

БИОРАЗНООБРАЗИЕ,
СИСТЕМАТИКА, ЭКОЛОГИЯ

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NEW SPECIES OF MACROMYCETES FOR REGIONS
OF THE RUSSIAN FAR EAST. 3

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The paper continues a series of publications devoted to the new finds of macrofungi (ascomycetes, basidiomycetes) in regions of the Russian Far East. A total of 61 species and intraspecific taxa of macromycetes are reported for the first time from 6 administrative units of the Russian Far East: Amur Oblast, Jewish Autonomous Oblast, Magadan Oblast, Kamchatka Krai, Khabarovsk Krai and Primorskiy Krai. For some of the rare species, notes are given about the main differences in morphology and ecology, about the features of distribution. The identification of *Granulobasidium vellereum*, *Scleroderma venenatum*, *Phallus ultraduplicatus*, *Echinochaete russiceps*, *Phanerochaetella angustocystidiata*, and *Hyphoderma mopanshanense* species by morphological methods is confirmed by molecular genetic data. Some species were isolated into pure culture (*Granulobasidium vellereum*, *Phallus ultraduplicatus*, *Echinochaete russiceps*). The material was deposited in VLA, MAG, SVER, LE F herbaria and in the Yu. Rebriev (YuR) personal collection. 17 species are reported as the first records for the Russian Far East, and 7 (*Aureoboletus auriflammeus*, *Hyphoderma mopanshanense*, *Echinochaete russiceps*, *Phanerochaetella angustocystidiata*, *Rheubarbariboletus persicolor*, *Scleroderma venenatum*, *Singerocybe alboinfundibuliformis*, *Stropharia acanthocystis*, *Trametes hirta*) are new species for Russia.

Keywords: Ascomycota, Basidiomycota, biodiversity, fungal distribution, molecular genetic identification, rare species, Russia

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INTRODUCTION

The paper is a third in the series of publications devoted to the new finds of macrofungi in the regions of the Russian Far East (Rebriev et al., 2020b, 2021). The

data contained in these publications are deposited on the GBIF resource (Rebriev et al., 2022).

Each annotated record provides details about specimen ecology and collection information: locality, habitat, substrate, specimen herbarium numbers, col-

lectors and determiners as well as notes on rarity and peculiar features of some species.

MATERIALS AND METHODS

Material was collected and identified by Anna V. Bogacheva (abbreviated as AB), Eugenia M. Bulakh (EB), Nadezhda V. Bukharova (NB), Elena A. Erofeeva (EE), Eugene S. Popov (EP), Nadezhda V. Psurtseva (NP), Yury A. Rebriev (YuR), Nina A. Sazanova (NS), Anton G. Shiryaev (AS), Elena A. Zvyagina (EZ) and others, as indicated in the text. If the specimen was collected and determined by the same specialist, such notes as “coll. and det.” are omitted in the text. Coordinates may not be specified for samples with incomplete label data. The taxa names are actualized in accordance with the Index Fungorum database (2022).

The material was accessioned in LE F (Saint Petersburg), MAG (Magadan), SVER (Ekaterinburg), VLA (Vladivostok) herbaria, as well as in the Yu. Rebriev (YuR) personal collection.

The novelty of finding the species in the region was assessed on the analysis of numerous publications. The main source of information for agaricoid and boletoid taxa is a cumulative checklist published at the end of 2021 (Bolshakov et al., 2021).

Information about the findings of some species of ascomycetes was previously given in A.V. Bogacheva's Doctoral Thesis (Bogacheva, 2009). As Thesis represents a manuscript, we consider the data suitable to publish in present paper.

The identification was carried out mainly by morphological methods. In several cases, a molecular genetic method was used as an additional or main one. This made it possible to confirm the identification of some specimens, as well as to identify an immature fruitbodies of *Phallus ultraduplicatus*.

Preparation for molecular analysis of the strains was performed by sampling a small piece of basidiomata or from the advancing zone of the colonies and using Thermo Scientific Phire Plant Direct PCR Kit and standard ITS primers 1F-4b. Sanger sequencing was carried out using equipment at The Core Facility Centre at the Komarov Botanical Institute RAS.

Some specimens were isolated into pure culture. Culturing was carried out in the field stations from either fresh basidiomata tissue or spores in Petri dishes with beer-wort (4%, Severnie Pivovarny, Saint Petersburg, Russia) agar (2%, Russia). After starting of mycelium growth or spores germinated a small pieces of newly growing mycelium of each culture were transferred into a steril cryovials with the same medium for transportation and protection from contamination. The cultures were characterised in laboratory conditions using morphological and molecular methods. The verified strains were preserved in the Komarov Botanical Institute Basidiomycetes Culture Collection (LE-BIN) using traditional preservation methods (Psurtseva, 2010)

and cryopreservation at -80°C (10% glycerol; freezing rate $1^{\circ}\text{C min}^{-1}$).

