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Lichenochora sedelnikoviorum, a new species from the Russian Arctic with a synopsis of published additions to the Panarctic checklist of lichenicolous fungi

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ABSTRACT. – *Lichenochora sedelnikoviorum*, a lichenicolous ascomycete growing on *Rostania ceranisca* (Collemataceae), is described as new to science from the Arctic. The species is characterized by the absence of gall-induction, more or less exposed ascomata up to 300 µm in diameter, 4–8-spored asci, 70–110 × 10–14 µm, and (rarely 0–)1-septate ascospores, (20.5–)24.5–31.5(–37) × (4.5–)5.5–6.5(–7.5) µm. A list of additions to the Panarctic checklist of lichenicolous fungi, which now includes 375 species, is presented.

KEYWORDS. – Asia, biodiversity, lichen-dwelling fungi, polar desert, Russia, taxonomy.

INTRODUCTION

The panarctic checklist of lichens and lichenicolous fungi published just over a decade ago included 1610 species of lichens and 250 species of associated fungi (Kristinsson et al. 2010). Since that time there have been many new discoveries, new data have been published, and some prior reports that had been missed have been uncovered. Recent work led to the discovery of a new species growing on *Rostania ceranisca* (Nyl.) Otálora, P.M.Jørg. & Wedin that required description and would be another addition to the checklist. In the context of describing this new species, named here *Lichenochora sedelnikoviorum*, a synopsis of the additions that have accumulated since publication of the checklist in 2010 was prepared. Based on these additions (see the Appendix), the list of Panarctic lichenicolous fungi has increased by 125 species and stands at 375 species. Thus, over the past decade the number of lichenicolous fungus species found in the Arctic has increased by about 50%.

MATERIALS AND METHODS

Microscopy and imaging were undertaken using a Stemi 2000-CS stereomicroscope fitted with an AxioCam MRc5 digital camera and a Zeiss Axio Imager.A1 compound microscope equipped with Nomarski differential interference contrast optics and fitted with an AxioCam 506 digital camera. Microscopic characters were studied from hand-made sections produced using a razor blade and then mounted in water, a 10% aqueous solution of potassium hydroxide (K), Lugol's Iodine solution, directly (I), and after KOH pre-treatment (K/I). Measurements were taken from water mounts. The length, width, and length/width ratio (l/w) of ascospores are given as (min–) ($\bar{x}$−SD)–($\bar{x}$+SD) (–max), where 'min' and 'max' are the extreme values observed, $\bar{x}$ the arithmetic mean, and SD the corresponding standard deviation. Colors were determined according to the tables of Kornerup and Wanscher (1978). Voucher specimens are deposited in the mycological herbarium of the V. L. Komarov Botanical Institute in St. Petersburg, Russia (LE).

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THE NEW SPECIES

***Lichenochora sedelnikoviorum* Zhurb., sp. nov.**

MycoBank #MB841758.

FIGURE 1.

Distinguished from *Lichenochora lepidiotae* by the longer asci (70–110 µm vs. 65–75 µm), ascospores that have not been observed to produce more than 1 septum ((0–)1-septate vs. (0–)1(–5)-septate), slightly wider ascospores ((4.5–)5.5–6.5(–7.5) µm vs. (4–)4.5–6 µm), and host (Collemataceae vs. Pannariaceae).

TYPE: RUSSIA. KRASNOYARSK TERRITORY (CENTRAL SIBERIA): Severnaya Zemlya Archipelago, NW extremity of Bol'shevik Island, peninsula with Cape Baranova at the E coast of Shokal'skogo Strait, near Mys Baranova polar station, 79°16′N, 101°40′E, elev. 20 m, polar desert with spotty lichen-bryophyte vegetation, on the thallus of *Rostania ceranisca* growing on soil, 15.vii.1996, *M.P. Zhurbenko 96779* (LE 310202, holotype).

DESCRIPTION. – Lichenicolous ascomycete growing on *Rostania* Trevis. *Vegetative hyphae* not observed. *Ascomata* perithecioid, black, glossy, exposed part slightly granulose due to irregularly swollen papillae 5–10 µm in diameter, subglobose, 165–300 µm in diameter, with distinct ostiole ca 30–50 µm in diameter, protruding only in the ostiolar area to almost sessile, dispersed. *Centrum* contains lipid droplets, I−, K/I−. *Exciple* medium to dark brown (above) on the outside, pigmentation amorphous, K+ light brown or greyish brown, almost colorless on the inside; in surface view composed of polygonal cells ca 6–22 µm in diameter with walls 1–1.5 µm thick, without Munk pores; in cross-section 20–30 µm wide, composed of ca 6 layers of tangentially elongated cells with walls ca 2 µm thick. *External ostiolar filaments* brown, aseptate, not branched, often with darker and slightly enlarged apex, 17–21 × 2.5–4 µm, bordering the ostiole and protruding slightly outwards. *Periphyses* hyaline, acuminate, 15–30 µm long, 0–3-septate, not branched. *Paraphyses* hyaline, septate, markedly constricted at the septa, composed of cells 5–10 µm wide, with delicate walls, sometimes inconspicuous. *Asci* functionally unitunicate, subcylindrical to narrowly clavate, long-stalked, wall ca 0.5 µm thick throughout, without any visible apical apparatus, 70–110 × 10–14 µm (n = 10), 4–8-spored, I−, K/I−. *Ascospores* hyaline, narrowly ellipsoid to fusiform, straight or occasionally slightly bent, (20.5–)24.5–31.5(–37) × (4.5–)5.5–6.5(–7.5) µm, l/w = (2.9–)3.9–5.7(–6.9) (n = 88), (rarely 0–)1-septate, with equal cells, not constricted at the septum, smooth-walled, non-halonate, irregularly 2–3-seriate in the ascus. *Asexual morph* not observed.

