

New and noteworthy lichenicolous and bryophylous fungi from the Ukrainian Carpathians

Valeriy V. Darmostuk¹, Alexander Ye. Khodosovtsev¹,
Jan Vondrák^{2,3}, Olha Ye. Sira⁴

¹Kherson State University, 27 Universytetska Str., 73000 Kherson, Ukraine.

E-mail: valeriidarmostuk@gmail.com

²Institute of Botany of the Czech Academy of Sciences, Zámek 1, 252 43 Průhonice, Czech Republic.

³Department of Botany, Faculty of Science, University of South Bohemia, Branišovská 1760,
CZ-370 05 České Budějovice, Czech Republic.

⁴V.N. Karazin Kharkiv National University, Svobody Sq. 4, 61022 Kharkiv, Ukraine.

Abstract: Nine species, *Acremonium rhabdosporum*, *Arthonia digitatae*, *Bryocentria metzgeriae*, *Diplolaeviopsis* cf. *symmictae*, *Skyttea gregaria*, *Rhymocarpus pubescens*, *Stromatopogon cladoniae*, *Tremella cetrariicola* and *Xenonectriella subimperspicua*, are newly reported for Ukraine. *Sphinctrina anglica* is recollected for the first time since 1955. *Parmelia saxatilis* and *Parmelina pastillifera* are new host species for *X. subimperspicua*.

Keywords: Carpathian Biosphere Reserve, Gorgany Nature Reserve, *Diplolaeviopsis*, *Stromatopogon*, *Xenonectriella*

INTRODUCTION

The first mention of lichenicolous fungi in the Ukrainian Carpathians was published by Czech lichenologists in the first half of the last century (e.g. Servít & Nádvorník, 1932; Servít, 1936). Further research was related to the project “Lobarion lichens as indicators of primeval forests in Carpathians (Ukraine)” supported by the Darwin Initiative in 1997. It was held in the Zakarpattia region and, as a result, supplemented data about lichens and lichenicolous fungi (Coppins et al., 1998). Records of lichens as well as lichenicolous species in the East Carpathians were summarized in the checklists by Kondratyuk et al. (2003). Furthermore, data about lichenicolous fungi in Ukraine and also in the Ukrainian Carpathians were included in the checklist by Darmostuk & Khodosovtsev (2017). Further data are published by Darmostuk (2018), Malíček et al. (2018) and Nyporko et al. (2018).

During the two Ukrainian-Czech expeditions in May and August 2019, a few new and noteworthy lichenicolous fungi as well one bryophilous fungus were collected. The aim of this paper is to contribute to the new records of lichenicolous and bryophilous fungi in the Ukrainian Carpathians from Ivano-Frankivsk and Zakarpattia regions.

MATERIAL AND METHODS

The specimens were examined by standard microscope techniques using microscopes Optica-1 and MICROMED-2. Microscopical examination was done in water, 10% KOH (K), Lugol’s iodine solution, directly (I) or after pretreatment with KOH (K/I), or Brilliant Cresyl Blue (BCr). The measurements were made in water with an accuracy of 0.5 µm for ascospores, asci, conidia, conidiogenous cells, conidiophores, and ascomatal and pycnidial wall cells, and 5 µm for ascomata and pycnidia. The length, breadth and length/breadth ratio (l/b) of ascospores and conidia are given (when 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. The photographs were taken with a Levenhuk C510 NG camera. All examined specimens are deposited in the lichenological herbarium of Kherson State University (KHER), in the herbarium of the Institute of Botany of the Czech Academy of Sciences (PRA) and in the private herbarium of the first author (herb. VD).

RESULT

Species newly reported for Ukraine are denoted by an asterisk (*).

