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A new species of the genus *Cribraria* (Myxomycetes) with violet spores

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Abstract. A new species of *Cribraria*, described herein as *C. arachnoidea*, was discovered in the southern part of European Russia (the village of Kanevskaya in the Krasnodar Territory). The two specimens upon which the new species is based were obtained in moist chamber cultures, and the sporocarps developed on the dead wood of undetermined deciduous trees. The sporocarps and spores were examined by light and scanning electron microscopy. The main diagnostic morphological characters of *Cribraria arachnoidea* are the deep violet color of the small sporocarps, relatively short stalk (no more than twice the diameter of the sporotheca), small calyculus, irregular and flat nodes of the peridial net, and the angular spores. Micrographs of all relevant features are presented.

Keywords: Amoebozoa, anthropogenic landscape, lignicolous species, moist chamber culture, morphology, slime moulds, taxonomy, Krasnodar Territory, Russia.

Новый вид рода *Cribraria* (Myxomycetes) с фиолетовыми спорами

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Резюме. Новый вид рода *Cribraria* — *C. arachnoidea* выявлен методом влажных камер на валеже лиственных деревьев, собранном на юге европейской части России (станица Каневская, Краснодарский край). Спорокарпы и споры исследованы методами световой и сканирующей электронной микроскопии. Основные диагностические признаки *Cribraria arachnoidea* — насыщенно-фиолетовый цвет небольших спорокарпов, достаточно короткая и не превышающая двух диаметров споротеки ножка, маленькая чашечка, уплощенные неправильной формы узелки сети перидия и угловатые споры. Представлены микрофотографии всех определительных признаков.

Keywords: Amoebozoa, антропогенные ландшафты, влажные камеры, лигнофильные виды, слизевики, таксономия, Краснодарский край, Россия.

Cribraria Pers. is one of the largest myxomycete genera, encompassing at least 47 species (Lado, 2005–2025). It is readily distinguished from other genera by several characters, including the stalked sporocarps, with a partially evanescent membranous peridium that remains as a network of threads (or as ribs) and as a calyculus at the base of the sporotheca; the calyculus may be very reduced or absent. Some species may be almost sessile and may form pseudoaethaloid forms, like *Cribraria argillacea* (Pers. ex J. F. Gmel.) Pers. or *C. cribrarioides* (Emoto) Hatano. Dictydine granules present on the calyculus, ribs, and nodes of the peridial net and sometimes on threads, in the stalk or on the spores. The stalk is usually translucent in transmitted light and sometimes filed with granules. The capillitium absent (Poulain *et al.*, 2011).

Together with those myxomycete taxa that form pseudoaethalia (*Lindbladia* Fr.) and aethalia (*Enteridium* Ehrenb.), the genus *Cribraria* belongs to the superorder Cribrariidia with the single order Cribrariales T. Macbr. and the family Cribrariaceae Corda (Moroz *et al.*, 2024). Due to the lack of genus-specific DNA primers for the marker genes, the phylogeny of this genus is comparatively badly studied (Leontyev *et al.*, 2019). At the present time only seven sequences of the 18S rRNA gene (small subunit, SSU), and seven partial sequences of EF1A (the protein elongation factor) have been submitted to GenBank (2025).

For *Cribraria*, an important taxonomic character is the color of the spore mass. Most species, including the type species *Cribraria rufa* (Roth) Rostaf., have a yellow or ochreous spore mass. Species with

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a dark brown spore mass, e. g., *Cribraria cancellata* (Batsch) Nann.-Bremek. and *C. mirabilis* (Rostaf.) Massee, have a peridium net consisting of parallel ribs and for this reason were long considered in the genus *Dictydium* Schrad. (Lister, 1925). However, the separate treatment of this group is not accepted (Nannenga-Bremekamp, 1962; Neubert *et al.,* 1993; Poulain *et al*., 2011). Some species of the genus have a violet (e. g., *Cribraria violacea* Rex and *C. lepida* Meyl.) or purple (*C. purpurea* Schrad.) spore mass. However, the division of species by the color of the spore mass is rather conditional because there are species with intermediate colors of spore mass. An example is *Cribraria ferruginea* Meyl. that has a brick-red spore mass.

Species of the genus *Cribraria* mostly occur on the acidic bark and coarse woody debris of conifers with pH usually 3.5–5.5 (Novozhilov *et al*., 2021). They are very rarely isolated in agar cultures (Haskins, Wrigley de Basanta, 2008). Moreover, only some species are able to form sporocarps in a moist chamber culture (Stephenson *et al*., 2018).

