



# First Data on Myxomycetes of the Bastak Nature Reserve (Jewish Autonomous Region, Russia)

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(2) [http://www.geobotanica.ru/bp/2026\\_15\\_01/BP\\_2026\\_15\\_1\\_bortnikov2\\_e\\_suppl.xlsx](http://www.geobotanica.ru/bp/2026_15_01/BP_2026_15_1_bortnikov2_e_suppl.xlsx)

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## ABSTRACT

The article presents the first data on the species diversity of myxomycetes in the Jewish Autonomous Region, the only region of the Far Eastern Federal District lacking any such data to date. In the summer of 2022, field studies were conducted in the Bastak Nature Reserve, where myxomycete sporocarps and fragments of plant substrates for moist chamber cultures were collected. As a result, 104 species were identified, of which two were described as new to science, *Diderma ussuriense* and *Licea conica*, and confirmed with additional findings in the Primorye Territory. Furthermore, a myxomycete specimen with unique morphology was discovered, which we preliminarily classified as *Listerella* sp.

**Keywords:** biodiversity, new species, regional checklist, Russian Far East

## РЕЗЮМЕ

**Бортников Ф.М., Бортникова Н.А. Первые данные о миксомицетах заповедника «Бастак» (Еврейская автономная область, Россия).** В статье приводятся первые данные о видовом разнообразии миксомицетов в Еврейской автономной области – единственном регионе Дальневосточного федерального округа, лишенном любых подобных сведений до настоящего момента. В ходе полевых исследований, проведенных на территории заповедника «Бастак» летом 2022 года, были собраны образцы спорocarпов миксомицетов и фрагменты различных субстратов растительного происхождения для их последующей обработки методом влажных камер. В результате было выявлено 104 вида, из которых два вида, *Diderma ussuriense* и *Licea conica*, были описаны как новые для науки виды, дополнительно подтвержденные находками в Приморском крае. Кроме того, был обнаружен образец миксомицета с уникальной морфологией, предварительно обозначенный нами как *Listerella* sp.

**Ключевые слова:** биоразнообразие, новый вид, региональный список, Российский Дальний Восток

Myxomycete biodiversity in the Russian Far East, especially in the continental part, is still understudied despite recent research undertaken in the Primorye (Novozhilov et al. 2017, Gmshinskiy et al. 2020, Bortnikov et al. 2022, 2023) and Kamchatka Territories (Novozhilov et al. 2024). The Jewish Autonomous Region (JAR) is located in the Far East between the Amur Region and the Khabarovsk Territory and borders Heilongjiang, the Chinese province. As of the beginning of 2025, this region remains one of only six federal subjects in Russia lacking data on myxomycete diversity (Bortnikov et al. 2020–2025).

The Bastak Nature Reserve is the sole federal-level protected area and at the same time the only nature reserve in the JAR. This protected area is situated about 15 km to the north of the biggest city in the region, the city of Birobidzhan, and is named Bastak after the river rising in and flowing through its territory.

The reserve comprises two clusters occupying a total area of 128 055 ha. The older cluster named Centralniy (Central) is almost equally divided into the northwestern montane part and the southern lowland part. Here starts the Middle Amur Lowland, which extends further to the south. The newer and smaller cluster named Zabelovskiy

is entirely located in the lowlands only 40 km west from Khabarovsk City.

Average altitudes in the montane part of the reserve range from 400–500 m in the south to 800 m or more in the north, and in the lowland part – from 70–80 to 200 m (Rubtsova 2007). The highest peaks in the reserve, Bydyr (1207 m), Tukulali (1103 m) and Balyabinskaya (893 m) mountains, are part of the spurs of the Bureya Range. All the rivers in the reserve belong to the Amur basin. They overflow during summer monsoons and easily flood the surrounding area, which is an important stopover site for migratory birds.

The reserve has a humid continental climate primarily influenced by the Siberian High resulting in cold, dry winters with low snowfall (30–40 cm), and the East Asian monsoon bringing heavy rainfall in the summer. Average annual precipitation is 670–740 mm per year, sometimes reaching 1100–1200 mm in the wettest areas (Rubtsova & Kalinin 2015).

The vegetation of the reserve is primarily composed of evergreen and summer-green coniferous boreal taiga and forest-steppe deciduous forests, combined with sparse larch forests in floodplain lowlands. The most valuable and

significant formation is the mixed forest of broadleaved trees, *Picea jezoensis* and *Pinus koraiensis* (Rubtsova 2007).

Here we provide preliminary data on the myxomycete species diversity in the Centralniy cluster of the Bastak Nature Reserve.

## MATERIAL AND METHODS

### Field studies

The research took place in the Centralniy cluster from June 23 to July 3, 2022 in 20 localities:

**Loc. 1.** Mixed forest with *Pbellodendron amurense*, *Betula* spp., *Quercus mongolica* and *Picea obovata* and *Pinus koraiensis* in the understory. 49.01447°N 132.86156°E, 195 m asl.

**Loc. 2.** Floodplain forest with *Populus maximowiczii*, *Chosenia arbutifolia* and *Fraxinus mandshurica*. 49.00911°N 132.86134°E, 176 m asl.

**Loc. 3.** Larch and alder swamp (*Larix cajanderi* and *Alnus* sp.). 48.98738°N 132.87602°E, 155 m asl.

**Loc. 4.** Larch forest (*Larix cajanderi*) with *Betula platyphylla*. 48.96886°N 132.88501°E, 159 m asl.

**Loc. 5.** Broadleaved forest with *Acer mono*, *Quercus mongolica*, *Populus tremula* and *Tilia amurensis*. 48.98133°N 132.89748°E, 198 m asl.

**Loc. 6.** Birch forest (*Betula platyphylla*) with *Alnus hirsuta* and *Juglans mandshurica*. 48.98117°N 132.90867°E, 158 m asl.

**Loc. 7.** Oak-linden forest (*Quercus mongolica* and *Tilia amurensis*) with *Maackia amurensis*, *Juglans mandshurica*, *Fraxinus mandshurica* and *Pbellodendron amurense*. 48.98677°N 132.89983°E, 220 m asl.

**Loc. 8.** Mixed forest dominated by *Abies nephrolepis* and *Pinus koraiensis* with *Fraxinus mandshurica*, *Ulmus laciniata*, *Acer ukurunduense*, *Tilia amurensis* and *Pbellodendron amurense*. 48.99674°N 132.89971°E, 181 m asl.

**Loc. 9.** Birch forest (*Betula costata*) with *Padus maackii*, *Pbellodendron amurense* and *Populus tremula*. 49.01062°N 132.89872°E, 283 m asl.

**Loc. 10.** Mixed forest dominated by *Abies nephrolepis*, *Picea obovata* and *Pinus koraiensis* with *Quercus mongolica*, *Betula costata*, *Tilia amurensis* and *Acer ukurunduense*. 49.01538°N 132.90342°E, 253 m asl.

**Loc. 11.** Mixed forest with *Pinus koraiensis*, *Fraxinus mandshurica* and *Quercus mongolica*. 49.01503°N 132.91987°E, 220 m asl.

**Loc. 12.** Floodplain forest with *Chosenia arbutifolia*, *Fraxinus mandshurica*, *Ulmus* spp. and occasional *Populus maximowiczii*. 49.02468°N 133.02120°E, 138 m asl.

**Loc. 13.** Oak forest (*Quercus mongolica*) with *Pbellodendron amurense*, *Acer mono*, *Maackia amurensis* and occasional *Pinus koraiensis*. 49.06906°N 133.07393°E, 141 m asl.

**Loc. 14.** Broad-leaved forest with *Quercus mongolica*, *Populus tremula* and *Fraxinus mandshurica*. 49.08820°N 133.08338°E, 171 m asl.

**Loc. 15.** Mixed forest with *Pinus koraiensis*, *Abies nephrolepis*, *Acer tegmentosum*, *Betula costata* and *Tilia amurensis*. 49.09496°N 133.06621°E, 298 m asl.

**Loc. 16.** Mixed forest with *Fraxinus mandshurica*, *Pinus koraiensis*, *Abies nephrolepis* and *Betula costata*. 49.09470°N 133.06019°E, 299 m asl.

**Loc. 17.** Birch forest (*Betula costata*) with *Tilia amurensis*, *Pbellodendron amurense* and occasional *Picea jezoensis*. 49.10452°N 133.03915°E, 360 m asl.

**Loc. 18.** Mixed forest with *Betula platyphylla*, *Picea* sp., *Pinus koraiensis* and *Abies nephrolepis*. 49.10406°N 133.05406°E, 585 m asl.

