

# New occurrences of corticioid and poroid fungi (Basidiomycota) in Kedrovaya Pad Nature Reserve, Primorye Territory, Russian Far East

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**Abstract:** New data on corticioid and poroid basidiomycetes from Kedrovaya Pad Nature Reserve, Primorye Territory, Russian Far East, is presented. Altogether there are 182 known species from the reserve; 76 are reported as new to the reserve and two as new to Russia. The material was collected in July of 2016 from 9 study plots located in forests of different types. Findings of some rarely collected species such as *Botryobasidium botryoideum*, *Cerinomyces* aff. *aculeatus*, *Junghuhnia aurantilaeta*, *Phanerochaete robusta* and *Tyromyces wynneae* are briefly discussed. The full-length ITS sequences of *Junghuhnia aurantilaeta*, *Phanerochaete robusta*, *Pyrrhoderma* cf. *sendaiense* and *Tyromyces wynneae* were obtained and deposited in the GenBank. *Junghuhnia aurantilaeta* is proposed to be included in the new edition of the Red Data Book of Primorye Territory. The paper expands the knowledge of distribution of many species and increases the total number of species reported for the reserve.

**Keywords:** biodiversity; corticioids; polypors; Russian Far East

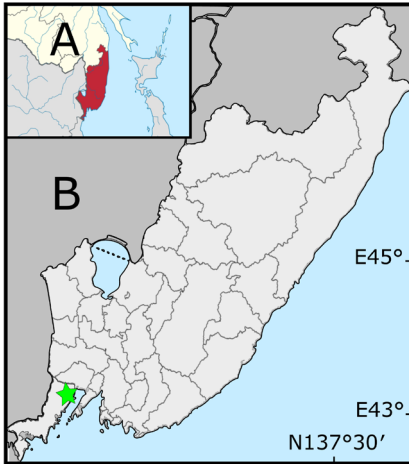
## INTRODUCTION

The Kedrovaya Pad Nature Reserve is located on the coastal spurs of the Manchurian Mountains. The river valley of Kedrovaya river lies between the Gakkelevsky and Sukhorechensky ridges (Fig. 1, 2). The microclimate of the reserve is affected by two main factors: warm humid air masses from the Philippines and a mountainous relief, which acts as a wind tunnel and transports moist air from the sea. As a result, the reserve is warmer and wetter in comparison with adjacent territories. Nature protection measures have been implemented in the area since 1916 supporting the forest conservation. The forest cover is unique in a sense that subtropical and coniferous-broadleaf forests overlap, which leads to a high diversity of plant and fungal species ([www.unesco.org](http://www.unesco.org)).

The data of the biodiversity of aphyllorphoid fungi in the reserve was reported by Nikolayeva (1967), Vassiljeva (1972) and Parmasto (1968, 1970) and summarized by Korkishko (2002). Moreover Kovalenko et al. (2012) listed some species. Before our study, only limited emphasis was made on aphyllorphoid fungi, and only 105 species were reported from the reserve (Korkishko, 2002; Kovalenko et al., 2012). We propose *Junghuhnia aurantilaeta* (Corner) Spirin as a good candidate for the new edition of the regional Red Data Book.

