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The lichenicolous lichen *Placocarpus americanus* and some noteworthy lichenicolous fungi from Russia

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Abstract: *Endococcus verrucosus* and *Placocarpus americanus* are reported as new to Russia; *Abrothallus caerulescens*, *A. cetrariae, Capronia peltigerae* and *Zwackhiomyces echinulatus* are reported as new to the central part of European Russia. A finding of *Lawalreea* cf. *lecanorae* is discussed.

Keywords: lichen-inhabiting fungi, biogeography, taxonomy, ecology, Eastern Europe

INTRODUCTION

The central part of European Russia [in the sense of 'European Center of Russia' according to Zhurbenko (2007: Fig. 1)] still remains one of the less explored regions of Russia respecting lichenicolous fungi. In the first Russian checklist of these fungi, just 12 species were enumerated from the area (Zhurbenko, 2007). Later on some 20 additional species have been reported (most important contributions: Notov et al., 2011; Zhurbenko & Gudovicheva, 2013). Thus it is not surprising that a revision of a small collection of lichenicolous fungi from Tver Region of Russia gathered by A. A. Notov revealed several noteworthy species, including two new to Russia.

MATERIAL AND METHODS

The material was identified by the first author using Zeiss microscopes Stemi 2000-CS and Axio Imager A1 equipped with Nomarski differential interference contrast (DIC) optics. Microscopical examination was done in water, 10% KOH (K), Lugol's iodine directly (I) or after a KOH pre-treatment (K/I). The length, breadth and length/breadth ratio (l/b) of asci, ascospores and conidia (when n ≥ 10) are given as: (min–)$\overline{X}$–SD–$\overline{X}$+SD(–max), where min and max are the extreme values, $\overline{X}$ the arithmetic mean, and SD the corresponding standard deviation. Measurements were taken from water mounts unless otherwise indicated. Examined specimens are deposited in the mycological herbarium of the V. L. Komarov Botanical Institute in St.-Petersburg, Russia (LE).

THE SPECIES

Abrothallus caerulescens I. Kotte – Tver Region, Toropets District, near Skvortsovo village, 56°27'16"N, 31°21'13"E, alt. 190 m, on *Xanthoparmelia conspersa* (thallus), 5.08.2003, A. A. Notov (LE 264399).

Notes – In European Russia the species was formerly known from Republic of Karelia (Zhurbenko & Ahti, 2005). New to the central part of European Russia.

Abrothallus cetrariae I. Kotte (syn. *Vouauxiomyces santessonii* D. Hawksw.) – Tver Region, Nelidovo District, Central-Forest State Nature Reserve, square 95, 56°27'56"N, 32°57'55"E, alt. 250 m, on *Platismatia glauca* (thallus) growing on spruce, 5.09.2011, A. A. Notov (LE 261422).

Notes – Only asexual stage of the species was found. Conidiomata erumpent, finally almost sessile, 150–350 µm diam., often green pruinose. Conidia (6.6–)6.7–8.7(–10.3) × (3.7–)4.3–5.3(–5.7) µm, l/b = 1.3–1.9(–2.6) (n = 25), with smooth walls, which corresponds to observations of Brackel (2009). According to Hawksworth (1981), conidia of *Vouauxiomyces santessonii* are wider, (7–)7.5–10.5(–11.5) × (5–)5.5–7(–7.5) µm, with ornamented walls. However, this author treated *V. santessonii* too broad, including specimens on *Parmelia saxatilis,* which should represent the asexual stage of *Abrothallus parmeliarum* (Sommerf.) Arnold. Formerly known in Russia from Republic of Karelia, Leningrad and Pskov Regions, Komi Republic and Karachayevo-

Circassian Republic (Zhurbenko, 2004, 2009; Zhurbenko & Ahti, 2005; Alstrup & Ahti, 2007; Zhurbenko & Kobzeva, 2014). New to the central part of European Russia.