**Loc. 19.** Larch forest (*Larix cajanderi*) with *Betula platyphylla*. 49.10403°N 133.11239°E, 137 m asl.

**Loc. 20.** Oak forest (*Quercus mongolica*) with *Betula davurica* and *Tilia amurensis*. 49.12556°N 133.13272°E, 165 m asl.

Samples of mature sporocarps and substrates for moist chamber cultures were collected according to a standard protocol. A total of 95 substrate samples were collected in 17 localities: 10 samples of dead wood, 10 samples of leaf litter and 75 samples of bark from living trees, shrubs and lianas of different species (Table 1).

### Morphological analysis

The morphological features of fruiting bodies were examined using a Zeiss Axio Zoom V16 zoom microscope, a Zeiss Axio Imager A1 microscope and an Olympus SX21 microscope.

The ultrastructural features of spores, capillitium and inner peridium were examined after gold-palladium alloy sputter coating using scanning electron microscopes JSM-6380LA (JEOL) and Quattro S (Thermo Fisher Scientific) in the Interdepartmental Laboratory of Electron Microscopy at the Faculty of Biology, Lomonosov Moscow State University.

### Phylogenetic analysis

Sequences of 18S and EF-1 $\alpha$  regions were retrieved from GenBank (Table S1), aligned using MAFFT version

**Table 1.** Types of substrates studied by the moist chamber technique. Samples on which neither sporocarps nor even non-fructificated plasmodia of myxomycetes were detected were considered negative.

Plant species	pH (Min–Max)	Collection localities	Number (negative of them)
<b>Substrate: bark of living plants</b>			
<i>Abies nephrolepis</i>	5.16–5.46	8, 16	2
<i>Acer mono</i>	6.11–6.39	7, 13, 17	3
<i>Acer ukurunduense</i>	5.98–6.27	8, 10	2 (1)
<i>Actinidia kolomikta</i>	6.05–6.69	8, 15, 16, 17	4
<i>Betula costata</i>	5.02–5.66	9, 17	3
<i>Betula platyphylla</i>	5.27	6	1
<i>Chosenia arbutifolia</i>	6.52–7.00	2, 12	5
<i>Fraxinus mandshurica</i>	6.50–6.96	6, 7, 12, 16	6
<i>Juglans mandshurica</i>	6.14	7	1
<i>Larix cajanderi</i>	3.98–4.54	4, 19	7
<i>Maackia amurensis</i>	5.82	13	1
<i>Padus maackii</i>	5.76–5.89	9	2
<i>Pbellodendron amurense</i>	4.87–5.71	7, 9, 13	3 (1)
<i>Picea ajanensis</i>	5.01–5.37	15, 17	2
<i>Picea cf. ajanensis</i>	4.49–5.93	10	3
<i>Picea obovata</i>	5.14–5.47	1	2
<i>Pinus koraiensis</i>	4.14–4.39	7, 8, 11, 15	6
<i>Populus maximowiczii</i>	6.99–7.63	2, 12	3
<i>Populus tremula</i>	6.16–6.30	9	2
<i>Quercus mongolica</i>	6.91–7.35	7, 13, 20	4
<i>Rhamnus davurica</i>	5.89–6.32	1, 12	3
<i>Tilia amurensis</i>	5.76–6.31	5	5
<i>Ulmus japonica</i>	6.20–6.41	12, 15	2
<i>Ulmus laciniata</i>	6.33–7.74	1, 12	2 (1)
<i>Vitis amurensis</i>	6.61	2	1
<b>Substrate: litter</b>			
	4.82–6.05	2, 6, 10, 12, 15, 16, 19	10 (2)
<b>Substrate: wood</b>			
	4.07–5.85	8, 10, 11, 12, 15, 16, 19	10 (2)

7.511 at the online server (Katoh et al. 2019) with the E-INS-i strategy for 18S and G-INS-i for EF-1 $\alpha$  with default gap penalties, then optimized with TrimAl v1.3 (Capella-Gutierrez et al. 2009) with automated 1 option using the webserver version implemented in Phylemon 2.0. (Sánchez et al. 2011) and concatenated using Concatenator 0.2.1 (Vences et al. 2021). Four specimens were represented only by 18S sequences. The final dataset consisted of 29 sequences and 1218 positions (697 for EF-1 $\alpha$  and 521 for 18S). Maximum likelihood (ML) analysis was carried out using the IQ-TREE 1.6.12 version (Nguyen et al. 2015) with 1000 nonparametric bootstrap replicates with the following best-fit substitution model selected by the integrated version of ModelFinder (Kalyaanamoorthy et al. 2017), HKY+F+I+G4 for EF1A (first codon position), TPM3+F+I for EF1A (second codon position), TVM+F+G4 for EF1A (third codon position) and TNe+G4 for 18S, launched on the local machine. Bayesian inference (BI) analysis was conducted with the same dataset and partitioning scheme in MrBayes v. 3.2.7a (Ronquist et al. 2012) on the local machine. We implemented the reversible jumping model choice with a gamma distributed rate heterogeneity and invariant sites with unlinked parameters for each partition (García-Martín et al. 2023). Two independent runs, each with four chains, were run for 8 million generations, but automatically stopped earlier (2.75 million), when the average standard deviation of split frequencies fell below 0.001. Sampling was made every 100 generations and the first 25 % were discarded as burn-in. Convergence was estimated in Tracer 1.7.2 (Rambaut et al. 2018) to verify that all parameters exceeded the effective sample size (ESS) value of 200.

Phylogenetic trees were visualized with FigTree 1.4.4 (<http://tree.bio.ed.ac.uk/software/figtree/>) and edited in Inkscape 1.3.2.

## RESULTS

A total of 496 specimens were identified: 207 collected in the field and 289 obtained from the moist chambers (see Table S2). Seven more field specimens were identified only to the genus level due to their poor state or extreme scarcity and were not included in the list. In addition, *Ceratiomyxa fruticulosa* (O.F. Müll.) T. Macbr. (including *C. f.* var. *porioides* (Alb. & Schwein.) G. Lister) (Protosteliomycetes), previously considered in the similar studies together with myxogastric slime molds, was not included in the list, although it had been found in the reserve (e.g., LE F-348786, LE F-348856).

A total of 104 species and 36 genera (out of 78 currently recognized) were recorded, including two species described as new to science. They are listed in alphabetical order.

### Annotated checklist

For each species, the abundance index (A/C/O/R – abundant/common/occasional/rare) according to the Stephenson scale (Stephenson et al. 1993) and the total number of specimens are given. In brackets, the number of specimens collected in the field (fc) or moist chambers (mc) is stated. Then, the number of specimens collected from various substrates, wood (w), litter (l) and bark of living plants

(b), is indicated, as well as a list of localities where the species was found. For corticolous myxomycetes, acronyms of the plant species on which they were found are additionally indicated (see also Table 1). Some species are illustrated in the Supplementary Materials (Fig. S3–S31).

#### *Arcyria cinerea* (Bull.) Pers.

A (27) [fc: 16, mc: 11], w: 16, b: 8 (LARcaj, PINkor), l: 3. Loc.: 4, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.

#### *Arcyria denudata* (L.) Wettst.

O (6) [fc: 6], w: 6. Loc.: 1, 12, 13, 14.

#### *Arcyria helvetica* (Meyl.) H. Neubert, Nowotny & K. Baumann

R (1) [fc: 1], w: 1. Loc.: 20.

#### *Badhamia bethelii* (T. Macbr. ex G. Lister) J.M.

García-Martín, J.C. Zamora & Lado (Fig. S3)

R (2) [fc: 2], w: 2. Loc.: 4.

#### *Badhamia cf. foliicola* Lister (Fig. S4)

R (1) [fc: 1], w: 1. Loc.: 18.

#### *Badhamiopsis cf. ainoae* (Yamash.) T.E. Brooks & H.W. Keller (Fig. S5)

R (1) [mc: 1], b: 1 (FRaman). Loc.: 12.

#### *Calomyxa metallica* (Berk.) Nieuwl.

C (8) [mc: 8], b: 8 (CHOarb, FRaman, LARcaj, PHEamu, POPmax, POPtre, TILamu). Loc.: 2, 5, 6, 7, 9, 12, 19.

#### *Clastoderma debaryanum* A. Blytt

R (2) [mc: 2], b: 2 (LARcaj, PICaja). Loc.: 4, 10.

#### *Clastoderma pachypus* Nann.-Bremek. (Fig. S6)

R (1) [mc: 1], b: 1 (ABInep). Loc.: 8.

