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New species and new records of
Laboulbeniales(Ascomycota) from
countries surrounding the Black Sea

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New species and new records of Laboulbeniales (Ascomycota) from countries surrounding the Black Sea

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ABSTRACT

Two new species of Laboulbeniales Lindau are described: *Distolomyces euxinus* W.Rossi & Mishustin, sp. nov., occurring on *Labidura riparia* Pallas from Georgia and Ukraine, and *Rhachomyces cimmeritei* W.Rossi & Mishustin, sp. nov., occurring on *Cimмерites* spp. from Russian Federation. Several new records are reported from countries surrounding the Black Sea: 21 from Georgia, 13 from Ukraine, three from Moldova, three from Turkey, two from Russian Federation and one from Romania. Unpublished records from Afghanistan, Azerbaijan, China, Germany, Greece, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Oman, Sweden, Switzerland and Turkmenistan are also reported. The recently proposed split of the genus *Stigmatomyces* H.Karst. is rejected and the synonymy between *Gloeandromyces* Thaxt. and *Stigmatomyces* is suggested.

RÉSUMÉ

Nouvelles espèces et nouveaux signalements de Laboulbéniales (Ascomycota) dans les pays entourant la mer Noire.

Deux nouvelles espèces de Laboulbéniales Lindau sont décrites : *Distolomyces euxinus* W.Rossi & Mishustin, sp. nov., parasite de *Labidura riparia* Pallas de Géorgie et d'Ukraine, et *Rhachomyces cimmeritei* W.Rossi & Mishustin, sp. nov., parasite de *Cimмерites* spp. de la Fédération de Russie. Plusieurs autres espèces sont signalées pour la première fois dans les pays entourant la mer Noire : 21 de Géorgie, 13 d'Ukraine, trois de Moldavie, trois de Turquie, deux de la Fédération de Russie et un de Roumanie. Quelques découvertes inédites d'Afghanistan, Allemagne, Azerbaïdjan, Chine, Grèce, Kazakhstan, Kirghizistan, Mongolie, Népal, Oman, Suède, Suisse et Turkménistan sont également signalées. La fragmentation du genre *Stigmatomyces* H.Karst. récemment proposée est rejetée et la synonymie entre *Gloeandromyces* Thaxt. et *Stigmatomyces* est suggérée.

KEY WORDS

Central Asia,
Georgia,
Ukraine,
Laboulbeniomycetes,
Distolomyces,
Rhachomyces,
Stigmatomyces,
new synonym,
new records,
new species.

MOTS CLÉS

Asie centrale,
Géorgie,
Ukraine,
Laboulbeniomycetes,
Distolomyces,
Rhachomyces,
Stigmatomyces,
synonyme nouveau,
signalements nouveaux,
espèces nouvelles.

INTRODUCTION

Laboubeniales Lindau, obligate ectobionts on living Arthropods, have been little studied in the countries surrounding the Black Sea. Much of what we know to date from this area is due to recent papers dealing with Laboulbeniomyces from Turkey, Bulgaria and Ukraine (Rossi 2016; Rossi *et al.* 2019; Mishustin *et al.* 2022; Mishustin & Khodosovtsev 2022, 2023). Regarding the distribution of Laboubeniales in this area, therefore, we refer to these works and also to the recent monograph by Santamaría & Pedersen (2021), which will be cited several times in the present paper. It should be stated preliminarily that as far as national boundaries are concerned, we have adjusted to those currently recognized by the United Nations organization. To the six nations that are actually in contact with the Black Sea we have added Moldova, not only because it is very close to its shores, but also because none of the Laboubeniales were known until now from this country. Unpublished records from a few other countries are also given for a better understanding of the geographical distribution of the species.

MATERIAL AND METHODS

Most of the insects bearing Laboubeniales were collected by the first author during the evacuation from occupied Kherson through countries surrounding the Black Sea by hand collecting, entomological net, pitfall traps, and light traps of various dimensions made of UV LED stripes. A few specimens were obtained by examining the insect collections of the Schmalhausen Institute of Zoology of the Academy of Sciences of Ukraine in Kiev (SZIK), while others were provided to us by entomologists from various countries (mainly, but not only, from Georgia and Ukraine; see Acknowledgements). The collected insects were kept in labelled Eppendorf tubes with ethanol 95% and later scanned with a microscope stereo zoom Optika SZM-2, trino, 7X-45X. Permanent slides-mounts of the fungi were prepared following the technique described in Rossi & Santamaría (2015), utilizing Amann's solution as mounting medium and cyanoacrylate gel for ringing slides. Photographs of the new species (Figs 2; 4) were taken with AxioCam MRc5 mounted on a Zeiss Axioplan 2 microscope, while photographs of the fungi representing new records (Figs 1; 3) were taken with Olympus LC30 camera on a microscope Olympus BX51. Photos of all studied fungi are kept in the author's databases. Nomenclature of fungi follows Index Fungorum while insect names follow De Jong *et al.* (2014).

For practical reasons, the examined material from the Black Sea area, except the types of the new species, is temporarily preserved by the first author, but will be deposited permanently in the herbarium of Kherson State University (KHER) and in the Institute of Ecology of the Carpatians (LWKS). The collection numbers of mycological slide-mounts and insects follow Mishustin *et al.* (2022). The holotypes of the new species and the slides of some of the fungi representing new records from outside the Black Sea area (labelled WR) are deposited in the Herbarium of the University of Florence, Italy (FI).

RESULTS

Family LABOULBENIACEAE G. Winter
Genus *Camptomyces* Thaxt.

Camptomyces europaeus W. Rossi & Cesari
(Fig. 1A)

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Beregovo district, Oleshnyk village; 48°10'32"N, 22°56'42"E; 05.III.2023; leg. R. Mishustin; slide #L00445; on tergites, sternites and legs of *Astenus procerus* (Gravenhorst, 1806) (#i00375-2-13).

KNOWN DISTRIBUTION. — This fungus was described from Italy and subsequently reported so far only from Denmark, Spain and Sweden on *Astenus* spp. (Coleoptera, Staphylinidae) (Santamaría & Pedersen 2021).

Genus *Cantharomyces* Thaxt.

Cantharomyces robustus T. Majewski
(Fig. 1B)

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022; leg. R. Mishustin; slide #L00175; on tergites of *Carpelimus* sp. (#i00139).

KNOWN DISTRIBUTION. — Reported on *Carpelimus* spp. (Coleoptera, Staphylinidae) from a few European countries (Belgium, Netherlands, Poland, Spain, Ukraine) and from Ecuador (Mishustin & Khodosovtsev 2022).

Genus *Corethromyces* Thaxt.

Corethromyces stilici Thaxt.
(Fig. 1C)

EXAMINED MATERIAL. — **Turkey** • Istanbul; 40°57'11"N, 29°13'48"E; 29.IV.2022; leg. R. Mishustin; slides #L00421, L00422; on sternites of *Rugilus rufipes* (Germar, 1836) (#i00351).

Ukraine • Zakarpatska oblast, Uzhhorod district, Velikiy Berezny village; 48°55'40"N, 22°29'44"E; 22.III.2023; leg. R. Mishustin; slide #L00434; on tergites, sternites and legs of *R. rufipes* (#i00361) • Berehovo district, Oleshnyk village; 48°10'32"N, 22°56'42"E; 05.III.2023; leg. R. Mishustin; on tergites of *R. rufipes* (#i00374-1, i00374-2).

KNOWN DISTRIBUTION. — This fungus has been reported on species of the genus *Rugilus* (synonym of *Stilicus*) (Coleoptera, Staphylinidae) from North and South America, from Indonesia and from several European countries (Santamaría & Pedersen 2021).

