus), 9 July 2018, O. Enkhtuya & S. Javkhlan (LE 309678).

* ***Muellerella lichenicola*** (Sommerf.) D. Hawksw.

Specimens examined. **2**: on *Gyalolechia flavovirescens* (apothecial discs), 9 July 2018, O. Enkhtuya & S. Javkhlan (LE 309646); **12**: on *Imshaugia aleurites* (thallus), 16 July 2018, O. Enkhtuya (LE 309786); **13**: on *Pertusaria glomerata* (thallus), 17 July 2018, M. Zhurbenko 1868b (LE 309703b).

Muellerella pygmaea (Körb.) D. Hawksw.

The species grows on various lichen genera (Brackel 2014) but was not previously documented on *Anamylopsora*.

Specimen examined. **9**: on *Anamylopsora pulcherrima* (thallus), 13 July 2018, M. Zhurbenko 1830a (LE 309652a).

Literature reports. MONGOLIA, Ömnögobi Aimag, on *Acarospora* spp. (Huneck et al. 1992).

* ***Neolamya peltigerae*** (Mont.) Theiss. & Syd.

Specimens examined. **2**: on *Peltigera lepidophora* (thallus), 9 July 2018, O. Enkhtuya (LE 309807); **11**: on *P. rufescens* (thallus), 15 July 2018, M. Zhurbenko 18206 (LE 309846).

* ***Nesolechia cetrariicola*** (Linds.) Arnold (Fig. 7)

Ascomata apothecial, evenly medium to dark brown or almost black, glossy, epruinose, with rough surface, erumpent, later superficial, ±roundish in surface view, plane to slightly convex, without distinct margin, never constricted at base, up to 0.6 mm wide, aggregated, delimited to occasionally confluent; developing on both sides of host lobes, which become enlarged and spoon-shaped under heavy infections but not discolored. Epihymenium medium brownish orange, without visible crystals, sometimes obscurely granular, sometimes covered by layer of colorless gel, ~5 µm thick. Hymenium pale brownish orange above, pale brownish orange to colorless below, 70–80 µm tall, occasionally obscurely granular, hymenial gel I–. Paraphyses repeatedly septate, apical cells more or less swollen, sometimes with dark brown apical rim. Hypothecium medium brown, 40–100 µm tall, composed of thick-walled, circular or irregularly elongated cells to 10 µm wide, develops below thin subhymenium and laterally, forming a kind of exciple proper, I–. Colorless layer 50–120 µm thick of unclear origin, probably referring to host cortex, composed of thick-walled, circular or irregularly elongated cells to 15 µm wide is developed below hypothecium. Asci clavate to broadly clavate, with strongly thickened apical wall, 50–65 × 16–22 µm. Ascospores hyaline, ellipsoid, narrowly ellipsoid or almost fusiform, with rather acute, sometimes pointed ends, occasionally forming apiculi to 2 µm long at one or both ends, homopolar, aseptate, (10.8–)13.6–16.6(–18.6) × (4.3–)5.5–7.1(–8.0) µm, L/B = (1.7–)2.1–2.7(–3.5) (n = 69), with smooth wall 0.5–0.7 µm thick throughout, non-halonate, usually with many conspicuous large and small guttules, irregularly biseriate in ascus. Asexual morph not observed.

So far the generic affinities of the species have remained somewhat uncertain (Diederich et al. 2018), However, the examined material fits well the diagnostic characters of *Nesolechia* as discussed below under *Phacopsis vulpicidae*. By the blackish ascomata and the brown hypothecium, the species is morphologically and anatomically very similar to *Nesolechia oxyspora* var. *fusca*. We provisionally treat it here as a distinct taxon

Figure 7. *Nesolechia cetrariicola* growing on thallus of *Cetraria laevigata* (LE 309640). Note enlarged and spoon-shaped infected host lobes. Scale bar = 1 mm.

until more is known about the morphological variability of the material growing on *Cetraria*.

The species was previously known in Asia only from a single find in the Krasnoyarsk Territory of Russia (Zhurbenko & Hafellner 1999).

Specimens examined. Both specimens on thalli of *Cetraria laevigata*. **7**: 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309640, herb. Diederich); **10**: 15 July 2018, O. Enkhtuya & S. Javkhlan (LE 309641b).

* ***Nesolechia oxyspora*** (Tul.) A. Massal. var. ***fusca*** (Triebel & Rambold) Diederich

Specimens examined. All specimens on thalli of *Xanthoparmelia conspersa*. **2**: 9 July 2018, M. Zhurbenko 18157a (LE 309841a); **9**: 13 July 2018, M. Zhurbenko 18162a (LE 309840a); **20**: 26 July 2018, M. Zhurbenko 18173 (LE 309839).

* ***Nesolechia oxyspora*** (Tul.) A. Massal. var. ***oxyspora***

Specimens examined. **9**: on *Parmelia omphalodes* (thallus), 13 July 2018, M. Zhurbenko 18180b (LE 309817b); **17**: on *Melanohalea olivacea* (thallus), 19 July 2018, M. Zhurbenko 1858 (LE 309669); **17**: on *Parmelia sulcata* (thallus), 19 July 2018, M. Zhurbenko 18182b (LE 309815b); **18**: on *P. sulcata* (thallus), 20 July 2018, O. Enkhtuya (LE 309791a); **19**: on *P. sulcata* (thallus), 21 July 2018, M. Zhurbenko 18175b (LE 309816b).

* ***Niesslia cladoniicola*** D. Hawksw. & W. Gams

Specimen examined. **10**: on *Cladonia rangiferina* (podetia), 15 July 2018, M. Zhurbenko 18114 (LE 309740).

* ***Niesslia keissleri*** Zhurb.

Specimens examined. **7**: on *Cladonia arbuscula* (podetia), 11 July 2018, M. Zhurbenko 18137 (LE 309812); **10**: on *C. amaurocraea* (podetia), 15 July 2018, M. Zhurbenko 18208 (LE 309811).

* ***Phacopsis cephalodioides*** (Nyl.) Triebel & Rambold

Specimen examined. **17**: on *Hypogymnia bitteri* (thallus), 19 July 2018, M. Zhurbenko 18193 (LE 309826).