RESULTS

Ascomycota

Chaetomellales

Propolis farinosa (Pers.) Fr. – new for Kamchatka Krai.

Specimen examined: *Kamchatka Krai:* Bystrinskiy District, Bystrinskiy Nature Park, vicinity of Esso village, right bank of the Bystraya river, 55.9237°N , 158.7164°E , flood-plain deciduous forest, on rotten wood of *Populus maximo-wiczii*, 11.08.2005, EP (LE 235784); vicinity of Esso village, the slope of the hill near the source of the stream Uboynyy, 55.9983°N , 158.7203°E , *Pinus pumila*, *Rhododendron aureum*, and *Vaccinium uliginosum* thickets, on dead dry wood of *P. pumila*, 06.08.2005, EP (LE 236580).

Helotiales

Pezicula carpinea (Pers.) Tul. ex Fuckel – new for Russian Far East.

Specimens examined: *Primorskiy Krai:* Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N , 132.6964°E , mixed forest, on twigs of hardwoods, 01.07.1988, AB (VLA D-1027).

Notes: The species is reported in the Bogacheva's Doctoral Thesis (Bogacheva, 2009).

P. ocellata (Pers.) Seaver – new for Magadan Oblast.

Specimen examined: *Magadan Oblast:* Khasynskiy District, upstream of the Ola river, vicinity of Yablonevyy settlement, 60.3960°N , 151.5321°E , on bark of a dead twig of *Salix* sp., 30.08.2017, coll. M. Dyakov, det. EP (LE 305271).

Podophacidium xanthomelum (Pers.) Kavina – new for Russian Far East.

Specimens examined: *Primorskiy Krai:* Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N , 132.6964°E , *Picea* sp. forest, on mossy forest soil, 22.08.2002, AB (VLA D-2229).

Notes: The species is reported in the Bogacheva's Doctoral Thesis (Bogacheva, 2009).

Pezizales

Byssonectria deformis (P. Karst.) U. Lindem. et M. Vega – new for Magadan Oblast.

Specimen examined: *Magadan Oblast:* Susumanskiy District, valley of the Ayan-Yuryakh river, 62.5240°N , 147.3363°E , *Duschekia fruticosa* forest, on soil, 19.08.2017, coll. M. Dyakov, det. EP (LE 305272).

Elaiopezia luteola (Velen.) Van Vooren – new for Russian Far East.

Specimens examined: *Primorskiy Krai:* Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N , 132.6964°E , *Picea* sp. forest, the bank of the stream, on soil, 21.08.2002, AB (VLA D-2104).

Notes: The species is reported in the Bogacheva's Doctoral Thesis (Bogacheva, 2009).

Helvella atra J. König – new for Kamchatka Krai.

Specimen examined: *Kamchatka Krai:* Bystrinskiy District, Bystrinskiy Nature Park, vicinity of Esso village, left bank of the Uksichan river, 55.9253°N , 158.6733°E , on soil along roadside, 05.08.2005, EP (LE 248133).

H. corium (Weberb.) Massee – new for Kamchatka Krai.

Specimen examined: *Kamchatka Krai*: Bystrinskiy District, Bystrinskiy Nature Park, vicinity of Esso village, ski slope near the observation deck, 55.9140°N, 158.7302°E, *Salix* sp., *Alnus* sp., and *Betula* sp. forest, on soil, 09.08.2005, EP (LE 248135).

Legaliana limnaea (Maas Geest.) Van Vooren – new for Magadan Oblast.

Specimen examined: *Magadan Oblast*: Yagodninskiy District, vicinity of Burkhala, valley of the Debin river, 62.6578°N, 149.2051°E, floodplain *Populus suaveolens* forest, on soil, 23.08.2017, coll. M. Dyakov, det. EP (LE 305273).

Peziza buxea Quél. – new for Russian Far East.

Specimens examined: *Primorskiy Krai*: Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N, 132.6964°E, mixed forest, on soil, 23.08.2003, AB (VLA D-2070).

Notes: The species is reported in the Bogacheva's Doctoral Thesis (Bogacheva, 2009).

P. griseorosea W.R. Gerard – new for Russian Far East.

Specimens examined: *Primorskiy Krai*: Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N, 132.6964°E, mixed forest, on the bark of a fallen coniferous trunk, 23.08.2002, AB (VLA D-1936).

Notes: The species is reported in the Bogacheva's Doctoral Thesis (Bogacheva, 2009).

Pulvinula convexella (P. Karst.) Pfister – new for Magadan Oblast.