Capronia peltigerae (Fuckel) D. Hawksw. – Tver Region, Vyshnii Volochek District, near Ilinskoe village, 57°22'23"N, 34°40'56"E, alt. 220 m, on *Peltigera rufescens* (thallus), 22.06.2007, A. A. Notov (LE 261271).

Notes – In European Russia the species was formerly known from Republic of Karelia (Alstrup et al., 2005). New to the central part of European Russia.

Endococcus verrucosus Hafellner – Tver Region, Andreapol District, near Gorbukhino village, 56°57'33"N, 31°39'56"E, alt. 280 m, on *Aspicilia* sp. (apothecia, thallus), growing on granite boulder, 7.08.2003, A. A. Notov (LE 264379). – Krasnoyarsk Territory, Putorana Plateau, mouth of Bunisyak River at eastern extremity of Lama Lake, 69°23'N, 91°36'E, alt. 100 m, on *Aspicilia* sp. (apothecia, thallus), 12.07.1984, M. P. Zhurbenko 84155 (LE 207262), det. J. Hafellner (June 1994), revised M. P. Zhurbenko (2015).

Notes – Ascomata 150–200 µm diam., usually up to ¼ protruding above the host thallus; wall dark brown above, pale brown at the base, K+ acquires a light olive shade. Hymenial gel K/I+ blue with reddish stripes. Ascospores ellipsoid or rarely obovoid or subglobose, ends rather acute or sometimes rounded, occasionally attenuated or with papilla at one end, hyaline then pale and finally medium greyish brown (K–), wall sometimes darker near septum and at the ends, granulate (clearly seen at ×1000), up to 1.5 µm thick, hyaline immature spores sometimes with halo up to 2 µm thick, (0–)1-septate, with both cells usually equal in shape and size, occasionally slightly constricted at the septum, usually with one large guttule in each cell, (7.5–)10.3–14.9(–21.3) × (5.1–)6.1–7.7(–9.6) µm, l/b = (1.1–)1.4–2.2(–3.7) (n = 172, in water or K) (Fig. 1). In the species protologue its ascospore size was given as (13–)14–17(–18) × 7–9 µm (Hafellner, 1994). New to Russia.