Genus *Cryptandromyces* Thaxt.

Cryptandromyces elegans (Maire)
W. Rossi & Castaldo

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Beregovo district, Oleshnyk village; 48°10'32"N, 22°56'42"E; 05.III.2023; leg. R. Mishustin; slide #L00449; on the elytra of *Brachygluta* sp. (#i00379).

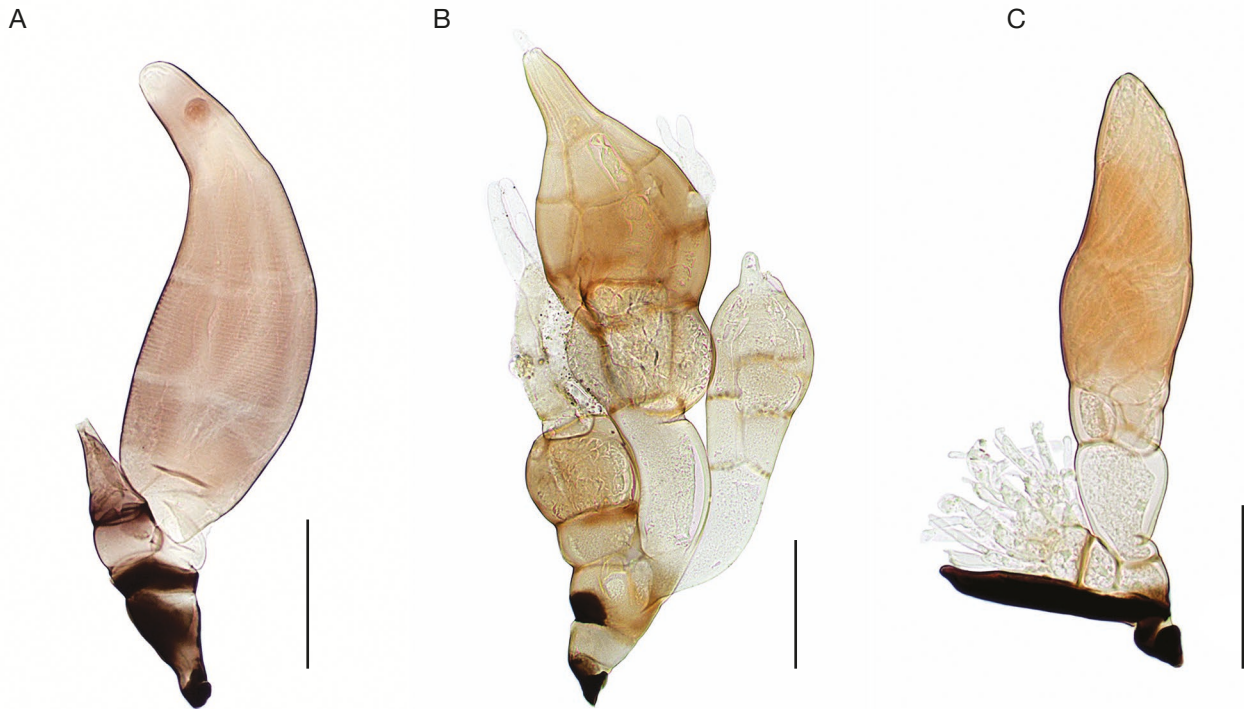


FIG. 1. — **A**, *Camptomyces europaeus* W.Rossi & Cesari; **B**, *Cantharomyces robustus* T.Majewski; **C**, *Corethromyces stilici* Thaxt. from Ukraine (slide #L00434). Scale bars: 50 μ m.

KNOWN DISTRIBUTION. — Described from Algeria as *Peyerimhoffiella elegans* and subsequently reported on a few genera of the Pselaphinae (Coleoptera, Staphylinidae) from several European countries, sometimes as *Corethromyces elegans* (Maire) Maire, *C. brachyglutae* (J.Siemaszko & W.Siemaszko) J.Siemaszko & W.Siemaszko and *Cryptandromyces brachyglutae* J.Siemaszko & W.Siemaszko (Castaldo et al. 2004; Santamaría & Pedersen 2021).

Genus *Dioicomycetes* Thaxt.

Dioicomycetes anthici Thaxt.

EXAMINED MATERIAL. — **Georgia** • KvemoKartli, Gardabani municipality, shore of lake Kumisi; 41°35'1"N, 44°51'35"E; 26.IV.2022; leg. R. Mishustin; slide #L00165; on the femur of *Cyclodinus constrictus constrictus* (Curtis, 1838) (#i00130-1) • *ibid.*; slide #L00166; on sternites (host #i00130-2).

KNOWN DISTRIBUTION. — Common and widespread species occurring on various species and genera of the ant-like beetles (Coleoptera, Anthicidae) in America, Africa, Europe and Asia (Santamaría & Pedersen 2021).

Genus *Distolomyces* Thaxt.

Distolomyces euxinus W.Rossi & Mishustin, sp. nov.
(Fig. 2)

TYPE MATERIAL. — **Ukraine** • Odesa oblast, Bilhorod-Dnistrovskiy district, 6 km SE of Prymorske village; 45°40'32"N, 29°52'8"E; 7-8.VI.2023; leg. Y. Khalaim; holotype: FI [slide WR4586a].

ADDITIONAL EXAMINED MATERIAL. — **Ukraine** • Odesa oblast, Bilhorod-Dnistrovskiy district, 6 km SE of Prymorske village; 45°40'32"N, 29°52'8"E; 7-8.VI.2023; leg. Y. Khalaim; FI [slides WR4583, WR4584, WR4585, WR4586b], KER, LWKS [L00463, L00464, L00465, L00466, L00467, L00468, L00509-L00517]; on the antennae of *Labidura riparia* (Pallas, 1773) (Dermaptera, Labiduridae).

Georgia • Kvemo Kartli, Gardabani municipality, Kumisi, shore of Lake Kumisi; 41°35'1"N, 44°51'35"E; 26.IV.2022; leg. R. Mishustin; KER [slides #L00157, L00158, L00160]; on antennae (mainly) and mouthparts of *L. riparia* (#i00126-1).

ETYMOLOGY. — From *Euxinum Mare*, the Latin name of the Black Sea.

INDEX FUNGORUM. — IF901676.

DESCRIPTION

Thallus mostly hyaline, except the lower cell of the appendage and, sometimes, the outgrowths originating from cell II and the preapical appendages. Basal cell of the receptacle (cell I) longer than broad, subtrapezoidal in outline. Suprabasal cell (cell II) much smaller, slightly broader than long, cell III similar to cell II and placed next to it, giving rise apically to a free appendage formed of three superposed cells: the lower elongate, tapered and distinctly extended above the insertion of the bicellular antheridial branchlet; the median very long and flexuous; the terminal is an elongate antheridium bearing laterally a small spine and ending in a long, tapering tip which can reach the height of the tip of the perithecium; a second antheridium is seldom present. Cell III usually bears also three outgrowths variable in length, from

digitiform to barely protruding, and also variable in color, from almost hyaline to light brown. Perithecium sessile, asymmetrical, similar in outline to a lemon wedge with the lower half slightly broader, tapering above to a relatively small conical tip subtended dorsally by two paired rounded bumps and on both sides by two symmetrically diverging, slender and curved, horn-like appendages. An abortive perithecium is frequently seen. Length from foot to perithecial apex 80–105 µm; outgrowths of the receptacle 0–13 µm; free appendage 55–70 µm; perithecium 45–80 × 15–25 µm; preapical appendages about 13 µm.