Specimen examined: *Magadan Oblast*: Susumanskiy District, valley of the Ayan-Yuryakh river, 62.5237°N, 147.3383°E, floodplain *Chosenia arbutifolia* and *Populus suaveolens* forest, on soil, 19.08.2017, coll. M. Dyakov, det. EP (305274).

Scutellinia kerguelensis (Berk.) Kuntze – new for Magadan Oblast.

Specimen examined: *Magadan Oblast*: Khasynskiy District, upstream of the Ola river, vicinity of Yablonevyy settlement, 60.4131°N, 151.5243°E, on soil, 29.08.2017, coll. M. Dyakov, det. EP (LE 295042).

Trichophaea albospadicea (Grev.) Boud. – new for Russian Far East.

Specimens examined: *Primorskiy Krai*: Shkotovskiy District, the southern slope of Mount Livadia (Pydan), 43.0709°N, 132.6964°E, mixed forest, on the bark of a fallen coniferous trunk, 22.08.2002, AB (VLA D-1894).

Rhytismatales

Spathularia flavida Pers. [= *S. rufa* Schmidel] – new for Amur Oblast.

Specimen examined: *Amur Oblast*: southern slope of the Tukuringra range, mixed forest with *Pinus* sp., *Quercus* sp., *Larix* sp., *Betula* sp., on litter, 12.09.1965, coll. B.A. Tomilin, det. EP (LE 236537).

Basidiomycota

Agaricales

Agrocybe paludosa (J.E. Lange) Kühner et Romagn. ex Bon – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: Birobidzhanskiy District, vicinity of Valdgeim village, 48.6611°N, 133.0144°E, arable land overgrown with cereals, on soil, 30.05.2019, EE (VLA M-27827).

Amanita battarrae (Boud.) Bon – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Olskiy District, Zavyalov Island, 59.0835°N, 150.6201°E, dwarfshrub tundra, on soil, 21.07.2021, NS (MAG 5629); Zavyalov Island, 59.0793°N, 150.6235°E, dwarfshrub tundra with *Salix sphenophylla*, on soil, 25.07.2021, NS (MAG 5630).

A. contui Bon et Courtec. [= *A. flavescens* (E.-J. Gilbert) Contu] – new for Russian Far East.

Specimens examined: *Magadan Oblast*: Olskiy District, Magadan Nature Reserve, Olskiy section, Cape Alevina, 58.8406°N, 151.3501°E, dwarfshrub-lichen tundra with *Salix sphenophylla*, *Rhododendron kamchatica*, *Arctous alpina*, on soil, 26.07.2018, NS (MAG 5099; fig. 1a).

Bovistella utrififormis (Bull.) Demoulin et Rebriev – new for Khabarovsk Krai.

Specimens examined: *Khabarovsk Krai*: Verkhnebureinskii District, village Chegdomyn, 51.1317°N, 133.0411°E, lawn, on soil, 01.09.2008, EE (YuR 3066).

B. utrififormis var. *lioui* (C. H. Chow) Demoulin et Rebriev – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: Leningradskiy District, vicinity of Babstovo village, 48.0885°N, 132.4770°E, amongst grasses between fields, on soil, 08.11.2018, coll. EE, det. YuR (YuR 3569, YuR 3570).

Bryoperdon acuminatum (Bosc) Vizzini – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: Bastak Nature Reserve, up the Bastak river, 49.0247°N, 133.0292°E, mixed forest, on mossy bark in the lower part of the trunk of a deciduous tree, 08.09.2021, EE (LE F-342215; fig. 1b).

Chrysomphalina chrysophylla (Fr.) Cléménçon – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Olskiy District, Magadan Nature Reserve, Kava-Chelomdzhinskiy section, cordon Moldot, 60.0183°N, 148.0362°E, mixed *Larix-Betula* forest, on a dead mossy trunk *Larix cajanderi* among primary *Cladonia* sp. thallus and green mosses, 22.08.2017, NS (MAG 5022).

Clavaria amoenoides Corner, K.S. Thind et Anand – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, on soil under deciduous trees and herbs, 16.09.2005, AS (SVER(F) 96707).

C. argillacea Pers. – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, mixed forest, on soil between stones, 17.09.2005, AS (SVER(F) 96704).

C. falcata Pers. – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, on soil of the herb-rich meadow, 16.09.2005, AS (SVER(F) 96706).

C. flavipes Pers. – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, on soil of the herb-rich meadow under deciduous trees, 15.09.2005, AS (SVER(F) 96701).