#### *Colloderma oculatum* (C. Lippert) G. Lister

R (1) [mc: 1], w: 1. Loc.: 19.

#### *Comatricha anomala* Rammeloo (Fig. S7)

R (2) [fc: 1, mc: 1], w: 1, b: 1 (PINkor). Loc.: 4, 8.

#### *Comatricha elegans* (Racib.) G. Lister

O (5) [fc: 2, mc: 3], w: 3, b: 2 (PHEamu, POPmax). Loc.: 7, 12, 19, 20.

#### *Comatricha nigra* (Pers. ex J.F. Gmel.) J. Schröt.

R (1) [fc: 1], w: 1. Loc.: 20.

#### *Craterium aureum* (Schumach.) Rostaf. (Fig. S8)

R (1) [fc: 1], l: 1. Loc.: 14.

#### *Cribraria argillacea* (Pers. ex J.F. Gmel.) Pers.

R (2) [fc: 2], w: 2. Loc.: 5, 15.

#### *Cribraria cancellata* (Batsch) Nann.-Bremek.

C (14) [fc: 14], w: 14. Loc.: 12, 13, 15, 16, 18, 20.

#### *Cribraria confusa* Nann.-Bremek. & Y. Yamam.

O (3) [mc: 3], w: 1, b: 2 (PINkor). Loc.: 7, 11, 19.

#### *Cribraria intricata* Schrad.

R (2) [fc: 2], w: 2. Loc.: 15.

#### *Cribraria languescens* Rex

O (4) [fc: 2, mc: 2], w: 4. Loc.: 10, 11, 16.

#### *Cribraria microcarpa* (Schrad.) Pers.

O (7) [fc: 1, mc: 6], w: 6, b: 1 (PINkor). Loc.: 7, 8, 10, 12, 13, 15.

#### *Cribraria minutissima* Schwein.

R (1) [mc: 1], b: 1 (PINkor). Loc.: 7.

#### *Cribraria oregana* H.C. Gilbert

R (1) [fc: 1], w: 1. Loc.: 16.

#### *Cribraria pertenuis* Flatau & Schirmer (Fig. S9)

R (1) [fc: 1], w: 1. Loc.: 18.

#### *Cribraria splendens* (Schrad.) Pers. (Fig. S10)

R (1) [fc: 1], w: 1. Loc.: 16.

#### *Cribraria tenella* Schrad. (Fig. S11)

R (2) [fc: 2], w: 2. Loc.: 12, 17.

***Cribraria violacea* Rex**

A (30) [fc: 1, mc: 29], w: 2, b: 28 (ACEmon, CHOarb, FRAMAN, POPmax, QUEmon, RHAdav, TILamu, ULMjap). Loc.: 1, 2, 5, 7, 12, 13, 15, 16, 17, 20.

***Cribraria vulgaris* Schrad.**

C (10) [fc: 9, mc: 1], w: 10. Loc.: 10, 15, 16, 17, 18, 19, 20.

***Diderma chondrioderma* (de Bary & Rostaf.) Kuntze**

O (3) [mc: 3], b: 2 (BETcos, MAAamu), l: 1. Loc.: 6, 9, 13.

***Diderma effusum* (Schwein.) Morgan**

R (1) [mc: 1], l: 1. Loc.: 10.

***Diderma saundersii* (Berk. & Broome ex Massee)****E. Sheld.**

R (2) [mc: 2], w: 1, b: 1 (PADmaa). Loc.: 8, 9.

***Diderma ussuriense* Bortnikov & Bortnikova sp. nov.**

(Figs 1, 2, 3, S12)

R (1) [mc: 1], b: 1 (ULMjap). Loc.: 12.

**MycoBank:** 861161

**Etymology:** from the name of the Ussuri River, since the southern regions of the Russian Far East (unofficially called the Ussuri Territory) appear to be the natural range of the new species.

**Description.** Sporangia stalked, solitary, 390–700 µm high. Sporotheca white, discoid, 430–980 µm in diameter, 140–240 µm thick. Stalk black, limeless, deeply furrowed, slightly wider near the base, 240–560 µm long. Hypothallus thin, black, but slightly lighter than the stalk. Peridium two-layered, outer layer calcareous, consisting of lime granules of different size, creamy white, with numerous incrustations of darker particles (probably refuse matter originating from the substrate); inner layer membranous, hyaline to light brownish. Columella poorly developed, flattened, wrinkled, concolorous with the inner peridium, cream to light brown. Capillitium brown, with hyaline tips, sparsely branched and anastomosing, 1–2 µm wide, with numerous thickenings up to 3.5 µm, under SEM minutely verrucose, verrucae simple, different in shape. Spores globose, (8.2–)9.1–10.4(–11.6) µm in diameter (Mean = 9.75, SD = 0.67, n = 300), warty, with hardly visible groups of darker warts; under SEM ornamentation pilate, each pilum bearing a botryoid caput. Plasmodium presumably white.

**Habitat:** bark of living trees (*Acer mandshuricum*, *A. mono*, *Chosenia arbutifolia*, *Juglans mandshurica*, *Juniperus davurica*, *Ulmus japonica*, *U. laciniata*) (median pH = 6.1) (in moist chambers).

**Distribution:** Russian Far East (Primorye Territory, Jewish Autonomous Region).

**Holotype:** RUSSIA, Primorye Territory, Kedrovaya Pad State Nature Reserve, 43.091027°N 131.573138°E, 15.11.2017, leg. Bortnikov F.M. in moist chamber on bark of *Chosenia arbutifolia* (pH = 6.59) (MYX 10163).

**Paratypes:** RUSSIA, Jewish Autonomous Region, Bastak Nature Reserve (LE F-349150); Primorye Territory: Kedrovaya Pad State Nature Reserve (MYX 10174, MYX 10176, MYX 10190, MYX 10192, MYX 10194, MYX 10199, MYX 10214, MYX 10447, MYX 10450, MYX 10452, LE F-352877, LE F-352878, LE F-352879, LE F-352880, LE F-352881), Botanical Garden-Institute FEB RAS (MYX 22427), see details in the Supplementary Materials (Table S2).

**Notes:** only one specimen of this species, consisting of several sporangia, was found in the Bastak Nature Reserve, but it has the same characteristics as several specimens we obtained earlier in the Primorye Territory and is undoubtedly conspecific with them.

Initially, these specimens were tentatively identified as *Diderma hemisphaericum* (Bull.) Hornem. based on their

white discoid sporotheca, with the black stalk being interpreted as a developmental aberration in moist chambers due to a lack of lime. The sequences of two specimens had also been erroneously published earlier as *D. hemisphaericum* (Prikhodko et al. 2022). However, a detailed study of the entire group of specimens confirmed the stability of morphological features and led to the conclusion that these specimens belong to a species new to science, described here as *Diderma ussuriense*.

In macroscopic morphological features, *Diderma ussuriense* most closely resembles *Didymium clavus* (Alb. & Schwein.) Rabenh., a species that has also been found in the Far East, including the Bastak Nature Reserve (compare Figs 1 and S15). The similarity lies in the peridium characteristics: it is rough and dirty in color in *D. ussuriense*, rather than shell-like white as in many *Diderma*. However, these two species are as easy to distinguish as most *Diderma* and *Didymium*, because of their different lime structure (globular and crystalline, respectively).

The new species can be distinguished from the closely related species *D. hemisphaericum* by two simple features. First, *D. hemisphaericum* inhabits leaf litter, while *D. ussuriense* is a strictly corticolous species. Second, *D. hemisphaericum* has a white stalk, while *D. ussuriense* always has a black and deeply furrowed one.

***Didymium anellus* Morgan (Fig. S13)**

R (2) [fc: 2], l: 2. Loc.: 13.

***Didymium babiense* Gottsb. (Fig. S14)**

O (5) [fc: 5], w: 1, l: 4. Loc.: 2, 12, 13, 16.

***Didymium clavus* (Alb. & Schwein.) Rabenh. (Fig. S15)**

R (1) [fc: 1], b: 1 (POPmax). Loc.: 2.

***Didymium nigripes* (Link) Fr.**

O (4) [fc: 1, mc: 3], b: 3 (CHOarb, POPmax), l: 1. Loc.: 2, 12, 13.

***Didymium squamulosum* (Alb. & Schwein.) Fr. & Palmquist**

C (11) [fc: 11], l: 11. Loc.: 13, 14, 16.

***Echinostelium minutum* de Bary**

C (10) [mc: 10], b: 10 (ABInep, LARcaj, PICaja, PINkor). Loc.: 4, 8, 10, 11, 16, 17.