## MATERIALS AND METHODS

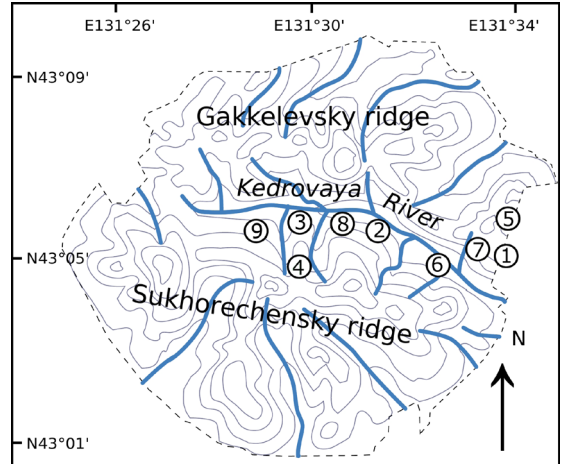
Fruit bodies were collected in Kedrovaya Pad Nature Reserve, Primorye Territory, Russian Far East (Fig. 1), near Primorskaya station (43°05'42"N, 131°35'6"E), Khasanskiy district in 24–31 July 2016. The studied area was comprised of nine forest sites (approximately 1 ha each, Fig. 2): herb rich oak (*Quercus mongolica* Fisch. ex Ledeb.) forest on eastern slope (1), coniferous-broadleaf forest (2), coniferous-broadleaf forest on northern slope (3), mixed Krummholz stand with fir (*Abies holophylla* Maxim.), birches (*Betula* spp.), maples (*Acer* spp.), oak and pine (*Pinus koraiensis* Siebold & Zucc.) (4), oak forest with maples and birches on southern slope (5), willow (*Salix* spp.) forest with maples (6), fern-maple-oak forest on fluvial terrace (7), conifer forest with fir and pine (8) and (9) coniferous-broadleaf forest with amur cork tree (*Phellodendron amurense* Rupr.). Each site was visited once. All sites were characterized by large amounts of dead wood except broadleaf forests (1, 5, 7) and Krummholz stand (4). Surveyed woody remnants were chosen randomly. Fragments of each fruit body were collected for microscopic identification using Melzer's reagent (IKI) and Cotton Blue (CB). In total, we collected or noted more than 400 specimens of fruit bodies. In the species-list we included all corticioids, polypores and heterobasidioid taxa



**Fig. 1.** A – Primorye Territory in Russian Far East, B – Kedrovaya Pad Nature Reserve in Primorye Territory.

like *Basidioidendron* spp. which are new for the reserve or rarely collected in Russia. The list consists of species names in Latin, followed by the substrate type (in most cases specified only up to angiosperm or gymnosperm wood) and the number of the collection location. Numbered specimens, which were deposited in a personal fungarium, can be requested from the Zoological Club of the Zoological Museum of Moscow University (KUN ZMMU). Duplicates of some specimens were deposited in the mycological collection of University of Helsinki (H). The specimens without number were deposited in the personal fungarium of I.V. The nomenclature follows MycoBank and Index Fungorum. Intraspecific taxa were not specified.

In addition, we obtained new full-length ITS sequences of *Junghuhnia aurantilaeta*, *Phanerochaete robusta* Parmasto, *Pyrrhoderma* cf. *sendaiense* (Yasuda) Imazeki and *Tyromyces wynneae* (Berk. & Broome) Donk. These particular species were selected since there is only a limited number of their sequences in the GenBank and their sequences from such remote areas as Russian Far East can be of interest in taxonomic studies. The large sizes and good preservation of these fruit bodies also facilitate DNA extraction which was difficult for several other species, sequences of which were not included here. The fragments of fruit bodies were grind under liquid nitrogen with a sterile



**Fig. 2.** Kedrovaya Pad Nature Reserve with collecting sites (circles).

pestle in sterilized eppendorf tube. DNA was extracted according to the standard CTAB protocol (Griffith & Shaw, 1998). rDNA fragments with internal transcribed spacers (ITS) was amplified with the universal primers ITS1 and ITS4 (White et al., 1990). PCR was performed with GenPak® PCR Core kit (Isogene, Russia). The following PCR conditions were used: one cycle for 3 min at 96 °C, 30 cycles with 30 sec at 94 °C, 30 sec at 55 °C, 30 sec at 72 °C, and 3 min at 72 °C. After amplification PCR products were run on a 1.5% agarose gel stained with ethidium bromide and visualized under the UV light. Amplification product was cut out from agarose gel with sterile scalpel and cleaned with Cleanup Standard kit (Evrogen Ltd, Moscow, Russia). Sequencing reactions were performed by the Evrogen company (Moscow, Russia) following the BigDye terminator protocol (ABI Prism) on an Applied Biosystems 3730 xl automatic sequencer (Applied Biosystems, CA, USA) with both forward and reverse primers. The raw sequence reads were trimmed manually and assembled into consensus sequences in Geneious (Biomatters Limited, Auckland, New Zealand) using default settings. ITS sequences were identified through BLASTn searches in UNITE (<https://unite.ut.ee/>), the BLASTn search was ran against the International Nucleotide Sequence Databases Consortium (INSDC; <http://www.insdc.org>) and UNITE (Abarenkov et al., 2010) databases.