C. rosea Fr. – new for Jewish Autonomous Oblast.



Fig. 1. Fruitbodies of some rare species of macromycetes: a – *Amanita contui* MAG 5099 (photo by N. Sazanova); b – *Bryoperdon acuminatum* LE F-342215 (photo by E. Erofeeva); c – *Pholiota terrestris* VLA M-26564 (photo by E. Bulakh); d – *Pluteus leucoborealis* MAG 3487 (photo by N. Sazanova); e – *Singerocybe alboinfundibuliformis* VLA M-24821 (photo by E. Bulakh); f – *Rheubarbari-boletus persicolor* VLA M-25318 (photo by E. Bulakh).

Specimens examined: *Jewish Autonomous Oblast:* border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, on soil shaded by tall herbs, 16.09.2005, AS (SVER(F) 96705).

Entoloma ameides (Berk. et Broome) Sacc. – new for Russian Far East.

Specimens examined: *Jewish Autonomous Oblast:* Birobidzhanskiy District, vicinity of Zheltyy Yar village, 48.5365°N, 133.0279°E, predominantly *Quercus* forest, on soil, 03.09.2018, EE (VLA M-27826).

Notes: Even a single fruitbody emitted a distinct flower-strawberry (like *Passiflora*) fragrance.

E. minimum (Velen.) Noordel. – new for Primorskiy Krai.

Specimen examined: *Primorskiy Krai*: vicinity of Vladivostok city, Muravyov-Amurskiy Peninsula, base of North-West slope of the Okeanskiy ridge, 43.2319°N, 132.0580°E, *Alnus* sp. forest, 09.08.2018, EB (VLA M-26866).

Granulobasidium vellereum (Ellis et Cragin) Jülich – new for Russian Far East.

Specimens examined: *Primorskiy Krai*: Ussuriskiy Urban Okrug, vicinity of Gorno-Tayozhnoye village, 43.6999°N, 132.1541°E, on *Aesculus hippocastanum*, 20.08.2020, NP (LE F-335048, VLA M-27718; strain LE-BIN 4673; ITS GenBank OL764906).

Gymnopilus bellulus (Peck) Murrill – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Tenkinskiy District, upper part of Kolyma river, Malyy Chubukalah brook valley, 62.0493°N, 148.7716°E, *Larix*-dominated forest with *Pinus pumila* and *Betula middendorffii* dwarfshrub-lichen, on wood *Larix cajanderi*, 02.08.2011, NS (MAG 5535).

G. odini (Fr.) Bon et P. Roux – new for Russian Far East.

Specimens examined: *Magadan Oblast*: Tenkinskiy District, upper part of Kolyma river, Orotuk station, 62.0431°N, 148.6445°E, old burner, sparse *Larix cajanderi* stands with *Vaccinium vitis-idaea*, on burnt peaty soil, 28.07.2011, NS (MAG 5537).

Hemistropharia albocrenulata (Peck) Jacobsson et E. Larss. – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: vicinity of Birobidzhan city, 48.7945°N, 132.8858°E, deciduous forest, floodplain of the Bira river, on damage at the base of a live *Populus* sp. trunk, 07.09.2021, EE (VLA M-27831).

Hygrophorus penarius Fr. – new for Russian Far East.

Specimen examined: *Primorskiy Krai*: vicinity of Vladivostok city, Muravyov-Amurskiy Peninsula, right-bank slope of Bogataya river, 43.2426°N, 132.0509°E, predominantly *Quercus* forest, on soil, 08.09.2018, EB (VLA M-26627).

Inocybe serotina Peck – new for Russian Far East.

Specimen examined: *Primorskiy Krai*: Khasanskiy District, Dalnevostochny Morskoy Nature Reserve, Mountain Pigeon rock, 42.4156°N, 130.7536°E, sands dunes, on sand, 19.06.2015, coll. E. Chubar, det. EB (VLA M-26057).

Lactarius nanus J. Favre – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Olskiy District, Magadan Nature Reserve, Olskiy section, Cape Alevina, 58.8391°N, 151.3492°E, depression with *Salix arctica*, *S. sphenophylla*, *Betula exilis*, *Duschekia fruticosa*, on soil among mosses, 28.07.2018, NS (MAG 5100).

L. pseudouvidus Kühner – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Khasynskiy District, Olskoe plateau, 60.6152°N, 151.5887°E, dryad tundra, on soil, 12.08.2011, coll. O. Mochalova, det. NS (MAG 4619); Olskoe plateau, Yablonovyy pass, 60.6152°N, 151.5887°E, dryad tundra, on soil among *Dryas ajanensis*, 22.08.2016, NS (MAG 5436).