* ***Phacopsis vulpicidae*** Zhurb. & Diederich, sp. nov. (Fig. 8)

MycoBank MB 831724

Diagnosis: Lichenicolous fungus. Differs from *Phacopsis vulpina* mainly by the smaller ascospores, 5–12 × 4–5.5 µm vs. 13–16 × 5–7 µm, and a different parmelioid host genus, *Vulpicida* vs. *Letharia*.

Type: Mongolia, Khuvsugul Aimak, Renchinlkhumbe Somon, headwaters of Ar Khordolyn gol River, NE slope of Khordolyn Sardig Nuru Range, 50°53′32″N, 99°56′50″E, elev. 2050 m, upper limit of *Larix sibirica* forest, on terricolous *Vulpicida juniperina* (thallus), 15 July 2018, M. P. Zhurbenko 1889 (LE 309877 – holotype, herb. Diederich – isotype).

Description. Vegatative hyphae not observed. Ascomata apothecial, medium to dark brown or almost black, often irregularly pigmented, particularly when young; glossy, epruinose, with rough surface, erumpent, later superficial, often compound due to fusion of many neighboring initials and then often tuberculose, irregularly convex due to development over gall-like swellings of host lobes induced by the fungus, sometimes constricted at base, without distinct margin, up to 3 mm wide, dispersed to aggregated. Exciple not developed. Epihymenium medium brownish orange (K+ brown), without visible crystals, sometimes obscurely granular, often covered by layer of colorless gel, ~5 µm thick, insoluble in K (evidently binding upper parts of paraphyses). Hymenium medium brownish orange above, pale brownish orange to colorless below, occasionally obscurely granular, 40–55 µm tall, hymenial gel I–, KI–. Paraphyses occasionally branched and anastomosing, 2–4 µm thick, repeatedly septate, sometimes distinctly swollen between septa; apical cells more or less swollen, 3–6.5 µm wide, sometimes with dark brown apical rim. Hypothecium colorless, 25–45 µm tall, composed of thick-walled, circular or irregularly elongated cells to 10 µm wide, I– and K/I–. Asci of *Lecanora*-type, clavate to broadly clavate, with strongly thickened apical wall, (35–)38–46 × (11–)13–17(–18) µm (n = 12, in I), 8-spored, wall I– and K/I+ pale blue, tholus I– and K/I+ blue except for I– and K/I– zone above axial body. Ascospores hyaline, narrowly to broadly ellipsoid, occasionally subglobose, with obtuse or rarely rather acute ends, homopolar, aseptate, (4.9–)8.0–10.6(–12.2) × (3.9–)4.4–5.2(–5.7) µm, L/B = (1.0–)1.6–2.2(–3.1) (n = 104), with smooth wall 0.5–0.7 µm thick throughout, non-halonate, usually with many conspicuous large and small guttules, irregularly biseriate in ascus. Conidiomata pycnidial, rare, intermixed with ascomata, from which they are hardly distinguishable macroscopically, immersed, subglobose, 50–100 µm wide; conidiogenous cells phialidic, enteroblastic, lageniform, 7–9.5 × 2–3 µm; conidia hyaline, bacilliform, ellipsoid or narrowly ellipsoid, truncated at base, aseptate, (3.8–)4.6–6.2(–7.8) × (1.6–)1.7–2.1(–2.4) µm, L/B = (1.8–)2.2–3.4(–4.6) (n = 45).

Notes. According to Triebel & Rambold (1995), species of *Phacopsis* s.lat., including *Nesolechia* and *Raesaenenia*, are mainly distinguished by the ascospore