ETYMOLOGY. – The new species is named after the couple, Vyacheslav Petrovich Sedel'nikov (1941–2021) and Nellya Vasil'evna Sedel'nikova (1940–), who made outstanding contributions to botanical knowledge of Siberia, where the type material was collected. Sedel'nikova is a well-respected Russian lichenologist widely known for her work on the lichens of the region (e.g., Sedel'nikova 2017). While Sedel'nikov, a corresponding member of the Russian Academy of Sciences, is widely regarded for his studies of Siberian vegetation (e.g., Sedel'nikov 2006).

DISTRIBUTION AND HOST. – The new species is known from two collections made in the same area in the polar desert zone of the Siberian Arctic in Asian Russia. It was found growing on apparently healthy thalli of the terricolous cyanolichen *Rostania ceranisca*, which belongs to the Collemataceae. This host is characterized by a circumpolar arctic-alpine distribution and is locally common, particularly in the Arctic (Jørgensen 2012). Pathogenic effects on the host were not observed.

DISCUSSION. – The new species fits well the concept of the lichenicolous genus *Lichenochora* Hafellner as presented in Hafellner and Navarro-Rosinés (2004). Thirty-nine of the 44 previously known species of *Lichenochora* are confined to a single host genus, four species to a single host family and only one (*L. arctica* Zhurb.) has been occasionally observed infecting a distantly related lichen that grew adjacent to the primary host thallus (Diederich et al. 2018, Zhurbenko 2013). Just one species of *Lichenochora* has previously been known to parasitize lichens of the family Collemataceae, namely *L. collematum* Nik.Hoffm. & Hafellner. Remarkably, this parasite also grows in the Arctic on the same host as the new species. However, it readily differs from *Lichenochora sedelnikoviorum* in its gall-induction,