NOTES

The above description is based on the numerous thalli from Ukraine; the fewer examined Georgian thalli are slightly larger on average (95–130 µm from foot to perithecial apex), and, when present, have shorter outgrowths of the receptacle.

Distolomyces euxinus W.Rossi & Mishustin, sp. nov. is allied to *D. forficulae* (T.Majewski) I. I. Tav., reported from several European countries on the earwig *Forficula auricularia* L., 1758 (Santamaría & Pedersen 2021). The new species is easily distinguishable for the outgrowths on the receptacle, which are usually conspicuous although rarely absent, and for the much longer and slenderer appendage, the lower cell of which is much paler (vs blackened in *D. forficulae*) and distinctly extended above the insertion of the antheridial branch.

Genus *Ecteinomyces* Thaxt.

Ecteinomyces trichopterophilus Thaxt.

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Kamianytsa village; 48°41'42"N, 22°23'14"E; 10.III.2023; leg. R. Mishustin; slide #L00426; on the elytra of *Acrotichis* sp. (#i00357).

KNOWN DISTRIBUTION. — This species is quite common in Europe, less commonly reported from the American continent and not (yet) recorded from other continents; it is associated with beetles of the Ptiliidae family, mostly on species of the genus *Acrotichis* (Rossi & Christian 2020).

Genus *Euzodiomyces* Thaxt.

Euzodiomyces lathrobii Thaxt.

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022; leg. R. Mishustin & A. Kovalev; slide #L00171; on tergites of *Lathrobium* sp. (#i00135).

Turkey • Istanbul; 40°57'11"N, 29°13'48"E; 29.IV.2022; leg. R. Mishustin; slide #L00420; on tergites of *Lathrobium* sp. (#i00350).

ADDITIONAL EXAMINED MATERIAL. — **Greece** • Samos Island, Potami river; 34°47'22"N, 26°39'52"E; 11.X.2007; leg. W.Rossi & E. Sarri; on the head and the elytra of *Lobrathium rugipenne* (Hochhuth, 1851) (slide WR3189).

KNOWN DISTRIBUTION. — Reported mostly on Staphylinidae, Paederinae, but also on other rove beetles and on ground beetles (Carabidae) from several European countries, with only a few records from other continents (Santamaría & Pedersen 2021).

Genus *Hesperomyces* Thaxt.

Hesperomyces virescens Thaxt. (*sensu lato*)

EXAMINED MATERIAL. — **Georgia** • Shida Kartli, Kaspi; 44°23'54"N, 44°23'54"E; 14.IV.2015; leg. Pljushch I.; on *Harmonia axyridis* (Pallas, 1773) (#i00353) • Tbilisi; 41°44'28"N, 44°46'43"E; 26.IV.2022; leg. R. Mishustin; slide #L00409; on *H. axyridis* (#i00340-1, #i00340-2).

ADDITIONAL EXAMINED MATERIAL. — **Afghanistan** • Varas village; 34°14'40"N, 66°54'39"E; 2500 m alt.; 23.VI.2016; leg. I. Pljushch; slide #L00502; on elytra and legs of *H. axyridis* (#i00424).

Tajikistan • Tigrovaya Balka Nature Reserve; 37°16'31"N, 68°28'51"E; 30.VII.2018; leg. I. Pljushch; slide #L00498; on the elytra of *H. axyridis* (#i00415-1, i00415-2).

KNOWN DISTRIBUTION. — A common and widespread “morphospecies”, reported from five continents on several genera and species of Coccinellidae (Coleoptera). On the basis of molecular analysis it has recently been suggested that it may be a “collective species” (Haelewaters & De Kesel 2020).

Genus *Ilyomyces* F.Picard

Ilyomyces mairei F.Picard (Fig. 3A)

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022; leg. R. Mishustin; slide #L00173; on tergites of *Stenus* sp. (#i00137).

KNOWN DISTRIBUTION. — Reported only from France (type) and Spain (Santamaría 1992) on *Stenus* spp. (Coleoptera, Staphylinidae). Immature specimens from the United States occurring on *S. clavicornis* (Scopoli, 1763) have been reported as *Ilyomyces* cf. *mairei* (Haelewaters 2013).

Genus *Laboulbenia* Mont. & C.P.Robin

Laboulbenia cristata Thaxt.

EXAMINED MATERIAL. — **Georgia** • Borjomi; 41°50'8"N, 43°23'3"E; 1200 m alt.; 25.IV.2016; leg. I. Pljushch; slide #L00505; on the tibia of *Paederus littoralis* Gravenhorst, 1802 (#i000422).

KNOWN DISTRIBUTION. — Cosmopolitan species associated with ground beetles (Staphylinidae) of the genus *Paederus* and closely related genera (Santamaría & Pedersen 2021).

Laboulbenia flagellata Peyr.

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°29'16"N, 44°24'11"E; 27.IV.2022; leg. R. Mishustin; slide #L00174; on the elytra and the pronotum of *Limodromus assimilis* (Paykull, 1790) (#i00138) • Akura village; 41°51'39"N, 45°36'47"E; 19.IV.2015; leg. I. Pljushch; slide #L00507; on sternites of *Harpalus ffinis* (Schrank, 1781) (#i00423).