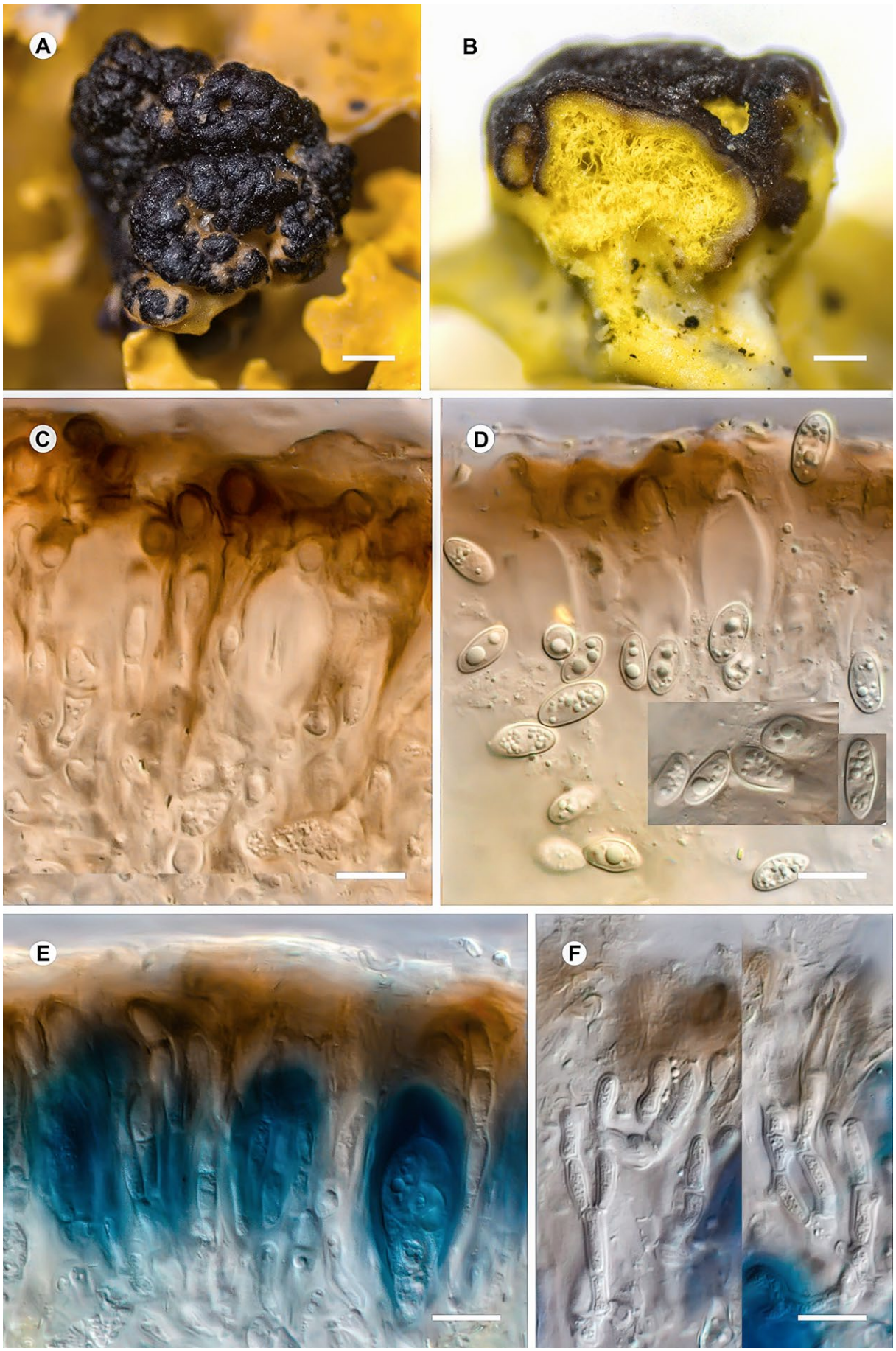

Figure 8. *Phacopsis vulpicidae* growing on thallus of *Vulpicida juniperina* (A – LE 309881; B, D, E – LE 309706; C, F – holotype). A – ascoma; B – section through ascoma; C – hymenium, in water; D – ascospores, in water; E – hymenium and asci, in K/I; F – paraphyses, in K/I. Scales: A, B = 200 µm; C–F = 10 µm.

characters, the color of the hypothecium and its reaction with I, and the host selection. *Raesaenenia huuskonenii* is easily distinguished from *Nesolechia* and *Phacopsis* species by its oblong ascospores with an apically thickened wall and elongate ascomata. *Phacopsis* s.str. species are distinguished from *Nesolechia* by strongly convex gall-like ascomata, often with a constricted base when mature, often densely aggregated or confluent and irregularly shaped, not clearly delimited at the margin, when young often irregularly pigmented, being dark mainly in central parts, pale and concolorous to the host around, frequently more than 0.5 mm wide (vs. not gall-like, flat or convex, never with a constricted base, not or loosely aggregated, not confluent, usually regularly roundish, with a clearly delimited margin, uniformly pigmented even when young, rarely exceeding 0.4 mm wide), a missing or reduced hypothecium (vs. a distinct proso- or scleroplectenchymatous hypothecium below the subhymenium), and subspherical to broadly ellipsoid ascospores with rounded ends, rarely fusiform (vs. lemon-shaped, fusiform or falciform ascospores with rather pointed ends, rarely ellipsoid).

The new species, *P. vulpicidae*, thus clearly belongs to *Phacopsis* s.str. The ascospores in this species are mainly 8–10.5 × 4.5–5 µm, distinctly smaller than in all other *Phacopsis* species listed in Diederich et al. (2018). The ascospores in *P. cephalodioides*, another species with brown ascomata, are similar in length but much broader, 7–11(–12) × (4–)5–7(–8) µm (Triebel & Rambold 1988). Ascomata of *P. lethariellae*, *P. oroarcticae*, *P. usneae* and *P. vulpina* are entirely black, and the ascospores are larger, over 11 × 5 µm (Triebel & Rambold 1988; Triebel et al. 1995; Hawksworth & Iturriaga 2006; Zhurbenko 2010b). *Phacopsis usneae* is further distinguished by its dark bluish grey epihymenium, much broader (to 10 µm) apical cells of paraphyses, and dark brown hypothecium (Hawksworth & Iturriaga 2006).

Etymology. The epithet refers to the host lichen genus *Vulpicida*.

Host and distribution. The new species is known from arctic and mountain tundra and taiga biomes of Europe, Asia and North America [Sweden, Russia, Mongolia, USA (Alaska)] growing on thalli of terricolous or rarely corticolous (one specimen of 11) populations of *Vulpicida juniperina* (*Parmeliaceae*). Infections induce bullate swellings of the host lobes; other visible damage to the host not observed.

Additional specimens examined (all on thalli of *Vulpicida juniperina*, growing on soil except for Wedin 6358 growing on twigs). SWEDEN: Jämtland, Frostviken par., W of Lake Leipikvattnet, Bjurälven Nat. Res., along the River Bjurälven, 64°55′N, 14°06′E, elev. 500 m, on twigs, 26 Sept. 2000, M. Wedin 6358 (UPS). RUSSIA: Komi Republic, Northern Ural, headwaters of Pechora River, 165 km ESE of Troitsko-Pechorsk, top of Mt. Medvezhya, 62°03′N, 59°03′E, elev. 700 m, mountain tundra, 2 July 1997, M. Zhurbenko 97424 (LE 309882); Republic of Sakha (Yakutia), Lower Lena River, Kharaulakh Range, Yuryung-Kysam urochishche opposite Tit-Ary Island, 71°59′N, 126°19′E, elev. 150 m, tundra, 19 Aug. 1998, M. Zhurbenko 9859 (GZU, LE 309880). MONGOLIA: **5**: 10 July 2018, M. Zhurbenko 1893a (LE 309709a); **7**: 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309704); **14**: 17 July 2018, M. Zhurbenko 1890 (LE 309706). USA: Alaska, 140 km E of Kotzebue, NE margin of the Great Kobuk Sand Dunes near Ahnewetut Creek, 67°02′N, 158°50′W, elev. 50 m, open lichen heath among sparse *Picea glauca–Populus balsamifera* forest, 30 July 2000, M. Zhurbenko 00155 (LE 309881); Seward Peninsula, 7 km NE of Nome, Newton Peak, 64°33′21″N, 165°21′23″W, elev. 220 m, *Salix*–dwarf shrub–lichen–moss tundra, 4 Sept. 2001, M. Zhurbenko 01123 (LE 309878); Brooks Range, Atigun Canyon, 68°26′42″N, 149°20′40″W, elev. 900 m, moss–lichen–*Dryas* tundra on limestones, 31 July 2001, M. Zhurbenko 01310 (LE 309879); same canyon, Galbraith Lake, 68°27′49″N, 149°21′35″W, elev. 850 m, arctic tundra, 20 Aug. 2010, L. Muggia & J. Hafellner (TSB, herb. Diederich).