Lepiota felina (Pers.) P. Karst. – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: vicinity of Magadan city, Nagaevskaya hill, 59.5676°N, 150.7584°E, *Betula lanata* forest, on soil among litter, 05.08.2015, NS (MAG 5407); *ibid.*, forest with *Betula lanata* and *Duschekia fruticosa*, on soil among litter, 25.08.2016, NS (MAG 5406); Khasynskiy District, 152 km of the Kolyma highway, 60.6032°N, 151.5739°E, south slope of the hill, *Duschekia fruticosa* thickets, on soil among litter, 12.08.2015, NS (MAG 5420).

Lepista multififormis (Romell) Gulden – new for Russian Far East.

Specimens examined: *Magadan Oblast*: Khasynskiy District, 130 km of the Kolyma highway, 60.3513°N, 151.3959°E, dryad sparse stands with *Larix cajanderi* and *Pinus pumila*, on soil, 29.08.2019, NS (MAG 5323).

Leucocortinarius bulbiger (Alb. et Schwein.) Singer – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: Bastak Nature Reserve, valley of Bastak river, 49.0250°N, 133.0293°E, mixed forest, on soil under *Pinus koraiensis*, 25.08.2021, EE (VLA M-27828).

Pholiota terrestris Overh. – new for Russian Far East.

Specimen examined: *Primorskiy Krai*: vicinity of Vladivostok city, Muravyov-Amurskiy Peninsula, base of North-West slope of the Okeanskiy ridge, 43.2383°N, 132.0617°E, deciduous forest, on soil, 26.09.2018, EB (VLA M-26564; fig. 1c); *Khabarovsk Krai*: Khekhtsirsky Reserve, Malyye Chirki river valley, 48.2497°N, 135.0092°E, mixed forest, on a stump, 16.09.2017, coll. EE, det. EB (VLA M-26902).

Pluteus leucoborealis Justo, E.F. Malysheva, Bulyonk. et Minnis – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: Olskiy District, Magadan Nature Reserve, Kava-Chelomdzhinskiy section, 59.7718°N, 147.9910°E, Kava river valley, mixed *Larix-Betula* forest, on deadwood *Betula platyphylla*, 21.08.2017, NS (MAG 5023); Tenkinskiy District, upper part of Kolyma river, Orotuk station, 62.0501°N, 148.6567°E, mixed *Larix-Betula* forest, on a dry trunk of *B. platyphylla*, 22.08.2017, coll. M. Pakhomov, det. NS (MAG 5034); 10 km to the SE from the village Orotuk, 62.0501°N, 148.6567°E, *Betula*-dominated forest with *Vaccinium vitis-idaea*, on deadwood *B. platyphylla*, 10.08.2018, coll. M. Pakhomov, det. NS (MAG 5295); Srednekanskiy District, Magadan Nature Reserve, Seymchanskiy section, 63.8406°N, 153.6088°E, *B. platyphylla* forest, on deadwood *B. platyphylla*, 05.08.2010, NS (MAG 3326); *ibid.*, 63.6589°N, 153.2874°E, *B. platyphylla* forest, on deadwood *B. platyphylla*, 08.08.2010, NS (MAG 3486); *ibid.*, 63.6021°N, 153.1332°E, mixed *Larix-Betula* forest, on deadwood *B. platyphylla* and *Duschekia fruticosa*, 10.08.2010, NS (MAG 3487; fig. 1d).

Notes: The specimen from Magadan Nature Reserve (Seymchanskiy section) is erroneously listed as *Pluteus pellitus* (Pers.) P. Kumm. (Sazanova, 2011).

Ramariopsis tenuiramosa Corner – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhan and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, on soil at the path edge, under grasses and herbs, 17.09.2005, AS (SVER(F) 96702).

R. vestitipes (Peck) Corner – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhan and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, deciduous forest, on rich soil under grasses, 15.09.2005, AS (SVER(F) 96700).

Singerocybe alboinfundibuliformis (Seok, Yang S. Kim, K.M. Park, W.G. Kim, K.H. Yoo et I.C. Park) Zhu L. Yang, J. Qin et Har. Takah. [= *Clitocybe trogioides* var. *odorifera* Har. Takah.] – new for Russia.

Specimen examined: *Primorskiy Krai*: Udegeyskaya Legend National Park, mouth of Armu river, 45.7631°N, 135.4675°E, mixed forest, on litter, 16.08.2015, EB (VLA M-24821; fig. 1e).

Notes: This specimen was identified as *Clitocybe hydrogramma* (Bull.) P. Kumm. (Bogacheva et al., 2020) due to the presence of club-shaped cells in the tissues of the cap skin. The fruitbodies of these species differ in shape and color. *S. albofunduliformis* has a white funnel-shaped pileus. Good drawings of microstructures of *Clitocybe trogioides* var. *odorifera* are given in Takahashi, 2000.

Stropharia acanthocystis Cortez et R.M. Silveira – new for Russia.