All newly obtained sequences were deposited in the GenBank (<http://www.ncbi.nlm.nih.gov/>); accession numbers are listed in the species-list.

## RESULTS AND DISCUSSION

In total we found 76 new species for the reserve, two species new to Russia (Korkishko, 2002; Spirin et al., 2007; Kovalenko et al., 2012). Most of our findings were observed on angiosperms, while only a limited number grew on gymnosperms, 69 and 4 respectively. Only 7 taxa grew both on gymnosperms and angiosperms. We collected two species which are included in the Red Data Book of the Primorye Territory: *Cryptoporus volvatus* (Peck) Shear and *Hericium erinaceus* (Bull.) Pers. (Baryshenko, 2008). According to our observations, *Junghuhnia aurantilaeta* could be included in the new edition of the Red Data Book. This species is extremely rarely collected in other parts of Russia: there is only one published record outside Kedrovaya Pad Nature Reserve (Bukharova & Zmitrovich, 2014). Nevertheless, it was previously collected in the studied area in 1944 and 2005 (Spirin et al., 2007), which indicates a stable population. *J. aurantilaeta* inhabits gymnosperm and angiosperm dead wood in pristine broadleaf and coniferous-broadleaf forests, which are the main target of forest management in Primorye Territory, so if the forests are cut down, *J. aurantilaeta* will become threatened. Also, it can be easily identified in the field by non-professional mycologists by the fleshy-tough consistency and orange color of fruit bodies together with comparatively large pores, 1–3 per mm.

### Annotated list of species

The species list is in alphabetical order. One asterisk (\*) indicates new records for Nature Reserve, two (\*\*) for Russia. The entries consist of the species name followed by substrate species (when available), personal specimen number (KUN ZMMU 1234) and the number of the collection site (Fig. 2). Short notes are provided for some records. As these records were made in a strictly protected area, we do not provide precise coordinates for the locations.

\**ABUNDISPORUS PUBERTATIS* (Lloyd) Parmasto – angiosperm wood (KUN ZMMU 2692); 7.

Note. *A. pubertatis* was reported previously from North-East China and Russian Far

east (Dai et al., 2002) and it seems to be one of the most common polypore species in southern part of Primorye Territory. Besides the studied area, we have seen it many times in the secondary oak forests of Lazovsky Nature Reserve (Primorye Territory, Russia) and Russky Island (Vladivostok, Primorye Territory, Russia).

\**AMPHINEMA BYSSOIDES* (Pers.) J. Erikss. – angiosperm wood, gymnosperm wood (KUN ZMMU 2195, 2199, 2201, 2274); 2, 7.

\**AMYLOCORTICIUM CEBENNENSE* (Bourdot) Pouzar – angiosperm wood (KUN ZMMU 2010); 9.

\**AMYLOCORTICIUM SUBINCARNATUM* (Peck) Pouzar – angiosperm wood (KUN ZMMU 2248); 9.

\**ANTRODIA PICEATA* K. Runnel, V. Spirin & J. Vlasak – gymnosperm wood (KUN ZMMU 1984, 1985, 2085); 7, 9.

\**AURANTIPORUS FISSILIS* (Berk. & M.A. Curtis) H. Jahn ex Ryvarde – *Quercus mongolica*; 5.

\**BASIDIODENDRON EYREI* (Wakef.) Luck-Allen – angiosperm wood (KUN ZMMU 2325); 1.

\**BOTRYOBASIDIUM BOTRYOIDEUM* (Overh.) Parmasto – angiosperm wood, gymnosperm wood (KUN ZMMU 2123, 2189, 2198, 2297); 2, 5, 7, 8.

