Botanica Pacifica. A journal of plant science and conservation. 2025. 14(2): 123–130
DOI: 10.17581/bp.2025.14215

TAXONOMIC NOVELTIES

Triseptata orientalis sp. nov. and *Leptodontidium viktortsoii* sp. nov., two species from the forest-tundra soils of the Magadan Region, Russia

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Manuscript received: 03.03.2025
Review completed: 28.10.2025
Accepted for publication: 05.11.2025
Published online: 07.11.2025

ABSTRACT

A novel species in genera *Triseptata* and *Leptodontidium* are described as *Triseptata orientalis* and *Leptodontidium viktortsoii*. The new species were isolated from the forest-tundra soils of the Magadan region (Russia) and is represented by ex-type strain VKM F-5014 and VKM F-5013, accordingly. To characterize the species, we used a polyphasic taxonomic approach. A description based on morphological characters is given and it is shown that the new species are morphologically different from closely related species. Partial sequences of internal transcribed spacer rDNA region (ITS1-5.8S-ITS2) and 28S rDNA (LSU) were analyzed. The partial sequence of SSU (18S rDNA) was analyzed for *L. viktortsoii* as well. Sequences data, macro- and micromorphological characteristics distinguish *T. orientalis* and *L. viktortsoii* from all known species in genera *Triseptata* and *Leptodontidium*.

Keywords: forest-tundra, *Leptodontidium*, microfungi, multi-gene phylogeny, soil fungi, *Triseptata*

РЕЗЮМЕ

Ильюшин В.А., Кирцидели И.Ю. *Triseptata orientalis* sp. nov. и *Leptodontidium viktortsoii* sp. nov., два новых вида из почв лесотундры Магаданской области, Россия. Новые виды микроскопических грибов, принадлежащих родам *Triseptata* и *Leptodontidium*, были описаны как *Triseptata orientalis* и *Leptodontidium viktortsoii*. Новые виды были выделены из почв лесотундры Магаданской области (Россия) и представлены штаммами VKM F-5014 и VKM F-5013, соответственно. Для характеристики видов мы использовали полифазный таксономический подход. Приведенное описание на основе морфологических признаков показывает, что новый вид морфологически отличается от близкородственных видов. Были проанализированы частичные последовательности региона ITS (ITS1-5.8S-ITS2) и 28S рДНК (LSU). Также была проанализирована частичная последовательность SSU (18S рДНК) для *L. viktortsoii*. Данные последовательностей, макро- и микроморфологические характеристики позволяют отличить *T. orientalis* и *L. viktortsoii* от всех других известных видов родов *Triseptata* и *Leptodontidium*.

Ключевые слова: лесотундра, *Leptodontidium*, микроскопические грибы, мультигенная филогения, почвенные грибы, *Triseptata*

Forest-tundra landscapes form a transitional strip with vague boundaries, where oppressed woodlands alternate with shrubby or typical tundra (Isachenko & Shlyapnikov 1989). The forest-tundra in the Magadan Region is an oppressed woodland of *Larix gmelini* (Rupr.) Rupr. with shrubs of *Betula nana* L. or *Pinus pumila* (Pall.) Regel in the undergrowth. Most of the Magadan Region is located in the Kolyma River basin and is characterized by the greater climate continentality (Gerasimov 1970, Galanina et al. 2021). The territory near Susuman town is referred to the Verkhoyansk province of the East Siberian subregion of the Boreal floristic region (Yurtsev 1974). The amount of precipitation in the forest-tundra is small (200–350 mm), however, due to permafrost and low temperatures, moisture evaporates very slowly.

Despite the great economic potential of the Magadan Region, not many studies have focused on the fungi of this area. Most of the research is devoted to macrofungi (Sazanova 2015, Volobuev et al. 2019, Rebriev et al. 2020). Some studies have been devoted to phytopathogens (Azbukina & Karatygin 2010, Sazanova et al. 2017, Dokuchaeva & Dokuchaev 2020). Several studies have focused on microfungi in the soils of tundra and forest-tundra (Egorova 1986, 2003, Grishkan 1994, 1997, Iliushin et al. 2022), larch forests (Egorova 2009) and such technogenic ecosystems as coal mine spoil tips (Iliushin et al. 2022).

Previous investigations of the mycobiota in forest-tundra soils reported the presence of fungi that belong mainly to genera *Alternaria* Nees, *Aspergillus* P. Micheli ex Haller, *Fusarium* Link, *Leucosporidium* Fell, Statzell, I.L. Hunter & Phaff, *Mortierella* Coem., *Ochrocladosporium* Crous & U. Braun, *Penicillium* Link and *Pseudogymnoascus* Raillo (Egorova 1986, 2009, Grishkan 1994, Iliushin et al. 2022).

An isolate belonging to a fungus of the genus *Triseptata* Boonmee & Phookamsak in forest-tundra soils was discovered by us for the first time. Boonmee et al. (2020) proposed a new genus *Triseptata* to include one new species *Triseptata sexualis* Boonmee & Phookamsak, based on mor-

phological and phylogenetic data. Triseptata is a genus of ascomycete fungi in the family Latoruaceae. Crous et al. (2015) proposed the new genus *Latorua* Crous and family Latoruaceae. Latoruaceae currently comprises five genera *Latorua*, *Matsushimamyces* Rah. Sharma & Roh. Sharma, *Polyschema* H.P. Upadhyay, *Pseudoasteromassaria* M. Matsum. & Kaz. Tanaka and *Triseptata* (Upadhyay 1966, Ariyawansa et al. 2015, Sharma et al. 2015, Wijayawardene et al. 2017). Until recently, the two fungi of the genus *Triseptata*, *T. sexualis* and *T. podargusstrigoides* Y.P. Tan & Bishop-Hurley, were known (Boonmee et al. 2020, Tan & Bishop-Hurley 2024).

Another isolate belonged to the fairly common soil genus *Leptodontidium* de Hoog. The genus was described by de Hoog in 1977 as *Leptodontium* de Hoog (Nom. illegit.) and re-circumscribed him again as *Leptodontidium* in 1979 (de Hoog & Hermanides-Nijhof 1977, de Hoog 1979). *Leptodontidium* is a genus of fungi belonging to the family Leptodontidiaceae. Leptodontidiaceae is introduced to accommodate species of *Leptodontidium* in 2017 by Hern.-Restr., Crous & Gen (Hernandez-Restrepo et al. 2017). The genus *Leptodontidium* comprises about ten species (de Hoog & Hermanides-Nijhof 1977, Castaneda- Ruiz 1988). In the forest-tundra of the Magadan Region, fungi of this genus were previously found based on metagenomic studies (GBIF 2023).