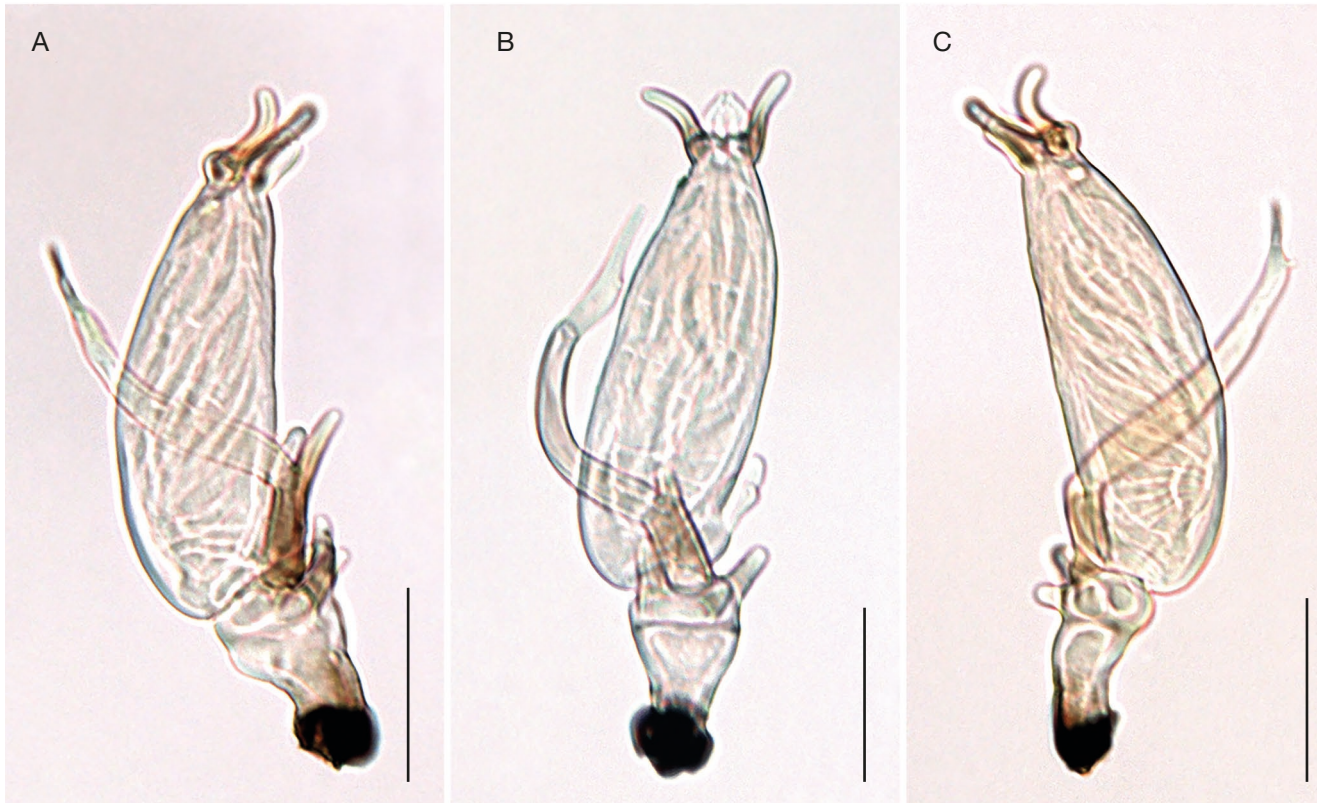


FIG. 2. – *Distolomyces euxinus* Rossi & Mishustin, sp. nov. from the type slide. Scale bars: 25 µm.

KNOWN DISTRIBUTION. — This fungus is reported on very many species and genera of ground beetles from five continents (Santamaría & Pedersen 2021).

Laboulbenia giardii Cépède & F.Picard

EXAMINED MATERIAL. — **Georgia** • Kvemo Kartli, Gardabani municipality, shore of lake Kumisi; 41°35'1"N, 44°51'35"E; 26.IV.2022; leg. R. Mishustin; slide #L00163; on the elytra and sternites of *Dicheirotichus* sp. (#i00128).

Ukraine • Kherson oblast, Kherson district, Zelenivka village; 46°43'26"N, 32°39'56"E; 11.II.2022; leg. R. Mishustin; slide #L00079; on *Dicheirotichus* (*Trichocellus*) *discicollis* (Dejean, 1829) (#i00064-1).

KNOWN DISTRIBUTION. — Reported so far only from European countries on *Dicheirotichus* spp. (Coleoptera, Carabidae); records on other hosts need confirmation (Santamaría & Pedersen 2021).

Laboulbenia notiophilii Cépède & F.Picard

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 14.IV.2022; leg. A. Seropian; slide #L00169; on elytra of *Notiophilus rufipes* Curtis, 1829 (#i00133) • *ibid.*; 27.IV.2022; leg. R. Mishustin; slide #L00178; on the elytra and the pronotum of *N. rufipes* (#i00134-1).

Moldova • Calarasi forest; 47°14'21"N, 28°17'14"E; 20.VI.1981; leg. Zaitsev; slide #L00360; on the elytra of *Cymindis cingulata* Dejean, 1825 (#i00291 = SZIK K71).

Russian Federation • Krasnodar Krai, Ubinskaya; 44°44'9"N, 38°32'23"E; 27.VI.1988; leg. A. Puchkov; slide #L00357; on the elytra and the pronotum of *Notiophilus rufipes* (#i00288 = SZIK K67).

KNOWN DISTRIBUTION. — Reported from several European countries and from North Africa on various species and genera of ground beetles (Santamaría & Pedersen 2021).

Laboulbenia pasquetii F.Picard

EXAMINED MATERIAL. — **Georgia** • Kvemo Kartli, Gardabani municipality, shore of lake Kumisi; 41°35'1"N, 44°51'35"E; 26.IV.2022; leg. R. Mishustin; slide #L00161; on the elytra of *Chlaenius spoliatus* (P.Rossi, 1792) (#i00127-1).

KNOWN DISTRIBUTION. — Although reported from three continents of the Old World, this fungus does not seem to be common. To date it was found in Africa (Algeria, Madagascar), Europe (France, Spain, Ukraine), Asia (Japan) (Mishustin & Khodosovtsev 2022).

NOTES

The “known distribution” must be extended to the UK. The fungus listed as *Laboulbenia schizogenii* Thaxt. in Lazenby 2017 is actually *L. pasquetii*: fig. 28 leaves no doubt in this regard.

Laboulbenia pedicellata Thaxt.

EXAMINED MATERIAL. — **Georgia** • Kvemo Kartli, Gardabani municipality, shore of lake Kumisi; 41°35'1"N, 44°51'35"E;

26.IV.2022; leg. R. Mishustin; slide #L00164; on the elytra of *Bembidion (Notaphus) varium* (G.-A. Olivier, 1795) (Bembidiinae) (#i00129).

ADDITIONAL EXAMINED MATERIAL. — **Kyrgyzstan** • Tien-Shan, Ferganskiy ridge; 41°17'17"N, 73°37'42"E; 3200 m alt.; 20.VII.2001; leg. A. Puchkov; slide #L00476; on the elytra of *Dyschiriodes ferganensis* (Znojko, 1930) (Scaritinae) (#i00394 = SZIK K107).

Mongolia • Gobi-Altai Aimak, Sharga Nature Reserve; 1149 m alt.; 25-26.VI.2016; leg. Schnitter; on the margin of the pronotum of *D. ferganensis* (slide WR4444).

KNOWN DISTRIBUTION. — Common and widespread fungus, reported on various genera of ground beetles (Carabidae), mostly Bembidiinae and Scaritinae (Santamaría & Pedersen 2021).

Laboulbenia proliferans Thaxt. (Fig. 3B)

EXAMINED MATERIAL. — **Georgia** • Kvemo Kartli, Gardabani municipality, shore of lake Kumisi; 41°35'1"N, 44°51'35"E; 26.IV.2022; leg. R. Mishustin; slide #L00162; on the elytra of *Chlaenius spoliatus* P.Rossi, 1792 (#i00127-2).

Ukraine • Chornomorsk district, Tarkhankut peninsula, Olenivka village, steppe; 45°22'16"N, 32°31'20"E; 04.V.2013; leg. A. Puchkov; slide #L00340; on the elytra of *Chlaenius aeneocephalus* Dejean, 1826 (#i00272 = SZIK K51) • Shchebetivka village; 44°55'38"N, 35°9'39"E; 02.V.1986; leg. A. Puchkov; slide #L00348; on the elytra of *Chlaenius festivus* (Panzer, 1796) (#i00280 = SZIK K59) • Donetsk oblast Mariupol district, Kalmius river valley; 47°7'22"N, 37°36'39"E; 04.VIII.2009; leg. A. Martynov; slide #L00349; on elytra and pronotum of *C. festivus* (#i00281 = SZIK K60).

ADDITIONAL EXAMINED MATERIAL. — **Iran** • Meyme; 33°26'24"N, 51°10'28"E; 19.VI.2011; leg. V. Gurko; slide #L00351; on the elytra of *C. festivus* (#i00283 = SZIK K62).

Nepal • Nepalgunj region; 3000 m alt.; 05.VIII.1999; leg. V. Gurko; slide #L00335; on the elytra of *Chlaenius* sp. (#i00286 = SZIK K65).

KNOWN DISTRIBUTION. — Reported on very many species of ground beetles (Carabidae) from all continents except America. However, it is impossible to provide definite data because in the past it has been frequently confused with *Laboulbenia pseudomasei* Thaxt. (Rossi & Weir 1997).

Laboulbenia pseudomasei Thaxt.

EXAMINED MATERIAL. — **Georgia** • Kvemo Svaneti, Lentekhi village, Mount Koldashi; 1500 m alt.; 4-7.VII.2019; leg. S. Vashchenko; slide #L00268; on the elytra of *Pterostichus lacunosus* (Chaudoir, 1844) (#i00200-1).