Note. According to our observations, *B. botryoideum* seems to be less rare than previously thought. In Russia, *B. botryoideum* occurs from the Far East (Langer, 1994; Spirin, unpublished) and Siberia (Shiryaev & Kotiranta, 2015 (2016)) to the Komi Republic in Europe (Viner, 2015). Several collections were also made by I.V. in the secondary oak forests of Lazovsky Nature Reserve (Primorye Territory, Russia), which suggests that *B. botryoideum* can inhabit old-growth forests as well as disturbed forests with a limited amount of dead wood.

\**BOTRYOBASIDIUM CONSPERSUM* J. Erikss. – angiosperm wood (KUN ZMMU 2025, 2191, 2217); 1, 3, 7.

\**BOTRYOBASIDIUM ISABELLINUM* (Fr.) D.P. Rogers – angiosperm wood (KUN ZMMU 2269); 8.

\**BOTRYOBASIDIUM MEDIUM* J. Erikss. – angiosperm wood (KUN ZMMU 2420); 5.

\**BOTRYOBASIDIUM OBTUSISPORUM* J. Erikss. – angiosperm wood (KUN ZMMU 2096); 2.

\**BOTRYOBASIDIUM SUBCORONATUM* (Hohn. & Litsch.) Donk – angiosperm wood, gymnosperm wood (KUN ZMMU 2240, 2244, 2264, 2394); 5, 7, 9.