***Enerthenema papillatum* (Pers.) Rostaf.**

O (7) [fc: 7], w: 7. Loc.: 4, 15, 16, 17, 18, 19.

***Erionema aureum* Penz. (Fig. S16)**

R (1) [fc: 1], w: 1. Loc.: 15.

***Fuligo luteonitens* L.G. Krieglst. & Nowotny (Fig. S17)**

R (1) [fc: 1], w: 1. Loc.: 5.

***Hemitrichia abietina* (Wigand) G. Lister**

R (1) [mc: 1], b: 1 (ABInep). Loc.: 16.

***Hemitrichia calyculata* (Speg.) M.L. Farr**

O (4) [fc: 4], w: 4. Loc.: 7, 14, 20.

***Hemitrichia clavata* (Pers.) Rostaf.**

O (5) [fc: 5], w: 5. Loc.: 5, 7, 13, 14.

***Hemitrichia decipiens* (Pers.) García-Cunch., J.C. Zamora & Lado**

O (3) [fc: 3], w: 3. Loc.: 12, 17, 18.

***Hemitrichia minor* G. Lister**

O (3) [mc: 3], b: 3 (BETcos, MAAamu, PICaja). Loc.: 13, 17.

***Hemitrichia pardina* (Minakata) Ing**

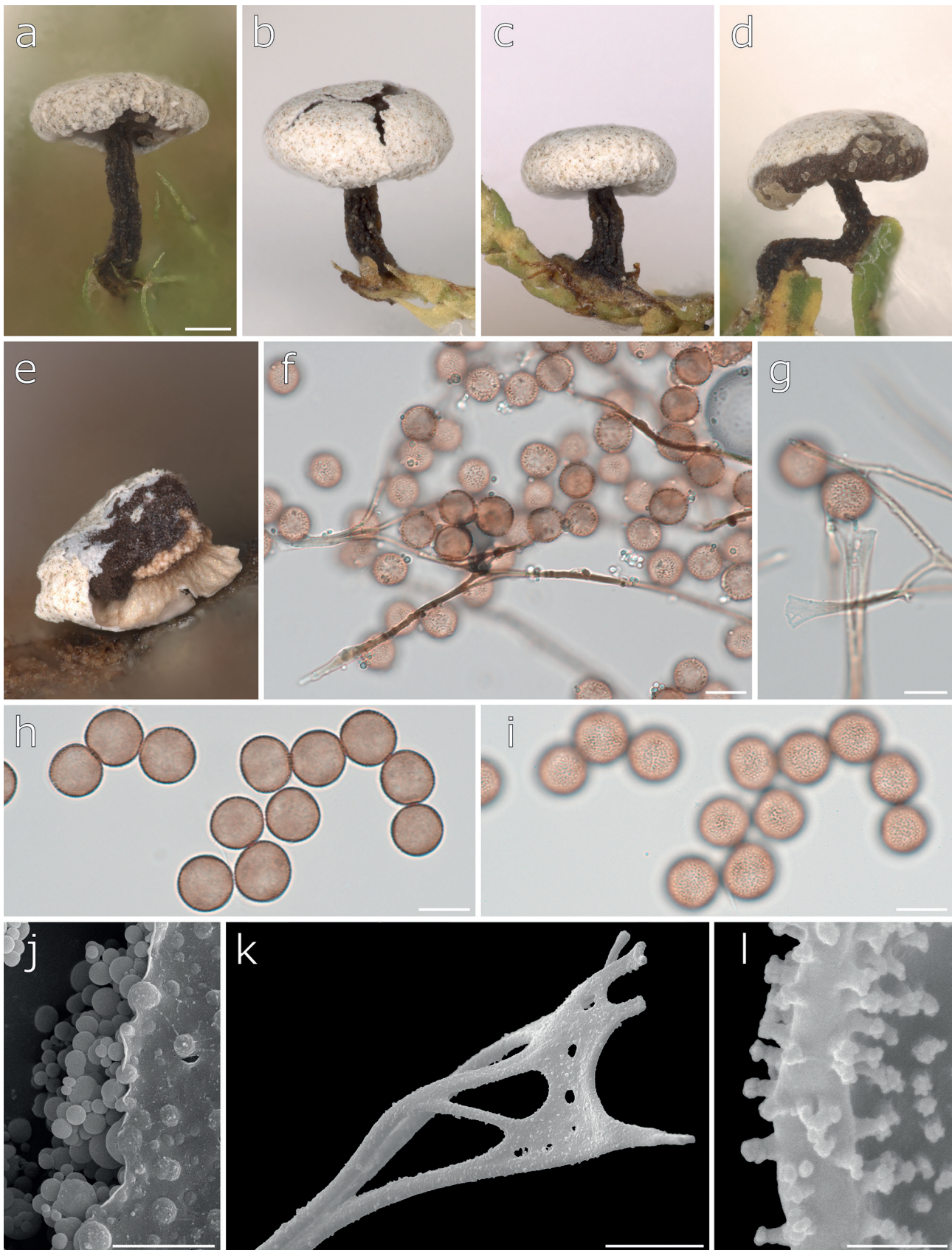
O (3) [mc: 3], b: 3 (PINkor). Loc.: 11, 15.

***Hemitrichia serpula* (Scop.) Rostaf. ex Lister**

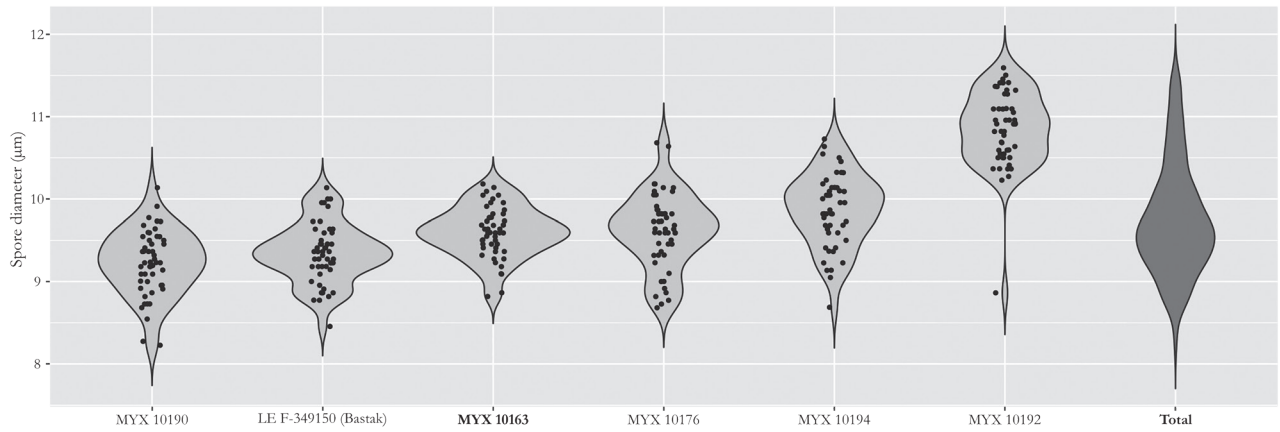
O (5) [fc: 3, mc: 2], w: 3, b: 1 (PICaja), l: 1. Loc.: 1, 5, 16, 17.

***Heterotrichia pomiformis* (Leers) Yatsiuk, Leontyev & Schnittler (Fig. S18)**

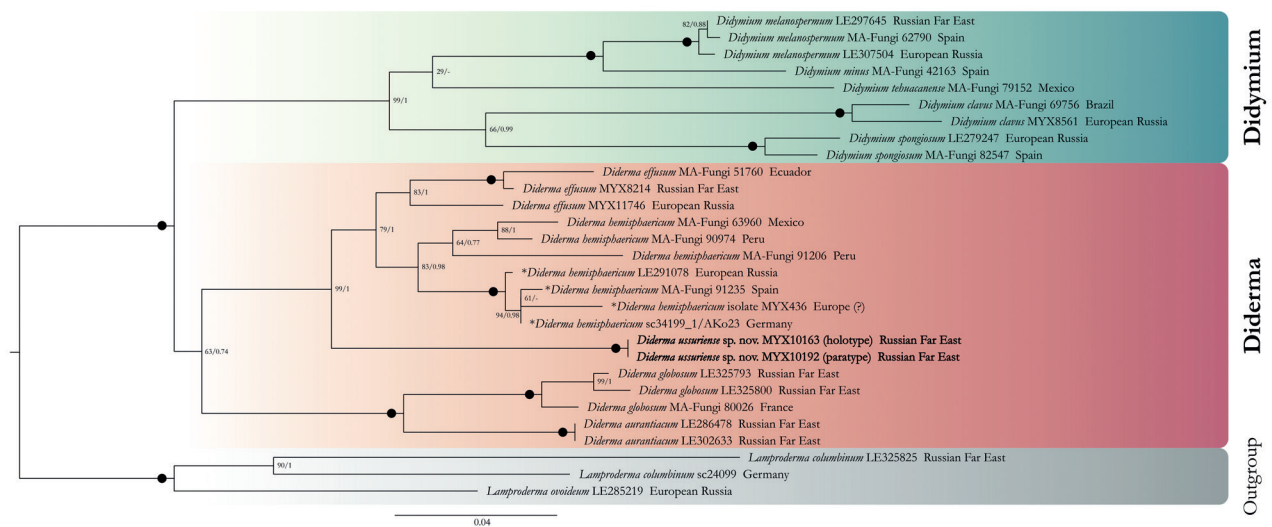
C (8) [fc: 4, mc: 4], w: 4, b: 4 (ABInep, LARcaj, PICaja, PINkor). Loc.: 4, 8, 11, 15, 16, 19, 20.