**Phoma peltigerae* (P. Karst.) D. Hawksw.

Specimen examined. **5**: on *Peltigera leucophlebia* (thallus), 10 July 2018, M. Zhurbenko 18200 (LE 309850).

**Phoma* sp.

Pycnidia up to 120 µm diam. Conidiogenous cells ampulliform, 4.6–5.7 × 3.6–4 µm. Conidia narrowly oblong to narrowly ellipsoid, (4.6–)5.9–7.1(–7.7) × (2.3–)2.4–2.6(–2.7) µm, L/B = (1.9–)2.4–2.8(–3.2) (n = 33). Causes slight discoloration of host lobes.

Specimen examined. **5**: on *Vulpicida juniperina* (thallus), 10 July 2018, M. Zhurbenko 1894c (LE 309701c).

**Plectocarpon hypogymniae* Zhurb. & Diederich

The species was previously known from three localities in Russia (Republic of Tuva and Trans-Baikal Territory; Zhurbenko et al. 2008; Zhurbenko & Yakovchenko 2014). In specimen Zhurbenko 18187 we observed, among ascomatal loculi, immersed pycnidia with hyaline, bacilliform, aseptate conidia 4.5 × 1.5 µm, not previously documented for this species.

Specimens examined. Both specimens on thalli of *Hypogymnia bitteri*. **18**: 20 July 2018, O. Enkhtuya (LE 309797a); **19**: 21 July 2018, M. Zhurbenko 18187 (LE 309806).

**Polycoccum clauzadei* Nav.-Ros. & Cl. Roux

The species was previously known in Asia from Russia (Primorye Territory and Republic of Buryatia) and India (Urbanavichene & Urbanavichus 2009; Kondratyuk et al. 2015; Joshi et al. 2016).

Specimen examined. **9**: on *Rusavskia elegans* (thallus), 13 July 2018, M. Zhurbenko 18143 (LE 309859).

Polycoccum vermicularium (Linds.) D. Hawksw.

Specimen examined. **13**: on *Thamnolia* sp. (thallus), 17 July 2018, O. Enkhtuya (LE 309770).

Literature reports. MONGOLIA, Bayanhongor Aimag and Zavkhan Aimag, on *Thamnolia* sp. (Zhurbenko 2012).

**Pronectria erythrinella* (Nyl.) Lowen

Specimens examined. Both specimens on thalli of *Peltigera rufescens*. **5**: 10 July 2018, M. Zhurbenko 18198 (LE 309853); **11**: 15 July 2018, M. Zhurbenko 18204 (LE 309854).

* ***Pronectria robergei*** (Mont. & Desm.) Lowen

Specimens examined. **14**: on *Peltigera didactyla* (thallus), 17 July 2018, M. Zhurbenko 18194 (LE 309847); on *P. rufescens* (thallus), 17 July 2018, M. Zhurbenko 18196 (LE 309848).

* ***Pseudopyrenidium tartaricola*** (Linds.) Nav.-Ros., Zhurb. & Cl. Roux

Specimen examined. **13**: on *Ochrolechia inaequatula* (thallus), 17 July 2018, M. Zhurbenko 1869 (LE 309694).

* ***Pyrenidium actinellum*** Nyl. s.lat.

In a strict sense the species is confined to *Scytinium teretiusculum*, in a broad sense it has been reported from a wide range of lichen host genera (Navarro-Rosinés & Roux 2007).

Specimen examined. **2**: on *Physcia* sp. (thallus) growing on mossy soil, 9 July 2018, O. Enkhtuya (LE 309721a).

Roselliniella cladoniae (Anzi) Matzer & Hafellner

Specimen examined. **12**: on *Cladonia gracilis* (podetia), 16 July 2018, O. Enkhtuya (LE 309758).

Literature reports. MONGOLIA, Arkhangai Aimag and Bulgan Aimag, on *Cladonia coniocraea*, *C. cornuta* and *C. pocillum* (Huneck et al. 1992; Zhurbenko 2009a; Zhurbenko & Pino-Bodas 2017).

* ***Roselliniella javkhlanae*** Zhurb., sp. nov. (Fig. 9)

MycoBank MB 831725

Diagnosis: Differs from *Roselliniella eriodermicola* by the slightly narrower and less orbicular ascospores, 9–14.5 × 7.5–11 µm, L/B = 1.3 vs. 8–15 × 8–12 µm, L/B = 1.2, and a different host genus, *Rinodina* (*Caliciales*) vs. *Erioderma* (*Peltigerales*).

Type: Mongolia, Khuvsugul Aimag, Khatgal Sum, SW coast of Hubsugul Lake, E slope of Ikh Uul Mt., 50°45′55″N, 100°13′37″E, elev. 1750 m, *Larix sibirica* forest, on *Rinodina turfacea* var. *ecrustacea* (apothecia, thallus) and occasionally on lignum, 20 July 2018, S. Javkhlan (LE 309858 – holotype).