MATERIAL AND METHODS

Strains isolation

The soil samples were collected from forest-tundra (Larch-dwarf cedar-shrub-lichen oppressed sparse forest, 63°16'47"N 146°42'10"E). The samples were collected in individual sterile plastic tubes and stored frozen.

Fungi were cultivated on Czapek agar (CZ) (Raper & Thom 1949). Single spore isolation was used to obtain pure cultures. The plates were inoculated with a spore suspension made in a 0.2 % agar and 0.05 % Tween 80 solution (Samson et al. 2014).

The strains were deposited in the All-Russian Collection of Microorganisms (VKM), G.K. Skryabin Institute of Biochemistry and Physiology of Microorganisms at the Pushchino Biological Research Center of the Russian Academy of Science, Pushchino, Russia, under No. VKM F-5014 and VKM F-5013 for *Triseptata orientalis* and *Leptodontidium viktortsoii*, accordingly. A dried type culture is preserved in the Mycological Herbarium of the Komarov Botanical Institute, St. Petersburg, Russia (acronym LE), under No. LE F-350179 and LE F-350180 for *T. orientalis* and *L. viktortsoii*, accordingly.

Morphological analysis

The isolate of *T. orientalis* was cultivated on CZ (Czapek agar) (Raper & Thom 1949) and MEA (malt extract agar) (Samson et al. 2010) for morphological observations. The isolate of *L. viktortsoii* was cultivated on CZ, MEA and PDA (potato-dextrose agar) (Hernandez-Restrepo 2017) for morphological observations. Isolates were inoculated on 9 cm Petri dishes and incubated for 21 days at 21°C in darkness. In addition, inoculated plates were incubated for 21 days at 4, 8, 12, 16, 18, 21, 25, 30, 32, 35 and 37°C. Color determination was performed according to the ISCC-NBS Centroid Color Charts (Kelly 1964, Nováková et al. 2012). The Zeiss Axio Imager A1 was used for micro-morphological examination.

Molecular studies and phylogenetic analysis

The pure culture was grown on CZ at 20°C for 21 days for molecular analysis. DNA was extracted by using a DiamondDNA Plant kit (ABT, Russia, Barnaul) according to the manufacturer's instructions.

The ITS1-5.8S-ITS2 (Internal transcribed spacer rDNA region) was amplified using the PCR-primers ITS1 (5'-TCCGTAGGTGAACCTTGCGG-3') and ITS4 (5'-TCCTCCGCTTATTGATATGC-3') (White et al. 1990). The PCR amplification conditions were: 2 min at 95°C, followed by 35 cycles, each consisting of 30 s at 95°C, 30 s at 55°C and 1 min at 72°C; the final PCR extension step was 10 min at 72°C. The LSU (28S rDNA) was amplified using the PCR-primers NL-1 (5'-GCATATCAATAAGCGGAGGAAAAG-3,) and NL-4 (5'-GGTCCGTGTTTCAAGACGG-3') (O'Donnell 1993). The SSU (18S rDNA) was amplified using the PCR-primers EukA (5'-AACCTGGTTGATCCTGCCAGT-3') and EukB (5'-TGATCCTTCTGCAGGTTCACCTAC-3') (Stoeck et al. 2006). When preparing the sequences of the 18SpRNA gene for sequencing, we faced the problem of insufficient sequence length when using standard EukA-EukB primers. By additionally amplification of a pair of primers: Euk360F (5'-CGGAGARGGMGCMTGAGA-3') and 1492R (5'-GGTTACCTTGTTACGACTT-3') (Stoeck et al. 2003), complete sequences of the 18S rRNA gene were obtained, ready for phylogenetic analysis. The PCR amplification conditions for LSU and SSU were: 2 min at 94°C, followed by 35 cycles, each consisting of 30 s at 94°C, 1 min at 55°C and 2 min at 72°C; the final PCR extension step was 5 min at 72°C.

Sequences were edited in BioEdit version 7.1.9. The obtained sequences were submitted to the NCBI GenBank, compared to available sequences in the database by using BLAST (https://blast.ncbi.nlm.nih.gov/Blast.cgi). The sequences were aligned with other Latoruaceae (for *T. orientalis*) and *Leptodontidium* (for *L. viktortsoii*) species using the multiple sequence alignment ClustalW (Larkin et al. 2007). A combined ITS+LSU data matrix containing 20 isolates belonging to 17 species was constructed for *T. orientalis*. A combined ITS+LSU+SSU data matrix containing 16 isolates belonging to 11 species was constructed for *L. viktortsoii*. Datasets were generated by combining the obtained sequences with reference sequences (preferably ex-type or holotype) from previous studies deposited in the nucleotide database at NCBI (Table 1 and 2, accordingly). Phylogenetic analyses were performed using the maximum likelihood method and Tamura-Nei model (Tamura & Nei 1993). Evolutionary analyses were conducted in MEGA X (Kumar et al. 2018). Initial trees for the heuristic search were obtained automatically by applying Neighbor-Join and BioNJ algorithms to a matrix of pairwise distances estimated using the Tamura-Nei model, and then selecting the topology with superior log likelihood value. Confidence

levels in nodes were determined using bootstrap analyses of 1000 replicates.

RESULTS

According to BLAST analysis of ITS region sequences, *T. orientalis* is related to *T. sexualis* and *T. podargusstrigoides* with 95.9 % and 94.5 % similarity of the sequence. BLAST analysis of the LSU sequences demonstrated a relationship between *T. sexualis* and *T. podargusstrigoides* with 98.4 % similarity. Sequence data from ITS and LSU, were analyzed for examination of the *T. orientalis* phylogeny. The data of 20 isolates including the outgroup (*Dothidea berberidis* CBS 186.58 and *Lepidosphaeria nicotiae* CBS 559.71) were used to reveal the phylogenetic relationships of the supposed new species with other species of Latoruaceae. The ITS region (332 sites/148 variable) and the partial 28S rDNA gene (LSU) (583 sites/154 variable) sequences were combined. There were a total of 915 positions in the final dataset. The combined maximum likelihood phylogenetic tree based on ITS and LSU is shown in Fig. 1. According to this analysis, *T. orientalis* clustered together with *T. sexualis* and *T. podargusstrigoides*.