- \*\**CERINOMYCES* aff. *ACULEATUS* N. Maek. – angiosperm wood (KUN ZMMU 2396, 2417; H7008652); 5, 8.  
Note. Our material was in a good accordance with the original description of *Cerinomyces aculeatus* (Maekawa, 1987), although species delimitation is problematic before the sequencing of the type material (A. Savchenko pers. comm.) we prefer to denote it as *C. aff. aculeatus*. *C. aculeatus* was reported previously only from Japan (Shirouzu et al., 2009), so our findings represent the first records for Russia and Continental Eurasia. One collection was also made by I.V. in the secondary oak forests of Lazovsky Nature Reserve (Primorye Territory, Russia).
- \**CERIPORIA EXCELSA* S. Lundell ex Parmasto – angiosperm wood (KUN ZMMU 2108); 2.
- \**CERIPORIA PURPUREA* (Fr.) Donk – angiosperm wood (KUN ZMMU 2333); 1.
- \**CERIPORIA VIRIDANS* (Berk. & Broome) Donk – angiosperm wood (KUN ZMMU 2324, 2327); 1.
- CRYPTOPORUS VOLVATUS* (Peck) Shear – gymnosperm wood (KUN ZMMU 2295); 8. Reported earlier in Korkishko (2002).  
Note. According to our observations, *C. volvatus* inhabits only old-growth forests with a large amount of gymnosperm dead wood, which makes it vulnerable to forest loss in Primorye Territory.
- \**DACRYOBOLUS KARSTENII* (Bres.) Oberw. ex Parmasto – angiosperm wood (KUN ZMMU 2272, 2551, 2552, 2553, 2556); 2, 5, 6, 7.  
Note. Our material was in good accordance with the original description, except having a bit thicker fruit body (1–2.5 vs 0.5–1 mm) and angiosperm wood as a substrate, which is unusual for *D. karstenii* (Eriksson & Ryvarden, 1975).
- \**DACRYOBOLUS SUDANS* (Alb. & Schwein.) Fr. – angiosperm wood (KUN ZMMU 2328); 1.  
Note. Our specimen was collected on an angiosperm log which is an unusual substrate for *D. sudans* (Eriksson & Ryvarden, 1975).
- \**FOMITIPORIA HARTIGII* (Allesch. & Schnabl) Fiasson & Niemelä – *Abies holophylla*; 2.
- \**GALZINIA INCRUSTANS* (Hohn. & Litsch.) Parmasto – angiosperm wood (KUN ZMMU 1997, 2003, 2086, 2088, 2100, 2121, 2122, 2125, 2126, 2184, 2216, 2252, 2254, 2265, 2304, 2306, 2397); 1, 2, 5, 6, 7.
- \**GLOIOTHELE CITRINA* (Pers.) Ginns & G.W. Freeman – angiosperm wood (KUN ZMMU 2418); 9.
- HERICIAM ERINACEUS* (Bull.: Fr.) Pers. – *Quercus robur*. Reported earlier by Korkishko (2002) and Kovalenko et al. (2012).  
Note. Besides the studied area, we have seen *H. erinaceus* many times growing on oaks in the secondary oak forests of Lazovsky Nature Reserve (Primorye Territory, Russia).
- \**HYMENOCHAETE TENUIS* Peck – angiosperm wood (KUN ZMMU 2182); 6.
- \**HYPHODERMA ARGILLACEUM* (Bres.) Donk – angiosperm wood (KUN ZMMU 2170, 2324); 1, 2.
- \**HYPHODERMA INCRUSTATUM* K.H. Larss. – angiosperm wood (KUN ZMMU 2101, 2188); 2, 7.
- \**HYPHODERMA OBTUSUM* J. Erikss. – angiosperm wood (KUN ZMMU 2270); 8.
- \**HYPHODERMA SETIGERUM* (Fr.) Donk – angiosperm wood (KUN ZMMU 2000, 2006, 2009, 2102, 2124, 2167, 2173, 2175, 2176, 2183, 2185, 2187, 2205, 2214, 2249, 2250, 2251, 2255, 2267, 2298, 2300, 2303); 1, 2, 5, 6, 7, 8.
- \**HYPHODERMA SIBIRICUM* (Parmasto) J. Erikss. & A. Strid – angiosperm wood (KUN ZMMU 2405); 7.
- \**HYPHODONTIA ALUTARIA* (Burt) J. Erikss. – angiosperm wood (KUN ZMMU 2022, 2242); 3, 9.
- \**HYPHODONTIA PALLIDULA* (Bres.) J. Erikss. – angiosperm wood (KUN ZMMU 2245, 2246); 9.
- \**HYPOCHNICIUM ALBOSTRAMINEUM* (Bres.) Hallenb. – angiosperm wood (KUN ZMMU 2189, 2257); 2, 7.
- \**HYPOCHNICIUM POLONENSE* (Bres.) A. Strid – angiosperm wood (KUN ZMMU 1987); 9.
- \**INTEXTOMYCES CONTIGUUS* (P. Karst.) J. Erikss. & Ryvarden – angiosperm wood (KUN ZMMU 2243); 9.
- JUNGHUHNIA AURANTILAETA* (Corner) Spirin – angiosperm wood (KUN ZMMU 2370, 2529, 2530); 6, 7, 8. GenBank Accession Number KY769581.  
Note. *J. aurantilaeta* is known from Indonesia (Corner, 1989), Taiwan, Japan (Hattori & Ryvarden, 1993) and China (Núñez & Ryvarden, 1999). In Russia, it was also collected in the Bastak Nature Reserve, Jewish Autonomous Region, Russian Far East (Bukharova & Zmitrovich, 2014).
- \**JUNGHUHNIA NITIDA* (Pers.) Ryvarden – angiosperm wood (KUN ZMMU 2334, 2358, 2366); 1, 2, 8.
- \**MEMBRANOMYCES SPURIUS* (Bourd.) Jülich – angiosperm wood (KUN ZMMU 2313); 2.
- \**ODONTICIUM FLABELLIRADIATUM* (J. Erikss. & Hjortstam) Zmitr. – angiosperm wood (KUN ZMMU 2299, 2308); 6.



\**OXYPORUS CORTICOLA* (Fr.) Ryvarden – angiosperm wood (KUN ZMMU 2369); 8.

\**PENIOPHORELLA PRAETERMISSA* (P. Karst.) K.H. Larss. – angiosperm wood (KUN ZMMU 1991, 1999, 2001, 2016, 2024, 2070, 2097, 2098, 2099, 2110, 2127, 2206, 2256, 2416); 1, 2, 3, 5, 6, 7, 8.