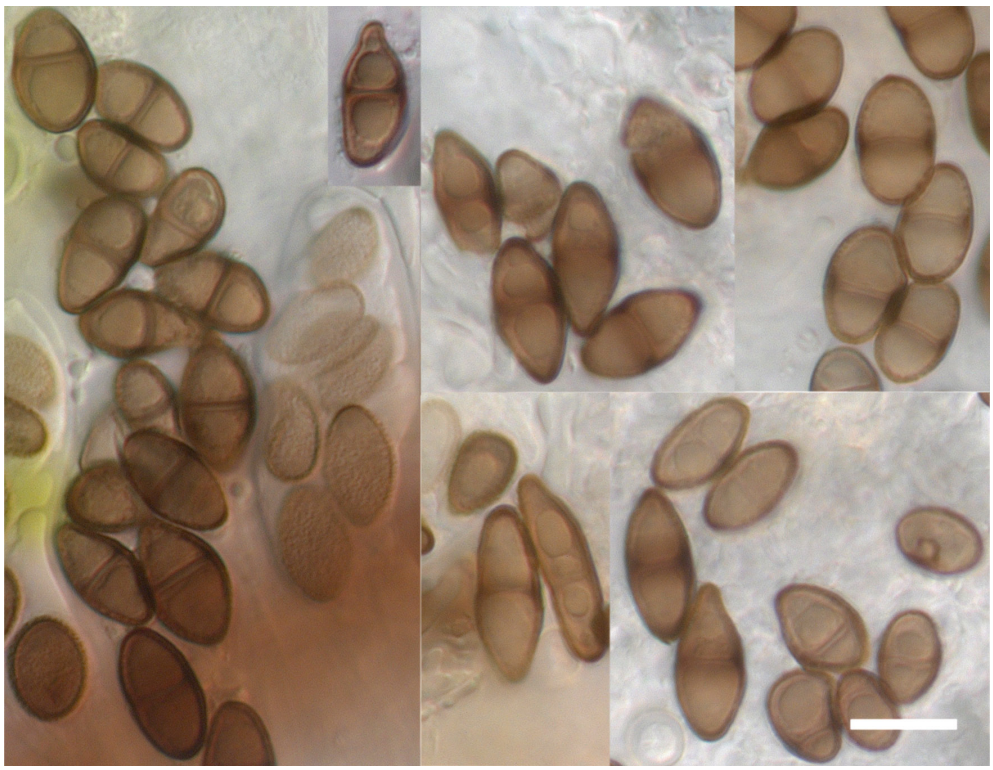

Fig. 1. *Endococcus verrucosus* (LE 264379, in water). A variety of shapes and sizes of the ascospores. Scale bar = 10 µm.

Lawalreea cf. lecanorae Diederich – Tver Region, Torzhok District, Shcherbovo homestead, 57°01'07"N, 34°34'18"E, alt. 220 m, on *Lecanora hagenii* (disc of apothecia) growing on house foundation, 25.08.2008, A. A. Notov (LE 264489).

Notes – Examined material differs from the species protologue (Diederich, 1990) in having slightly larger conidiogenous cells, (6.4–)7.0–9.4(–9.8) × 4.4–5.6(–6.3) µm (n = 17, in water or K) vs. 5–8 × 2.5–5 µm, and conidia, (6.1–)8.1–9.9(–11.9) × (2.5–)3.0–3.6(–4.0) µm, l/b = (1.7–)2.4–3.0(–3.4) (n = 89) vs. (5–)5.5–6.5(–7.5) µm (Fig. 2). Additionally, the conidiomata wall is pale brown below and medium brown above with a greenish grey hue around the ostiole (wall K–, but with traces of dissolved olive pigment around), while in the protologue it was said to be green in the upper part and hyaline in the lower part, K–. The species was known from Spain, France, Luxembourg, Germany and Poland (Diederich, 1990; Boqueras, 2000; Jando & Kukwa, 2003; Signoret & Diederich, 2003; Brackel, 2014), but not from Russia.

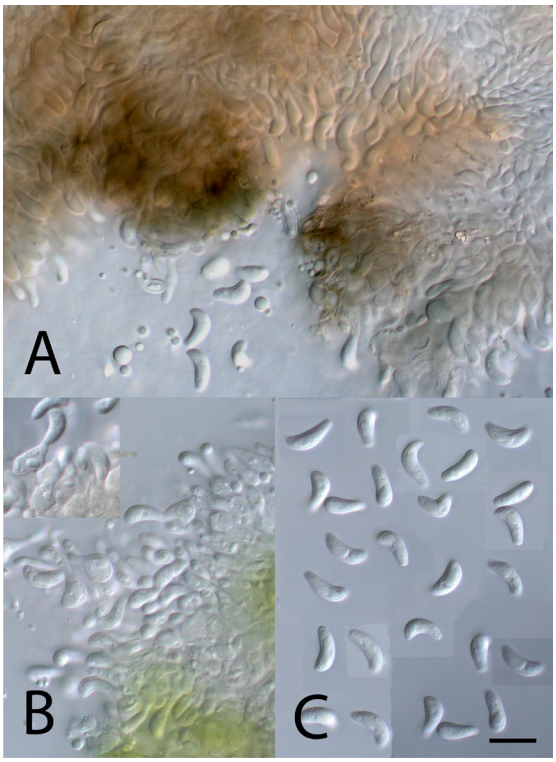

Fig. 2. *Lawalreea* cf. *lecanorae* (LE 264489). A: squashed wall of conidioma, note greenish grey hue around the ostiole (in water). B: conidiogenous cells (in K). C: conidia (in K). Scale bar = 10 µm.