**Figure 1** *Diderma ussuriense* sp. nov. (a–l): a–d – intact sporangia, e – destroyed sporangium with a well-noticeable columella, f–i – capillitium and spores in TL, j – outer layer (on the left) and inner membranous layer of the peridium (on the right) under SEM, k – capillitium thread (SEM), l – spore ornamentation (SEM). a, d – LE F-349150, b, c, e, f, j, k – MYX 10163 (holotype), g–i, l – MYX 10192. Scale bars: a–e – 200  $\mu$ m, f–i – 10  $\mu$ m, j, k – 5  $\mu$ m, l – 1  $\mu$ m



**Figure 2** Violin and dot plot of spore diameter range in 6 specimens of *Diderma ussuriense* sp. nov. and in total. Fifty spores of each specimen were measured



**Figure 3** Two-gene maximum likelihood tree demonstrating phylogenetic position of the new species *Diderma ussuriense* and rooted with the members of the genus *Lamproderma*. Maximum likelihood bootstrap values (BS) and Bayesian posterior probabilities (PP) are shown near the nodes; fully supported branches are indicated by black circles (BS/PP = 100/1). A dash instead of PP indicates that this node was not recovered by Bayesian inference analysis. The scale bar represents the average number of nucleotide substitutions per site. New species is highlighted in bold. Geographic regions where each specimen was found are added after collection numbers

***Lamproderma scintillans* (Berk. & Broome) Morgan**

R (2) [fc: 2], l: 2. Loc.: 13.

***Licea atricapilla* Nann.-Bremek. & Y. Yamam.**

R (1) [mc: 1], b: 1 (ACEmon). Loc.: 17.

***Licea belmontiana* Nann.-Bremek.**

O (6) [mc: 6], b: 6 (ACEmon, CHOarb, POPmax, QUEmon). Loc.: 2, 12, 13, 17, 20.

***Licea biforis* Morgan (Fig. S19)**

O (7) [mc: 7], b: 7 (ACTkol, CHOarb, POPmax, TILamu, ULMjap). Loc.: 2, 5, 15, 16, 17.

***Licea castanea* G. Lister**

R (2) [mc: 2], b: 2 (CHOarb, ULMlac). Loc.: 1, 12.

***Licea conica* Bortnikov sp.nov. (Figs 4, S20, S21, S22)**

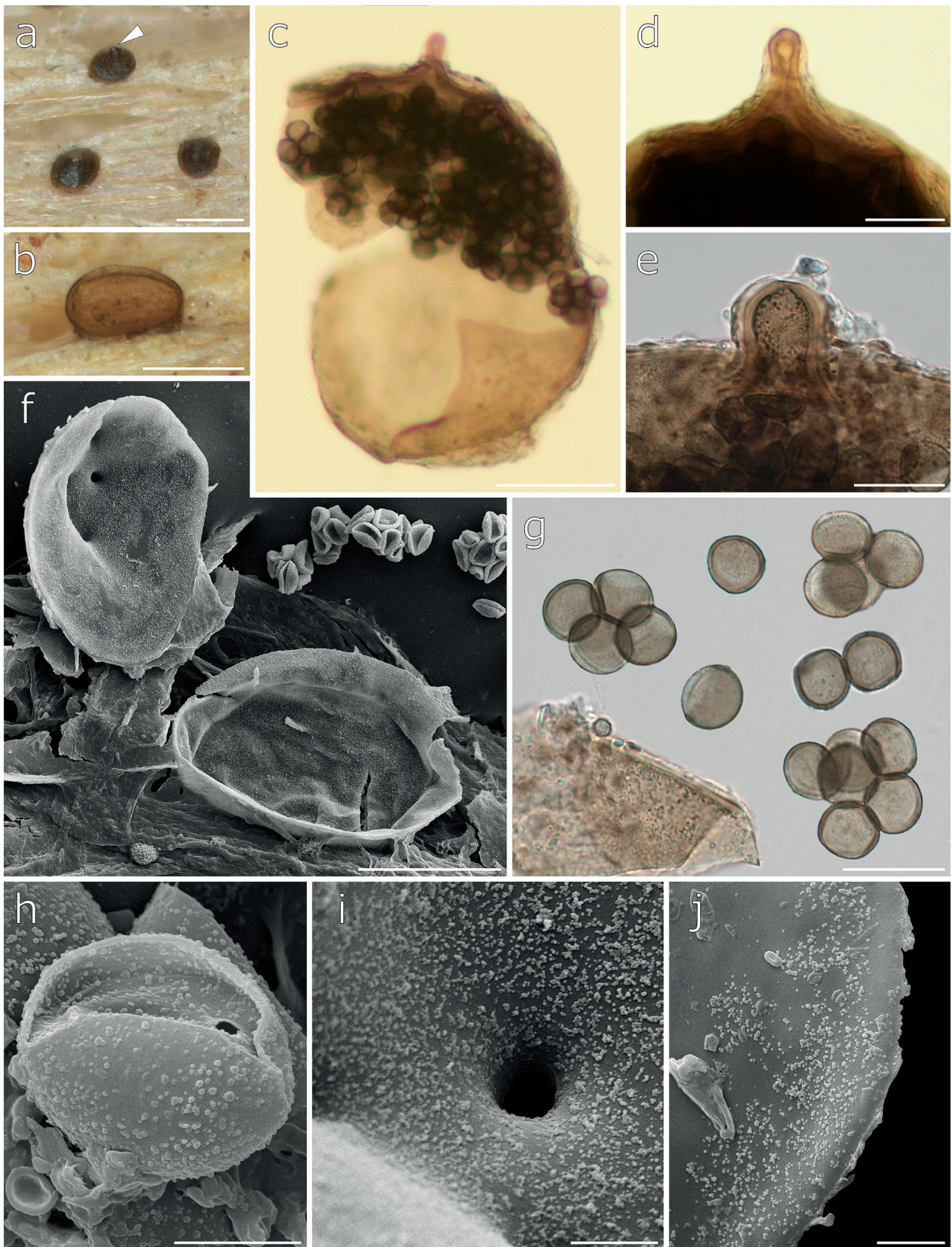
O (3) [mc: 3], w: 3. Loc.: 8, 15, 19.