***ACREMONIUM RHABDOSPORUM** W. Gams

The species was isolated from *Cladonia* thallus collected in Austria (Gams, 1971). Later, *A. rhabdosporum* has been observed on various corticolous lichens from Austria, the Czech Republic, Germany, the Great Britain, Luxembourg, Italy, Spain and Sweden (Gams, 1971; Hawksworth, 1979; Diederich, 1989; Santesson et al., 2004; Etayo & López de Silanes, 2008; Brackel, 2008; 2010; Kocourková, 2009).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, 48°18'26.2"N, 23°43'56.9"E, alt. 830 m, on *Pseudevernia furfuracea* (thallus), on *Fagus sylvatica* twig, 24 May 2019, V. Darmostuk (herb. VD 329).

***ARTHONIA DIGITATAE** Hafellner

Our specimen is characterized by very inconspicuous, convex ascomata, slightly constricted at the base, brownish epichecium, colorless hymenium, indistinct K reaction of hymenium, 1-septate hyaline ascospores measuring (9.2–)10.6–11.8(–14.6) × (3.8–)4.4–4.8(–6.2) μm (n=30). These morphological features fit the concept of *A. digitatae* (Kocourková & van den Boom, 2005; Brackel, 2015; Zhurbenko & Pino-Bodas, 2017). This is a widespread holarctic species occurring also in polar desert biome (Zhurbenko & Pino-Bodas, 2017).

Specimen examined. Ukraine. Ivano-Frankivsk region, Nadvornyans'kyi district, Nature Reserve „Gorgany“, 48°27'47.8"N, 24°18'36.4"E, alt. 1310 m, on *Cladonia digitata* (squamules), on wood, 27 August 2019, V. Darmostuk (KHER 13531).

***BRYOCENTRIA METZGERIAE** (Ade & Höhn.) Döbblers

This is a common in Europe bryophilous fungus growing on *Radula complanata* (Döbblers, 2004, 2010).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, near Lushanka river, 48°18'26.2"N, 23°43'56.9"E, alt. 830 m, on *Radula complanata*, on *Fagus sylvatica* bark, 22 May 2019, A. Khodosovtsev (KHER).

CLYPEOCOCCUM HYPOCENOMYCIS D. Hawksw.

This is a common but yet overlooked species in Ukraine, previously recorded from Dnipropetrovsk, Lviv, Kharkiv, Kherson, Ternopil, Volyn and Zhytomyr regions (Darmostuk & Khodosovtsev, 2017, 2020; Darmostuk & Sira, 2020). Here it is newly reported for Ivano-Frankivsk region.

Specimen examined. Ukraine. Ivano-Frankivsk region, Nadvornyans'kyi district, Nature Reserve „Gorgany“, 48°27'47.8"N, 24°18'36.4"E, alt. 1310 m, on *Hypocenomyce scalaris* (thallus), on *Pinus cembra* bark, 26 August 2019, V. Darmostuk (herb. VD 546).

DIDYMOCYRTIS MELANELIXIAE (Brackel) Diederich, R.C. Harris & Etayo

The species is probably rare in Ukraine. Recently, it has been reported on *Platismatia glauca* from Petros Mt. (Darmostuk, 2018).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, 48°19'34.5"N, 23°44'10.9"E, alt. 840 m, on *Melanelixia glabratula*, on *Fagus sylvatica* bark, 22 May 2019, V. Darmostuk (herb. VD 590).

***DIPLOLAEVIOPSIS** cf. **SYMMICTAE** Diederich & Coppins (Fig. 1)

Ascomata not observed. Conidiomata pycnidia, arising singly (2–5 per host apothecium), unilocular, immersed to semi-immersed in apothecia of *Lecanora symmicta*, subglobose, macroscopically dark brown, 70–90 μm in diam. Pycnidial wall up to 15 μm thick, composed of 2–6 layers of pseudoparenchymatous cells, aeruginous, K+ olive brown. Conidiogenous cells subcylindrical, with a slight collarete, hyaline, smooth, (4.8–)5.2–5.6(–6.4) × (2.0–)2.2–3.0(–3.4) μm (n=15). Conidia holoblastic, arising singly, elongate soleiform to tadpole-shaped, 1-septate, constricted at the septum, hyaline, smooth, (7.2–)7.8–9.2(–9.8) × (2.2–)2.8–3.6(–3.8) μm (n=30), upper cell ± globose, lower cell subcylindrical, sometimes equal in length with upper cell, base truncate.