Specimen examined: *Primorskiy Krai*: Udegeyskaya Legend National Park, mouth of Armu river, 45.7631°N, 135.4675°E, mixed forest, on litter, 16.08.2015, EB (VLA M-26562).

Notes: The fruitbodies of this fungus have a brownish cap with yellowish veil remnants along the edge, ring missing. The hymenium contains acanthocysts, cystids and chryso-cystids (Cortez, Silveira, 2007).

Tricholomopsis flammula Métrod ex Holec – new for Russian Far East.

Specimens examined: *Jewish Autonomous Oblast*: Bastak Nature Reserve, valley of Bastak river, 49.0250°N, 133.0293°E, mixed forest, on litter, 25.08.2021, EE (VLA M-27829).

Volvopluteus gloiocephalus (DC.) Vizzini, Contu et Justo – new for Magadan Oblast.

Specimens examined: *Magadan Oblast*: vicinity of Magadan city, Novaya Veselaya, valley of Kedrovyy Klyuch brook, 59.5229°N, 150.8976°E, country cottage area, garden with carrots, on well-drained soil, 18.07.2021, NS (MAG 5558); *ibid.*, on a pile of rubbish and weeds, on loose composted soil, 28.07.2021, NS (MAG 5559).

Boletales

Aureoboletus auriflammeus (Berk. et M.A. Curtis) G. Wu et Zhu L. Yang – new for Russia.

Specimen examined: *Primorskiy Krai*: Muravyov-Amurskiy Peninsula, right-bank slope of Bogataya river, 43.4447°N, 132.1458°E, predominantly *Quercus* forest, on soil, 04.08.2017, EB (VLA M-25851).

Hygrophoropsis aurantiaca (Wulfen) Maire – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: Bastak Nature Reserve, cordon “39th km”, 49.0908°N, 133.0892°E, mixed forest, on litter and belowground wood, 25.08.2021, EE (VLA M-27830).

Leccinum schistophilum Bon – new for Russian Far East.

Specimens examined: *Magadan Oblast*: vicinity of Magadan city, Nagaevskaya hill, 59.5681°N, 150.7523°E, forest with *Betula lanata*, on soil among mosses, 06.09.2021, NS (MAG 5628); Olskiy District, Zavalov Island, 59.0815°N, 150.6198°E, *Betula middendorffii* thickets, on soil, 22.08.2021, NS (MAG 5627); Susumanskiy District, Momontai Lake area, 63.7330°N, 148.1204°E, *Larix cajanderi* forest with *Betula exilis* shrub-lichen, 31.07.2018, coll. E. Andriyanova, det. NS (MAG 5326).

Rheubarbariboletus persicolor (H. Engel, Klofac, H. Grünert et R. Grünert) Vizzini, Simonini et Gelardi – new for Russia.

Specimen examined: *Primorskiy Krai*: vicinity of Vladivostok city, Muravyov-Amurskiy Peninsula, North-West slope of the Okeanskiy ridge, 43.2395°N, 132.1092°E, mixed forest, on soil under *Quercus* sp., 01.09.2016, EB (VLA M-25318; fig. 1f).

Scleroderma venenatum Y.Z. Zhang, C.Y. Sun et Hai J. Li – new for Russia.

Specimens examined: *Primorskiy Krai*: Khankaiskiy District, vicinity of Turiy Rog village, lake Khanka, 45.1572°N, 132.0012°E, predominantly *Quercus* forest, on soil, 16.08.2018, coll. YuR, det. EZ (LE F-342311; ITS GenBank OM874611; LSU GenBank OM855578; fig. 2a); Ussuriyskiy Urban Okrug, vicinity of Gorno-Tayozhnoye village, Arboretum of the Gornotayozhnaya Research Station, 43.6929°N, 132.1498°E, mixed predominantly *Quercus* forest, on soil, 30.08.2020, coll. YuR, det. EZ (LE F-342312; ITS GenBank OM874613; fig. 2b); *ibid.*, 43.6929°N, 132.1498°E, predominantly *Quercus* forest, on soil, 31.07.2009, coll. EB, det. YuR (VLA M-22361); Vladivostok city, 43.1870°N, 131.9197°E, predominantly *Quercus* forest, on soil, 03.08.1989, coll. EB, det. YuR (VLA M-21139); Vladivostok city, Botanical Garden-Institute FEB RAS, 43.2211°N, 131.9924°E, deciduous forest, on soil, 15.09.1994, coll. EB, det. YuR (VLA M-21137); *Jewish Autonomous Oblast*: Bastak Nature Reserve, valley of Bastak river, 48.9989°N, 133.0402°E, deciduous forest, on soil, 14.08.2006, coll. EB, det. YuR (VLA M-21218).