Description. Vegatative hyphae abundant, medium brown, 3–7 µm diam., sparsely branched and septate, not constricted at septa, mostly immersed in substrate, occasionally freely extending out from lower exposed parts of ascomata. Ascomata perithecial, brownish black, glossy, subglobose, ovoid or pyriform (with short papilla), 170–300 µm diam., often with distinct ostiole ~20 µm diam., with rough surface, erumpent, finally almost superficial, dispersed. Ascomatal cavity with lipid drops. Exciple 20–40 µm thick (thicker above), in section outwardly composed of medium brown (K–) suborbicular or tangentially elongated cells with walls 1–2 µm thick, inwardly composed of subhyaline, strongly elongated, radially compressed cells with walls 0.5–1 µm thick. Ostiolar filaments abundant, hyaline, filamentous, not branched, 15–40 µm long, 2–4 µm thick at base, slightly tapering towards apex 1–2 µm thick, scarcely septate. Interascal filaments well-developed, persistent, hyaline, 2.5–4.5 µm thick, varying in thickness, not anastomosing, scarcely branched and septate, sometimes slightly inflated between septa. Interascal gel I– and K/I–. Asci elongate-clavate to subcylindrical, stalked, unitunicate in structure, walls apically not thickened, without internal apical structures, 80–110 × 11–13 µm, 8-spored, I– and K/I–. Ascospores hyaline for a long time, eventually light brown to rarely medium brown (K+ greyish orange), broadly ellipsoid to sometimes orbicular, apices rounded or occasionally somewhat acute, without beaks, (9.0–)10.8–13.0(–14.5) × (7.3–)8.4–10.0(–11.0) µm, L/B = (1.0–)1.2–1.4(–1.6) (n = 70), aseptate, often with some large and numerous small guttules, with smooth wall ~1 µm thick, composed of thin subhyaline outer layer and pigmented inner layer,

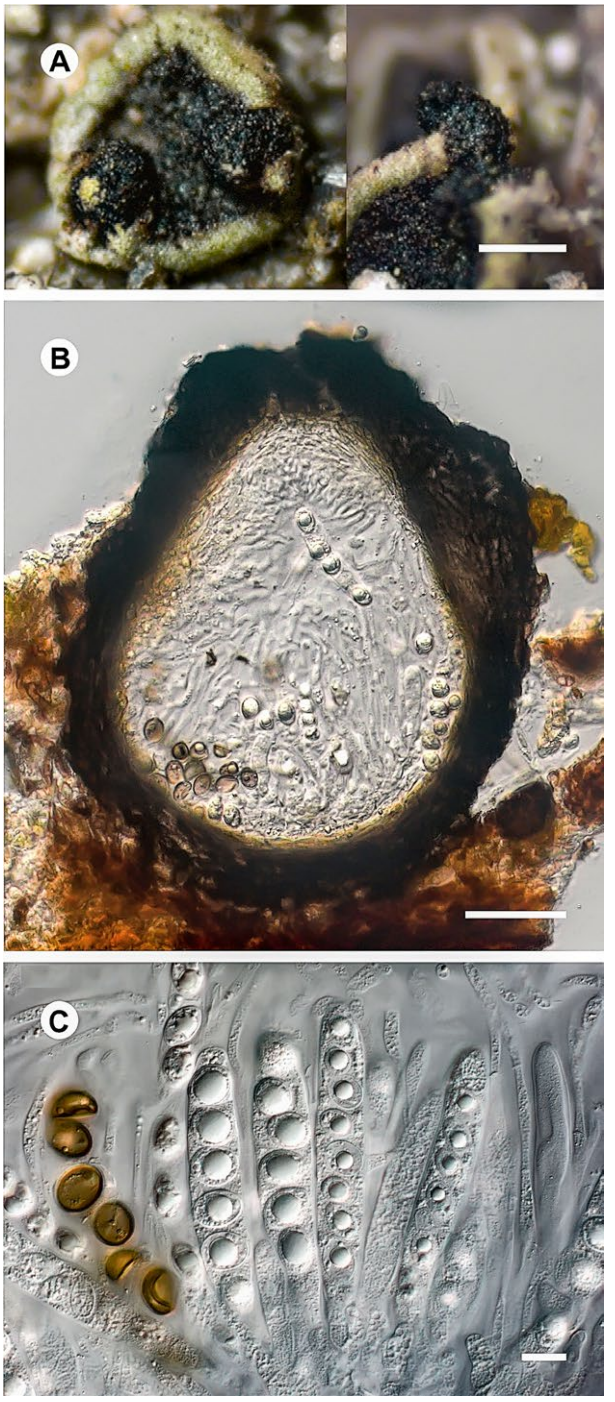

Figure 9. *Roselliniella javkhlanae* growing on apothecia of *Rinodina turfacea* var. *ecrustacea* (holotype). A – ascomata; B – section through ascoma, in water; C – asci, ascospores and interascal filaments, in water. Scales: A = 200 µm; B = 50 µm; C = 10 µm.

distinct halo not observed, more or less uniseriate in ascus. Asexual morph not observed.

Notes. By its ascomata up to 300 µm diam., 8-spored asci and broadly ellipsoid to sometimes orbicular, aseptate ascospores up to 14.5 µm long, the new species is quite similar to *Roselliniella eriodermicola* (Matzer & Hafellner 1990) and distinct from the other known species of the genus (Darmostuk et al. 2018). *Roselliniella eriodermicola* is distinguished from the new species by the slightly broader and more orbicular ascospores, 8–15 × 8–12 µm, L/B = 1.2 vs. 9–14.5 × 7.5–11 µm, L/B = 1.3, and different host, a species of the foliose genus *Erioderma*, *Peltigerales*, vs. crustose species of *Rinodina*, *Caliciales*. We consider these differences to be sufficient to distinguish *Roselliniella javkhlanae* as a distinct species, since 18 of the 19 species of *Roselliniella* known so far are confined to a particular host genus (Diederich et al. 2018), and modest differences in ascospore size can represent a valid taxonomic character in the taxonomy of this genus (Hawksworth et al. 2010).

Etymology. The species is named after Samiya Javkhlan, who collected the holotype.

Host and distribution. The new species is so far known only from the holotype, collected in a sparse *Larix sibirica* mountain forest in northern Mongolia. It was mainly observed on the thallus and discs and margins of apothecia of *Rinodina turfacea* var. *ecrustacea* (*Physciaceae*), but sometimes possibly also on lignum of *Larix sibirica*, growing among lichen thalli, with vegetative hyphae penetrated in both the lignum and lichen. Thus the species is possibly not obligately lichenicolous. Visible damage to the host lichen was not observed.

Rosellinula frustulosae (Vouaux) R. Sant.

Specimen examined. **9**: on *Lecanora frustulosa* (apothecia, thallus), 13 July 2018, M. Zhurbenko 1848a (LE 309664).

Literature report. MONGOLIA, Tuv Aimag, on *Lecanora frustulosa* (Hafellner 1985).