KNOWN DISTRIBUTION. — Because until 1997 this species was frequently confused with *Laboulbenia proliferans* and *Laboulbenia pterostichi* Thaxt., it is not possible to determine with certainty the list of its hosts and its geographical distribution (Rossi & Weir 1997).

Laboulbenia rougetii C. P. Robin

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022; leg. R. Mishustin; slide #L00172; on the elytra of *Brachinus explodens* Duftschmid, 1812 (#i00136) • Zemo Svaneti, Mestia municipality,

Pari village; 43°3'29"N, 42°29'16"E; 17.VI.2014; leg. R. Mishustin & S. Vashchenko; on *B. crepitans* (Linnaeus, 1758) (#i00198) • Kaspi; 41°55'47"N, 44°23'54"E; 14.IV.2015; leg. I. Pljushtch; slide #L00503; on elytra of *B. explodens* (#i00420-1, i00420-2) • Akura village; 41°51'39"N, 45°36'47"E; 19.IV.2015; leg. I. Pljushtch; slide #L00504; on the elytra of *B. explodens* (#i00421).

Moldova • Ungheni district, Korneshty; 47°21'42"N, 27°59'1"E; 20-25.VI.1975; leg. V. Dolin; slides #L00137, L00138; all over the body of *Aptinusbombarda* (Illiger, 1800) (#i00112 = SZIK K128).

ADDITIONAL EXAMINED MATERIAL. — **Azerbaijan** • Yardimili; 38°54'28"N, 48°14'57"E; 30.V.1977; *s.c.*; slide #L00341; on the elytra of *Chlaenius aeneocephalus* Dejean, 1826 (#i0073 = SZIK K52).

Kyrgyzstan • Western Tien-Shan, Kara-Kuldzha village, Kel-Ak-Bulak tract; 40°37'47"N, 73°35'39"E; 19.V.1991; leg. I. Belousov; slide #L00518; on the elytra of *Brachinus kryzhanovskiy* Belousov & Kabak, 1992 (i00419 = SZIK K154).

Tajikistan • Tigrovaya Balka Nature Reserve; 37°16'31"N, 68°28'51"E; 30.VII.2018; leg. I. Pljushtch; slide #L00499; on the elytra of *Anchomenus turkestanicus* Ballion, 1871 (#i00416).

KNOWN DISTRIBUTION. — Widespread species reported on various genera and species of ground beetles (Carabidae); very common in Europe and also found in Africa, Asia and Oceania; records from the American continent need confirmation (Santamaría & Pedersen 2021).

Laboulbenia stenolophi Speg.

EXAMINED MATERIAL. — **Russian Federation** • Krasnodar Krai, Ubinskaya; 44°44'9"N, 38°32'23"E; 03.VII.1988; leg. Perkovsky & A. Puchkov; slide #L00367; on the elytra of *Stenolophus discophorus* (Fisher von Walheim, 1823) (#i00298 = SZIK K82).

ADDITIONAL EXAMINED MATERIAL. — **Azerbaijan** • Ali-Bayram HPP (Shamkir), Kura river; 40°55'37"N, 46°10'12"E; 10.VIII.1977; leg. V. Dolin; slide #L00366; on the elytra of *S. persicus* Mannerheim in Chaudoir, 1844 (#i00297 = SZIK K81).

Greece • Samos Island, Pyrgos; 12.X.2007; leg. W.Rossi & E.Sarri; all over the body of *S. teutonius* (Schrank, 1781) (slide WR3195).

KNOWN DISTRIBUTION. — It is impossible to precisely define the distribution of this species because of its taxonomic "travails". It is found on various species and genera of ground beetles, mostly *Stenelophus* and *Acupalpus*, in Europe, America, Asia and Africa. For more details on the taxonomy and distribution of this fungus we refer, as usual, to the excellent monograph of Santamaría & Pedersen (2021).

Laboulbenia stilicicola Speg.

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Storozhnytsia village; 48°36'21"N, 22°13'55"E; 30.I.2023; leg. R. Mishustin; slide #L00393; on the elytra of *Rugilus rufipes* (Germar, 1836) (#i00324) • Kamianytsa village; 48°41'41"N, 22°23'10"E; 10.III.2023; leg. R. Mishustin; slide #L00424; on the elytra of *Rugilus* sp. (#i00354).

KNOWN DISTRIBUTION. — Reported from several European countries on *Rugilus* (= *Stilicus*) spp. (Coleoptera, Staphylinidae) and from the United States (Santamaría & Pedersen 2021).

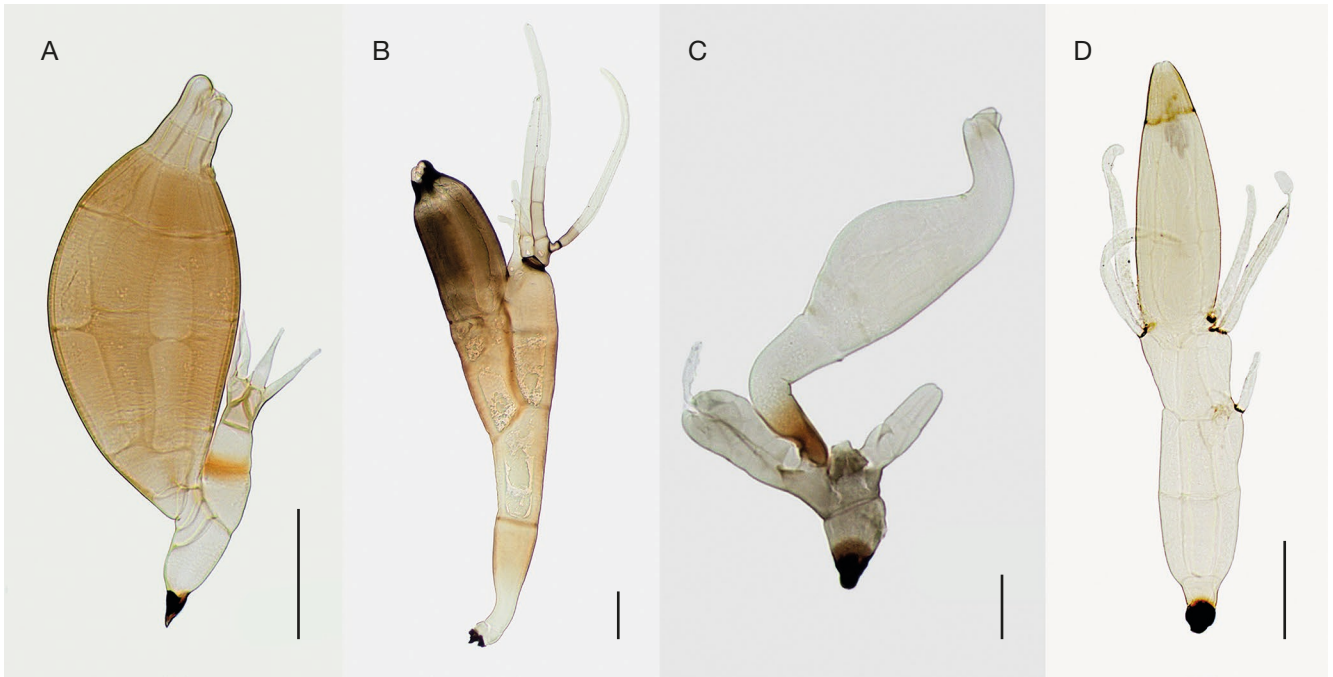


FIG. 3. — **A**, *Ilyomyces mairei* F.Picard; **B**, *Laboulbenia proliferans* Thaxt.: thallus with few branches, on *Chlaenius spoliatus* P.Rossi from Georgia (slide #L00162); **C**, *Monoicomyces athetae* Thaxt. from Georgia (slide #L00167); **D**, *Peyritsiella oxyteli* (Cépède & F.Picard), Santam. from Turkey (slide #L00423). Scale bars: 50 μ m.