There are some discrepancies between the examined specimen and the protologue (Diederich & Coppins, 2014), where conidiomata were reported as being larger, and the pycnidial wall is hyaline to olivaceous, K–. Another species of the genus, *Diplolaeviopsis ranula*, is characterized by similar morphological features, but differs in its brown, K+ purplish excipular pigment and different host species, *Lecanora strobilina* and *L. strobilinoidea* (Giralt & Hawksworth, 1991; Suija et al., 2015). To date, *Diplolaeviopsis symmictae* was reported from Europe and North America (Diederich & Coppins, 2014; Haldeman, 2019).

Specimen examined. Ukraine. Ivano-Frankivsk region, Nadvornyans'kyi district, Nature Reserve „Gorgany“, 48°27'47.8"N, 24°18'36.4"E, alt. 1310 m, on *Lecanora symmicta* (apothecia), on *Pinus cembra* twig, 27 August 2019, V. Darmostuk (KHER 13446).

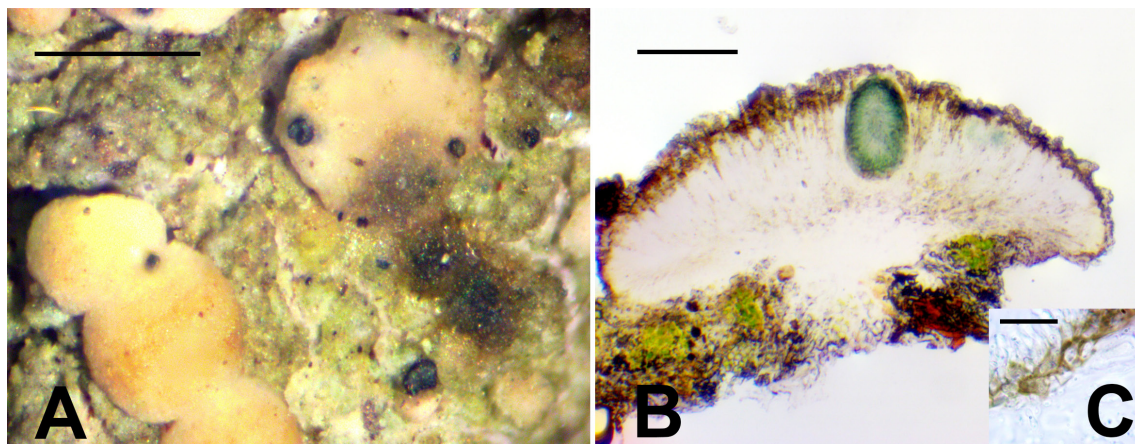


Fig. 1. *Diplolaeviopsis* cf. *symmictae* (KHER 13446): A – conidiomata on host apothecia; B – cross-section of the conidiomata; C – pycnidial wall in KOH. Scale bars: A – 1 mm, B – 100 μ m, C – 10 μ m.

EPICLADONIA SANDSTEDEI (Zopf) D. Hawksw.

Conidiomata semi-immersed, up to 150 μ m in diam., forming distinct galls, pycnidial wall orange-brown, conidia hyaline, smooth 0–1-septate (9.0–)10.0–12.8(–14.2) \times (2.2–)2.6–3.2(–3.4) μ m (n=30). *Epicladonia sandstedei* is a widely distributed species in the Holarctic (Zhurbenko & Pino-Bodas, 2017), and it was reported in Ukraine only from Kherson region on the thallus of *Cladonia rangiformis* (Darmostuk & Khodosovtsev, 2017).

Specimen examined. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, 48°18'26.2"N, 23°43'56.9"E, alt. 830 m, on *Cladonia* sp. on *Fagus sylvatica* bark at the base of trunk, 24 May 2019, A. Khodosovtsev (KHER 13013).

EPICLADONIA STENOSPORA (Harm.) D. Hawksw. s.lat.