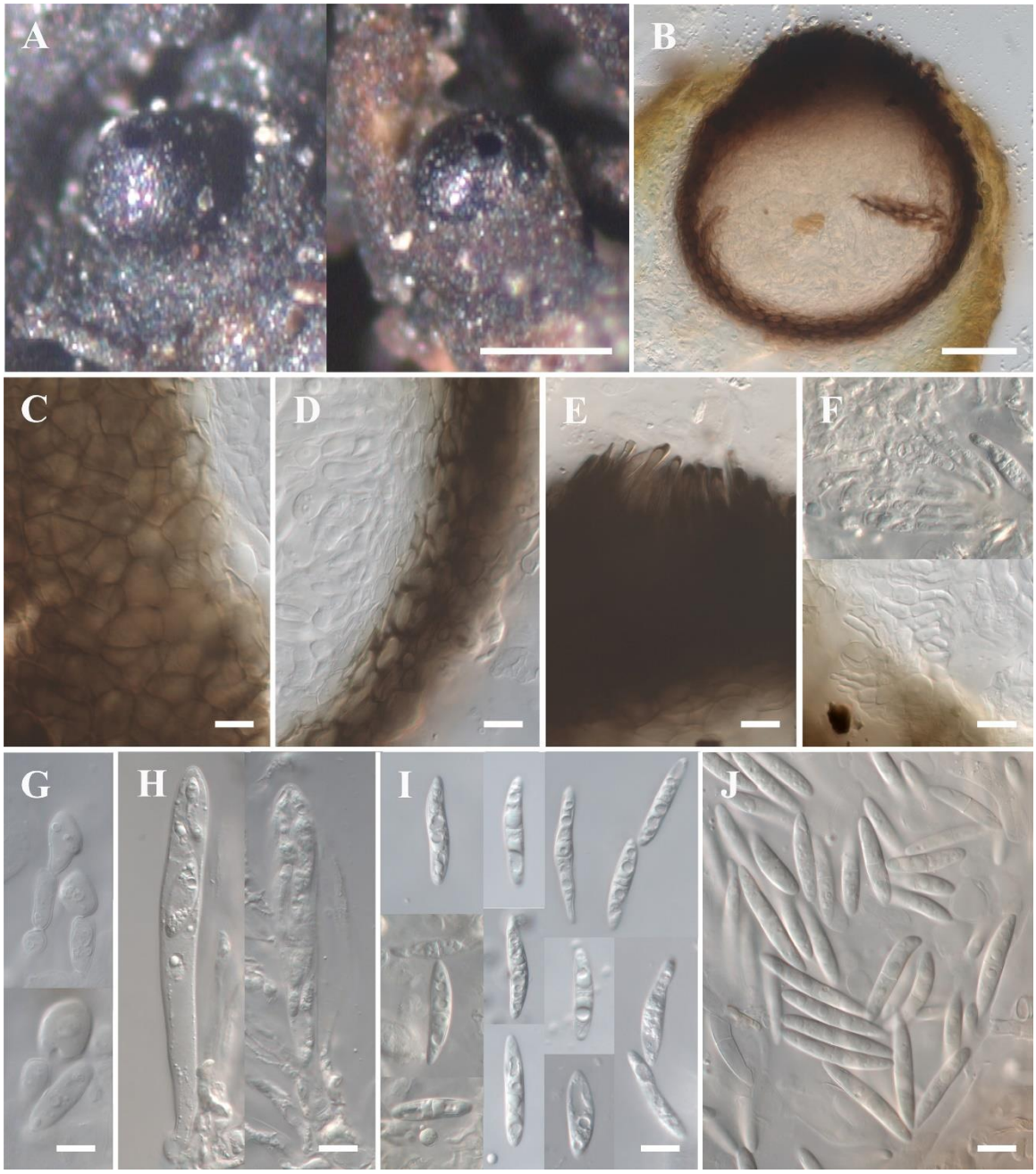

Figure 1. *Lichenochora sedelnikoviorum* (A-G, I, J from holotype; H from *Zhurbenko 961036*). **A,** habitus of ascomata on the thallus of *Rostania ceranisca*. **B,** ascoma in cross-section in water. **C,** exciple in surface view in K. **D,** exciple in cross-section in K. **E,** external ostiolar filaments in K. **F,** periphyses in K. **G,** paraphyses in K. **H,** asci in water. **I,** ascospores in water. **J,** ascospores in K. Scale bars = 200 µm in A, 50 µm in B, 10 µm in C-J.

completely submerged, smaller ascomata (up to 200 µm in diameter), smaller asci (50–60 × 8–12 µm), and aseptate, smaller ascospores (17–21 × 3.5–5 µm; Hoffmann and Hafellner 2000).

Compared to other *Lichenochora* species, the new species is most similar to *L. lepidiotae* (Anzi) Etayo & Nav.-Ros. which grows on *Fuscopannaria praetermissa* (Nyl.) P.M.Jørg. (Pannariaceae). The latter can be distinguished by the shorter asci (65–75 µm long), ascospores that sometimes have more than one septum ((0–)1(–5)-septate) and are slightly narrower ((4–)4.5–6 µm wide), and different host (Pannariaceae; Etayo and Navarro-Rosinés 2008). Morphologically, the new species can also be confused

with *Rhagadostoma collematum* Etayo & Nav.-Ros. which grows on *Lathagrium auriforme* (With.) Otálora, P.M.Jørg. & Wedin, another species in the same family Collemataceae. However, species of *Rhagadostoma* Körb., typified by *R. lichenicola* (De Not.) Keissl., are distinguished by deep cracks in the outer wall of the ascoma, a more massive, stromatic-like exciple with Munk pores, and the absence of brown external ostiolar filaments (Navarro-Rosinés and Hladún 1994; see cited specimen of *R. lichenicola* examined for comparison). Additionally, *R. collematum* has 2–4(–6)-spored asci and wider ascospores ((23–)26–34(–38.5) × (7.5–)8.5–11.5(–15.5) µm; Navarro-Rosinés et al. 1999).

Rostania ceranisca was formerly placed in *Collema* Weber ex F.H.Wigg. and thus *Lichenochora sedelnikoviorum* should be added after couplet 11 to the recently published key to the lichenicolous fungi on *Collema* s. lat. (Brackel and Döbbeler 2020).

Additional specimen examined. – **RUSSIA.** KRASNOYARSK TERRITORY (CENTRAL SIBERIA): Severnaya Zemlya Archipelago, N extremity of Bol'shevik Is., W coast of Mikoyan Bay at 200 m from the bay coast, 79°18′N, 101°55′E, elev. 10 m, polar desert with spotty *Papaver*-graminoid-lichen-bryophyte vegetation in micro-depressions, on the thallus of *Rostania ceranisca* growing on soil, 21.vii.1996, *M. P. Zhurbenko 961036* (LE 310203).

Specimen of Rhagadostoma lichenicola *examined for comparison*. – **RUSSIA.** MURMANSK REGION: Barents Sea coast, mouth of Voronya River, 69°09′N, 35°50′E, elev. 20 m, dwarf-shrub-moss-lichen tundra, on the thallus of *Solorina crocea* growing on soil, 30.viii.1997, *M. P. Zhurbenko 9732* (LE 207393).