According to BLAST analysis of ITS region sequences, *L. viktortsoii* is related to *L. elatius* with 96.5 % similarity of the sequence. BLAST analysis of the LSU sequences demonstrated a relationship between *L. viktortsoii* and *L. beauverioides* (de Hoog) de Hoog with 96.4 % similarity. BLAST analysis of the SSU sequences demonstrated a relationship between *L. viktortsoii* and *L. elatius* with 99.1 % similarity. Sequence data from ITS LSU, and SSU, were analyzed for examination of the *L. viktortsoii* phylogeny. The data of 16 isolates including the outgroup (*Orbilia vinosa* (Alb. & Schwein.) P. Karst. CGMCC3.13368) were used to reveal the phylogenetic relationships of the supposed new species with other species of *Leptodontidium*. The ITS region (505 sites/307 variable), the partial 28S rDNA gene (LSU) (577 sites/131 variable) and

Table 1. Strains included in the phylogenetic analysis of *Triseptata orientalis* and GenBank accession numbers.

Species	Collection No.	ITS	LSU
Latorua caligans	isolate 58OCT	ON712288	nd*
Latorua caligans	NTOU 4286	MZ422989	nd
Latorua caligans	TJU_APR34	OM237262	nd
Latorua grootfonteinensis	CBS:369.72	nd	MH877741
Matsushimamyces bohaniensis	CBEC001	KP765516	KR350633
Matsushimamyces bohaniensis	CBS 140592	NR_156293.1	nd
Matsushimamyces venustum	CBS:140212	KT428157	KT428158
Polyschema congolense	CBS:542.73	MH860770	MH872486
Polyschema larviformis	CBS 463.88	nd	EF204503
Polyschema larviformis	ILLS 00171087	MH472659	MH472659
Polyschema sclerotigenum	CBS:139502	NR_137973	MH878647
Polyschema terricola	CBS:301.65	MH858576	MH870213
Pseudoasteromassaria aquatica	MFLUCC 18-1397	MT627674	NG_073803
Pseudoasteromassaria fagi	KT3432	LC061595	LC061590
Pseudoasteromassaria spadicea	MFLUCC 15-0973	KY522726	KY522724
Triseptata orientalis	**VKM F-5014**	**OL989264**	**OR801563**
Triseptata podargusstrigoides	BRIP 76063a	NR_191342	NG_243442
Triseptata sexualis	MFLUCC:11-0002	MN977832	MN977833
Outgroup:			
Dothidea berberidis	CBS 186.58	EU167601	KC800752
Lepidosphaeria nicotiae	CBS:559.71	NR_156218	MH872024

* nd – no data

Table 2. Strains included in the phylogenetic analysis of *Leptodontidium viktortsoii* and GenBank accession numbers.

Species	Collection No.	ITS	LSU	SSU
Dematioscypha dematiicola	FMR 11585	HF677177	HF677187	HF937353
Leptodontidium aureum	FMR 11834	KY853447	KY853507	HF937355
Leptodontidium beauverioides	CBS:169.78B	MH861125	MH872885	nd*
Leptodontidium beauverioides	CBS:672.76	MH861023	MH872794	nd
Leptodontidium boreale	CBS 682.76	NR_145270	MH872796	NG_065505
Leptodontidium camptobactrum	CBS:675.76	MH861024	MH872795	nd
Leptodontidium camptobactrum	CBS:237.53	MH857172	MH868712	nd
Leptodontidium irregulare	CBS:851.73	KY853448	KY853508	AY129281
Leptodontidium irregulare	CBS:152.60	MH857936	MH869480	nd
Leptodontidium obscurum	CBS:405.85	MH861893	MH873582	nd
Leptodontidium quercuum	UAMH 8341	nd	nd	AF056375
Leptodontidium trabinellum	CBS:329.53	AY129285	KY853509	AY129280
Leptodontidium trabinellum	CBS:833.69	MH859449	MH871225	nd
Leptodontidium trabinellum	CBS:624.69	MH859388	MH871159	nd
Leptodontidium viktortsoii	**VKM F-5013**	**OL989266**	**OR801564**	**OR805562**
Outgroup:				
Orbilia vinosa	AFTOL-ID 905	DQ491511	HQ110696	DQ471000