Placocarpus americanus K. Knudsen, Breuss & Kocourk. – Tver Region, Konakovo District, near Zavidovo village, 56°34'20"N, 36°24'11"E, alt. 120 m, on *Lecanora muralis* (thallus and apothecia) growing on granite boulder, 30.07.2008, A. A. Notov (LE 264329).

Notes – Ascomata subglobose, up to 250 µm diam, immersed to slightly protruding, densely aggregated to sometimes concrescent. Exciple medium brown above (pigmentation spotty), K+ acquiring light olive shade, colourless below. Hymenial gel K/I+ blue with reddish stripes. Asci 53–68 × 18–23 µm (n = 6), wall K/I+ blue. Ascospores hyaline or occasionally pale yellowish, oblong, ellipsoid, narrowly ellipsoid or rarely broadly ellipsoid, (12.5–)15.3–20.5(–22.7) × (5.3–)6–8(–9.2) µm, l/b = (1.7–)2.2–3.0(–3.7) (n = 45), 0(–1)-septate, occasionally with halo ca. 1.5 µm thick (Fig. 3). Infected host tissues become grey. Conidiomata not observed. In spite of presence of abundant mature ascomata morphologically distinct own thallus was not observed.

Placocarpus americanus is a juvenile parasite of *Lecanora muralis*, rarely of *L. garovaglioi* or *Rhizoplaca chrysoleuca,* eventually developing an independent lichenized grey thallus, formerly known from western North America (Arizona and California) (Knudsen et al. 2009, 2013). The examined material also fits the protologue of another juvenile lichen parasite, *Placocarpus melanophthalmosus* Cl. Roux & Gueidan, so far known from the French Pyrenees, starting its life cycle on *Rhizoplaca melanophthalma* (Roux & Gueidan, 2011). These species might be conspecific, though ascospores of *Placocarpus americanus* were reported as being significantly narrower than those of *P. melanophthalmosus*, viz. 18–22 × 5–8 µm vs. (15.5–)17.5–22.5(–25) × (7.5–)8–11(–11.5) µm, l/b = (1.6–)1.8–2.6(–2.9) (n = 39) (Knudsen et al., 2009; Roux & Gueidan, 2011). It is noteworthy that so far septate or pale yellowish ascospores have not been observed in species of *Placocarpus* Trevis. emend. O. Breuss (Knudsen et al., 2009; Roux & Gueidan, 2011). A similar lichenicolous lichen, *Placocarpus schaereri* (Fr.) Breuss, also growing on *Lecanora muralis,* can be distinguished from *P. americanus* by its larger ascospores, (18–)20–28(–32) × 8–10(–12) µm (Breuss, 1985). New to Russia.