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LITERATURE CITED

Alstrup, V. and E.S. Hansen. 2001. New lichens and lichenicolous fungi from Greenland. Graphis Scripta 12: 41–50.

Alstrup, V. and M. Olech. 1993. Lichenicolous fungi from Spitsbergen. Polish Polar Research 14: 33–42.

Alstrup, V., J. Kocourková, M. Kukwa, J. Motiejūnaitė, W. von Brackel and A. Suija 2009: The lichens and lichenicolous fungi of South Greenland. Folia Cryptogamica Estonica 46: 1–24.

Brackel, W. von and P. Döbbeler. 2020. An addition to the knowledge of lichenicolous fungi of Greece with a key to the lichenicolous fungi on *Collema* s. l. Folia Cryptogamica Estonica 57: 147–152.

Calatayud, V., P. Navarro-Rosins and J. Hafellner. 2013. Contributions to a revision of *Cercidospora* (Dothideales), 2: Species on *Lecanora* s.l., *Rhizoplaca* and *Squamarina*. Mycosphere 4: 539–557.

Diederich, P. 2021. Notes on lichenicolous taxa of the asexual fungal genera *Intralichen* and *Trimmatostroma*, with a revised key and descriptions of four new species. Herzogia 34: 101–126.

Diederich, P., J.D. Lawrey and D. Ertz. 2018. The 2018 classification and checklist of lichenicolous fungi, with 2000 non-lichenized, obligately lichenicolous taxa. The Bryologist 121: 340–425.

Dillman, K.L., T. Ahti, C.R. Björk, P. Clerc, S. Ekman, T. Goward, J. Hafellner, S. Pérez-Ortega, C. Printzen, S. Savić, M. Schultz, M. Svensson, G. Thor, T. Tønsberg, O. Vitikainen, M. Westberg and T. Spribille. 2012. New records, range extensions and nomenclatural innovations for lichens and lichenicolous fungi from Alaska, U.S.A. Herzogia 25: 177–210.

Ertz, D., P. Diederich, J.D. Lawrey, F. Berger, C.E. Freebury, B. Coppins, A. Gardiennet and J. Hafellner. 2015. Phylogenetic insights resolve Dacampiaceae (Pleosporales) as polyphyletic: *Didymocyrtis* (Pleosporales, Phaeosphaeriaceae) with *Phoma*-like anamorphs resurrected and segregated from *Polycoccum* (Trypetheliales, Polycoccaceae fam. nov.). Fungal Diversity 74: 53–89.

Etayo, J. and P. Navarro-Rosinés. 2008. Una combinación y tres especies nuevas de *Lichenochora* (Phyllachorales, ascomicetes liquenícolas), y notas adicionales para el género. Revista Catalana de Micologia 30: 27–44.

Fryday, A.M. 2011. *Phacographa protoparmeliae* new to northern Europe from Arctic Russia. Graphis Scripta 23: 21–23.

Hafellner, J. and P. Navarro-Rosinés. 2004. *Lichenochora*. In: Nash III, T.H., B.D. Ryan, P. Diederich, C. Gries and F. Bungartz (eds), *Lichen Flora of the Greater Sonoran Desert Region, Volume 2*. Lichens Unlimited, Arizona State University, Tempe, Arizona. Pp. 656–659.