* nd – no data

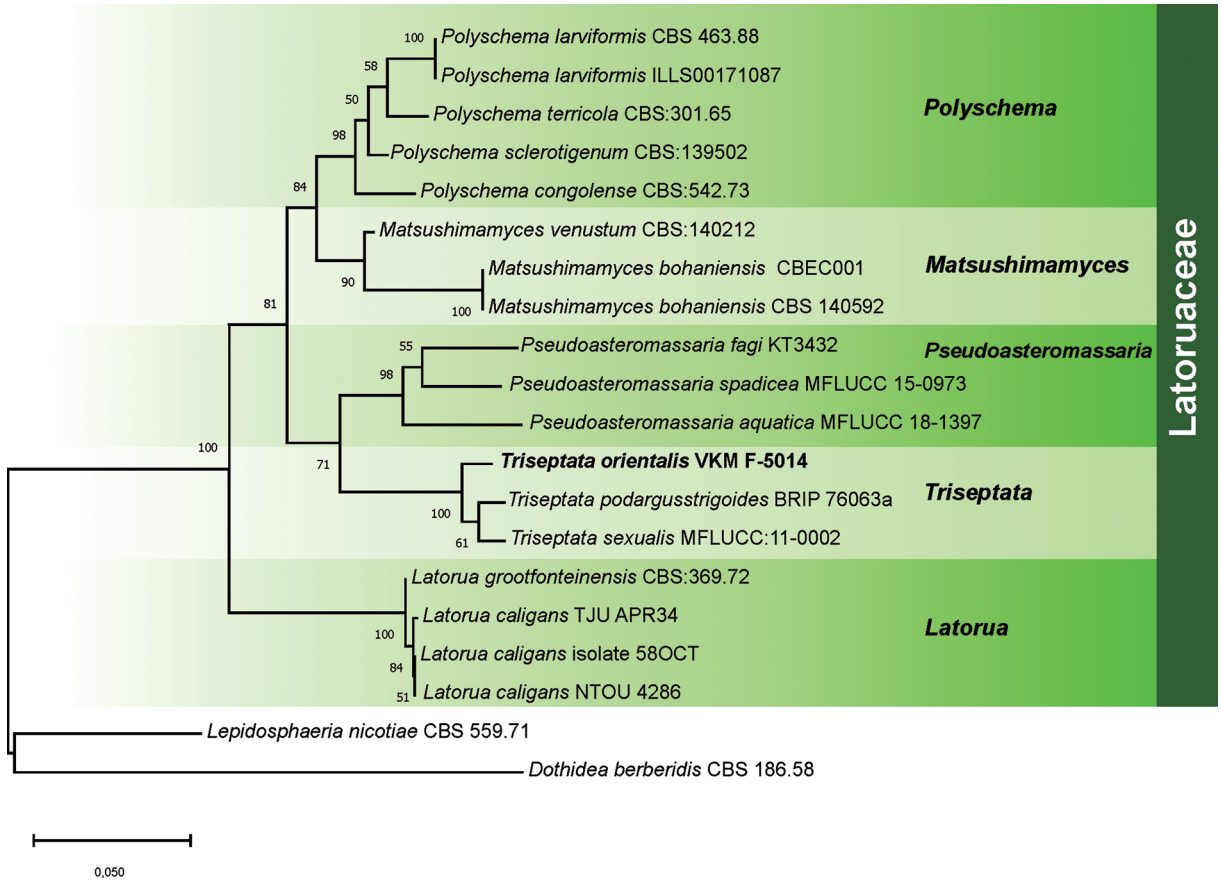

Figure 1 Phylogenetic tree based on maximum likelihood (ML) analysis of combined ITS+LSU sequences showing relationships of *Triseptata orientalis* **sp. nov.** to other Latoruaceae species. The tree is rooted with *Dothidea berberidis* (Wahlenb.) De Not. CBS 186.58 and *Lepidosphaeria nicotiae* Parg.-Leduc CBS 559.71. The bootstrap percentages >50% are given at the nodes. The scale bar indicates the number of substitutions per site. The new species *T. orientalis* (VKM F-5014) is shown in bold

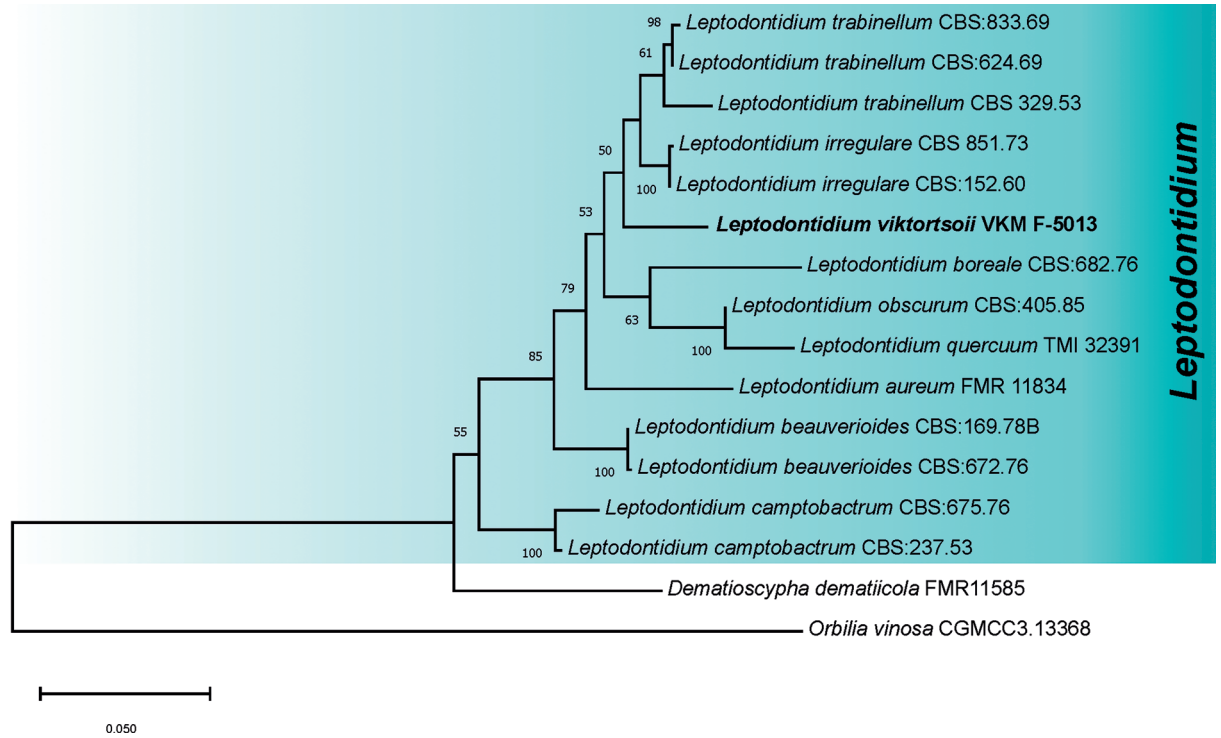

Figure 2 Phylogenetic tree based on maximum likelihood (ML) analysis of combined ITS+LSU+SSU sequences showing relationships of *Leptodontidium viktortsoii* **sp. nov.** to other *Leptodontidium* species. The tree is rooted with *Orbilia vinosa* (Alb. & Schwein.) P. Karst. CGMCC3.13368. The bootstrap percentages >50 % are given at the nodes. The scale bar indicates the number of substitutions per site. The new species *L. viktortsoii* (VKM F-5013) is shown in bold

the partial 18S rDNA gene (SSU) (538 sites/97 variable) sequences were combined. There were a total of 1550 positions in the final dataset. The combined maximum likelihood phylogenetic tree based on ITS, LSU and SSU is shown in Fig. 2. According to this analysis, *L. viktortsoii* clustered together with *L. trabinellum* and *L. irregulare* (de Hoog) de Hoog.

A detailed description of *T. orientalis* and *L. viktortsoii* is given in the Taxonomy section. Morphology of the new species was compared with the related species and given in the Discussion section.

TAXONOMY

Triseptata orientalis V.A. Iliushin & I.Y. Kirtsideli, **sp. nov.** (Fig. 3) MB 850982

Type (typus): RUSSIA. Magadan Region: near the town of Susuman, (63°16'47"N 146°42'10"E): from soil of the forest-tundra, isol. V.A. Iliushin, (holotype LE F-350179 dried culture); ex-type culture VKM F-5014. ITS barcode: OL989264 (alternative markers: LSU = OR801563).

Etymology: Orientalis (Lat.): refers to the Russian Far East (Magadan region) where the species was found.