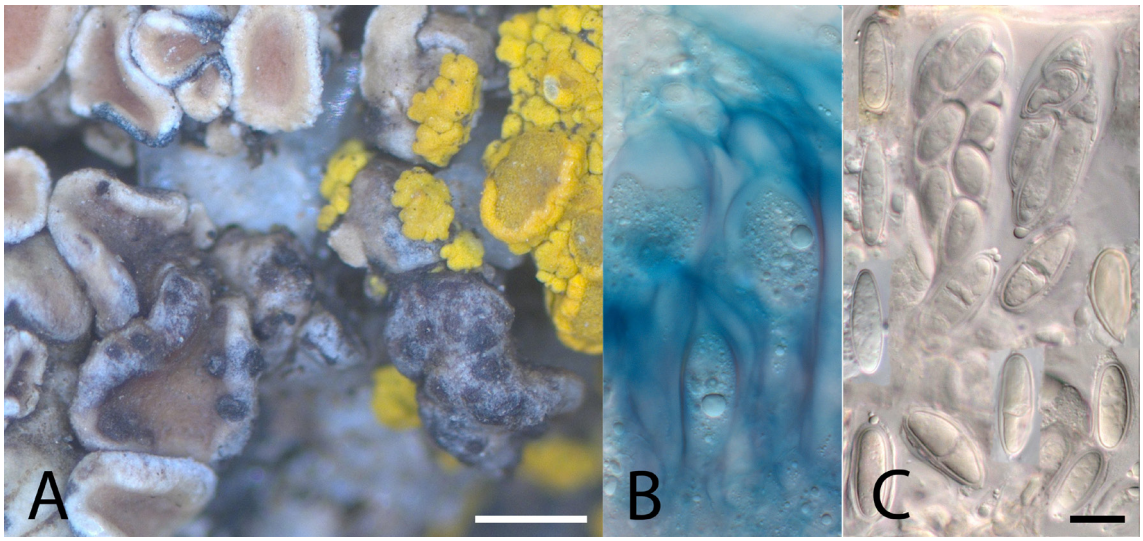

Fig. 3. *Placocarpus americanus* (LE 264329). A: infection habitus. B: hymenium in K/I. C: ascospores in water. Scale bars: A = 500 µm; B, C = 10 µm.

Zwackhiomyces echinulatus Brackel – Tver Region, Ostashkov District, Bolshoi Kolodnyi Island at Lake Seliger, 57°18'55"N, 33°05'10"E, alt. 200 m, on *Physcia aipolia* (lobe margins and thalline margin of apothecia), 4.08.2005, A. A. Notov (LE 264339).

Notes – Asci (57–)62–72(–75) × 13–15(–16) µm (n = 10), 4(–8)-spored. Ascospores (20.6–)22.3–24.9(–26.0) × (6.8–)7.2–8.4(–9.4) µm, l/b = (2.7–)2.8–3.2(–3.5) (n = 29). Formerly known in Russia from Tula Region and Karachayevo-Circassian Republic (Zhurbenko & Gudovicheva, 2013; Zhurbenko & Kobzeva, 2014). New to the central part of European Russia.

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REFERENCES

Alstrup, V., Zavarzin, A. A., Kocourková, J., Kravchenko, A. V., Fadeeva, M. A. & Shiefelbein, U. 2005. Lichens and lichenicolous fungi found in northern Ladoga Lake region (Karelia Republic) during an international field excursion in August 2004 before 5th IAL Congress. (In Russian). *Trudy Karel'skogo Nauchnogo Tsentra RAN* 7: 3–15.

Alstrup, V. & Ahti, T. 2007. New reports of lichenicolous fungi, mainly from Finland and Russia. *Karstenia* 47: 1–4.

Boqueras, M. 2000. *Líquens epífits i fongs liquenícoles del sud de Catalunya: flora i comunitats* [*The epiphytic lichens and lichenicolous fungi of South Catalonia: flora and communities*]. Institut d'Estudis Catalans (Arxius de les Seccions de Ciències 127, Secció de Ciències Biològiques), Barcelona. 556 pp.

Brackel, W. von. 2009. Weitere Funde von flechtenbewohnenden Pilzen in Bayern – Beitrag zu einer Checkliste IV. *Berichte der Bayerischen Botanischen Gesellschaft* 79: 5–55.

Brackel, W. von. 2014. Kommentierter Katalog der flechtenbewohnenden Pilze Bayerns. *Bibliotheca Lichenologica* 109: 1–476.

Breuss, O. 1985. On the lichen genera *Placocarpus* and *Placidiopsis* (Verrucariaceae). *Plant Systematics and Evolution* 148: 313–315. http://dx.doi.org/10.1007/BF00985931

Diederich, P. 1990. New or interesting lichenicolous fungi 1. Species from Luxembourg. *Mycotaxon* 37: 297–330.