****Sclerococcum ahtii*** (Zhurb. & Pino-Bodas) Ertz & Diederich

In the species protologue, ascospores were stated to be (0–)1-septate (Pino-Bodas et al. 2017); however, 2-septate ascospores were also rarely observed in the specimens examined for this study.

Specimens examined. All specimens on podetia of *Cladonia rangiferina*. **7**: 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309757a, LE 309754b); **10**: 15 July 2018, M. Zhurbenko 18115 (LE 309743); M. Zhurbenko 18124a (LE 309758a).

****Sclerococcum deminutum*** (Th. Fr.) Ertz & Diederich

Specimens examined. **11**: on *Bryoplaca sinapisperma* (thallus), 15 July 2018, M. Zhurbenko 1836 (LE 309645); **13**: on *B. jungermanniae* (thallus), 17 July 2018, M. Zhurbenko 1863 (LE 309680); on *Biatora subduplex* (thallus), 17 July 2018, M. Zhurbenko 1864 (LE 309681).

****Sclerococcum glaucomarioides*** (Tuck.) Ertz & Diederich

Specimens examined. **7**: on *Ochrolechia upsaliensis* (thallus), 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309690); **13**: on *Megaspora verrucosa* (thallus), 17 July 2018, M. Zhurbenko 1878b (LE 309691b); on *Ochrolechia upsaliensis* (apothecia, thallus), 17 July 2018, M. Zhurbenko 1877 (LE 309689).

****Sclerococcum homoclinellum*** (Nyl.) Ertz & Diederich

Specimen examined. **19**: on *Lecanora campestris* (thallus), 21 July 2018, O. Enkhtuya & S. Javkhlan (LE 309659b).

*[L]***Scutula dedicata*** Triebel, Wedin & Rambold

This is a lichenicolous lichen growing on species of *Peltigera* (Triebel et al. 1997). It was previously known in Asia only from the Chukotka Autonomous Area and the Republic of Sakha (Yakutia) of Russia (Zhurbenko 2009b).

Specimen examined. **18**: on *Peltigera* sp. (moribund thallus), 20 July 2018, S. Javkhlan (LE 309809).

****Skyttea lecanorae*** Diederich & Etayo

Specimen examined. **1**: on *Lecanora allophana* (thallus), 8 July 2018, M. Zhurbenko 1865a (LE 309684a).

****Skyttella mulleri*** (Willey) D. Hawksw. & R. Sant.

The species was previously known in Asia only from the Kamchatka Territory and the Karachaevo-Cherkesiya Republic of Russia (Zhurbenko et al. 2012; Zhurbenko & Kobzeva 2014).

Specimen examined. **20**: on *Peltigera collina* (thallus), 26 July 2018, M. Zhurbenko 18202 (LE 309846).

****Sphaerellothecium araneosum*** (Arnold) Zopf

It is noteworthy that abundant infections severely damage host hymenia.

Specimen examined. **13**: on *Ochrolechia upsaliensis* (apothecia, thallus), 17 July 2018, M. Zhurbenko 1867 (LE 309686).

Sphaerellothecium cladoniae (Alstrup & Zhurb.) Hafellner

Syn. *S. araneosum* (Arnold) Zopf var. *cladoniae* Alstrup & Zhurb.

Specimens examined. **2**: on *Cladonia pyxidata* (basal squamules), 8 July 2018, M. Zhurbenko 18118 (LE 309749); **4**: on *C. pocillum* (basal squamules), 10 July 2018, M. Zhurbenko 18125 (LE 309760); **11**: on *C. pocillum* (basal squamules), 15 July 2018, M. Zhurbenko 18120 (LE 309751); **13**: on *C. pocillum* (basal squamules), 17 July 2018, O. Enkhtuya (LE 309747).

Literature reports. MONGOLIA, Arkhangai Aimag, Bayankhongor Aimag and Uverkhangai Aimag, on *Cladonia ochrochlora*, *C. pyxidata* and unspecified species of *Cladonia* (Zhurbenko & Alstrup 2004; Zhurbenko 2009a; Zhurbenko & Pino-Bodas 2017).

Sphaerellothecium cladoniicola E. S. Hansen & Alstrup

Specimens examined. **7**: on *Cladonia rangiferina* (podetia), 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309757b); **10**: on *C. arbuscula* (podetia), 15 July 2018, O. Enkhtuya (LE 309753b); on *C. stellaris* (podetia), 15 July 2018, M. Zhurbenko 18121 (LE 309752); on *C. rangiferina* (podetia), 15 July 2018, M. Zhurbenko 18124c (LE 309758c); on *C. rangiferina* (podetia), 15 July 2018, M. Zhurbenko 18117b (LE 309748b);

12: on *C. arbuscula* (podetia), 16 July 2018, M. Zhurbenko 18119 (LE 309750).

Literature report. MONGOLIA, Arkhangai Aimag, on *Cladonia stellaris* (Zhurbenko & Pino-Bodas 2017).

Sphaerellothecium minutum Hafellner

Literature report. MONGOLIA, Uvs Aimag, on *Sphaerophorus fragilis* (Zhurbenko 2009a).

****Sphaerellothecium*** cf. ***parmeliae*** Diederich & Etayo

The specimens examined for this study are identical to a fungus that is rather common in boreal regions of Eurasia, and which was described and illustrated as *Sphaerellothecium* cf. *parmeliae* in Zhurbenko & Zheludeva (2015). It differs from the species protologue (Etayo & Diederich 1998) mainly in having permanently hyaline and larger ascospores [(10.5–)11.2–12.8(–13.5) × (3.6–)3.8–4.6(–4.9) µm, L/B = (2.4–)2.7–3.1(–3.4) (n = 30) vs. 8.5–10 × 3–4 µm] and in being not associated with black necrotic areas of the host lobes.

Specimens examined. All specimens on thalli of *Parmelia omphalodes*. **9**: 13 July 2018, M. Zhurbenko 18180c (LE 309817c); **18**: 20 July 2018, O. Enkhtuya (LE 309796); **19**: 21 July 2018, M. Zhurbenko 18176 (LE 309820).