Heuchert, B. and U. Braun. 2014. Two new lichen-associated *Trimmatostroma* species. Herzogia 27: 227–236.
Heuchert, B., M.P. Zhurbenko and U. Braun. 2014. Reassessment of the lichenicolous hyphomycete genus *Talpapellis*. Herzogia 27: 83–92.
Heuchert, B., U. Braun, P. Diederich and D. Ertz. 2018. Taxonomic monograph of the genus *Taeniolella* s. lat. (Ascomycota). Fungal Systematics and Evolution 2: 69–261.
Heuchert, B., P. Diederich, M.P. Zhurbenko and U. Braun. 2019. *Taeniolella diploschistis* sp. nov. – a new lichenicolous fungus on *Diploschistes scruposus*. Herzogia 32: 94–100.
Hoffmann, N. and J. Hafellner. 2000. Eine Revision der lichenicolen Arten der Sammelgattungen *Guignardia* und *Physalospora* (Ascomycotina). Bibliotheca Lichenologica 77: 1–181.
Jørgensen, P.M. 2012. Collemataceae. *Nordic Lichen Flora* 3: 14–42.
Kornerup, A. and J.H. Wanscher. 1978. *Methuen Handbook of Colour*. Eyre Methuen, London. 252 pp.
Kristinsson, H., M. Zhurbenko and E.S. Hansen. 2010. Panarctic checklist of lichens and lichenicolous fungi. CAFF Technical Report No. 20, CAFF International Secretariat, Akureyri, Iceland, July 2010. 120 pp.
Navarro-Rosinés, P. and N. Hladun. 1994. Datos sobre el género *Rhagadostoma* (ascomicetes liquenícolas, Sordariales). Bulletin de la Société linnéenne de Provence 45: 431–442.
Navarro-Rosinés, P., J. Etayo. and V. Calatayud. 1999. *Rhagadostoma collematum* sp. nov. (ascomicetes liquenícolas, Sordariales) y nuevos datos para otras especies del género. Bulletin de la Société linnéenne de Provence 50: 233–241.
Pino-Bodas, R., M.P. Zhurbenko and S. Stenroos. 2017. Phylogenetic placement within Lecanoromycetes of lichenicolous fungi associated with *Cladonia* and some other genera. Persoonia 39: 91–117.
Sedel'nikov, V.P. 2006. The plant world of Siberia. Herald of the Russian Academy of Sciences 76(11): 1031–1033.
Sedel'nikova, N.V. 2017. *Species diversity of lichen biota of Western Siberia and evaluation of lichen species participation in its main mountain and plain phytocenoses*. Geo Academic Publishing House, Novosibirsk. 611 pp.
Zhurbenko, M.P. 2002. *Arthonia triebeliae* (Arthoniales), a new lichenicolous fungus from the Arctic. Mycological Progress 1: 137–141.
Zhurbenko, M.P. 2009a. Lichenicolous fungi and some lichens from the Holarctic. Opuscula Philolichenum 6: 87–120.
Zhurbenko, M.P. 2009b. Lichenicolous fungi and lichens from the Holarctic. Part II. Opuscula Philolichenum 7: 121–186.
Zhurbenko, M.P. 2010a. Lichenicolous fungi and lichens growing on *Stereocaulon* from the Holarctic, with a key to the known species. Opuscula Philolichenum 8: 9–39.
Zhurbenko, M.P. 2010b. New and interesting lichenicolous fungi from Eurasia. II. Mycosphere 1: 213–222.
Zhurbenko, M.P. 2012. Lichenicolous fungi growing on *Thamnolia*, mainly from the Holarctic, with a worldwide key to the known species. The Lichenologist 44: 147–177.
Zhurbenko, M.P. 2013. Lichenicolous fungi and some allied lichens from the Canadian Arctic. Opuscula Philolichenum 12: 180–197.
Zhurbenko, M.P. 2015. *Sphaerellothecium siphulae* (Dothideomycetes incertae sedis), a new lichenicolous fungus on *Siphula ceratites* from the Arctic. Nova Hedwigia 101: 419–425.
Zhurbenko, M.P. 2020a. *Clypeococcum lenae* (Dothideomycetes), a new lichenicolous species from the Arctic, with a key to species of lichenicolous fungi on *Solorina*. Opuscula Philolichenum 19: 199–207.
Zhurbenko, M.P. 2020b. Lichenicolous fungi from the Holarctic. Part III: New reports and a key to species on *Hypogymnia*. Opuscula Philolichenum 19: 180–189.
Zhurbenko, M.P. 2021a. Lichenicolous fungi from the Holarctic. Part IV: New reports and a key to species on *Dermatocarpon*. Opuscula Philolichenum 20: 44–53.
Zhurbenko, M.P. 2021b. New species of lichenicolous fungi on *Solorina*. Herzogia 34: 127–137.
Zhurbenko, M.P. and W. von Brackel. 2013. Checklist of lichenicolous fungi and lichenicolous lichens of Svalbard, including new species, new records and revisions. Herzogia 26: 323–359.
Zhurbenko, M.P. and U. Braun. 2013. *Ameroconium cladoniae* gen. et sp. nov. and *Phoma psoromatis* sp. nov., new anamorphic lichenicolous fungi from the Holarctic. The Lichenologist 45: 583–591.
Zhurbenko, M.P. and M. Grube. 2010. *Arthonia pannariae* (Arthoniaceae, Arthoniales), a new lichenicolous fungus from northern Holarctic. Graphis Scripta 22: 47−51.
Zhurbenko, M.P. and R. Pino-Bodas. 2017. A revision of lichenicolous fungi growing on *Cladonia*, mainly from the Northern Hemisphere, with a worldwide key to the known species. Opuscula Philolichenum 16: 188–266.

APPENDIX – COMPILATION OF NEW RECORDS OF PANARCTIC LICHENICOLOUS FUNGI

The Panarctic checklist of lichenicolous fungi was published by Kristinsson et al. (2010). There have been many subsequent published reports in the literature and the checklist is no longer up to date. A synopsis of these additional records is provided here, together with the publication where they were reported, and the names used in the publication. In case where the name used in the reporting publication is no longer accepted, both the current name and the one used in the original publication are provided.