**Mycobank:** 861162

**Etymology:** from Greek κωνικός, conical, in reference to the cone-shaped sporangia.

**Description.** Sporocarps sessile sporangia, usually in very abundant groups, always scattered, dark brown to black, (50–) 60–100 (–120)  $\mu\text{m}$  in diameter, varying in shape even within a single colony; the most typical is a conical spo-

rangium with a rounded flattened base and a conical cap, but sometimes sporangia compressed from both sides or completely minute, reduced to almost cylindrical shape (Fig. S20d–h); practically always bearing a ‘papilla’ on top of sporangium with a shiny tip, 8–12  $\mu\text{m}$  in diameter (Fig. 4a, S20a–c, g–h, S21a, e–g). Peridium two-layered, outer layer gelatinous, with deposits of refuse matter, in transmitted light (TL) varying in color depending on the type and color of deposits from almost transparent to brown; inner layer thick, light brown to dark brown near the dehiscence line, uniformly minutely verrucose on the inside (visible by both LM and SEM), with the same ornamentation near the dehiscence line. “Papilla” formed by the outgrowth of the inner peridium, presumably with an ostiole on the top, hollow, covered with a very thin or even reduced outer layer near the top (Fig. 4c–e, S20r–z); sometimes one or more additional papillae may originate near the central one, but never fully develop and outgrow the main papilla (Fig. 4d,f). Dehiscence circumscissile, in the lower quarter of the sporangium, leaving a deep plate-like base; sometimes more dehiscence lines can form separating the cap into 2–4 unequal platelets, but the main one always the biggest; sometimes radial dehiscence lines can occur connecting circumscissile line with the



**Figure 4** *Licea conica* sp. nov. (a–j): a – three intact sporangia; the arrow shows the "papilla", b – sporangium base after dehiscence, c–e – sporangium (TL), f – dehiscent sporangium (SEM), g – spores in TL, h – spore (SEM), i, j – inner peridium with "papilla" and peridium margin (SEM). a, b, e, g – MYX 10295 (holotype), c, d, f, h–j – LE F-349180. Scale bars: a, b – 100  $\mu$ m, c, f – 50  $\mu$ m, d, e, g – 20  $\mu$ m, h–j – 5  $\mu$ m

sporangium apex, but never forming additional platelets (Fig. 4c, S21d,g, S22b,c). Spores in mass brownish-black, in TL olive-gray to brownish-black, globose, free or in easily dissociated clusters, paler on one side (with thin-walled area), (9.8–)10.7–12.0(–12.8) (Mean = 11.35, SD = 0.60, n = 50), almost smooth to slightly rough (LM) and finely verrucose (SEM). Plasmodium not observed.

**Habitat:** dead wood (preferably coniferous), pH: 4.07–5.63.

**Distribution:** Russian Far East (Primorye Territory, Jewish Autonomous Region).

**Holotype:** RUSSIA, Primorye Territory, Kedrovaya Pad State Nature Reserve, 43.119222°N 131.470250°E, coniferous forest, wood sampling 12.08.2017, moist chamber starting 11.10.2018, specimen collected 13.12.2018, leg. Bortnikov F.M. in moist chamber on dead wood (pH = 5.12) (MYX 10295). Isotype: LE F-349199. Paratype obtained on the same substrate sample as the holotype, but in a second experiment: LE F-327754.

**Paratypes:** RUSSIA, Jewish Autonomous Region, Bastak Nature Reserve (LE F-349180); Primorye Territory, Kedrovaya Pad State Nature Reserve (MYX 10270, MYX 10300, LE F-327754, LE F-327755), see details in the Supplementary Materials (Table S2).

**Note:** We have earlier discovered specimens of this species in the Primorye Territory and published them as *Licea* sp. (Bortnikov et al. 2022). However, additional findings in the Bastak Nature Reserve led us to describe a new species, *Licea conica*.

This species is characterized by large but scattered colonies, consisting of several dozens or hundreds of minute sporangia, which can be found both accidentally in the field and in moist chambers. The morphological features of the new species vary greatly between different specimens and even within a single colony. Thus, the size and shape of the sporangia, the number of dehiscence lines and, accordingly, dehiscence type, as well as the size and ornamentation of the spores may differ. The most typical are conical sporangia about 60–100 µm in diameter, with one circumscissile dehiscence line near the base and free spores about 11–12 µm in diameter, almost smooth or rough under LM and irregularly minutely warted under SEM. However, sporangia can sometimes be very reduced (Fig. S20d–h). In addition to the ring-shaped line, 1–3 dehiscence lines may form, dividing peridium into several fragments instead of a single cap (Fig. 4c, S21d,g, S22b,c). Spore sometimes reach 13.7 (–15.6) µm in diameter (in specimens MYX 10270 and MYX 10300). Rarely spores can be almost smooth even under SEM (Fig. S21c). A unique papilla at the sporangium top, of unknown origin, is usually present but may be absent in rare cases (or possibly be too faint to see). Nevertheless, observation of the whole colony usually allows one to identify this species.

Another characteristic feature of this species is its ecology: all records from two different regions of Russia were made exclusively on dead wood. During our studies in the JAR and Primorye Territory we examined hundreds of moist chambers with bark of various trees, but never observed anything similar to *L. conica*. Thus, *Licea conica* is a lignicolous species, unlike all other morphologically similar species of *Licea*.

The morphologically closest species to *Licea conica* is *L. rufocuprea* Nann.-Bremek. & Y. Yamam. It has spherical or somewhat conical sporangia no larger than 0.1 mm and spores ornamented with minute warts. However, in our opinion, *L. rufocuprea* has several significant differences: 1) there is a number of large warts along the dehiscence line, while the inner peridium of *L. conica* is uniformly ornamented; 2) the spores of *L. rufocuprea* are warted, which

is especially clearly visible under SEM, while the spores of *L. conica* are rough and unevenly covered with warts, which are sometimes very small and almost invisible even under SEM; 3) *L. rufocuprea* is a corticolous species, while *L. conica* inhabits wood; 4) in the descriptions of *L. rufocuprea*, including those based on type specimens, there is no data on the presence of any ‘papilla’ that we found in *L. conica* (Wrigley de Basanta et al. 2013, 2023).

*Licea conica* differs from *L. pseudoconica* T.E. Brooks & H.W. Keller, which has also been found in the JAR (Fig. S25), by the sporangia of actually conical shape and not only appearing conical due to the accumulation of refuse matter on top of spherical sporangia (see Fig. S22). Additionally, *L. pseudoconica* has inner peridium with large, rounded warts and has smooth spores, and *L. conica* has inner peridium with smaller irregular markings and rough spores with small irregular warts (Bortnikov et al. 2022).

***Licea* cf. *craterioides* Y. Yamam.** (Fig. S23)

R (1) [mc: 1], b: 1 (CHOarb). Loc.: 12.

**Note:** This rare species was described from Japan and we have previously recorded it in the Primorye Territory based on a single specimen (Bortnikov et al. 2022). However, specimens collected in the JAR and in the Primorye Territory differ, which makes our understanding of this species uncertain.

According to the original description, *L. craterioides* was obtained on living bark and has sessile cylindrical sporangia with dark lid and narrow, paler rim, warted peridium and smooth spores 11–12.7 µm in diameter (Yamamoto 1991). The two specimens we have studied agree with this description. However, SEM examination revealed that the specimen from the Primorye Territory has completely smooth spores (Bortnikov et al. 2022, fig. 6e), while the specimen from the JAR has numerous tiny warts that are not visible under a light microscope (Fig. S23f,g). The spore size also differs: 12.5–15.2 µm in the specimen from the Primorye Territory and 9.2–11.7 µm in the specimen from the JAR. In the first case, spores are somewhat larger than in the original description, and in the second case, on the contrary, slightly smaller. Finally, the details of the inner peridium ornamentation differ: both specimens have large warts, but the specimen from the JAR has additional secondary ornamentation consisting of smaller warts (compare Fig. S23e and Bortnikov et al. 2022, fig. 6d). Thus, given that the type specimen has not been examined under SEM, it is impossible to confidently assign the specimens to either *L. craterioides* s.s. or a closely related *Licea* species based on the above characteristics.

Nevertheless, we designate the specimen from the JAR as *L. cf. craterioides* because it was obtained on the bark of *Chosenia arbutifolia* with a pH of 6.81, while the specimen from the Primorye Territory was obtained on the bark of *Syringa amurensis* with a pH of 5.23, whose acidity is presumably closer to that of *Pinus thunbergii*, original substrate of the holotype (*Pinus* spp. usually have bark with a pH of 4–5).

Interestingly, regardless of species affiliation, the specimen from the JAR is presumably phylogenetically close to *Licea eleanorae* Ing and *L. ocellata* D.W. Mitch. & G. Moreno, since all these species have circumscissile dehiscence and spore ornamentation unique to the genus *Licea*, consisting mainly of three- and four-edged warts (Wrigley de Basanta & Lado 2005, Mitchell & Moreno 2009).

***Licea kleistobolus* G.W. Martin** (Fig. S24)

O (4) [mc: 4], w: 1, b: 3 (LARcaj, PHEamu). Loc.: 4, 7, 19.

***Licea operculata* (Wingate) G.W. Martin**

C (12) [mc: 12], b: 12 (ABInep, BETcos, PHEamu, PICaja, PICobo, RHAdav, TILamu). Loc.: 1, 5, 7, 9, 10, 15, 16, 17.

***Licea parasitica* (Zukal) G.W. Martin**

O (3) [mc: 3], b: 3 (ABInep, CHOarb, ULMjap). Loc.: 2, 8, 15.

***Licea pedicellata* (H.C. Gilbert) H.C. Gilbert**

R (1) [mc: 1], b: 1 (QUEmon). Loc.: 20.