Our specimen is characterized by semi-immersed to erumpent conidiomata up to 100 μ m in diam., light brown pycnidial wall, hyaline smooth 0–(1)-septate conidia (8.8–)9.8–11.0(–11.4) \times (2.8–)3.0–3.4(–3.8) μ m (n=30). Distinct gall formation was not observed. In Ukraine, it was reported from Sumy region on thalli of *Cladonia foliacea* (Khodosovtsev & Darmostuk, 2017).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, 48°21'20.3"N, 23°44'10.4"E, alt. 830 m, on *Cladonia digitata* (thallus), on *Picea abies* bark, 26 May 2019, V. Darmostuk (herb. VD 638).

**RHYMBOCARPUS PUBESCENS* (Etayo & Diederich) Diederich & Etayo

Our material is characterized by rather immersed than erumpent ascomata with blackish hair, up to 200 μ m in diam., greenish grey exciple, 8-spored asci and ellipsoid 0-septate hyaline ascospore, (8.2–)8.8–9.4(–9.8) \times (2.4–)3.2–3.6(–4.0) μ m (n=30). To date, this species was reported only from Great Britain, Norway, Russia (Caucasus), Spain and Papua New Guinea (Etayo & Diederich, 1998; Diederich & Etayo, 2000; Santesson et al., 2004; Urbanavichus et al., 2020).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv's'kyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, Manchul, 48°18'41.2"N, 23°41'59.7"E, alt. 1100 m, on thallus of *Lepraria incana*, at the base of *Fagus sylvatica*, 27 May 2019, A. Khodosovtsev (KHER 13856).

**SKYTTEA GREGARIA* Sherwood, D. Hawksw. & Coppins

This widespread species was previously reported from Austria, Finland, Germany, Great Britain, Norway, Poland, Russia, Slovenia, Spain, Sweden and USA (e.g. Diederich & Etayo, 2000; Kukwa & Czarnota, 2006; Stepanchikova et al., 2018).

Specimens examined (all on *Violella fucata*). Ukraine. Ivano-Frankivsk region, Nadvornyans'kyi district, Nature Reserve „Gorgany“, 48°25'49.2"N, 24°19'25.9"E, alt. 1070 m, on *Fagus sylvatica* twig, 24 August 2019, V. Darmostuk (KHER 13684); Ibidem, on twig of *Picea abies*, J. Vondrák (PRA Vondrák

22116); Yaremchans'ka city council, Tatariv, Polianytsa, c. 7.5 Km NW of Polianytsa, above valley of river Zubrinka, 48°24'35.7"N, 24°23'41.6"E, alt. 1300 m, 26.08.2019, J. Vondrák (PRA Vondrák 22021); Zakarpattia region, Tyachiv'skyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, near river Luzhanka, 48°19'34.5"N, 23°44'10.1"E, alt. 840 m, on *F. sylvatica* bark, 22 May 2019, A. Khodosovtsev (KHER 14118); 48°18'26.2"N, 23°43'56.9"E, alt. 830 m, on *F. sylvatica* bark, 24 May 2019, V. Darmostuk (KHER 13149).

SPHINCTRINA ANGLICA Nyl.

Previously, this species was known in Ukraine from a single report [as *Sphinctrina microcephala* (Sm.) Nyl.] from Chernivtsi region, growing on an unidentified corticolous crustose brown lichen (Makarevich, 1955).

Specimens examined. Ukraine. Ivano-Frankivsk region, Nadvornyyans'kyi district, Nature Reserve „Goryany“, 48°24'34.7"N, 24°23'42.2"E, alt. 1310 m, on *Protoparmelia* cf. *hypotremella* (thallus), on *Betula obscura* bark, 26 August 2019, J. Vondrák & A. Khodosovtsev (KHER 13075, 13563, PRA Vondrák 22033, 22036).

*STROMATOPOGON CLADONIAE Diederich & Sérus.

Conidiomata pycnidia, immersed, arising singly, subglobose, dark brown, 80–100 µm in diam.; pycnidial wall brown, 12–15 µm thick, conidiogenous cell hyaline, ampulliform to short cylindrical; macroconidia variable in shape, spherical, ellipsoid or obpyriform, (2–)4(–7)-septate, hyaline, thick-walled, (7.8–)9.4–13.8(–16.4) × (6.0–)6.8–8.2(–9.2) µm (n=30); microconidia not observed; infected parts of squamules become decolored.