Diagnosis: *Triseptata orientalis* has globose to subglobose cleistothecia, ellipsoid-fusiform aseptate ascospores, ostiolar hyphae and chains of chlamydospores. This species is able to grow at 35°C and does not grow at 37°C.

Colony characters: Colonies on MEA after 21 d at 27°C reached a diameter of 65–68 mm, from woolly in the center to velvety on the edge of the colony, non-zonate, light olive gray (#8a8776); exudates absent; sporulation absent; reverse dark brown (#422518). Colonies on CZ after 21 days of cultivation at 27°C reached a diameter of 56–60 mm, velvety, non-zonate, flat, grayish olive gray (#57554c); exudates absent; sporulation absent; reverse dark brown (#422518). Cultivation at different temperature conditions did not affect the color and structure of the colonies. Growth temperature range: 8–35°C. Optimum: 27°C.

Micromorphology: Mycelium hyaline to brown, branched, smooth-walled, septate, 1.8–4.2 µm wide. Cleistothecia superficial, dark green (#1b4d3e) to pale green (#8da399), globose to subglobose, 15–22 µm long in diameter. Asci 8-spored, evanescent at maturity. Ascospores 6.5–8.5 × 3.0–4.0 µm, ellipsoid-fusiform, straight or slightly curved, aseptate, hyaline. Ostiolar hyphae present, pale brown, septate, numerous in the center of the colony, branched, 10.0–32.0 µm overall width, consists of 5 to 12 separate hyphae. Hyphae forming chains of chlamydospores, becoming dark olive green, ovate to elliptical, smooth- and thick-walled, 4.5–6.5 × 2.5–4.5 µm. Anamorph not observed.

Leptodontidium viktortsoii V.A. Iliushin & I.Y. Kirtsideli, **sp. nov.** (Fig. 4) MB 850983

Type **(typus):** RUSSIA. Magadan Region: near the town of Susuman, (63°16'47"N 146°42'10"E): from soil of the forest-

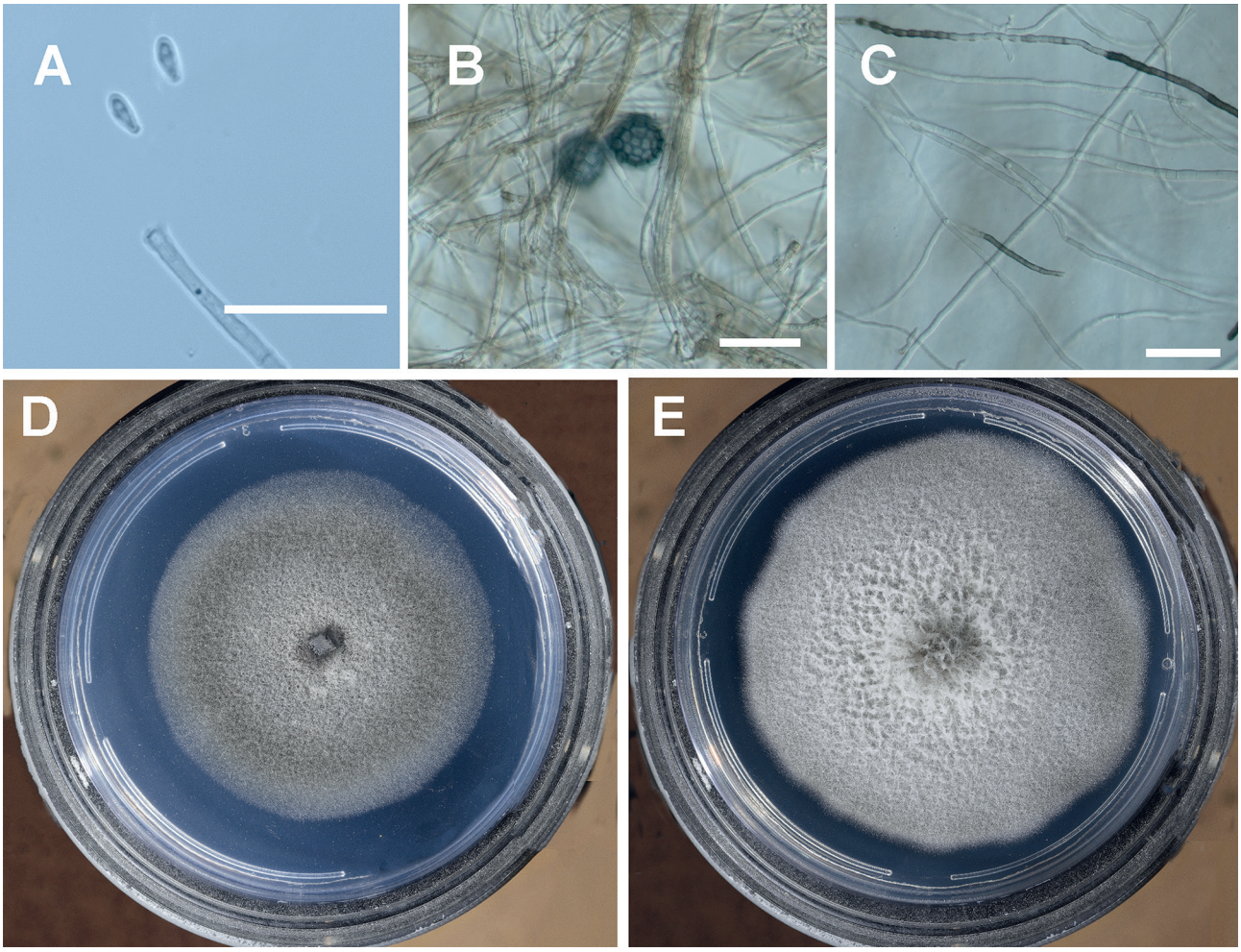

Figure 3 Morphology of *Triseptata orientalis* **sp. nov.** A – ascospores, B – cleistothecia and ostiolar hyphae, C – chain of chlamydospores, D – colony on CZ after 3 weeks at 27°C, E – colony on MEA after 3 weeks at 27 °C. Scale bar – 20 µm