Notes: this species probably is rather common in deciduous forests of Russian Far East. The specimen VLA M-21218 was pointed in Bau et al., 2011 as *S. verrucosum* Pers. The main distinguishing features are small sessile basidiomata 0.5–3.5 cm in diam., peridium with scattered thin scales and verrucose basidiospores 9–13 µm (*S. venenatum* var. *venenatum*) or 12–16 µm (*S. venenatum* var. *macrosporium*) (Zhang et al., 2020).

Geastrales

Geastrum quadrifidum Pers. – new for Jewish Autonomous Oblast and Khabarovsk Krai.

Specimens examined: *Jewish Autonomous Oblast*: Lenskiy District, vicinity of Kirovo village, 47.9031°N, 132.1492°E, plantation of *Pinus* sp., on sandy soil mixed with litter, 10.09.2019, EE (LE F-335191); *Khabarovsk Krai*: Sovetsko-Gavanskiy District, Botcha Nature Reserve, 48.1037°N, 139.1781°E, *Abies* sp. forest, floodplain of the stream Teply, on litter, 18.08.2017, coll. AB, det. YuR (LE F-342258).

Sphaerobolus stellatus Tode – new for Khabarovsk Krai.

Specimens examined: *Khabarovsk Krai*: Anyuyskiy National Park, the mouth of Anyuy River, 49.2972°N, 136.5147°E, deciduous forest, on fallen trunk, 03.08.2010, EE (VLA M-22809).

Hymenochaetales

Alloclavaria purpurea (O.F. Müll.) Dentinger et D.J. McLaughlin – new for Jewish Autonomous Oblast.

Specimens examined: *Jewish Autonomous Oblast*: border of Birobidzhanskiy and Obluchenskiy Districts, 25 km west of Birobidzhan city, eastern slope of Schuki-Poktoi mountain range, 48.8451°N, 132.6869°E, coniferous forest, on soil, 17.09.2005, AS (SVER(F) 96703).

Phallales

Phallus ultraduplicatus X.D. Yu, W. Lv, S.X. Lv, Xu H. Chen et Qin Wang – new for Russian Far East.

Specimens examined: *Primorskiy Krai*: Ussuriyskiy Urban Okrug, Komarov forestry, Przhevalsky Pass, 43.6519°N, 132.4294°E, mixed forest, on coniferous litter, 21.08.2020,



Fig. 2. Fruitbodies and spores of some rare species of macromycetes: a – *Scleroderma venenatum* LE F-342311 (photo by Yu. Rebriev); b – *S. venenatum* (spores) LE F-342312 (photo by Yu. Rebriev); c – *Phallus ultraduplicatus* LE F-335045 (photo by N. Psurtseva); d – *Echinochaete russiceps* LE F-335060 (photo by N. Psurtseva); e – *Phanerochaetella angustocystidiata* VLA M-27713 (photo by N. Bukharova); f – *Trametes hirta* VLA M-27716 (photo by N. Bukharova).

NP (LE F-335045; strain LE-BIN 4670; ITS GenBank OL764905; fig. 2c).

Notes: The specimen was collected in egg stage. A BLAST search revealed that the ITS sequence newly generated from our material is identical (100%) with those from type specimen deposited in GenBank. The find confirms the assumption that the species is quite common in the Asian part of Russia (Rebriev et al., 2020a).

Polyporales

Echinochaete russiceps (Berk. et Broome) D.A. Reid – new for Russia.

Specimens examined: *Primorskiy Krai:* Ussuriskiy Urban Okrug, vicinity of Gorno-Tayozhnoye village, floodplain of the Krivoy brook, 43.6941°N, 132.1647°E, mixed forest, on dead branch of deciduous tree, 23.08.2020, NP (LE F-335060,

VLA M 27719; strain LE-BIN 4685; ITS GenBank OL764913; fig. 2d).

Notes: According to the ITS sequence, which had homology 98.9–100% with the other *E. russiceps* sequences in the NCBI, the identification of the species was confirmed, however, according to macromorphological features, it is closer to the species *Echinochaete ruficeps* (Berk. et Broome) Ryvarden (Cui et al., 2019).

Hyphoderma mopanshanense C.L. Zhao – new for Russia.

Specimens examined: *Khabarovsk Krai*: Sovetsko-Gavanskiy District, Botcha Nature Reserve, basin of the Solonchakoviy stream (a tributary of the Mulpa River), 48.3117°N, 139.5582°E, *Betula-Alnus-Larix* forest, on dead wood of *Alnus hirsuta*, 08.08.2007, NB (VLA M 27714; ITS GenBank ON167511).

Notes: Species identification of this specimen was confirmed by the ITS sequence, which had 99.02% homology with other *H. mopanshanense* sequences in the NCBI. *H. mopanshanense* is a recently described species from China (Ma et al., 2021).