Laboulbenia vulgaris Peyr.

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 14.IV.2022; leg. A. Seropian; slide #L00168; on the elytra of *Bembidion decorum subconvexum* K. Daniel & J. Daniel, 1902 (#i00132) • *ibid.*; 27.IV.2022; leg. R. Mishustin; slide #L00177; on the elytra of *B. decorum subconvexum* (#i00141-1) • *ibid.*; 27.IV.2022; leg. R. Mishustin; slide #L00178; on the elytra and the femora of *B. (Nepha) tetrasemum* Chaudoir, 1846 (#i00142-1) • Martvili municipality, Lebarde village; 42°44'29"N, 42°29'41"E; 1800-2000 m alt.; 25-27.VI.2005; Shumov; slide #00379; on the elytra of *Trechus* sp. (#i00310 = SZIK K94).

ADDITIONAL EXAMINED MATERIAL. — **Kazakhstan** • Eastern Terskey-Alatau, left bank of the Ulken-Kokpak river; 42°33'42"N, 79°50'14"E; 2500 m alt.; 05.VII.1991; leg. A. Puchkov; slide #L00484; on the elytra of a paratype of *T. batyr* Belousov & Kabak, 1992 (#i00402 = SZIK K114).

Kyrgyzstan • Tien-Shan, near Tchon-Ashu pass; 42°23'24"N, 79°3'44"E; 3800 m alt.; 10.VII.2001; leg. A. Puchkov; slide #L00485; on the pronotum and the elytra of *T. placidus* Jeannel, 1962 (#i00403 = SZIK K115).

KNOWN DISTRIBUTION. — Cosmopolitan species, occurring especially on ground beetles (Carabidae) of the tribes Bembidiini and Trechini (Santamaría & Pedersen 2021).

Laboulbenia stenolophi Thaxt.

EXAMINED MATERIAL. — **Georgia** • Akura village; 41°51'39"N, 45°36'47"E; 19.IV.2015; leg. I. Pljushch; slide #L00506; on the

prothorax and the mesothorax of *Harpalus affinis* (Schrank, 1781) (#i00423).

ADDITIONAL EXAMINED MATERIAL. — **Tajikistan** • Tavildara; 38°40'54"N, 70°29'51"E; 1600 m alt.; 18.VII.2018; leg. I. Pljushch; slide #L00500; on the prothorax and the mesothorax of *Harpalus distinguendus* (Duftschmid, 1812) (#i00417-1, i00417-2, i00417-3).

KNOWN DISTRIBUTION. — Reported from a few European countries and from the United States on *Harpalus* spp. (Coleoptera, Carabidae) (Gerstman & De Kesel 2023).

Genus *Misgomyces* Thaxt.

Misgomyces dyschirii Thaxt.

EXAMINED MATERIAL. — **Moldova** • Cantemir district, Ciobalaccia village; 46°9'55"N, 28°16'42"E; 12.VIII.1986; *s.c.*; slide #L00481; on the elytra of *Dyschirius nitidus* (Dejean, 1825) (#i00399 = SZIK K112).

ADDITIONAL EXAMINED MATERIAL. — **Nepal** • Chitwan (Roy. Nat. Park), Sauraha village; 166 m alt.; 21-27.VII.2000; leg. J. Schneider; on the elytra of *Dyschiriodes disjunctus* (Andrewes, 1929) (slide WR4454).

Oman • Sulfi env., Orzulik; 5.III.2019; on the left elytral margin of *D. bengalensis* (Andrewes, 1929) (slide WR4522).

Turkmenistan • 10 km N of Giaurs village, near water; 37°52'6"N, 58°46'9"E; 14.IV.1989; leg. A. Puchkov; slide #L00480; on the elytra of *Dyschirius nitidus* (#i00399 = SZIK K112).

KNOWN DISTRIBUTION. — Common and widespread species, reported from several countries of Europe, Africa, Asia, and from the United States. It is found on species of the genera *Dyschirius*

and *Dyschiriodes* (Coleoptera, Carabidae, Scaritini) (Santamaría & Pedersen 2021); the taxonomic position of the parasites occurring on *Bledius* (Staphylinidae), described as a different species (*Misgomyces lavagnei*), is still questioned.

Genus *Monoicomycetes* Thaxt.

Monoicomycetes athetae Thaxt.
(Fig. 3C)

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 14.IV.2022; leg. A. Seropian, on anal sternite (slide #L00167) and on anal tergite (slide #L00185) of *Amischa analis* (Gravenhorst, 1802) (#i00131). **Romania** • jud. Harghita, Munti Giurghiu, 6 km NE Liban, Pasul Sicas (Libán-tető); 46°20'39"N, 25°19'24"E; 1000 m alt.; *Abies-Corylus* groves, on mushrooms; 10.VIII.2009; leg. G. Makranczy; on the abdomen near apex of *Atheta paracrassicornis* Brundin, 1954 (slide WR3574). **Ukraine** • Zakarpatska oblast, Uzhhorod district, Tepla Yama tract; 48°42'58"N, 22°26'18"E; 03.I.2023; leg. R. Mishustin; slides #L00318, L00319, L00320; on anal sternite of *Geostiba circellaris* (Gravenhorst, 1806) (#i00250-1, i00250-2).

ADDITIONAL EXAMINED MATERIAL. — **China** • Sichuan, Gongga Shan, Hailuoguo for.; 2800 m alt.; 05.VII.1998; leg. A. Smetana; at the apex of the abdomen of *Atheta stenotheca* Pace, 2004 (slide WR2301) and *A. subinopinata* Pace, 1998 (slides WR2302, WR2303, WR2304).

Switzerland • Ticino, Lumino, Moesa river; VIII.1991; leg. A. Focarile; apex abdomen of *Gnypeta ripicola* (Kiesenwetter, 1844) (slide WR2424).

KNOWN DISTRIBUTION. — Reported on Staphylinidae Aleocharinae from a few European countries only (Santamaría & Pedersen 2021).

NOTES

The records from China considerably extend the geographical distribution of *Monoicomycetes athetae*. Moreover, *Amischa*, *Geostiba* and *Gnypeta* represent new host genera for this parasite.

Genus *Peyritschiella* Thaxt.

Peyritschiella furcifera (Thaxt.) I.I.Tav.

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Kamianytsa village; 48°41'42"N, 22°23'14"E; 10.III.2023; leg. R. Mishustin; slides #L00430, L00431, L00432, L00433; on the elytra and the tarsus of *Philonthus debilis* (Gravenhorst, 1802) (#i00360-1-12).

KNOWN DISTRIBUTION. — Cosmopolitan species associated with rove beetles (Staphylinidae) of the genus *Philonthus* Stephens, 1829 and a few other allied genera (Santamaría & Pedersen 2021).

Peyritschiella oxyteli (Cépède & F.Picard) Santam.
(Fig. 3D)

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022;

leg. R. Mishustin; slide #L00176; on the elytra of *Anotylus* sp. (#i00140-1).

Turkey • Istanbul; 40°57'11"N, 29°13'48"E; 29.IV.2022; leg. R. Mishustin; slide #L00423; on head, pronotum, elytra and tarsus of *Anotylus sculpturatus* (Gravenhorst, 1806) (#i00352-1, i00352-2, i00352-3).