In this paper, we describe a new species of *Cribraria* with a violet spore mass that appeared in moist chamber cultures on the dead wood of deciduous trees.

Materials and Methods

All specimens were obtained in moist chamber cultures according to standard protocols (Wrigley de Basanta, Estrada-Torres, 2022). The specimens described below are deposited in the Herbarium of the Department of Mycology and Algology, faculty of Biology, Lomonosov Moscow State University, Moscow, Russia (MYX).

Morphological studies. Micrographs of sporocarps were taken with a Micromed 3 var. 3LED light microscope equipped with a E3CMOS06300 digital camera and epi-illumination and with Nikon D3200 digital camera with Nikon AF-S DX 40mm/2.8G micro-objective equipped with two extension macro rings. A series of pictures was taken in different optical sections and processed using Helicon Focus ver. 6.0.18. Light microscopy (LM) of sporocarps and spores were taken with a Micromed 3 var. 3LED light microscope equipped with a E3CMOS06300 digital camera and a Bresser Researcher Trino microscope equipped with a ToupCam UA1000CA digital camera. Sporocarps for LM were mounted in polyvinyl lactophenol or 4% KOH. The dimensions of spores, capillitium, and sporocarps were calculated using ImageJ ver. 1.52a (free software). Spore size was recorded according to the largest measurement, including surface warts, with an oil immersion lens. Surface details of spores and capillitium were studied on a scanning electron microscope JEOL, JSM-6380LA. Accelerating voltage 20 kV. SEI mode. SEM Control User Interface Version 7.11 (JEOL) software. Sporocarps for SEM were mounted on copper stubs coated with nail polish and sputtered with gold-palladium coating.

Color notations in parentheses follow the ISCC-NBS colour-name charts illustrated with centroid colors (Centore, 2016).

Results

Cribraria arachnoidea Botyakov et Gmoshinskiy, sp. nov. (Figs. 1–3)

MycoBank: 857642.

Etymology: from Greece Ἀράχνη – spider. Refer to form of the peridial nodes.

Holotype: **Russia,** Krasnodar Territory, Kanevsky District, near stanitsa Kanevskaya [46.119°N, 38.940°E], in the forest belt with *Populus* sp., *Fraxinus* sp., *Ulmus* sp., *Acer* sp., *Gleditsia* sp., on dead wood of a deciduous tree and appearing in a moist chamber: substrate collected 7 IX 2024, experiment started 29 IX 2024, specimen collected 16 X 2024, *Botyakov* (MYX 24308).

Paratype: **Russia,** Krasnodar Territory, *ibid*., on dead wood of a deciduous tree in a moist chamber culture: substrate collected 7 IX 2024, experiment started 29 IX 2024, specimen collected 7 X 2024, *Botyakov* (MYX 24851).

Diagnosis. Sporocarps stalked, stalk deep- or dark violet, no more than twice the diameter of the sporotheca, cap flat ($\frac{1}{8}$–$\frac{1}{5}$ diam.), peridial nodes abundant, flat, spores angular, 6.8–7.3 µm in diam. (Figs. 1–3).

Morphological description. Sporocarps scattered, stalked, erect of slightly nodding, 0.4–0.7(1.4) mm high (Fig. 1A, B, D, E). Sporotheca globose, 0.17–0.26(0.75) mm in diam., deep (208: 60, 22, 104) or dark violet (212: 53, 37, 77) (Fig. 1). Hypothallus well-defined, membranous, dark purplish blue (201: 34, 34, 72) to almost black (267: 43, 41, 43), individual or common to a group of adjacent sporocarps. Stalk furrowed, sometimes slightly expanded at the base and tapered above, almost black (267: 43, 41, 43) at the base or dark violet (212: 53, 37, 77) above, 0.25–0.68 mm high, straight or slightly curved. Calyculus small or replaced by a basal disc ($\frac{1}{6}$–$\frac{1}{5}$ of the sporotheca diameter) (Fig. 3A, B), slightly plicate (Fig. 3C), deep violet (208: 60, 22, 104), with uniformly