Phanerochaetella angustocystidiata (Sheng H. Wu) C.C. Chen et Sheng H. Wu – new for Russia.

Specimens examined: *Jewish Autonomous Oblast*: Obluchenskiy District, Bastak Nature Reserve, at the foot of Skalistaya Mount., 49.0132°N, 132.8979°E, mixed forest, on fallen hardwood twig, 24.08.2009, NB (VLA M 27713; ITS GenBank ON167512; fig. 2e).

Notes: Species identification of this specimen was confirmed by the ITS sequence, which had 100% homology with other *Ph. angustocystidiata* sequences in the NCBI. This species is known from Taiwan, China and Japan (Wu, 2000; Chen et al., 2021).

Trametes hirta (P. Beauv.) Zmitr., Wasser et Ezhov [= *Hexagonia hirta* (P. Beauv.) Fr.] – new for Russia.

Specimens examined: *Primorskiy Krai*: Askold Island, northern part of the island, 42.7774°N, 132.3515°E, deciduous forest, on a dead hardwood trunk, 05.08.2021, NB (VLA M 27716; fig. 2f).

DISCUSSION

A total of 61 species and intraspecific taxa of macromycetes are reported as new for the Russian Far East. 15 species belong to the *Ascomycota* (*Chaetomellales*, *Helotiales*, *Pezizales* and *Rhytismatales*), and 46 – to the *Basidiomycota* (*Agaricales*, *Boletales*, *Geastrales*, *Hymenochaetales*, *Phallales* and *Polyporales*). 17 species (*Amanita contui*, *Elaiopezia luteola*, *Entoloma ameides*, *Granulobasidium vellereum*, *Gymnopilus odini*, *Hygrophorus penarius*, *Inocybe serotina*, *Leccinum schistophilum*, *Lepista multiformis*, *Pezicula carpinea*, *Peziza bux- ea*, *P. griseorosea*, *Phallus ultraduplicatus*, *Pholiota terrestris*, *Podophacidium xanthomelum*, *Tricholomopsis flammula*, *Trichophaea albospadicea*) are reported for the first time for the Russian Far East. Seven species (*Aureoboletus auriflammeus*, *Hyphoderma mopanshanense*, *Echinochaete russiceps*, *Phanerochaetella angustocystidiata*, *Rheubarbariboletus persicolor*, *Scleroderma venenatum*, *Singerocybe alboinfundibuliformis*, *Stropharia acanthocystis*, *Trametes hirta*) are a new species for Russia.

The distribution of new records of macromycetes within the regions is as follows:

- 1 – new for Amur Oblast;
- 3 – Kamchatka Krai;
- 3 – Khabarovsk Krai;
- 17 – Magadan Oblast;
- 19 – Primorskiy Krai;
- 20 – Jewish Autonomous Oblast.

The studies on fungal diversity in the Far Eastern regions of Russia to be continued.

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Новые для регионов Российского Дальнего Востока виды макромицетов. 3

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Статья является продолжением серии, посвященной находкам новых для Дальневосточного региона видов макромицетов. Приведены сведения о 61 виде и внутривидовом таксоне базидиальных и сумчатых макромицетов, впервые отмеченных в шести административных единицах Дальнего Востока (Амурской, Магаданской, Еврейской автономной областей, Камчатского, Приморского и Хабаровско-

го краев). Для некоторых редких видов даны примечания об основных отличиях в морфологии и экологии, об особенностях распространения. Идентификация видов *Granulobasidium vellereum*, *Scleroderma venenatum*, *Phallus ultraduplicatus*, *Echinochaete russiceps*, *Phanerochaetella angustocystidiata* и *Hyphoderma mopanshanense* морфологическими методами подтверждена молекулярно-генетическими данными. Ряд видов выделены в чистую культуру (*Granulobasidium vellereum*, *Phallus ultraduplicatus*, *Echinochaete russiceps*). Цитируемый материал хранится в микологических коллекциях VLA (Владивосток), MAG (Магадан), SVER (г. Екатеринбург), LE (Санкт-Петербург) и в личных коллекциях авторов. 17 видов отмечены впервые для Дальнего Востока России. 7 видов (*Aureoboletus auriflammeus*, *Hyphoderma mopanshanense*, *Echinochaete russiceps*, *Phanerochaetella angustocystidiata*, *Rheubarbariboletus persicolor*, *Scleroderma venenatum*, *Singerocybe alboinfundibuliformis*, *Stropharia acanthocystis*, *Trametes hirta*) являются новыми для России.

Ключевые слова: аскомицеты, биоразнообразие, базидиомицеты, молекулярно-генетические методы идентификации, распространение грибов, редкие виды, Россия