\**PENIOPHORELLA PUBERA* (Fr.) P. Karst. – angiosperm wood, gymnosperm wood (KUN ZMMU 2004, 2005, 2008, 2012, 2113, 2172, 2180, 2181, 2197, 2209, 2215, 2273, 2276, 2302); 1, 2, 6, 7, 8, 9.

*PHANEROCHAETE ROBUSTA* Parmasto – angiosperm wood (KUN ZMMU 2115, 2116); 2. Reported earlier by Korkishko (2002). GenBank Accession Number KY769582.

Note. In Russia, this species is known only from the Kedrovaya Pad Nature Reserve, but it also occurs in the adjacent part of China (Spirin et al., 2017).

\**PHANEROCHAETE SANGUINEA* (Fr.) Pouzar – angiosperm wood (KUN ZMMU 2075); 7.

\**PHANEROCHAETE SORDIDA* (P. Karst.) J. Erikss. & Ryvarden – angiosperm wood (KUN ZMMU 2076); 7.

\**PHELLINUS CONTIGUUS* (Pers.) Pat. – angiosperm wood (KUN ZMMU 2271, 2322); 1, 8.

\**PHLEBIA LILASCENS* (Bourdot) J. Erikss. & Hjortstam – angiosperm wood (KUN ZMMU 2395); 5.

\**PHLEBIA LIVIDA* (Pers.: Fr.) Bres. – angiosperm wood (KUN ZMMU 2329, 2330, 2335, 2359, 2365, 2368); 1, 2, 8.

\**PHLEBIA RADIATA* Fr. – angiosperm wood (KUN ZMMU 2514); 6.

\**PHLEBIA RUF A* (Pers.) M.P. Christ. – angiosperm wood (KUN ZMMU 2402); 6.

\**POROTHELEUM FIMBRIATUM* (Pers.) Fr. – angiosperm wood, *Pinus koraiensis* (KUN ZMMU 2545, 2548); 2, 6.

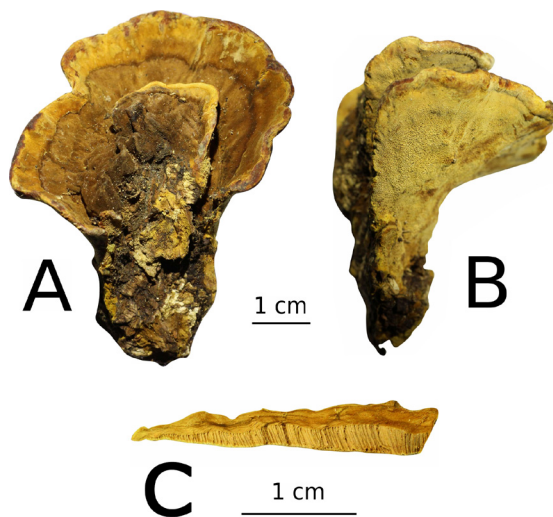
\**POSTIA LATERITIA* Renvall – *Pinus koraiensis* (KUN ZMMU 2546); 2.

\**POSTIA TEPHROLEUCA* (Fr.) Jülich – angiosperm wood (KUN ZMMU 2337); 1.

\*\**PYRRHODERMA* cf. *SENDAIENSE* (Yasuda) Imazeki – angiosperm wood, gymnosperm wood (KUN ZMMU 2177, 2196, 2210, 2296; H7008653); 2, 8. GenBank Accession Number KY769583.