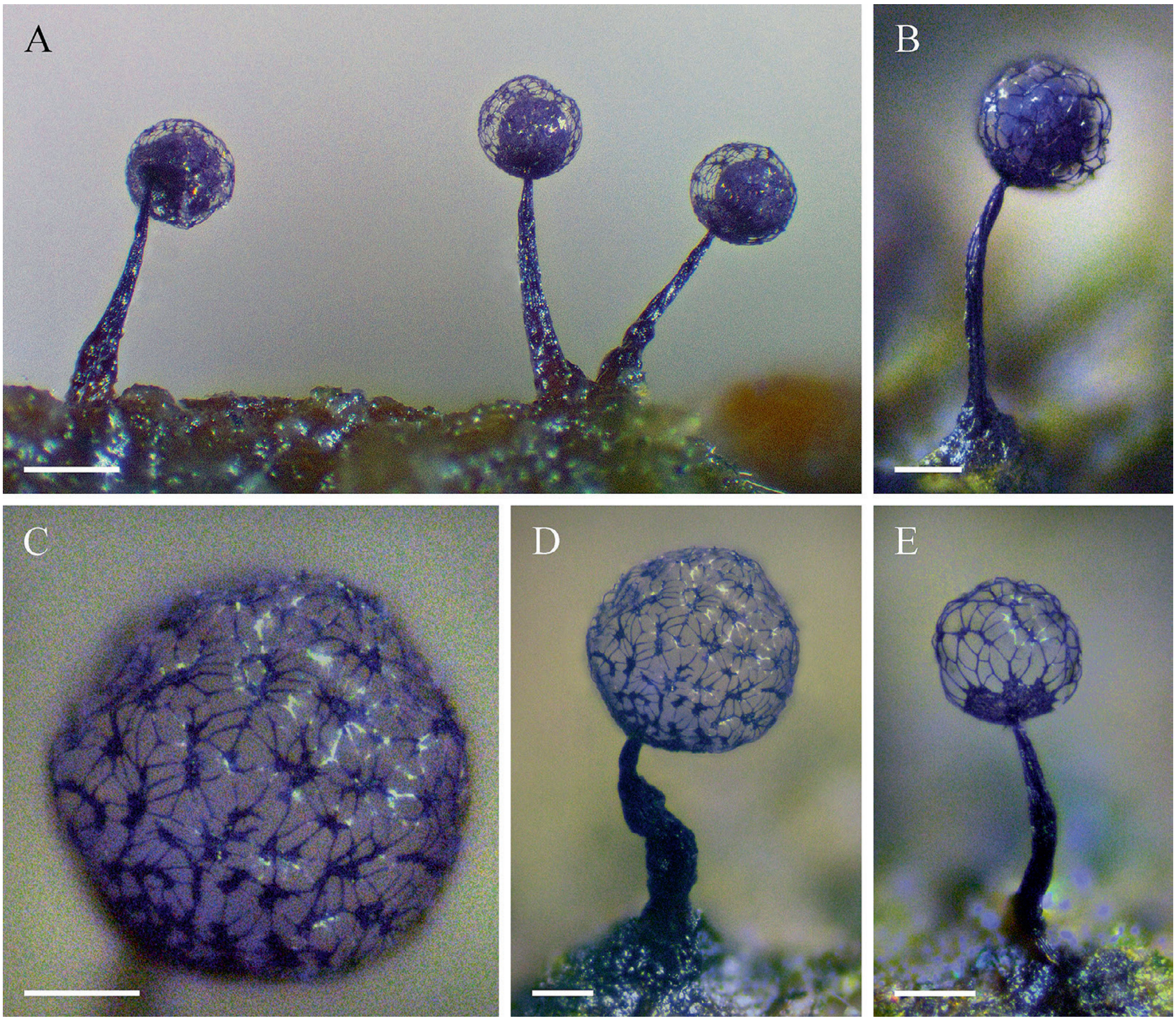

Fig. 1. *Cribraria arachnoidea* (holotype, MYX 24308).
A — fresh sporocarps in moist chamber culture; B–E — sporocarps in herbarium after drying.
Scale bars: A — 200 µm; B–E — 100 µm.

distributed dictydine granules, with a dentate margin (Fig. 3B). Peridial net almost without free ends, small-meshed, consisting of many flat irregular nodes, with many dictydine granules, connected to many thin threads (Figs. 1C, D, 2A–C, E, 3B, D, E). Dictydine granules small (1–1.5 µm in diam.), dark violet (212: 52, 37, 77) in KOH (Fig. 2A–C) or very deep purplish red (257: 84, 6, 60) in polyvinyl lactophenol (Fig. 2E) in transmitted light. Spore mass of fresh sporocarps strongly violet (207: 97, 65, 156) after drying becomes deep violet (208: 60, 22, 104); spores in transmitted light purplish blue (199: 137, 145, 203) in KOH (Fig. 2D), in polyvinyl lactophenol greyish purple pink (253: 199, 163, 185), angular, with uniformly thick wall, (6.4)6.8–7.3(7.7) µm (mean = 7.1, SD = 0.29, n = 110) in diam., minutely and unevenly spinulose (Fig. 2F). Under SEM spores uniformly spinulose (Fig. 3G, H).