This species was reported only from Belgium (Diederich & Sérusiaux, 2003).

Specimen examined. Ukraine. Ivano-Frankivsk region, Yaremchans'ka city council, near Zarosliak village, 48°09'48.4"N, 24°33'16.2"E, alt. 903 m, on *Cladonia* sp. (thallus), on *Picea abies* bark, 7 August 2019, V. Darmostuk & O. Sira (herb. VD 061).

*TREMELLA CETRARIICOLA Diederich & Coppins

This common species has been reported from Europe (Great Britain, Germany, Finland, France, Italy, Norway, Svalbard and Sweden), Asia (Russia), Canary Islands and North America (USA and Canada) (Diederich, 1996; Pippola & Kotiranta, 2008; Zhurbenko et al., 2012; Zhurbenko & Brackel, 2013; Brackel, 2014; Moreau et al., 2015; Brackel & Puntillo, 2016).

Specimens examined (all on thalli *Tuckermannopsis chlorophylla*). Ukraine. Ivano-Frankivsk region,

Yaremchans'ka city council, near Zarosliak village, 48°09'48.4"N, 24°33'16.2"E, alt. 903 m, on *Picea abies* bark, 7 August 2019, V. Darmostuk & O. Sira (herb. VD 058); Zakarpattia region, Tyachiv'skyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, Manchul, 48°18'41.2"N, 23°41'59.7"E, alt. 1100 m, on *Fagus sylvatica* bark, 27 May 2019, V. Darmostuk (KHER 13311).

XENONECTRIELLA FISSURIPRODIENS (Etayo) Etayo

It was previously reported (as *Pronectria fissuriprodiens* Etayo) from Zakarpattia region without certain locality (Kondratyuk et al., 2003).

Specimen examined. Ukraine. Zakarpattia region, Tyachiv'skyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, 48°19'34.5"N, 23°44'10.1"E, alt. 840 m, on *Lobaria pulmonaria*, on *Fagus sylvatica*, 22 May 2019, A. Khodosovtsev (KHER 14172).

*XENONECTRIELLA SUBIMPERSPICUA (Speg.) Etayo

Ascomata perithecia, immersed in host thalli, globose, orange, arising singly or in groups of 2–4, 100–150 µm in diam.; exciple up to 20 µm thick, K+ violet; asci cylindrical, 8-spored (36–)42–49(–52) × (5.5–)8–9.2(–10) µm (n=10); ascospores 1-septate, broadly ellipsoid, hyaline, constricted at the septum, (6.2–)6.8–7.8(–8.0) × (4.4–)4.8–5.4(–5.6) µm (n=30). This species was previously reported on various species of Parmeliaceae and Physciaceae from Argentina, Brazil, Ecuador, Germany, India, New Zealand and Spain (Brackel, 2007; Zhurbenko, 2013; Motiejūnaitė & Grochowski, 2014; Etayo & Pérez-Ortega, 2016; Etayo, 2017). *Parmelia saxatilis* and *Parmelina pastillifera* are new host species.

Specimen examined. Ukraine. Zakarpattia region, Tyachiv'skyi district, Carpathian Biosphere Reserve, Shyrokyi Luh Massive, Manchul, 48°18'41.2"N, 23°41'59.7"E, alt. 1100 m, on *Parmelina pastillifera* and *Parmelia saxatilis* (thallus), on *Fagus sylvatica*, 27 May 2019, A. Khodosovtsev (KHER 13385).

ACKNOWLEDGMENTS

We express our gratitude to Wolfgang von Brackel, Michael Haldeman and Jurga Motiejūnaitė for kindly providing the literature and Nataliya Maluga for help with herbarium management (KHER). Jiří Maliček, Zdeněk Palice, Ondřej Peksa, Yaroslav Petraschuk, Stanislav Svoboda and Olexandr Yurchenko were of indispensable assistance during fieldwork excursions. The anonymous reviewer and Tiina Randlane (Tartu) are thanked for their valuable comments and

suggestions. This study was financially supported by the Ministry of Science and Education of Ukraine (Project No 0219U000270).