Sphaerellothecium pumilum (Lettau) Nav.-Ros., Cl. Roux & Hafellner

Specimens examined. All specimens on thalli of *Physcia phaea*. **18**: 20 July 2018, O. Enkhtuya (LE 309782); (LE 309784b); **19**: 21 July 2018, O. Enkhtuya (LE 309781); **20**: 26 July 2018, M. Zhurbenko 18140 (LE 309861).

Literature report. MONGOLIA, Tuv Aimag, on *Physcia phaea* (Navarro-Rosinés et al. 2018).

****Sphaerellothecium taimyricum*** (Zhurb.) Zhurb., comb. & stat. nov.

MycoBank MB 831727

Basionym: *Sphaerellothecium thamnoliae* Zhurb. var. *taimyricum* Zhurb., Lichenologist 44: 167. 2012. [MB 563057]

Type: Russia, Krasnoyarsk Territory, Taimyr Peninsula, Byrranga Mts, N of Levinson-Lessinga Lake, 74°34′N, 98°47′E, elev. 250 m, arctic tundra, on *Thamnolia* sp. (thallus), 20 Aug. 1995, M. P. Zhurbenko 95586 (LE 260438 – holotype!).

Notes. Zhurbenko (2012) described *Sphaerellothecium thamnoliae* Zhurb. as comprising two varieties, viz. var. *thamnoliae* and var. *taimyricum*, which clearly differ in the size of their asci and ascospores. Subsequent findings of these taxa (Zhurbenko & Kobzeva 2014; Zhurbenko & Ohmura 2018; present paper) confirmed the stability of these differences, and therefore we propose to consider these taxa at the rank of species.

Specimen examined. **14**: on *Thamnolia* sp. (decaying bases of podetia), 17 July 2018, M. Zhurbenko 18101 (LE 309773).

****Sphaeropezia intermedia*** (Diederich, Zhurb. & Etayo) Baloch & Wedin

The species was previously known only from the type locality in Alaska, North America (Diederich et al. 2002) and is here newly documented for Eurasia.

Specimen examined. **12**: on *Thamnolia* sp. (moribund base of podetia), 16 July 2018, M. Zhurbenko 18102 (LE 309776).

*[L]***Steinia geophana*** (Nyl.) Stein

This is an ephemeral, facultatively lichenized fungus growing on soil, decaying wood and other substrates including lichens (Nimis et al. 2018), mainly on decaying thalli of *Peltigera* species. Due to its poorly developed thallus it can be mistaken for a lichenicolous fungus.

Specimens examined. Both specimens on moribund parts of *Peltigera leucophlebia* thalli. **5**: 10 July 2018, O. Enkhtuya (LE 309810c); **15**: 17 July 2018, M. Zhurbenko 18197d (LE 309845).

****Stigmidium cladoniicola*** Zhurb. & Diederich

Specimens examined. **6**: on *Cladonia* cf. *cornuta* (basal squamules, podetia), 11 July 2018, M. Zhurbenko 18122 (LE 309756); **7**: on *C. rangiferina* (podetia), 11 July 2018, O. Enkhtuya & S. Javkhlan (LE 309756).

Stigmidium frigidum (Sacc.) Alstrup & D. Hawksw.

Literature report. MONGOLIA, Zavkhan Aimag, on *Thamnolia* sp. (Zhurbenko 2012).

Stigmidium microcarpum Alstrup & J. C. David

Specimens examined. **12**: on *Vulpicida juniperina* (thallus), 16 July 2018, O. Enkhtuya & S. Javkhlan (LE 309707); **15**: on *Flavocetraria cucullata* (thallus), 17 July 2018, M. Zhurbenko 1846 (LE 309642).

Literature reports. MONGOLIA, Arkhangai Aimag and Zavkhan Aimag, on *Flavocetraria cucullata* and *Vulpicida juniperina* (Zhurbenko 2009a).

****Stigmidium peltideae*** (Vain.) R. Sant.

Specimen examined. **5**: on *Peltigera elisabethae* (moribund parts of thallus), 10 July 2018, M. Zhurbenko 18199 (LE 309851).

****Stigmidium pseudopeltideae*** Cl. Roux & Triebel

Specimen examined. **15**: on *Peltigera leucophlebia* (thallus), 17 July 2018, M. Zhurbenko 18197b (LE 309852b).

****Stigmidium*** cf. ***psorae*** (Anzi) Hafellner

Identification is somewhat uncertain, as the ascospores are shorter than reported by Triebel (1989), viz. (14.2–)14.4–15.2(–15.5) × (6.2–)6.5–7.9(–8.2) µm (n = 11) vs. (16–)17.5–22(–23.5) × (5–)5.5–7.5(–8) µm.

Specimen examined. **8**: on *Psora testacea* (thallus), 12 July 2018, M. Zhurbenko 18104 (LE 309777).

****Stigmidium solorinarium*** (Vain.) D. Hawksw.

Specimens examined. **12**: on *Solorina saccata* (thallus), 16 July 2018, M. Zhurbenko 1884 (LE 309697); **13**: on *S. bispora* (thallus), 17 July 2018, M. Zhurbenko 18213 (LE 309698).

Taeniolella rolfii Diederich & Zhurb.

Literature report. MONGOLIA, Arkhangai Aimag, on *Cetraria aculeata* (Diederich & Zhurbenko 2001).

Talpapellis beschiana (Diederich) Zhurb., U. Braun, Diederich & Heuchert

Syn. *Taeniolella beschiana* Diederich

Specimens examined. **7**: on *Cladonia pocillum* (basal squamules), 11 July 2018, O. Enkhtuya (LE 309755); **10**: on *C. chlorophaea* (basal squamules, podetia), 15 July 2018, O. Enkhtuya (LE 309764); **11**: on *C. coniocraea* (basal squamules), 15 July 2018, M. Zhurbenko 18116 (LE 309744).

Literature reports. MONGOLIA, Arkhangai Aimag, on *Cladonia ochrochlora* and *C. rangiferina* (Zhurbenko & Pino-Bodas 2017).

*[L] ***Tetramelas pulverulentus*** (Anzi) A. Nordin & Tibell

This is an obligately lichenicolous, endoparasitic lichen growing on members of *Physciaceae* (Nordin 2000).