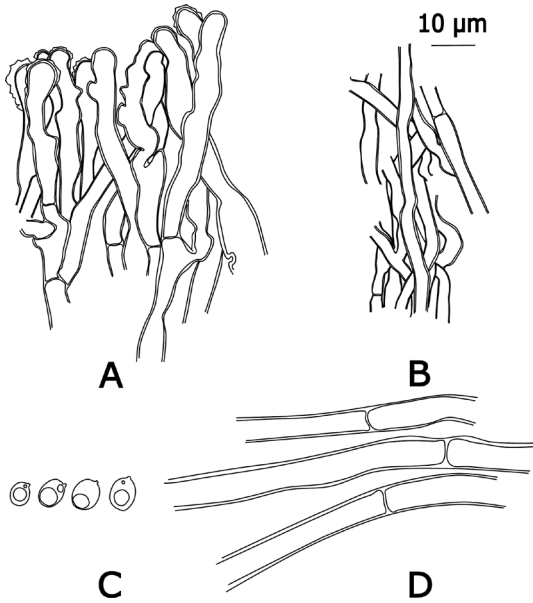
Note. Basidiocarps annual, but hard and corky, centrally stipitate to substipitate. Stipe 3–4 cm long and 1.5 cm thick; pileus with obtuse margin appanate, circular, sometimes lobed, solitary or branching from

a common base, projecting up to 6 cm. Pileal surface yellowish-brown to reddish-brown, glabrous, faintly concentrically zonate. Pore surface yellowish-brown to dull-brown, the pores circular, 5–6 per mm, with thick, entire dissepiments. Context yellowish-brown to brown, hard-fibrous with distinct brown layer in the upper part delimiting a cuticle. Tubes slightly paler than context, up to 3 mm long (Fig. 3).



**Fig. 3.** *Pyrrhoderma* cf. *sendaiense* (Yasuda) Imazeki (KUN ZMMU 2177): A – pileal surface, B – stipe and pore surface, C – context and tubes.

Hyphal system monomitic, simple-septate and with fairly frequent septa, faintly positive in CB. Hyphae of context pale yellowish in CB, thick-walled, straight, rarely branched, 6–11  $\mu\text{m}$  in diam. Hyphae in the cuticle hyaline and thick-walled, arranged into a palisade, 5.5–9  $\mu\text{m}$  in diam, sometimes encrusted. A layer of dark-brown hyphae underlying the cuticle, these hyphae distinctly thick-walled, 5–7  $\mu\text{m}$  in diam. Tramal hyphae yellowish-brown to pale yellowish, arranged parallel along the tubes. 2.5–5  $\mu\text{m}$  in diam. Setae absent. Basidia 13–16  $\times$  6.8–9  $\mu\text{m}$ , clavate, tetrasterigmatic, simple septate at the base. Basidiospores subglobose, hyaline, thin-walled, smooth, negative in IKI, faintly positive in CB, 5.6–7.3  $\times$  4.5–5.6  $\mu\text{m}$ , with distinct oily droplet (Fig. 4).



**Fig. 4.** *Pyrrhoderma* cf. *sendaiense* (Yasuda) Imazeki (KUN ZMMU 2296): A – palisade cells from cuticle, B – hyphae from trama, C – spores, D – hyphae from context.

Our specimens seem to be close to *Pyrrhoderma sendaiense*. Nevertheless, we prefer to denote them as *Pyrrhoderma* cf. *sendaiense*, since the genus *Pyrrhoderma* is polyphyletic and has poor morphological species delimitation (Spirin, unpublished), so for proper species delimitation further studies of type specimens with sequencing are needed. Our material was compared with specimens from Khabarovsk Territory, Russian Far East (Spirin, unpublished) and they seem to be the same.

- \*REPETOBASIDIUM MIRIFICUM J. Erikss. – angiosperm wood (KUN ZMMU 2321, 2525); 1, 5.
- \*RHIZOCHAETE FILAMENTOSA (Berk. & M.A. Curtis) Gresl., Nakasone & Rajchenb. – angiosperm wood (KUN ZMMU 2512, 2513); 2.
- \*SCOPULOIDES RIMOSA (W.B. Cooke) Jülich – angiosperm wood (KUN ZMMU 2002, 2011); 9.
- \*SIDERA VULGARIS (Fr.) Miittinen – angiosperm wood (KUN ZMMU 2084); 5.
- \*SISTOTREMA BRINKMANNII (Bres.) J. Erikss. – angiosperm wood (KUN ZMMU 2315); 2.
- \*SISTOTREMA OCTOSPORUM (J. Schrot. ex Hohn. & Litsch.) Hallenb. – angiosperm wood (KUN ZMMU 2111); 2.