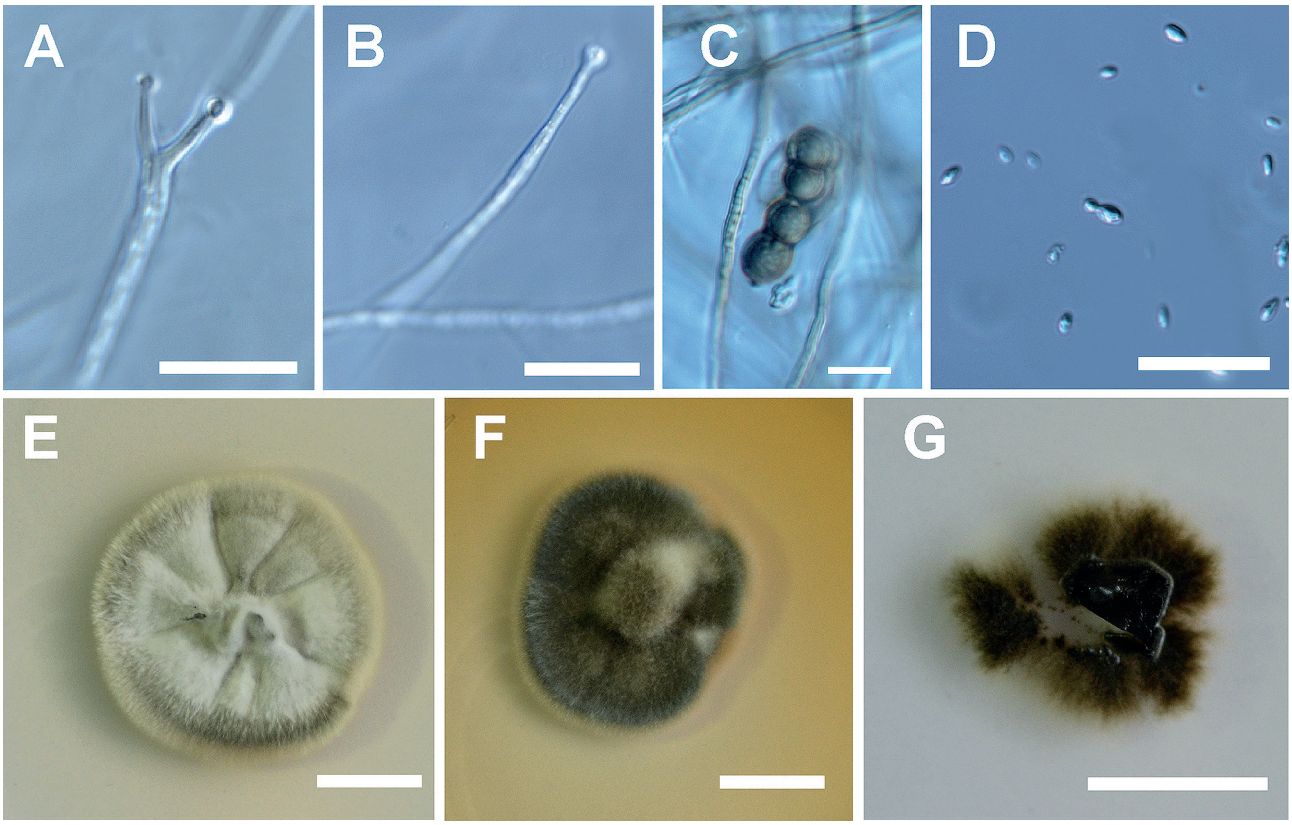

Figure 4 Morphology of *Leptodontidium viktortsoii* **sp. nov.** A, B – conidiophores, C – chains of chlamydospores, D – conidia. Scale bar (A–D) – 10 μm. E – colony on PDA after 3 weeks at 21°C, F – colony on MEA after 3 weeks at 21°C, G – colony on CZ after 3 weeks at 21°C. Scale bar (E–G) – 1 cm

tundra, isol. V.A. Iliushin, (holotype LE F-350180 dried culture); ex-type culture VKM F-5013. ITS barcode: OL989266 (alternative markers: LSU = OR801564; SSU = OR805562).

Etymology: Named in honor of Viktor Robertovich Tsoi, a famous Russian rock singer and songwriter. Founder and leader of the rock band "Kino".

Diagnosis: *Leptodontidium viktortsoii* has terminal cylindrical conidiogenous cells, aseptate globose to elliptical conidia and chains of chlamydospores. This species is able to grow at 30°C and does not grow at 32°C.

Colony characters: Colonies on MEA after 21 d at 21°C reached a diameter of 20–26 mm, velvety, slightly elevated at the centre, grayish olive green (#515744) with pale yellow green (#dadfb7) areas; exudates absent; very rare sporulation; reverse dark gray (#555555). Colonies on CZ after 21 days of cultivation at 21°C reached a diameter of 17–18 mm, non-zonate, flat, margin uneven, slightly feathery; semi-hyaline to white (#f2f3f4) with pale greenish yellow (#ebe8a4) area in the center of colony; exudates absent; sporulation absent; reverse the same color. Colonies on PDA after 21 d at 21°C reached a diameter of 26–29 mm, slightly velvety, purplish white (#e8e3e5) to yellowish white (#f0ead6) at the centre and yellowish gray (#bfb8a5) toward the periphery; exudates absent; very rare sporulation; reverse medium gray (#848482). Cultivation at different temperature conditions did not affect the color and structure of the colonies. Growth temperature range: 12–30°C. Optimum: 21°C.

Micromorphology: Mycelium hyaline, branched, smooth-walled, septate, 1.5–3.0 μm wide. Conidiophores are formed very rarely, macronematous, straight, arising from agar surface or aerial hyphae, hyaline, septate, simple or branched in two, smooth, 5.0–30.0 × 2.0–3.0 μm, often reduced to conidiogenous cells. Conidiogenous cells terminal, cylindrical, 4.5–11 × 1–2.0 μm, hyaline, smooth, often with a terminal conidium remaining attached. Conidia aseptate, hyaline, smooth-walled, globose or subglobose to elliptical, 2.0–6.0 × 2.0–3.5 μm. Chlamydospores terminal or intercalary, in chains, aseptate, smooth, globose to subglobose, 7.0–14.5 × 5.0–11.0 μm, hyaline becoming brown. Teleomorph not observed.