Specimens examined. Both specimens on thalli of *Physconia muscigena*. **3**: 9 July 2018, M. Zhurbenko 18138 (LE 309862); **5**: 10 July 2018, M. Zhurbenko 18126 (LE 309762).

*[L] ***Thelocarpon epibolum*** Nyl.

This is an ephemeral, facultatively lichenized fungus growing on organic soil, decaying bryophytes and lichens (Nimis et al. 2018), mainly on aged parts of *Peltigera* species.

Specimen examined. **15**: on *Peltigera leucophlebia* (thallus), 17 July 2018, M. Zhurbenko 18197a (LE 309852a).

* ***Thamnogalla crombiei*** (Mudd) D. Hawksw.

Specimen examined. **14**: on *Thamnolia* sp. (thallus), 17 July 2018, M. Zhurbenko 18100 (LE 309775).

Trematosphaeriopsis parmeliana Jacz. & Elenkin

Specimens examined. **2**: on *Xanthoparmelia stenophylla* (thallus), 9 July 2018, O. Enkhtuya (LE 309789a); **3**: on *X. vagans* (thallus), 9 July 2018, M. Zhurbenko 18166 (LE 309835); **20**: on *X. stenophylla* (thallus), 26 July 2018, M. Zhurbenko 18174a (LE 309836).

Literature report. MONGOLIA, Khentii Aimag, on *Xanthoparmelia vagans* (Hafellner 2001).

* ***Tremella everniae*** Diederich

Specimen examined. **20**: on *Evernia mesomorpha* (thallus), 26 July 2018, M. Zhurbenko 1895 (LE 309715).

* ***Tremella hypogymniae*** Diederich & M. S. Christ.

Specimen examined. **17**: on *Hypogymnia bitteri* (thallus), 19 July 2018, M. Zhurbenko 18190 (LE 309829).

* ***Zwackhiomyces berengerianus*** (Arnold) Grube & Triebel

Specimen examined. **11**: on *Bryobilimbia hypnorum* (thallus), 15 July 2018, M. Zhurbenko 1839a (LE 309651a).

Zwackhiomyces coepulonus (Norman) Grube & R. Sant.

Literature report. MONGOLIA, Ömnogobi Aimag, on *Xanthoria elegans* (Huneck et al. 1992).

* ***Zwackhiomyces physciicola*** Alstrup

The species usually grows on species of *Physcia*, but was also reported from *Phaeophyscia* (Hafellner & Türk 1995). It was previously known in Asia from the Chukotka Autonomous Area and the Republic of Adygeya of Russia (Zhurbenko 2009b; Urbanavichus & Urbanavichene 2014).

Specimen examined. **2**: on *Phaeophyscia sciastra* (apothecia, thallus), 9 July 2018, O. Enkhtuya (LE 309783).

Discussion

Prior to our research, 33 species of lichenicolous fungi were reported from Mongolia in various publications (Hafellner 1985, 2001; Huneck et al. 1992; Diederich & Christiansen 1994; Navarro-Rosinés & Hafellner 1996; Diederich & Zhurbenko 2001; Zhurbenko & Alstrup 2004; Alstrup & Ahti 2007; Zhurbenko & Triebel 2008; Zhurbenko 2009a, b, 2010a, 2012; Ertz et al. 2015; Zhurbenko & Pino-Bodas 2017; Navarro-Rosinés et al. 2018). We collected and identified 102 species, increasing the number of lichenicolous fungi known from Mongolia to 114 species.

It can be assumed that the true diversity of lichenicolous fungi in Mongolia is much higher. Our field studies were carried out almost exclusively in one province of Mongolia (Khuvsugul Aimag), mainly in mountain forests with *Larix sibirica*, where we inspected terricolous and epiphytic lichens primarily. About 30 collected species remain unnamed. Only ten species (*Abrothallus caerulescens*, *A. parmeliarum*, *Arthonia digitatae*, *A. lecanorina*, *Bachmanniomyces punctum*, *Didymocyrtis* cf. *melanelixiae*, *Lichenostigma cosmopolites*, *L. maureri*, *Nesolechia oxyspora* and *Sphaerellothecium cladoniicola*) were collected five or more times. Fifty-five (54%) of the 102 species are represented by a single sample, which suggests, according to the Turing estimator, that the true diversity of lichenicolous fungi in the study area is no less than 200 species.

Five (5%) of the 102 species are described as new to science, two (2%) are newly reported for Eurasia or Asia, and an additional 71(70%) are newly reported for Mongolia. Such a high percentage of regional novelties is well explained by the lack of past studies focused on lichenicolous fungi in Mongolia. Such comparatively low percentages of species new to science or to Eurasia/Asia indicate that knowledge of the diversity of these fungi in extratropical Eurasia is fairly good. For comparison, a recent inventory of lichenicolous fungi of Ecuador in South America resulted in 22% of the documented species being new to science (Etayo 2017).

Acknowledgements

Paul Diederich helped in the taxonomic treatment of *Nesolechia cetrariicola* and *Phacopsis vulpicidae*, Javier Etayo of *Minutoexcipula* cf. *beaglei* and *Stigmidium psorae*, Alexander Khodosovtsev and Valeriy Darmostuk of *Feltgeniomyces mongolicus*, and Ave Suija of *Abrothallus peyritschii*. Mats Wedin and Lucia Muggia are thanked for putting additional specimens of *Phacopsis vulpicidae* at our disposal. Anna Kiyashko is thanked for help in preparing illustrations. The authors are grateful to the Russian-Mongolian biological expedition of the Russian and Mongolian Academies of Sciences for support of the field studies in Mongolia. We thank Enkhjargal Enkhtaivan for pleasant company and help during the expedition. The study of M. P. Zhurbenko was carried out within the framework of the research project of the V. L. Komarov Botanical Institute of the

Russian Academy of Sciences, entitled 'Biodiversity, ecology, structural and functional features of fungi and fungus-like protists' (AAAA-A19-119020890079-6), using equipment of its Core Facility Center 'Cell and Molecular Technologies in Plant Science'.

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