REFERENCES

- Brackel, W. v. 2007. Weitere Funde von flechtenbewohnenden Pilzen in Bayern Beitrag zu einer Checkliste III. *Berichte Der Bayerischen Botanischen Gesellschaft* 77: 5–26.
- Brackel, W. v. 2008. *Zwackhiomyces echinulatus* sp. nov. and other lichenicolous fungi from Sicily, Italy. *Herzogia* 21: 181–198.
- Brackel, W. v. 2010. Weitere Funde von flechtenbewohnenden Pilzen in Bayern – Beitrag zu einer Checkliste V. *Berichte Der Bayerischen Botanischen Gesellschaft* 80: 5–32.
- Brackel, W. v. 2014. Kommentierter Katalog der flechtenbewohnenden Pilze Bayerns. *Bibliotheca Lichenologica* 109: 1–476.
- Brackel, W. v. 2015. Lichenicolous fungi from Central Italy with notes on some remarkable hepaticolous, algicolous and lichenized fungi. *Herzogia* 28(1): 212–281. <https://doi.org/10.13158/hea.28.1.2015.212>
- Brackel, W. v. & Puntillo, D. 2016. New records of lichenicolous fungi from Calabria (Southern Italy), including a first checklist. *Herzogia* 29(2): 277–306. <https://doi.org/10.13158/hea.29.2.2016.277>
- Coppins, B. J., Kondratyuk, S. Ya., Khodosovtsev, A. Ye., Zelenko, S. D., Coppins A. M., Wolseley P. A. & Virchenko V. M. 1998. Diversity of Lichens and Bryophytes in Regional Landscape Park „Stuzhytzia” (Ukrainian part of the International Biosphere Reserve „Eastern Carpathians”). In: *Lobarion lichens as indicators of the primeval forests of the Eastern Carpathians (Darwin International Workshop, 25–30 May 1998, Kostrino, Ukraine)*, Kostrino. Pp. 139–161.
- Darmostuk, V. V. 2018. The new records of lichenicolous fungi from Ukrainian Carpathians. *Chornomorski Botanical Journal* 14(2): 173–179. (In Ukrainian). <https://doi.org/10.14255/2308-9628/18.142/7>
- Darmostuk, V. V. & Khodosovtsev, A. Ye. 2017. Lichenicolous fungi of Ukraine: An annotated checklist. *Studies in Fungi* 2(1): 138–156. <https://doi.org/10.5943/sif/2/1/16>
- Darmostuk, V. V. & Khodosovtsev, A. Ye. 2020. Notes to lichen-forming and lichenicolous fungi in Ukraine I. *Chornomorski Botanical Journal* 16(3): 257–274. <https://doi.org/10.32999/ksu1990553X/2020-16-3-6>
- Darmostuk V. V. & Sira O. Ye. 2020. New and remarkable records of lichenicolous fungi from Ternopil Oblast (Ukraine). *Czech Mycology* 72(1): 33–41. <https://doi.org/10.33585/cmy.72103>
- Diederich, P. 1989. Les lichens épiphytiques et leurs champignons lichénicoles (macrolichens exceptés) du Luxembourg. *Travaux Scientifiques du Musée National D'Histoire Naturelle de Luxembourg* 14: 1–268.
- Diederich, P. 1996. The lichenicolous heterobasidiomycetes. *Bibliotheca Lichenologica* 61: 1–198.