DISCUSSION

Species of *Leptodontidium* has reported from various sources locations around the world (Hernandez-Restrepo et al. 2017). This study adds one new species from the forest-tundra, *L. viktortsoii*, to the list of species in this genus. *Leptodontidium viktortsoii* has some unique morphological characteristics with other members of genus *Leptodontidium*. It is distinguished from other species by its typical gray-green coloration on CZ and MEA. *Leptodontidium viktortsoii* is similar to *L. trabinellum* and *L. aureum* in that it has erect conidiophores and conidiogenic cells; however, the conidia of the first of them differ in shape – cylindrical, from straight to curved, in *L. viktortsoii* – globose or subglobose to elliptical. The conidia of *L. aureum* are larger (4.5–8 × 2–3 μm) than the conidia of *L. viktortsoii* (2.0–6.0 × 2.0–3.5 μm). A combined tree based on ITS+LSU+SSU partial sequences showed that *L. viktortsoii* is most closely related to *L. elatius*, *L. trabinellum* and *L. irregulare*. *Leptodontidium viktortsoii* has a unique ITS sequence and can be differentiated from all the other species using the barcoding ITS locus.

Species of *Triseptata*, on the contrary, were found only from warm countries (Thailand and Australia), the source

of which was decayed wood. This study adds one new species from the subarctic soils of forest-tundra, *T. orientalis*, to the list of species in this genus. Species of the genus *Triseptata* have morphological differences. Colonies of *T. orientalis* and *T. sexualis* have similar texture on MEA, although they vary in colour. Colonies of *T. orientalis* are greener than colonies of *T. sexualis*. The growth rate is also higher (about 2–2.5 times). The main difference from other species of the genus

Triseptata is aseptate ascospores.

Triseptata orientalis and *L. viktortsoii* are soil inhabitants of the forest tundra. The minimum growth temperatures (8 and 12°C) confirmed the adaptability of these species to the low temperatures typical of the Subarctic.

CONCLUSIONS

Our data indicate that the isolates of the new species can be clearly distinguished from others based on phylogenetic and phenotypic analysis, and they are representatives of the new species *Triseptata orientalis* and *Leptodontidium viktortsoii*.

ACKNOWLEDGEMENTS

This study was carried out as part of the state assignment according to the thematic plan of the Komarov Botanical Institute of the Russian Academy of Sciences (theme No. 12401310-0829-3). The research was done using equipment of The Core Facilities Center "Cell and Molecular Technologies in Plant Science" at the Komarov Botanical Institute RAS (St.-Petersburg, Russia).

LITERATURE CITED

Ariyawansa, H.A., K.M. Thambugala, D.S. Manamgoda, R. Jayawardena, E. Camporesi, S. Boonmee, D.N. Wanasinghe, R. Phookamsak, S. Hongsanan, ... & K.D. Hyde 2015. Towards a natural classification and backbone tree for Pleosporaceae. *Fungal Diversity* 71: 85–139.

Azbukina, Z.M. & I.V. Karatygin 2010. Melampsoraceous group of Uredinales in Russia: taxonomic revisions of recent years. *Mikologiya i fitopatologiya* 44:177–196 (in Russian with English summary). [Азбукина З.М., Каратыгин И.В. 2010. Мелампсороидная группа ржавчинных грибов в России: таксономические ревизии последних лет // Микология и фитопатология. Т. 44. С. 177–196].

Boonme, S., M.S. Calabon, R. Phookamsak, A.M. Elgorban & K.D. Hyde 2020. *Triseptata sexualis* gen. et sp. nov. in Latoruaceae (Pleosporales). *Phytotaxa* 447(4): 252–264.

Crous, P.W., L.M. Carris, A. Giraldo, J.Z. Groenewald, D.L. Hawksworth, M. Hernández-Restrepo, W.M. Jaklitsch, M.-H. Lebrun, R.K. Schumacher, ... & A.R. Wood 2015. The genera of fungi – fixing the application of the type species of generic names - G 2: *Allantophomopsis*, *Latorua*, *Macrodiplodiopsis*, *Macrohilum*, *Milospium*, *Protostegia*, *Pyricularia*, *Robillarda*, *Rotula*, *Septoriella*, *Torula*, and *Wojnowicia*. *IMA Fungus* 6(1):163–198.

de Hoog, G.S. & E.F. Hermanides-Nijhof 1977. The black yeast and allied *Hyphomycetes*. *Studies in Mycology* 15:1–122.

de Hoog, G.S. 1979. Nomenclatural notes on some black yeast-like *Hyphomycetes*. *Taxon* 28(4):347–348.

Dokuchaeva, V.B. & N.E. Dokuchaev 2020. Detection of the rust fungus *Chrysomyxa woronini* Tranzschel in artificial planting of spruce trees in the Magadan Region. *Vestnik DVO RAN* 3:134–137 (in Russian with English summary). [Докучаева В.Б., Докучаев Н.Е. 2020. Обнаружение ржавчинного гриба *Chrysomyxa woronini* Tranzsche в искусственных посадках елей на территории Магаданской области // Вестник ДВО РАН. № 3. С. 134–137].

Egorova, L.N. 1986. *Soils fungi of the Far East: Hyphomycetes*. Nauka, Leningrad, 192 pp. (in Russian). [Егорова Л.Н. 1986. Почвенные грибы Дальнего Востока: Гифомицеты. Ленинград: Наука. 192 с.].

Egorova, L.N. 2003. Soil ascomycetes of the Russian Far East. *Mikologiya i Fitopatologiya* 37:13–21 (in Russian with English summary). [Егорова Л.Н. 2003. Почвообитающие аскомицеты российского Дальнего Востока // Микология и фитопатология. Т. 37, № 2. С. 13–21].

Egorova, L.N. 2009. Soil Zygomyceyes (Mucorales, Mortierellales) of coniferous forest of the Russian Far East. *Mikologiya i Fitopatologiya* 43:292–297 (in Russian with English summary). [Егорова Л.Н. 2009. Почвообитающие зигомицеты Zygomyceyes (Mucorales, Mortierellales) хвойных лесов российского Дальнего Востока // Микология и фитопатология. Т. 43, С. 292–297].

Galanina, I.A., L.S. Yakovchenko, E.V. Zheludeva & Y. Ohmura 2021. The genus *Rinodina* (Physciaceae, lichenized Ascomycota) in the Magadan Region (Far East of Russia). *Novosti sistematiki nizshikh rastenii* 55(1):97–119 (in Russian with English summary). [Галанина И.А., Яковченко Л.С., Желудева Е.В., Омура Й. 2021. Род *Rinodina* (Physciaceae, lichenized Ascomycota) в Магаданской области (Дальний Восток России) // Новости систематики низших растений Т. 55, № 1. С. 97–119].

GBIF Backbone Taxonomy 2023. *Leptodontidium* de Hoog *in GBIF Secretariat. Checklist dataset*. Available from: https://doi.org/10.15468/39omei Last accessed 31.01.2025.