Abrothallus lobariae (Diederich & Etayo) Diederich & Ertz – Reference: Zhurbenko and Braun (2013, as *Phoma lobariae* Diederich & Etayo).
Abrothallus psoromatis (Zhurb. & U.Braun) Diederich & Zhurb. – Reference: Zhurbenko and Braun (2013, as *Phoma psoromatis* Zhurb. & U.Braun).
Acaroconium lavrinenkoae Zhurb. – Reference: Zhurbenko (2021b).
Adelococcus immersus Etayo & Breuss – Reference: Zhurbenko (2021a).
Arthonia aspiciliae Alstrup & E.S.Hansen – References: Alstrup and Hansen (2001), Zhurbenko and Brackel (2013).
Arthonia digitatae Hafellner – References: Zhurbenko (2013), Zhurbenko and Pino-Bodas (2017).
"*Arthonia* cf. *lepidophila* (Anzi) Clauzade, Diederich & Cl.Roux" comb. inval. – Reference: Zhurbenko and Pino-Bodas (2017).
Arthonia nephromiaria Nyl. – Reference: Alstrup et al. (2009).
Arthonia pannariae Zhurb. & Grube – References: Zhurbenko and Brackel (2013), Zhurbenko and Grube (2010).
Arthonia phaeophysciae Grube & Matzer – Reference: Dillman et al. (2012).
Arthrorhaphis aeruginosa R.Sant. & Tønsb. – Reference: Alstrup et al. (2009).
Arthrorhaphis olivacea R.Sant. & Tønsb. – Reference: Alstrup et al. (2009).
Bachmanniomyces muscigenae (Alstrup & E.S.Hansen) Diederich & Pino-Bodas – Reference: Alstrup and Hansen (2001, as *Phaeopyxis muscigenae* Alstrup & E.S.Hansen).
Capronia thamnoliae Zhurb. – Reference: Zhurbenko (2012).
Carbonea intrudens (H.Magn.) Hafellner – Reference: Dillman et al. (2012).
Cercidospora epithamnolia Zhurb. – Reference: Zhurbenko (2012).
Cercidospora melanophthalmae Nav.-Ros., Calat. & Hafellner – Reference: Calatayud et al. (2013).
Cercidospora ochrolechiae Zhurb. – References: Zhurbenko (2010b, 2013), Zhurbenko and Brackel (2013).
Cercidospora thamnoliae Zhurb. – Reference: Zhurbenko (2012).
Cercidospora xanthoriae (Wedd.) R.Sant. – Reference: Zhurbenko (2009b).
Cladosporium licheniphilum Heuchert & U.Braun – Reference: Zhurbenko (2012).
Clypeococcum cetrariae Hafellner – Reference: Zhurbenko (2002).
Clypeococcum lenae Zhurb. – Reference: Zhurbenko (2020a).
Corticifraga fusispora Zhurb. – Reference: Zhurbenko (2009b).
Cryptodiscus epicladonia Zhurb. & Pino-Bodas – Reference: Pino-Bodas et al. (2017).
Dacampia thamnoliicola Zhurb. ad int. – Reference: Zhurbenko (2012).
Didymellopsis latitans (Nyl.) Clem. & Shear – Reference: Zhurbenko (2009b).
Didymellopsis pulposi (Zopf) Grube & Hafellner – Reference: Zhurbenko (2013).
Didymellopsis solorinae Zhurb. – Reference: Zhurbenko (2021b).
Didymocyrtis bryonthae (Arnold) Hafellner– References: Zhurbenko (2009b), Zhurbenko and Brackel (2013); in both as *Polycoccum bryonthae* (Arnold) Vězda.
Didymocyrtis cladoniicola (Diederich, Kocourk. & Etayo) Ertz & Diederich – Reference: Alstrup et al. (2009, as *Phoma cladoniicola* Diederich, Kocourk. & Etayo).
Didymocyrtis consimilis Vain.– References: Ertz et al. (2015), Zhurbenko (2009a); in both as its heterotypic synonym *Phoma caloplacae* D.Hawksw.
Didymocyrtis epiphyscia Ertz & Diederich– Reference: Zhurbenko (2009b, as its heterotypic synonym *Phoma physciicola* Keissler).
Endococcus macrosporus (Arnold) Nyl. – References: Alstrup and Olech (1993), Dillman et al. (2012), Zhurbenko and Brackel (2013).
Endococcus sendtneri (Arnold) Hafellner – Reference: Zhurbenko and Brackel (2013).
Endococcus verrucisporus Alstrup – Reference: Alstrup et al. (2009).
Endococcus verrucosus Hafellner – Reference: Alstrup et al. (2009).
Epibryon conductrix (Norman) Nik.Hoffm. & Hafellner – References: Alstrup et al. (2009), Zhurbenko (2009b), Zhurbenko and Brackel (2013).
Epibryon solorinae (Vain.) Nik.Hoffm. & Hafellner – Reference: Zhurbenko (2009b).
Epithamnolia karatyginii Zhurb. – Reference: Zhurbenko (2012).
Epithamnolia longicladoniae (Diederich & van den Boom) Diederich & Suija – Reference: Zhurbenko and Pino-Bodas (2017, as *Hainesia longicladoniae* Diederich & van den Boom).