Hafellner, J. 1994. Beiträge zu einem Prodromus der lichenicolen Pilze Österreichs und angrenzender Gebiete. I. Einige neue oder seltene Arten. *Herzogia* 10: 1–28.

Hawksworth, D. L. 1981. The lichenicolous coelomycetes. *Bulletin of the British Museum (Natural History), Botany Series* 9: 1–98.

Jando, K. & Kukwa, M. 2003. Porosty, grzyby naporostowe i nazywiczne projektowanego rezerwatu «Wiszace Torfowiska nad jeziorem Jaczno» oraz terenów przyleglych do jeziora Jaczno w Suwalskim Parku Krajobrazowym (Pólnoco-Wschodnia Polska) [Lichens, lichenicolous and resinicolous fungi of the planned nature reserve «Wiszace Torfowiska nad jeziorem Jaczno» and the areas adjacent to Lake Jaczno in Suwalski Landscape Park (NE Poland)]. *Parki Narodowe i Rezerwaty Przyrody* 22(1): 3–17.

Knudsen, K., Breuss, O. & Kocourkova, J. 2009. A new species of *Placocarpus* (Verrucariaceae) from southern California. *Lichenologist* 41: 627–630. http://dx.doi.org/10.1017/S0024282909008949

Knudsen, K., Harding, M. & Hoines, J. 2013. The lichen flora of Joshua Tree National Park: An annotated checklist. *Natural Resource Technical Report* NPS/JOTR/NRTR—2013/743: 1–77.

Notov, A. A., Himelbrant, D. E. & Urbanavichus, G. P. 2011. *Annotated list of the lichen flora of Tver Region.* (In Russian). Tver State University, Tver. 124 p.

Roux, C. & Gueidan, C. 2011. Deux espèces nouvelles de Verrucariaceae des Pyrénées-Orientales (France): *Placocarpus melanophthalmosus* sp. nov. et *Placopyrenium breussii* sp. nov. *Bulletin de la Société linnéenne de Provence, numéro spécial* 14: 163–176.

Signoret, J. & Diederich, P. 2003. Inventaire des champignons lichénisés et lichénicoles de la Réserve Naturelle des rochers et tourbières du Pays de Bitche. *Annales scientifiques de la réserve de Biosphère transfrontalière Vosges du Nord-Pfälzerwald* 11: 193–222.

Zhurbenko, M. P. 2004. Lichenicolous and some interesting lichenized fungi from the Northern Ural, Komi Republic of Russia. *Herzogia* 17: 77–86.

Zhurbenko, M. P. 2007. The lichenicolous fungi of Russia: geographical overview and a first checklist. *Mycologia Balcanica* 4: 105–124.

Zhurbenko, M. P. 2009. Lichenicolous fungi and lichens from the Holarctic. Part II. *Opuscula Philolichenum* 7: 121–186.

Zhurbenko, M. & Ahti, T. 2005. A preliminary list of lichenicolous fungi of Republic of Karelia, Russia. In: Bondartseva M. A. et al. (eds). *Fungi in Natural and Anthropogenic Ecosystems. Proceedings of the International Conference Dedicated to the Centenary of the Beginning by Professor A. B. Bondartsev his Research at the V. L. Komarov Botanical Institute, RAS 24–28 April, 2005.* Volume 1. Russian Academy of Sciences, V. L. Komarov Botanical Institute, St. Petersburg. Pp. 194–200.

Zhurbenko, M. P. & Gudovicheva, A. V. 2013. *Zwackhiomyces echinulatus* and other lichenicolous fungi from Tula Region of Russia (in Russian, English summary). *Mikologiya i Fitopatologiya* [*Mycology and phytopathology, St.-Petersburg*] 47(1): 19–20.

Zhurbenko, M. P. & Kobzeva, A. A. 2014. Lichenicolous fungi from Northwest Caucasus, Russia. *Herzogia* 27: 377–396. http://dx.doi.org/10.13158/heia.27.2.2014.377