Gerasimov, I.P. 1970. *Natural conditions and natural resources of the USSR. The North of the Far East*. Nauka, Moscow, 488 pp. (in Russian). [Герасимов И.П. 1970. Природные условия и естественные ресурсы СССР. Север Дальнего Востока. Москва: Наука. 205 с.].

Grishkan, I.B. 1994. Soil micromycetes of sphagnum larch woodlands in the upper reaches of the Kolyma river. *Mikologiya i Fitopatologiya* 28:28–33 (in Russian). [Гришкан И.Б. 1994. Почвенные микромицеты сфагновых лиственничных редколесий в верховьях реки Колымы // Микология и фитопатология. Т. 28. С. 28–33].

Grishkan, I.B. 1997. *Mycobiota and the biological activity of soils of the upper Kolyma*. Dalnauka, Vladivostok, 136 pp. (in Russian). [Гришкан И.Б. 1997. Микобиота и биологическая активность почв верховий Колымы. Владивосток: Дальнаука. 136 с.].

Hernández-Restrepo, M., J. Gené, R.F. Castañeda-Ruiz, J. Mena-Portales, P.W. Crous & J. Guarro 2017. Phylogeny of saprobic microfungi from Southern Europe. *Studies in Mycology* 86:53–97.

Iliushin, V.A., I.Y. Kirtsideli & N.A. Sazanova 2022. Diversity of microfungi of coal mine spoil tips in the Magadan Region, Russia. *Current Research in Environmental & Applied Mycology* (*Journal of Fungal Biology*) 12(1):136–146.

Isachenko, A.G. & A.A. Shlyapnikov 1989. *Landscapes*. Mysl, Moscow, 503 pp. (in Russian). [Исаченко А.Г., Шляпников А.А. 1989. Ландшафты. Москва: Мысль. 503 с.].

Kelly, K.L. 1964. *Inter-Society Color Council – National bureau of standards color name charts illustrated with centroid colors*. Government Printing Office, Washington, DC: US. 20 pp.

Kumar, S., G. Stecher, M. Li, C. Knyaz & K. Tamura 2018. MEGA X: Molecular evolutionary genetics analysis

across computing platforms. *Molecular Biology and Evolution* 35:1547–1549.

Nováková, A., V. Hubka, C. Saiz-Jimenez & M. Kolarik 2012. *Aspergillus baeticus* sp. nov. and *Aspergillus thesauricus* sp. nov., two species in section Usti from Spanish caves. *International Journal of Systematic and Evolutionary Microbiology* 62:2778–2785.

O'Donnell, K. 1993. *Fusarium* and its near relatives. In: *The fungal holomorph: Mitotic, meiotic and pleomorphic speciation in fungal systematics* (D.R. Reynolds & J.W. Taylor, eds), pp. 225–233, CABI Publishing, Wallingford.

Raper, K.B. & C. Thom 1949. *A manual of the penicillia*. The Williams & Wilkins Company, Baltimore, 875 pp.

Rebriev, Y.A, E.M. Bulakh, N.A. Sazanova & A.G. Shiryaev 2020. New species of macromycetes for regions of the Russian Far East. 1. *Mikologiya i Fitopatologiya* 54(4):278–287.

Ruíz, R.F.C. (ed.) 1988. *Fungi cubenses III*. Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt". Havana, Cuba.

Samson, R.A., J. Houbraken, U. Thrane, J.C. Frisvad & B. Andersen 2010. *Food and indoor fungi, CBS Laboratory Manual Series 2*. CBS-Fungal Biodiversity Centre, Utrecht, 390 pp.

Samson, R.A., C.M. Visagie, J. Houbraken, S.B. Hong, V. Hubka, C.H.W. Klaassen, G. Perrone, ... & J.C. Frisvad 2014. Phylogeny, identification and nomenclature of the genus *Aspergillus*. *Studies in Mycology* 78:141–173.

Sazanova, N.A. 2015. New species in the mycobiota of Magadan oblast. *Vestnik SVNC DVO RAN* 1:69–76 (in Russian with English summary). [Сазанова Н.А. 2015. Новые виды в микобиоте Магаданской области // Вестник ДВО РАН. Т. 1, С. 69–76].

Sharma, R., R. Sharma & P.W. Crous. 2015. *Matsushimamyces*, a new genus of keratinophilic fungi from soil in central India. *IMA Fungus* 6(2):337–343.

Stoeck, T., B. Hayward, G.T. Taylor. R. Varela & S.S. Epstein 2006. A multiple PCR-primer approach to access the microeukaryotic diversity in environmental samples. *Protist* 157(1):3 1–43.

Stoeck, T., G.T. Taylor & S.S. Epstein 2003 Novel eukaryotes from the permanently anoxic Cariaco Basin (Caribbean Sea). *Applied and Environmental Microbiology* 69(9):5656–5663.

Tamura, K. & M. Nei 1993. Estimation of the number of nucleotide substitutions in the control region of mitochondrial DNA in humans and chimpanzees. *Molecular Biology and Evolution* 10: 512–526.

Tan, Y.P. & S.L. Bishop-Hurley 2024. Index of Australian Fungi no. 28. *Zenodo* 10460343.

Upadhyay, H.P. 1966. Soil fungi from North-East Brazil, II. *Mycopathologia et Mycologia Applicata* 30(3–4):276–286.

Volobuev, S.V., S.Y. Bolshakov, A.G. Shiryaev, N.A. Sazanova, Y.A. Rebriev, O.N. Ezhov, V.A. Vlasenko, ... & I.V. Zmitrovich 2019. New species for regional mycobiotas of Russia. 4. Report 2019. *Mikologiya i Fitopatologiya* 53(5): 261–271.

White, T.J., T.D. Bruns, S.B. Lee & J.W. Taylor 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: *PCR protocols: a guide to methods and applications* (M.A. Innis, D.H. Gelfand, J.J. Sninsky & T.J. White, eds), pp. 315–322, Academic Press, London.

Wijayawardene, N.N., K.D. Hyde, K.C. Rajeshkumar, D.L. Hawksworth, H. Madrid, P.M. Kirk, U. Braun & S.C. Karunarathna 2017. Notes for genera: Ascomycota. *Fungal Diversity* 86:1–594.

Yurtsev, B.A. 1974. *Problems of botanical geography of Northeast Asia*. Nauka, Leningrad, 159 pp. (in Russian). [Юрцев Б.А. 1974. Проблемы ботанической географии Северо-Восточной Азии. Ленинград: Наука. 159 с.].