Epithamnolia pertusariae (Etayo & Diederich) Diederich & Suija – Reference: Zhurbenko and Brackel (2013, as its heterotypic synonym *Hainesia bryonorae* Zhurb.)
Feltgeniomyces mongolicus Zhurb. – Reference: Zhurbenko (2020b).
Halospora discrepans (Arnold) Hafellner – Reference: Dillman et al. (2012).
Hobsoniopsis santessonii (Lowen & D.Hawksw.) D.Hawksw. – Reference: Zhurbenko (2009b).
Lasiosphaeriopsis salisburyi D.Hawksw. & Sivan. – Reference: Zhurbenko (2009b).
Lichenochora arctica Zhurb. – Reference: Zhurbenko (2013).
Lichenochora caloplacae Zhurb. – Reference: Zhurbenko and Brackel (2013).
Lichenochora coppinsii Etayo & Nav.-Ros. – References: Zhurbenko (2009b), Zhurbenko and Brackel (2013).
Lichenochora elegantis Hafellner – Reference: Zhurbenko (2009b).
Lichenochora cf. *polycoccoides* Hafellner & R.Sant. – Reference: Zhurbenko (2009b).
Lichenochora rinodinae Zhurb. – Reference: Zhurbenko (2013).
Lichenochora sedelnikoviorum Zhurb. – Reference: present paper.
Lichenoconium edgewoodensis Alstrup & M.S.Cole – Reference: Alstrup et al. (2009).
Lichenoconium xanthoriae M.S.Christ. – Reference: Zhurbenko (2009b).
Lichenopeltella stereocaulorum Zhurb. – Reference: Zhurbenko (2010a).
Lichenosticta dombrovskae Zhurb. – Reference: Zhurbenko (2010a).
Lichenostigma cosmopolites Hafellner & Calat. – Reference: Dillman et al. (2012).
Lichenostigma elongatum Nav.-Ros. & Hafellner – Reference: Zhurbenko (2009b).
Llimoniella catapyrenii Zhurb., Kukwa & Flakus – Reference: Zhurbenko (2013).
Merismatium thamnoliicola Alstrup & E.S.Hansen – References: Alstrup and Hansen (2001), Zhurbenko (2012).
Minutoexcipula mariana V.Atienza – Reference: Zhurbenko (2013).
Minutoexcipula tephromelae V.Atienza, Etayo & Pérez-Ortega – Reference: Zhurbenko (2010b).
Muellerella atricola (Linds.) Sacc. & D.Sacc. – References: Zhurbenko (2009b), Zhurbenko and Brackel (2013).
Neolamya ahtii Zhurb. – Reference: Zhurbenko and Pino-Bodas (2017).
Nesolechia doerfeltii (Alstrup & P.Scholz) Diederich – Reference: Alstrup et al. (2009, as *Phacopsis doerfeltii* Alstrup & P.Scholz).
Niesslia kununguakii Alstrup & E.S.Hansen – Reference: Alstrup and Hansen (2001).
Nigropuncta rugulosa D.Hawksw. – Reference: Alstrup et al. (2009).
Odontotrema japewiae Zhurb. & Diederich – Reference: Zhurbenko (2009b).
Opegrapha buelliae Zhurb. – Reference: Zhurbenko (2013).
Opegrapha geographicola (Arnold) Hafellner – Reference: Zhurbenko (2009b).
Opegrapha pulvinata Rehm – Reference: Zhurbenko (2009b).
Phacographa protoparmeliae Hafellner – Reference: Fryday (2011).
Phacopsis cf. *cephalodioides* (Nyl.) Triebel & Rambold – Reference: Zhurbenko (2009b).
Phacopsis oroarcticae Zhurb. – Reference: Zhurbenko (2010b).
Phaeoseptoria peltigerae Punith. & Spooner – Reference: Zhurbenko (2009b).
Phaeospora verrucariae Alstrup & E.S.Hansen – Reference: Alstrup and Hansen (2001).
Phoma peltigerae (P.Karst.) D.Hawksw. – Reference: Zhurbenko (2009b).
Phoma thamnoliae Zhurb. ad int. – Reference: Zhurbenko (2012).
Plectocarpon cladoniae R.Sant. – Reference: Dillman et al. (2012).
Plectocarpon peltigerae Zhurb., Ertz, Diederich & Miądl. – Reference: Dillman et al. (2012).
Polycoccum crassum Vězda – Reference: Zhurbenko (2009b).
Polycoccum microcarpum Diederich & Etayo – Reference: Zhurbenko and Pino-Bodas (2017).
Polydesmia lichenis Huhtinen & R.Sant. – Reference: Zhurbenko (2009b).
Reconditella physconiarum Hafellner & Matzer – Reference: Zhurbenko (2009b).
Rhagadostoma brevisporum (Nav.-Ros. & Hladun) Nav.-Ros. – References: Alstrup et al. (2009), Zhurbenko (2009b).
Rhymbocarpus geographici (J.Steiner) Vouaux – Reference: Zhurbenko (2009b).
Roselliniella pannariae Matzer & Hafellner – Reference: Zhurbenko (2009b).
Sagediopsis aquatica (Stein) Triebel – Reference: Alstrup et al. (2009).
Sagiolechia parasitica Alstrup & E.S.Hansen – Reference: Alstrup and Hansen (2001).