KNOWN DISTRIBUTION. — For a long time this fungus has been reported as *Peyritschiella protea* and the new combination has been established only recently (Santamaría & Pedersen 2021). Therefore, old records lacking any illustration need to be confirmed. *P. oxyteli* is found on a few genera of rove beetles (Staphylinidae), especially on species of *Oxytelus* Gravenhorst, 1802 and *Anotylus* Thomson, 1859.

Genus *Phaulomyces* Thaxt.

Phaulomyces mediterraneus Santam. & W.Rossi, 1999

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Velikiy Berezny village; 48°16'41"N, 22°29'44"E; 22.III.2023; leg. R. Mishustin & S. Saluk; slide #L00439; on the elytra and the pronotum of *Cerylon histeroides* (Fabricius, 1792) (#i00368).

KNOWN DISTRIBUTION. — Described on *Cerylon* Latreille, 1802 spp. (Coleoptera, Cerylonidae) from France, Italy and Spain (Santamaría & Rossi 1999) and never reported again.

Genus *Rhachomyces* Thaxt.

Rhachomyces canariensis Thaxt.

EXAMINED MATERIAL. — **Georgia** • Telavi distr., Kobadze env., Turlo river valley; 41°50'40"N, 45°19'19"E; 1100 m alt.; 5-8.VI.2008; leg. A. Puchkov; slide #L00385; on the elytra of *Trechus quadristriatus* (Schrank, 1781) (#i00316 = SZIK K100).

ADDITIONAL EXAMINED MATERIAL. — **Greece** • Samos island, river Imvresos near Myli; 5.IV.2008; leg. W.Rossi & E.Sarri; all over the body of *T. quadristriatus* (slide WR3247).

KNOWN DISTRIBUTION. — Reported on *Trechus* Clairville, 1806 spp. (Coleoptera, Carabidae) from several European countries, from the Canary Islands (type), Madeira Islands, Morocco and Turkey (Santamaría & Pedersen 2021).

Rhachomyces cimberitei W.Rossi & Mishustin, sp. nov.
(Fig. 4)

TYPE MATERIAL. — **Russian Federation** • W Caucasus, Krasnodar Region, Dzykhra Mt., banks of the Mzymta River; 1200 m alt.; 15.V.1994; leg. I. A. Belousov; on *Cimberites ovatus* Belousov, 1998 (Coleoptera, Carabidae); holotype: FI [WR1958].

ADDITIONAL EXAMINED MATERIAL. — **Russian Federation** • W Caucasus, Krasnodar Region, Dzykhra Mt., banks of the Mzymta River; 1200 m alt.; 15.V.1994; leg. I. A. Belousov; on *Cimberites ovatus* Belousov, 1998 (Coleoptera, Carabidae); FI [WR1956, WR1957, WR2017] • Aibga Ridge; c. 1650 m alt.; 1.VI.1995; leg. A. G. Koval & A. I. Roubchenya; on a female specimen of *C. convexus* Belousov, 1995; KHER [L00328] (#i00259 = SZIK K28).

ETYMOLOGY. — Referring to the name of the host insects.

INDEX FUNGORUM. — IF901677.

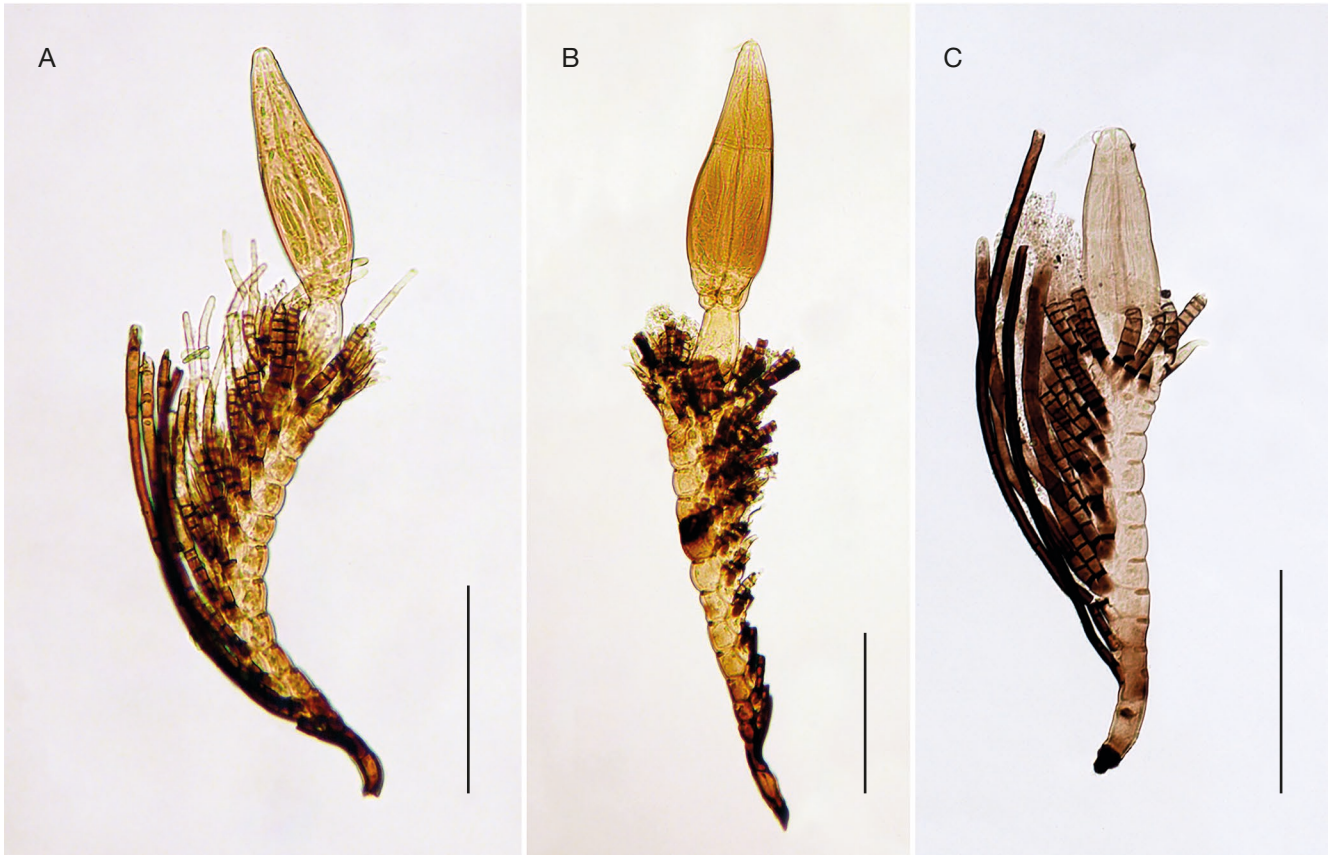


FIG. 4. – *Rhachomyces cimmeritei* W.Rossi & Mishustin, sp. nov.: **A, B**, from the type slide; **C**, paratype (slide WR2017). Scale bar: 100 μ m.