- Diederich, P. & Coppins, B. 2014. *Diplolaeviopsis symmictae* (Helotiales, Ascomycota), a new lichenicolous fungus on *Lecanora symmicta*. *Bulletin de La Société Des Naturalistes Luxembourgeois* 115: 151–155.
- Diederich, P. & Etayo, J. 2000. A synopsis of the genera *Skyttea*, *Llimoniella* and *Rhymbocarpus* (Lichenicolous Ascomycota, Leotiales). *The Lichenologist* 32(05): 423–485. <https://doi.org/10.1006/lich.2000.0290>
- Diederich, P. & Sérusiaux, E. 2003. *Stromatopogon cladoniae* sp. nova, a remarkable new lichenicolous coelomycete from Belgium. *Bibliotheca Lichenologica* 86: 103–106.
- Döbbeler, P. 2004. *Bryocentria* (Hypocreales), a new genus of bryophilous Ascomycetes. *Mycological Progress* 3(3): 247–256. <https://doi.org/10.1007/s11557-006-0095-7>
- Döbbeler, P. 2010. New species and records of *Bryocentria* – a hypocrealean genus of bryophilous ascomycetes. *Karstenia* 50: 11–23. <https://doi.org/10.29203/ka.2010.437>
- Etayo, J. 2017. *Hongos liquenícolas de Ecuador*. San Miguel de Tucumán. 540 pp.
- Etayo, J. & Diederich, P. 1998. Lichenicolous fungi from the Western Pyrenees, France and Spain. IV. Ascomycetes. *The Lichenologist* 30: 103–120. <https://doi.org/10.1006/lich.1997.0121>
- Etayo, J. & López de Silanes, M. E. 2008. Líquenes epífitos y hongos liquenícolas del Bosque Viejo de Munain-Okariz (Álava, País Vasco, España). *Nova Acta Científica Compostelana (Biología)* 17: 11–29.
- Etayo, J. & Pérez-Ortega, S. 2016. Lichenicolous lichens and fungi from Monfragüe National Park (Western Spain). *Herzogia* 29(2): 315–328. <https://doi.org/10.13158/hea.29.2.2016.315>
- Gams, W. 1971. *Cephalosporium-artige Schimmelpilze (Hyphomycetes)*. Stuttgart. 262 pp.
- Giralt, M. & Hawksworth, D. L. 1991. *Diplolaeviopsis ranula*, a new genus and species of lichenicolous coelomycetes growing on the *Lecanora strobilina* group in Spain. *Mycological Research* 95(6): 759–761. [https://doi.org/10.1016/S0953-7562\(09\)80828-9](https://doi.org/10.1016/S0953-7562(09)80828-9)
- Haldeman, M. 2019. New and interesting records of lichens and lichenicolous fungi from Northwestern USA II. *Evansia* 36(3): 63–73. <https://doi.org/10.1639/0747-9859-36.3.63>
- Hawksworth, D. L. 1979. The lichenicolous Hyphomycetes. *Bulletin of the British Museum of Natural History* 6: 183–300.
- Hawksworth, D. L. 1981. The lichenicolous Coelomycetes. *Bulletin of the British Museum for Natural History* 9(1): 1–98.
- Khodosovtsev, A. Ye. & Darmostuk, V. V. 2017. *Zwackhiomyces polischukii* sp. nov., and other