Sclerococcum ahtii (Zhurb. & Pino-Bodas) Ertz & Diederich – Reference: Pino-Bodas et al. (2017, as *Dactylospora ahtii* Zhurb. & Pino-Bodas).
Sclerococcum homoclinellum (Nyl.) Ertz & Diederich – Reference: Zhurbenko (2009b, as *Dactylospora homoclinella* (Nyl.) Hafellner).
Sclerococcum cf. *lobariellum* (Nyl.) Ertz & Diederich – Reference: Zhurbenko (2013, as *Dactylospora* cf. *lobariella* (Nyl.) Hafellner).
Sclerococcum montagnei Hafellner – Reference: Zhurbenko (2009b).
Sclerococcum rhyparizae (Arnold) Ertz & Diederich – Reference: Zhurbenko (2013, as *Dactylospora rhyparizae* Arnold).
Scutula epiblastematica (Wallr.) Rehm – Reference: Zhurbenko (2009b).
Skyttea dacampiae Zhurb. – Reference: Zhurbenko (2013).
Skyttea tephromelarum Kalb & Hafellner – Reference: Zhurbenko (2009b).
Sphaerellothecium arctoparmeliae (Brackel & Schiefelbein) Diederich, Zhurb. & Brackel – Reference: Diederich (2021).
Sphaerellothecium atryneae (Arnold) Cl.Roux & Triebel – Reference: Alstrup et al. (2009).
Sphaerellothecium epilecanora Zhurb. – Reference: Zhurbenko and Brackel (2013).
Sphaerellothecium siphulae Zhurb. – Reference: Zhurbenko (2015).
Sphaerellothecium taimyricum (Zhurb.) Zhurb. – Reference: Zhurbenko (2012, as *S. thamnoliae* var. *taimyricum* Zhurb.).
Sphaerellothecium thamnoliae Zhurb. – References: Zhurbenko (2012), Zhurbenko and Brackel (2013).
Stigmidium joergensenii R.Sant. – Reference: Alstrup et al. (2009).
Stigmidium mitchellii Cl.Roux & Bricaud – References: Alstrup et al. (2009), Zhurbenko (2009b, 2013), Zhurbenko and Brackel (2013).
Stigmidium squamariae (B. de Lesd.) Cl.Roux & Triebel – Reference: Zhurbenko (2009b).
Taeniolella arctoparmeliae Heuchert & Zhurb. – Reference: Heuchert et al. (2018).
Taeniolella diploschistis Heuchert, U.Braun, Diederich & Zhurb. – Reference: Heuchert et al. (2019).
Taeniolella ionaspisicola Alstrup & E.S.Hansen – Reference: Alstrup and Hansen (2001).
Taeniolella verrucosa M.S.Christ. & D.Hawksw. – Reference: Alstrup et al. (2009).
Talpapellis peltigerae Alstrup & M.S.Cole – Reference: Heuchert et al. (2014).
Tremella christiansenii Diederich – Reference: Zhurbenko (2009b).
Tremella hypogymniae Diederich & M.S.Christ. – Reference: Dillman et al. (2012).
Trichosphaeria lichenum P.Karst. & Har. – Reference: Zhurbenko (2009b).
Trimmatostroma cetrariae Brackel – Reference: Zhurbenko and Brackel (2013).
Trimmatostroma varicellariae Heuchert & U.Braun – Reference: Heuchert and Braun (2014).
Unguiculariopsis thallophila (P.Karst) W.Y.Zhuang – Reference: Zhurbenko (2009b).
Weddellomyces protearius Nav.-Ros. & Cl.Roux – Reference: Zhurbenko (2009b).
Xenonectriella lutescens (Rehm) Weese – References: Zhurbenko (2009b, 2013), Zhurbenko and Brackel (2013).
Zwackhiomyces coepulonus (Norman) Grube & R.Sant. – References: Alstrup et al. (2009), Zhurbenko (2009b).
Zwackhiomyces diederichii D.Hawksw. & Iturr. – Reference: Zhurbenko and Pino-Bodas (2017).
Zwackhiomyces lacustris (Arnold) Orange – Reference: Alstrup et al. (2009).
Zwackhiomyces physciicola Alstrup – Reference: Zhurbenko (2009b).
Zwackhiomyces socialis (Körb.) Cl.Roux– Reference: Zhurbenko (2009b, as its heterotypic synonym *Z. immersae* (Arnold) Grube & Triebel).