- \*SISTOTREMA PORULOSUM Hallenb. – angiosperm wood (KUN ZMMU 2077, 2207); 7, 8.
- \*SISTOTREMASTRUM NIVEOCREMEUM (Hohn. & Litsch.) J. Erikss. – angiosperm wood (KUN ZMMU 2112, 2406); 2.
- \*SISTOTREMASTRUM SUECICUM Litsch. ex J. Erikss. – angiosperm wood (KUN ZMMU 2531); 4.
- \*SKELETOCUTIS NIVEA (Jungh.) Jean Keller – angiosperm wood (KUN ZMMU 2027, 2078, 2128, 2129, 2239, 2332, 2360, 2364); 1, 2, 3, 5, 6.
- \*SPHAEROBASIDIUM MINUTUM (J. Erikss.) Oberw. ex Jülich – angiosperm wood (KUN ZMMU 2266); 5.
- \*STECCHERINUM MURASHKINSKYI (Burt) Maas Geest. – angiosperm wood (KUN ZMMU 2106); 2.
- \*STECCHERINUM TENUISPINUM Spirin, Zmitr. & Malysheva – angiosperm wood (KUN ZMMU 2363); 2.
- \*SUBULICYSTIDIUM LONGISPORUM (Pat.) Parmasto – angiosperm wood (KUN ZMMU 2171, 2307); 2, 6.
- \*TRECHISPORA STELLULATA (Bourdot & Galzin) Liberta – angiosperm wood (KUN ZMMU 2213); 1.
- \*TUBULICRINIS CALOTHRIX (Pat.) Donk – angiosperm wood (KUN ZMMU 2178, 2258); 2, 7.
- \*TYROMYCES CHIONEUS (Fr.) P. Karst. – angiosperm wood (KUN ZMMU 2532, 2533, 2534); 2, 6, 7.
- \*TYROMYCES WYNNEAE (Berk. & Broome) Donk – angiosperm wood (KUN ZMMU 2547); 9. GenBank Accession Number KY795989. Note. This species has a sporadic distribution all over the Europe (Ryvarden & Melo, 2014), Caucasus (Khacheva, 2016) and Siberia (Vlasenko, 2013). Thus, our finding is the most easternmost in Eurasia at present.
- \*XENASMA PRAETERITUM (H.S. Jacks.) Donk – angiosperm wood (KUN ZMMU 1995, 1996, 2072, 2179, 2247); 6, 7, 9. Note. *X. praeteritum* is rarely collected in Russia and we failed to find any published record of this species in Russia except Russian Caucasus (Ghobad-Nejhad et al., 2009). Nevertheless, it seems to be common species in the studied area, which can growth on large-sized angiosperm logs as well as small twigs.
- \*XENASMATELLA BOREALIS (K.H. Larss. & Hjortstam) Duhem – angiosperm wood (KUN ZMMU 1995); 6.
- \*XENASMATELLA CHRISTIANSENI (Parmasto) Stalpers – angiosperm wood (KUN ZMMU 2398, 2399); 5.

- \*XENASMATELLA FIBRILLOSA (Hallenb.) Stalpers – angiosperm wood (KUN ZMMU 2119, 2208, 22528); 2, 5, 8.
- \*XYLOBOLUS FRUSTULATUS (Pers.) P. Karst. – *Quercus mongolica* (KUN ZMMU 2026); 3.
- \*XYLON ASPERUS (Fr.) Hjortstam & Ryvarde – angiosperm wood, gymnosperm wood (KUN ZMMU 1992, 2241); 9.
- \*XYLON BUGELLENSIS (Ces.) Hjortstam & Ryvarde – sensu Bernicchia and Gorjón (2010) – gymnosperm wood (KUN ZMMU 2727); 2.
- \*XYLON NESPORI (Bres.) Hjortstam & Ryvarde – angiosperm wood (KUN ZMMU 2007); 6.

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