Distribution. Known only from the type locality: Russia, Krasnodar Territory, near stanitsa Kanevskaya.

Ecology: on the dead wood of deciduous trees.

Method of isolation: the moist chamber cultures.

Discussion

This species is distinguished from the other species of the genus *Cribraria* with a purple spore masses by its relatively short stalks that are no more than twice the diameter of the sporotheca and a peridium net bearing numerous flattened nodes and a relatively small calyculus of ⅛–⅕ times the diameter of the sporotheca.

The closest species to *Cribraria arachnoidea* in repect to sporocarp size and habit is *C. elegans* Berk. et M. A. Curtis, whose peridial net is also represented by flattened nodes. The main

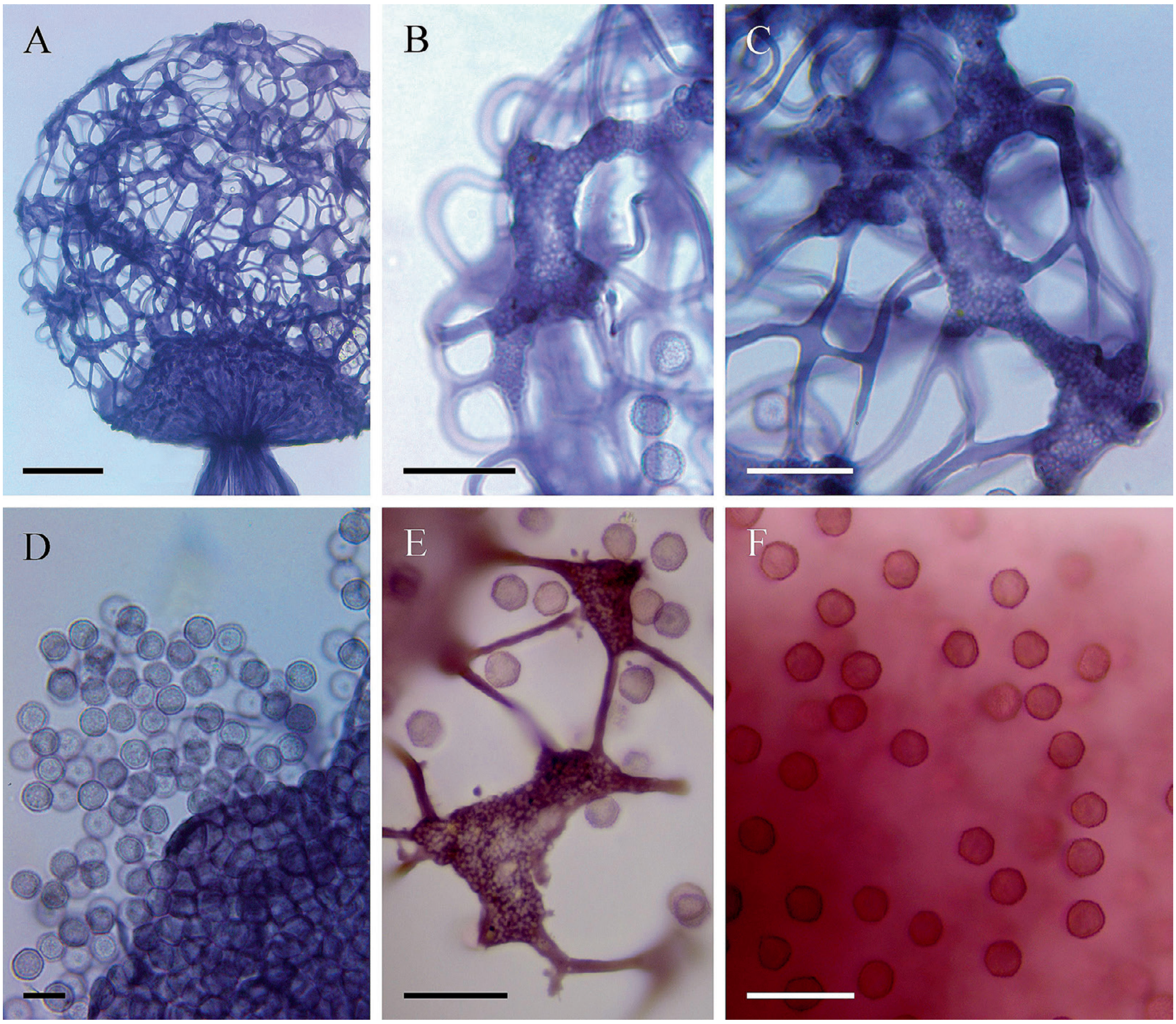

Fig. 2. *Cribraria arachnoidea* (holotype, MYX 24308) in transmitted light.
A — peridium net in KOH; B, C — peridium nodes in KOH; D — spores in KOH; E — peridium nodes in polyvinyl lactophenol; F — spores in polyvinyl lactophenol. Scale bars: A — 50 µm; B–F — 20 µm.

differences are the reddish-purple coloration of the peridium (Berkley, 1873) and spore mass, the deep calyculus reaching half the diameter of the sporotheca (Emoto, 1977; Neubert *et al.*, 1993: 62), the large dictydine granules (2–2.5 µm in diam.) (Lister, 1925) and the smaller spores (4–6 µm in diam. according to Lister, 1925, and 6–6.5 µm in diam. according to Martin, Alexopoulos, 1969). Other species of the genus *Cribraria* with a purple color of the peridium and the spore mass and often forming sporocarps in moist chamber cultures are the widely distributed *C. violacea*, the rare species *C. tecta* Hooff., and *C. elegans* Berk. et M. A. Curtis. The first differs from *Cribraria arachnoidea* in having a deep calyculus that usually occupies ⅓ to ⅔ of the diameter of the sporotheca, and a peridial net formed by a few large dilated polyhedral nodes connected by short hyaline tubules (Rex, 1891). The second has an unique convex "lid" on the sporotheca that is shaped like a "parachute" and is attached to the calyculus by threads (van Hooff, 2009). Other species of the genus *Cribraria* that have tints of purple or violet color in the spore mass also differ from *C. arachnoidea* in some characters. These are: (1) rare species *C. bicolor* S. L. Stephenson et al. (Stephenson *et al.*, 2018), which has long bicolored stalk, bright-red over the lower one-third and light yellow or orange yellow over the upper two-thirds, and small peridial nodes; (2) *C. lepida* Meyl., which has long stalks 4–8 times the diameter of the sporotheca, a large calyculus occupying ¼ to ⅓ of the diameter of the sporotheca, and thickened peridial nodes, rounded or slightly angular, not exceeding 30 µm in diam. (Kowalski, 1975); (3) *C. languescens* Rex (Rex, 1891) and *C. gothica* Sadykov (Sadykov, Potapov, 2023), which are characterized by longer stalks 7–10 times the diameter of the sporotheca,