***Licea pseudoconica* T.E. Brooks & H.W. Keller (Fig. S25)**

C (12) [mc: 12], b: 12 (ACEmon, CHOarb, FRaman, QUEmon, TILamu, ULMjap). Loc.: 2, 5, 7, 12, 13, 16, 17, 20.

***Licea pusilla* Schrad.**

R (1) [mc: 1], b: 1 (PINkor). Loc.: 11.

***Licea pygmaea* (Meyl.) Ing**

O (6) [mc: 6], b: 6 (ABInep, CHOarb, PADmaa, PHEamu, PINkor, RHAdav). Loc.: 1, 7, 9, 12, 15, 16.

***Licea rugosa* Nann.-Bremek. & Y. Yamam.**

O (3) [mc: 3], b: 3 (FRaman, TILamu). Loc.: 5, 7, 16.

***Licea synchryospora* Bortnikov (Fig. S26)**

O (5) [mc: 5], b: 5 (CHOarb, FRaman, POPmax). Loc.: 2, 7, 12.

**Note:** we have earlier described this species from the Primorye Territory (Bortnikov et al. 2022). Specimens from the Bastak Nature Reserve have typical black sporangia, often covered with brownish-orange deposits. Spores are yellow to brownish-yellow, clustered, under SEM covered with very fine warts, with smooth areas only in places where spores contact in a group.

We suggest that this species is actually widespread in the south of the Russian Far East and in the neighboring territories of China and North Korea. It can be easily found by a targeted examination of suitable substrates.

***Lindbladia tubulina* Fr.**

R (1) [fc: 1], w: 1. Loc.: 18.

***Listerella* sp.**

R (1) [mc: 1], w: 1. Loc.: 10.

**Note:** the studied specimen has a unique set of characteristics that distinguish it from any of the previously described myxomycete species.

On the one hand, sporangia are small, with free dark spores about 8.7–9.3  $\mu\text{m}$  in diameter, circumscissile dehiscence and large warts along the dehiscence line, which is typical for some *Licea* (but not *Licea* subgen. *Licea*). On the other hand, it has a well-developed capillitium, which radically distinguishes this specimen from all *Licea* species.

The combination of the *Licea* habit and a developed capillitium is a typical feature of the genus *Listerella*. However, the only species of this genus, *Listerella paradoxa* E. Jahn, differs from our specimen in several characteristics. First, in *L. paradoxa*, the peridium consists of plates and opens along several preformed lines (as in *Licea* subgen. *Licea*), while in our specimen, the dehiscence is circumscissile, leaving a round cap and a saucer-shaped base. Secondly, *L. paradoxa* has unique, moniliform ornamentation of the capillitium, while our specimen has uniformly rough capillitium threads covered with numerous warts, but without any moniliform pattern.

Unfortunately, due to the very limited material available, we cannot describe this specimen as a new taxon, despite its noticeable differences from other *Licea* and *Listerella* species.

It should be noted that our observations add weight to the theory that the thickenings on the peridium of *Licea* species are reduced (or rudimentary) capillitium threads, since the capillitium in our specimen starts precisely near the dehiscence line, in the exact same place where the thickenings are found (Fig. 5d). In addition, the combination of capillitium (typical for *Listerella*) and circumscissile dehiscence (typical for some *Licea*) in our specimen may be

an argument in favor of synonymizing *Licea* and *Listerella* (Eliasson 2017).

***Lycogala epidendrum* (L.) Fr. agg.**

O (7) [fc: 7], w: 6, l: 1. Loc.: 5, 7, 16, 17, 19.

***Lycogala exiguum* Morgan agg.**

C (12) [fc: 12], w: 12. Loc.: 12, 15, 17, 18, 20.

***Macbrideola cornea* (G. Lister & Cran) Alexop.**

C (14) [mc: 14], b: 14 (ACEmon, CHOarb, FRaman, POPmax, QUEmon, TILamu). Loc.: 2, 5, 7, 12, 13, 16, 17, 20.

***Macbrideola scintillans* var. *verrucosa* (Nann.-Bremek. & Y. Yamam.) Y. Yamam. (Fig. S27)**

A (15) [mc: 15], b: 15 (ACEmon, CHOarb, FRaman, QUEmon, TILamu, ULMjap). Loc.: 5, 7, 12, 15, 16, 17, 20.

**Note:** we assigned all specimens to *M. scintillans* var. *verrucosa*, originally described from Japan as *M. verrucosa* Nann.-Bremek. & Y. Yamam. (Nannenga-Bremekamp & Yamamoto 1983). The main differences of this variety are warted peridium and longer stalk (l.c.).

All specimens were obtained in moist chambers on the bark of various deciduous trees with pH 5.8–7.1 (median 6.5). We observed similar preferences in the Primorye Territory, where this species is also widespread (unpublished data).

Sporangia of *M. scintillans* var. *verrucosa* are rather easily detected in moist chambers due to iridescent peridium and despite their small size. Columella reaches the sporotheca top, sometimes merging with it. Capillitium is either completely reduced or preserved in the form of several branches at the top of the columella. Using SEM, we also found that distinctive warts cover not only the inner surface of the peridium, but also the columella (Fig. S27).

***Metatrichia vesparia* (Batsch) Nann.-Bremek. ex G.W. Martin & Alexop.**

R (2) [fc: 2], w: 2. Loc.: 5, 13.

***Nannengaella lakhanpalii* (Nann.-Bremek. & Y. Yamam.) J.M. García-Martín, J.C. Zamora & Lado (Fig. S28)**

O (4) [mc: 4], b: 4 (ACTkol, JUGman, POPmax). Loc.: 2, 7, 16, 17.

***Oligonema favogineum* (Batsch) García-Cunch., J.C. Zamora & Lado**

O (3) [fc: 3], w: 3. Loc.: 1, 7.

***Ophiotheca chryosperma* Curr.**

C (12) [mc: 12], b: 11 (ACTkol, CHOarb, FRaman, PICaja, POPmax), l: 1. Loc.: 2, 6, 10, 12, 15, 16.

***Paradiacheopsis cribrata* Nann.-Bremek.**

R (2) [mc: 2], b: 2 (PICobo, PINkor). Loc.: 1, 11.

***Paradiacheopsis fimbriata* (G. Lister & Cran) Hertel ex Nann.-Bremek.**

R (2) [mc: 2], b: 2 (LARcaj). Loc.: 4.

***Paradiacheopsis rigida* (Brândză) Nann.-Bremek.**

C (9) [fc: 1, mc: 8], w: 1, b: 8 (ABInep, LARcaj, PINkor). Loc.: 4, 8, 11, 15, 16, 19.

***Paradiacheopsis solitaria* (Nann.-Bremek.) Nann.-Bremek.**

R (1) [mc: 1], b: 1 (PHEamu). Loc.: 13.