DESCRIPTION

Axis consisting of 9-14 cells, the lower of which are brown colored, sometimes quite dark, especially the suprabasal, the others variably paler, depending mainly on the age of the fungus. Basal cell (cell I) usually slender and elongate. Suprabasal cell of the receptacle (II) always smaller, shorter and darker than the former, bearing a long, dark, appendage consisting of elongate cells. The following cells of the axis are paler, gradually larger and isodiametric, the third from the foot bearing a long appendage whose lower cells are shorter, paler and divided by black septa, sometimes paired with a second shorter appendage composed entirely of short and paler cells. This latter type of appendage is the only found on the upper portion of the thallus, is originated in groups of two or three from each cell of the axis, and is sometimes replaced by antheridial appendages. The latter are usually very few, sometimes found only above the insertion of the perithecial stalk-cell, composed of three cells, the lower short and brownish, the second also short but subhyaline, separated from the lower by a blackish septum and bearing distally a hyaline elongate antheridium which has a distinctly tapered and not strongly curved upper portion. Perithecium sessile or short stalked, usually erect, symmetrical, about three times longer than broad, with the lower half slightly inflated and the upper portion more or less distinctly tapering to a truncate-conical tip ending in a blunt apex. Length from

foot to perithecial apex (235)255-380(490) μ m; perithecium 100-165 \times 35-50 μ m; perithecial stalk up to 50 μ m; longest appendages 230 μ m.

NOTES

At a first glance *Rhachomyces cimmeritei* W.Rossi & Mishustin, sp. nov. looks a lot like *R. aphaenopsis* Thaxt., but a closer examination reveals several differences, although none of them is particularly striking. However, the differences in the lower part of the receptacle between the two fungi immediately catches the eye: in the new species the lower cells are dark, slender, and gradually broader, the basal cell being distinctly elongate; in *R. aphaenopsis* these cells do not differ greatly from each other and from the upper cells. With the exception of the lower ones, the cells forming the axis of the fungus are mostly squarish in the new species, while they are generally broader than long in *R. aphaenopsis*. The blackish and long appendages are very few in *R. cimmeritei* W.Rossi & Mishustin, sp. nov., sometimes limited to just one originated from the suprabasal cell; the same are usually more numerous and also longer in *R. aphaenopsis*. As to the perithecium, the upper portion is narrower than the lower in the new species, sometimes distinctly so, while in *R. aphaenopsis* the perithecium is nearly oblong, with the upper portion equal or slightly narrower than the lower (Santamaría & Faille 2007).

Genus *Siemaszkoa* I.I.Tav. & T.Majewski

Siemaszkoa fennica Huldén

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Kamianytsa village; 48°41'42"N, 22°23'14"E; 10.III.2023; leg. R. Mishustin; slide #L00427; on sternites of *Ptenidium* sp. (#i00358).

KNOWN DISTRIBUTION. — Described from Finland and subsequently reported from a few European countries on *Ptenidium* Erichson, 1845 spp. (Coleoptera, Ptiliidae) (Santamaría & Pedersen 2021).

Genus *Stigmatomyces* H.Karst.

Stigmatomyces entomophilus (Peck, 1885) Thaxt.

EXAMINED MATERIAL. — **Ukraine** • Zakarpatska oblast, Uzhhorod district, Kamianytsa village; 48°36'21"N, 22°13'55"E; 20.VII.2023; leg. R. Mishustin; slide #L00472; on tergites of *Drosophila* (*Drosophila*) cf. *funebis* (Fabricius, 1787) (#i00391-1).

ADDITIONAL EXAMINED MATERIAL. — **Germany** • Ober-Bayern, Schöngesing bei Fürstenfeldbruck "Ort"; 550 m alt.; 17.VI.1999; leg. W. Schacht on *D. funebis* (slides WR3386a & WR3386b).

KNOWN DISTRIBUTION. — This fungus is associated with species of *Drosophila* subsp. *Drosophila* (Diptera, Drosophilidae); records on other subspecies need confirmation. It is reported from America (Bolivia, United States), Europe (Austria, Czech Republic, Denmark, France, The Netherlands, United Kingdom), and from Africa (Gabon, South Africa) (Santamaría & Pedersen 2021). It was also reported from Jamaica under the synonym *Stigmatomyces drosophilae* Thaxt. (Rossi 1998).

NOTES

The new findings of *Stigmatomyces entomophilus* forces us to take a position on the taxonomy of this species (and others in the same genus).

Stigmatomyces is a large genus including so far 156 species associated with flies (Diptera) (Santamaría & Pedersen 2021). In a recent study (Haelewaters *et al.* 2020), based on molecular phylogenetic analysis, the small genus *Gloeandromyces* Thaxt. was found nested within a clade including species of the genus *Stigmatomyces*. To resolve the recovered polyphyly of *Stigmatomyces* the species of this genus has been split into three genera. Although there is a degree of subjectivity in delimiting genera, and there are often multiple ways to name the clades of a phylogenetic tree, we argue that synonymizing *Gloeandromyces* with *Stigmatomyces* is a preferable choice to maintain monophyletic taxa. First of all, there aren't any morphological or ecological characters that clearly distinguish the genera proposed by Haelewaters *et al.* (2020). In addition, Haelewaters *et al.* (2020) only analyzed nine *Stigmatomyces* species, representing less than 6% of the species assigned to this genus at present. Therefore, following the splitting of *Stigmatomyces*, there would be over 140 species (not analyzed by this study) that cannot be safely assigned to the various genera, pending a future molecular assessment. This is highly unlikely for many species, considering that about 50% of the described species of *Stigmatomyces* are known from the type

series only. Second, the merge of *Gloeandromyces* with *Stigmatomyces* would require far fewer nomenclatorial changes compared to the splitting of *Stigmatomyces* into multiple genera. *Gloeandromyces* only include 10 species and assigning them to *Stigmatomyces* would leave no species in an undefined taxonomic position. Finally, it should also be mentioned that among the few species included in the molecular analysis of Haelewaters *et al.* (2020) it is not included the type species of the genus *Stigmatomyces*. This adds further taxonomic uncertainty because even the genus names attributed to the four clades by this study are provisional, pending the clarification of the phylogenetic position of the type species of the genus *Stigmatomyces*.

Based on the reasons stated above we reject the splitting of the genus *Stigmatomyces* and suggest instead the synonymy of the genus *Gloeandromyces* with *Stigmatomyces*. We further recommend that major systematic changes of the classification of the large genus *Stigmatomyces* should only be pursued when a large number of species are available for molecular phylogenetic analyses.

Our opinion on the split of the genus *Stigmatomyces* does not differ substantially from what was recently written on the same topic by Santamaría & Pedersen (2021: 251-252).

Genus *Teratomyces* Thaxt.

Teratomyces actobii Thaxt.

EXAMINED MATERIAL. — **Georgia** • Mtskheta-Mtianeti, Tbilisi municipality, Telovani village; 41°48'8"N, 44°40'33"E; 27.IV.2022; leg. R. Mishustin; slides #L00179, L00180, L00181; all over the body of various specimens of *Erichsonius subopacus* (Hochhuth, 1851) (#i00143-1, i00143-2, i00143-3).

KNOWN DISTRIBUTION. — This fungus is found on species of the genus *Erichsonius* Fauvel, 1874 and closely related genera (Coleoptera, Staphylinidae); it was described from the United States. and later reported from a few European countries, from Algeria and from Sri Lanka (Santamaría & Pedersen 2021).

DISCUSSION

The knowledge of the Laboulbeniales from the countries surrounding the Black Sea is significantly increased. The species previously recorded from Georgia were only four and, as stated before, none of these fungi was reported from Moldova. Moreover, with the 14 species added in this paper, Ukraine reaches 107 species, making it the second country in Eastern Europe in terms of number of reported Laboulbeniomyces, although far behind Poland, which has twice as many recorded species (Santamaría & Pedersen 2021). Also noteworthy are the findings from Central Asia, an area that is almost completely unknown as far as Laboulbeniales are concerned.

The description of two new species and the reporting of a large number of new records testify to how much more there is still to be done in the study of the Laboulbeniales in the area surrounding the Black Sea, and beyond.

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