- noteworthy lichenicolous fungi from Ukraine. *Polish Botanical Journal* 62(1): 27–35. <https://doi.org/10.1515/pbj-2017-0006>
- Kocourková, J. 2009. Observations on the genus *Necolamya*, with the description of the new species *N. xanthoparmeliae* (Ascomycota, genera incertae sedis). *Opuscula Philolichenum* 6: 137–148.
- Kocourková, J. & van den Boom, P. 2005. Lichenicolous fungi from the Czech Republic II. *Arthrurhaphis arctoparmeliae* spec. nov. and some new records for the country. *Herzogia* 18: 23–35.
- Kondratyuk, S. Ya., Popova, L. P., Lackovicova, A. & Pišút, I. 2003. *A catalogue of the Eastern Carpathian Lichens*. Kiev-Bratislava. 263 pp.
- Kukwa, M. & Czarnota, P. 2006. New or interesting records of lichenicolous fungi from Poland IV. *Herzogia* 19: 111–123. <https://doi.org/10.13158/heia.23.1.2010.111>
- Makarevich, M. F. 1955. To study of lichen flora of Chernivtzi oblast. *Botanical Zhurnal of Academy of Sciences of USSR* 12(2): 52–59.
- Malíček, J., Palice, Z., Acton, A., Berger, F., Bouda, F., Sanderson, N. & Vondrák, J. 2018. Uholka primeval forest in the Ukrainian Carpathians – a keynote area for diversity of forest lichens in Europe. *Herzogia* 31(1): 140–171. <https://doi.org/10.13158/099.031.0110>
- Moreau, P.-A., Haluwyn, C. V., Roux, C. & Sussey, J.-M. 2015. *Tremella cetrariicola* Diederich et Coppins, première récolte en France. *Bulletin d'informations de l'Association Française de Lichénologie* 40(2): 163–167.
- Motiejūnaitė, J. & Grochowski, P. 2014. Miscellaneous new records of lichens and lichenicolous fungi. *Herzogia* 27(1): 193–198. <https://doi.org/10.13158/heia.27.1.2014.193>
- Nyporko, S. O., Barsukov, O. O. & Kapets, N. V. 2018. Floristic records of mosses, lichens and lichenicolous fungi from Hutsulschyna National Nature Park. *Ukrainian Botanical Journal* 75(2): 179–186. <https://doi.org/10.15407/ukrbotj75.02.179>
- Pippola, E. & Kotiranta, H. 2008. The genus *Tremella* (Basidiomycota, Tremellales) in Finland. *Annales Botanici Fennici* 45: 401–434. <https://doi.org/10.5735/085.045.0601>
- Santesson, R., Moberg, R., Nordin, A., Tønsberg, T. & Vitikainen, O. 2004. Lichen-forming and lichenicolous fungi of Fennoscandia. Uppsala. 359 pp.
- Servit, M. 1936. Neue und seltener Flechten aus den Familien Verrucariaceae und Dermatocarpaceae. *Beihefte zum botanischen Centralblatt* 55: 251–274.
- Servit, M. & Nádvořník, J. 1932. Flechten aus der Čechoslowakei. II. Karpatorussland und Südostslovaeki. *Věstník Královské české společnosti nauk. Třída mathematicko-přirodovědecká*. Pp. 1–41.
- Stepanchikova, I. S., Himelbrant, D. E., Motiejūnaitė, J., Ahti, T., Suija, A., Kuznetsova, E. S. & Dyomina, A. V. 2018. New records of lichens and allied fungi from the Leningrad Region, Russia. IX. *Folia Cryptogamica Estonica* 55: 117–124. <https://doi.org/10.12697/fce.2018.55.12>
- Suija, A., Ertz, D., Lawrey, J. D. & Diederich, P. 2015. Multiple origin of the lichenicolous life habit in Helotiales, based on nuclear ribosomal sequences. *Fungal Diversity* 70(1): 55–72. <https://doi.org/10.1007/s13225-014-0287-4>
- Urbanavichus, G., Vondrák, J., Urbanavichene, I., Palice, Z. & Malíček, J. 2020. Lichens and allied non-lichenized fungi of virgin forests in the Caucasus State Nature Biosphere Reserve (Western Caucasus, Russia). *Herzogia* 33: 90–138. <https://doi.org/10.13158/heia.33.1.2020.90>
- Zhurbenko M. P. 2013. A first list of lichenicolous fungi from India. *Mycobiota* 3: 19–34. <https://doi.org/10.12664/mycobiota.2013.03.03>
- Zhurbenko, M. P. & Brackel, W. v. 2013. Checklist of lichenicolous fungi and lichenicolous lichens of Svalbard, including new species, new records and revisions. *Herzogia* 26(2): 323–359. <https://doi.org/10.13158/heia.26.2.2013.323>
- Zhurbenko, M. P., Himelbrant, D. E., Kuznetsova, E. S. & Stepanchikova, I. S. 2012. Lichenicolous fungi from the Kamchatka Peninsula, Russia. *The Bryologist* 115(2): 295–312. <https://doi.org/10.1639/0007-2745-115.2.295>
- Zhurbenko, M. P. & Pino-Bodas, R. 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.