***Perichaena corticalis* (Batsch) Rostaf.**

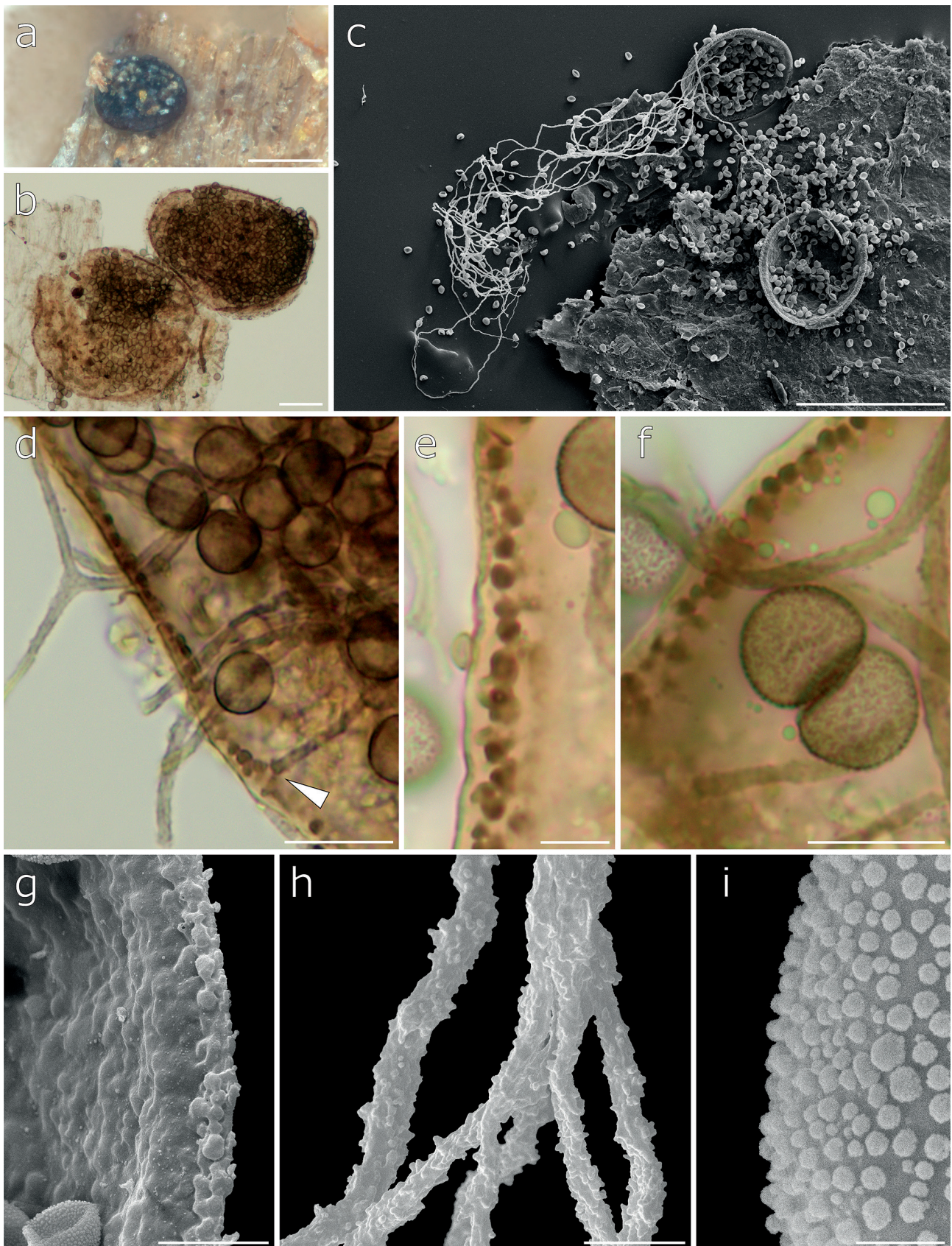
C (14) [mc: 14], b: 14 (ACEmon, ACTkol, FRaman, PHEamu, POPmax, POPtre, QUEmon, ULMlac, VITamu). Loc.: 1, 2, 7, 9, 13, 16, 20.

***Perichaena depressa* Lib.**

O (3) [mc: 3], b: 3 (ACEmon, ACTkol, QUEmon). Loc.: 13, 15, 17.

***Physarum aeneum* (Lister) R.E. Fr.**

R (1) [mc: 1], b: 1 (CHOarb). Loc.: 12.



**Figure 5** *Listerella* sp. (a–i): a – intact sporangium, b – dehiscent sporangium (TL), c – dehiscent sporangium (SEM), d–f – peridium with a well-noticeable dentate margin, capillitium, and spores (TL), g – dentate peridium margin (SEM), h – capillitium threads with rough surface (SEM), i – spore ornamentation (SEM). a–i – LE F-349184. Scale bars: a – 100  $\mu$ m, b – 50  $\mu$ m, c – 150  $\mu$ m, d – 15  $\mu$ m, e, h – 5  $\mu$ m, f, g – 10  $\mu$ m, i – 1  $\mu$ m

***Physarum album* (Bull.) Chevall.**

○ (3) [fc: 1, mc: 2], w: 1, b: 2 (BETpla, PICaja). Loc.: 4, 6, 17.

***Physarum compressum* Alb. & Schwein.**

R (1) [mc: 1], b: 1 (TILamu). Loc.: 5.

***Physarum luteolum* Peck**

R (1) [mc: 1], b: 1 (FRAMAN). Loc.: 7.

***Physarum notabile* T. Macbr.**

○ (3) [mc: 3], b: 3 (CHOarb, RHAdav, VITamu). Loc.: 2, 12.

***Physarum viride* (Bull.) Pers.**

A (15) [fc: 9, mc: 6], w: 9, b: 6 (ABInep, PICobo, PINkor). Loc.: 1, 7, 8, 11, 15, 16, 17, 18.

***Reticularia intermedia* Nann.-Bremek.**

R (1) [fc: 1], w: 1. Loc.: 3.

***Stemonaria minuta* Nann.-Bremek. & Y. Yamam.**

R (1) [mc: 1], b: 1 (QUEmon). Loc.: 20.

***Stemonitis axifera* (Bull.) T. Macbr.**

C (11) [fc: 11], w: 11. Loc.: 7, 12, 13, 15, 16, 18, 19, 20.

***Stemonitis smithii* T. Macbr.**

R (2) [fc: 2], w: 2. Loc.: 16, 19.

***Stemonitis fusca* Roth**

○ (3) [fc: 3], w: 3. Loc.: 12, 16, 20.

***Stemonitis herbatica* Peck (Fig. S29)**

R (1) [fc: 1], l: 1. Loc.: 13.

***Stemonitis lignicola* Nann.-Bremek.**

R (2) [fc: 2], w: 2. Loc.: 17, 20.

***Stemonitopsis aequalis* (Peck) Y. Yamam.**

○ (6) [fc: 5, mc: 1], w: 5, b: 1 (QUEmon). Loc.: 7, 13, 15, 17, 18.

***Stemonitopsis amoena* (Nann.-Bremek.) Nann.-Bremek.**

○ (4) [fc: 4], w: 4. Loc.: 14, 19.

***Stemonitopsis gracilis* (G. Lister) Nann.-Bremek.**

R (2) [fc: 2], w: 2. Loc.: 13, 17.

***Stemonitopsis hyperopta* (Meyl.) Nann.-Bremek.**

C (9) [fc: 9], w: 9. Loc.: 12, 15, 18, 19.

***Stemonitopsis subcaespitosa* (Peck) Nann.-Bremek.**

R (1) [fc: 1], w: 1. Loc.: 4.

***Stemonitopsis typhina* (F.H. Wigg.) Nann.-Bremek.**

○ (5) [fc: 4, mc: 1], w: 4, b: 1 (PINkor). Loc.: 12, 14, 15.

***Trichia crateriformis* G.W. Martin**

R (1) [mc: 1], b: 1 (ACEmon). Loc.: 13.

***Trichia scabra* Rostaf.**

R (2) [fc: 2], w: 2. Loc.: 12.

***Trichia cf. taeniifila* Bortnikov (Fig. S30)**

R (1) [fc: 1], w: 1. Loc.: 20.

**Note:** we have earlier described this species from the Primorye Territory (Bortnikov et al. 2023). The only specimen from the Bastak Nature Reserve was found in the field in a very poor condition, but it has mainly retained its microscopic features. The elaters are about 260–450 µm long and 4.1–6.2 µm thick with the tips 30–43 µm long and spores 8.1–8.7 µm wide. The average values slightly differ from those given in the original description (l.c.), but this specimen still shows the strongest resemblance to *T. taeniifila*.

***Trichia titanica* Bortnikov, Bortnikova & Novozh.**

(Fig. S31)

A (16) [mc: 16], b: 16 (ACEmon, CHOarb, FRAMAN, POPmax, QUEmon, TILamu, ULMjap, ULMlac). Loc.: 2, 5, 7, 12, 13, 17, 20.

**Note:** like the previous one, we have earlier described this species from the Primorye Territory (Bortnikov et al. 2023). The discovery of numerous specimens of this species confirms our assumption that *T. titanica* is actually widespread in the Russian Far East (l.c.). Specimens from the Bastak Nature Reserve have typical minute sporangia and very

short elaters (Fig. S31) and occur on the bark of deciduous trees with a pH of 6.1–7.6 (median 6.7, n = 16), which is consistent with the original description of this species.

***Tubifera ferruginosa* (Batsch) J.F. Gmel.**

R (2) [fc: 2], w: 2. Loc.: 15, 16.

**CONCLUSIONS**

The conducted research provided the first data on the biodiversity of myxomycetes in the Bastak Nature Reserve, moving the JAR from the 11th to the 3rd place in the list of subjects of the Far Eastern Federal District of Russia, after Primorye and Kamchatka Territories, in terms of known species richness (Bortnikov et al. 2020–2025).

In addition to some rare species, two species, *Diderma ussuriense* and *Licea conica*, were discovered and described as new to science. Both species have been confirmed by additional specimens from the Primorye Territory, which may indicate their wider distribution in the Far East and neighboring regions of China. Another specimen, designated as *Listerella* sp., may be of great interest for further discussion of the genus delimitation issues within Liceales due to its combination of characters typical for both *Licea* and *Listerella*.

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