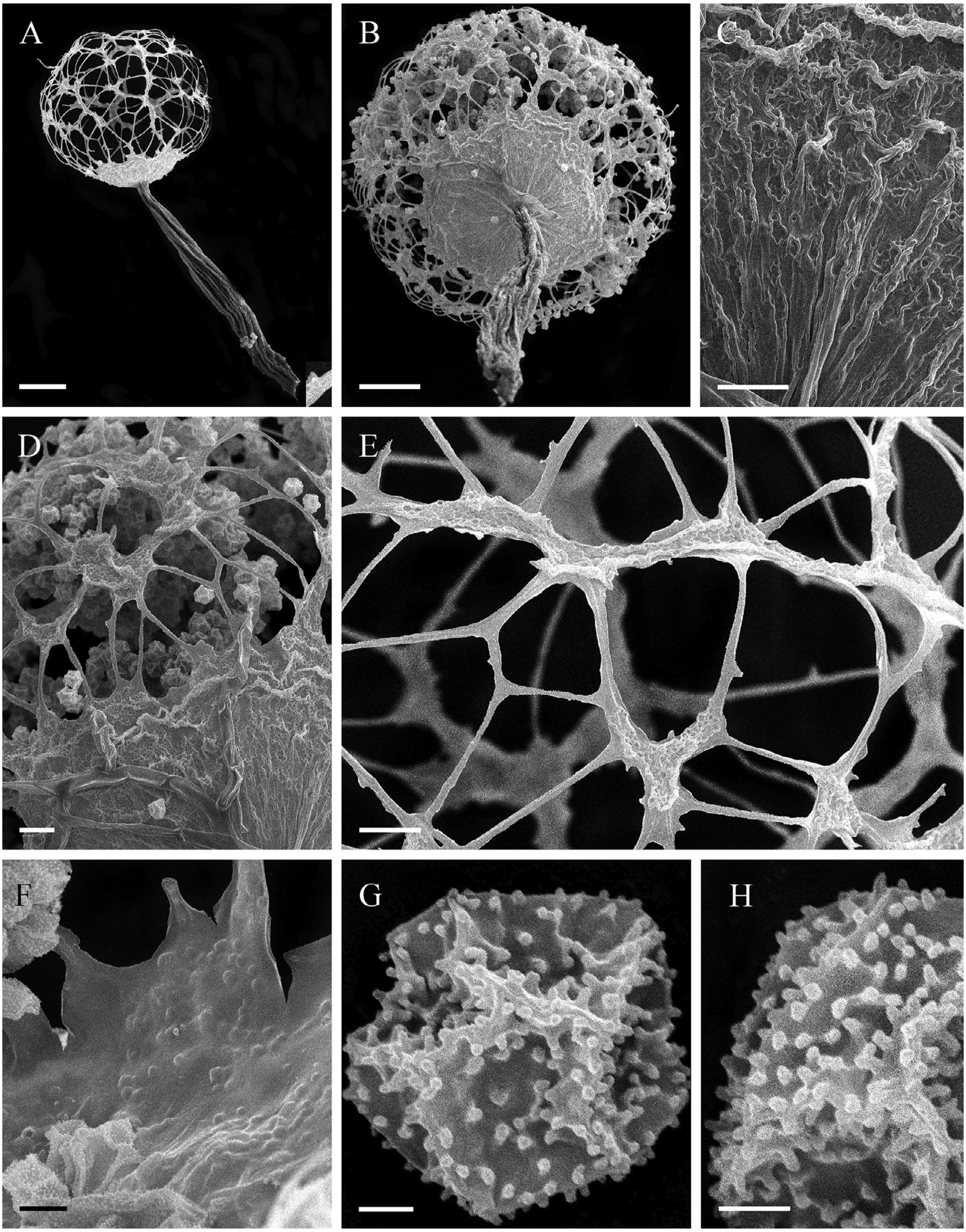

Fig. 3. *Cribraria arachnoidea* (holotype, MYX 24308) in SEM.
A — sporocarp morphology; B — peridial calyculus and peridial net; C — surface of peridial calyculus;
D — margin of calyculus; E — perdidal nodes and threads; F — inner surface of calyculus; G, H — spore surface.
Scale bars: A, B —50 μm; C, D — 10 μm.

a well-defined calyculus and compact nodes of the peridium net; (4) *C. spinispora* Lado et D. Wrigley, which is also characterized by longer stalks exceeding that exceed diameter of the sporotheca, sporangium by more than 3 times, a deep calyculus occupying ⅓– ½ of the diameter of the sporotheca, and large (9–10 μm in diam.) spiny spores (Lado *et al*., 2019); (5) *C. purpurea*, which is characterized by purple color of the spore mass, the much larger sporangium (0.3)0.6–1(1.2) mm in diam. and 2–2.5 mm tall, deep calyculus (about ⅓ of the diameter of the sporotheca), large and irregular nodes of the peridium and filled with large dictydine granules (about 2–2.5 μm in diam.) (Lister, 1925); and (6) *C. fragilis* Lado et Estrada, which has a very deep calyculus occupying up to ⅔ of the diameter of the sporotheca, a peridial net that is represented by few large nodes, and a unique spore ornamentation consisting of longitudinal bands and scattered warts (Estrada-Torres *et al*., 2001; Lizárraga *et al*., 2008: Figs. 4, 5).

Conclusions

Cribraria arachnoidea was found in a forest belt between a busy highway and a field that can be considered a manmade habitat. In such places, a whole range of new ecological niches are created, which may be suitable for rare or exotic species. The traffic flow through plant communities across different climatic zones facilitates the dispersal of spores and vegetative propagules over considerable distances as well as their subsequent establishment in the transformed ecosystems. Such anthropogenic landscapes are widespread throughout the world that also favors the dispersal of species adapted to them. Further research on the biota of anthropogenic landscapes will help us better understand its diversity and assess the effects of the human impact. Perhaps, the human activity makes possible the existence of unique species complexes that can be studied "in our back yard".

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Conflicts of Interest. The authors declare no conflict of interest.

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