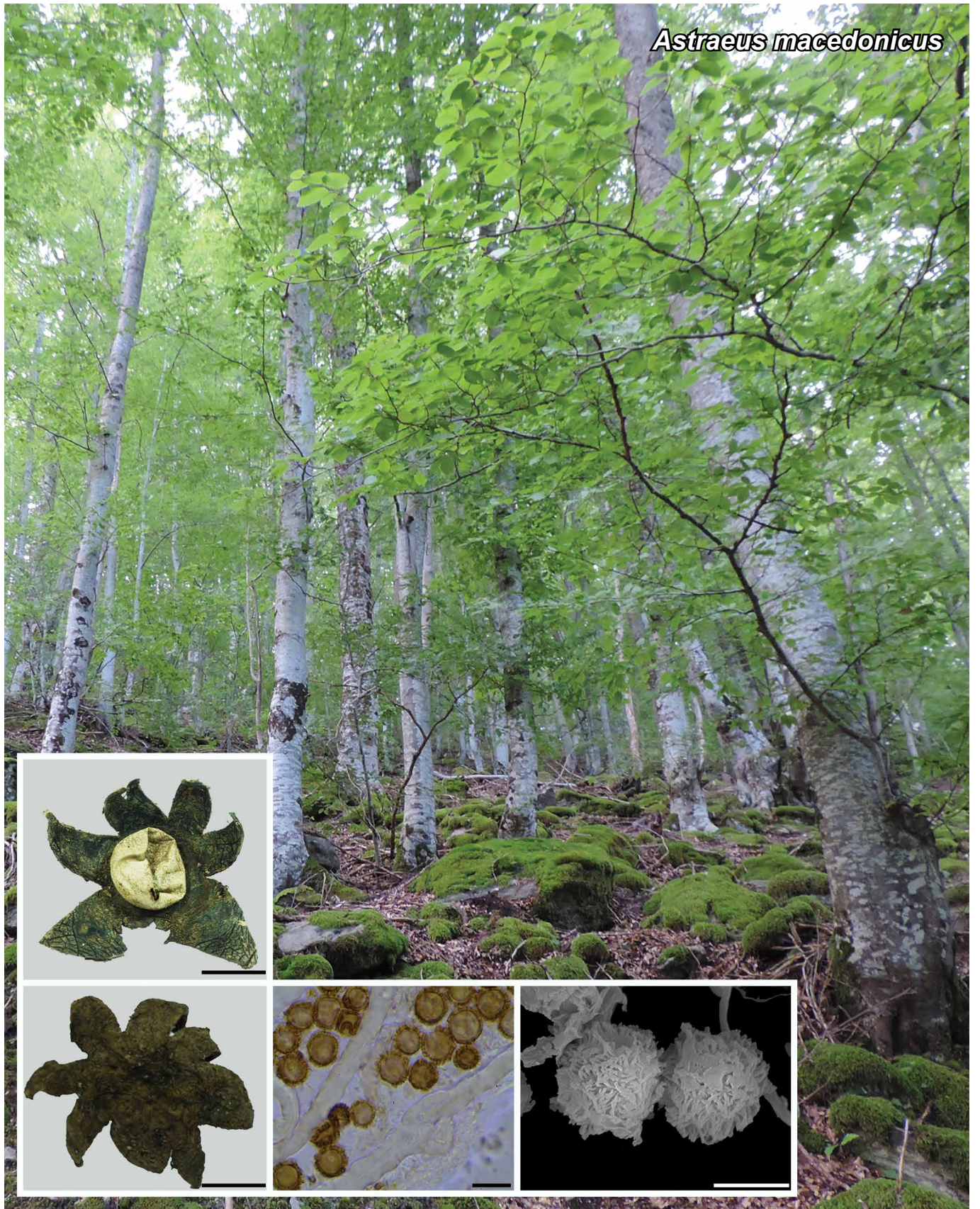


Astraeus macedonicus



Fungal Planet 906 – 19 July 2019

Astraeus macedonicus Rusevska, Karadelev, Telleria & M.P. Martín, *sp. nov.*

Etymology. Named after the country where this species was collected, the Republic of Macedonia.

Classification — *Diplocystaceae*, *Boletales*, *Agaricomycetes*.

Basidiomata from closed specimens 17 × 22 mm, not fully opened 25 × 30 mm, and almost opened 27 × 37 mm; regularly globose to slightly subglobose, epigeous, sessile. *Outer peridium* splitting to star shaped when mature into (6–)8–10 rough rays, expanding to 14–33 mm in length, 10–11 mm in width (at the middle, at the longest part), hygroscopic. *Endoperidium* sessile, subglobose to globose, papery-thin sack, 18–23 mm diam, pale cream to very light grey coloured, the surface papery-fibrillose; opening as an irregular slit. *Gleba* pale brownish to dark brownish, without columella. *Capillitium* hyaline, thick-walled, branched and interwoven, 4.2–10 µm diam, with capitate ends up to 12 µm diam, with rare septa, some of them with a clamp connection-like structure. *Basidiospores* globose, 7.3–10.1 µm diam, with dense, rounded, narrow, tapered, separate tubercles (up to 1 µm) which coalesce in groups.

Typus. MACEDONIA, Bistra, Lazaropole village, footpath to St. Gjorgija church, 1300 m asl, 8 Aug. 2005, K. Rusevska (holotype 05MCF5221, ITS and LSU sequences GenBank MK491320 and MK496886, MycoBank MB829660).

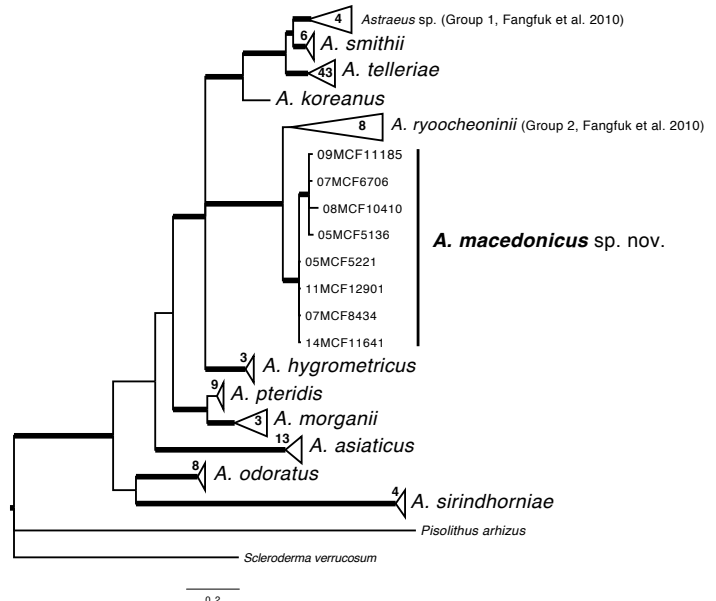
Additional materials examined. MACEDONIA, Bilina Planina, Zhidilovo vill., deciduous forest (*Quercus* sp., *Fagus*, *Betula pendula*), 19 May 2011, K. Rusevska, 11MCF12901, ITS sequence GenBank MK491321; Kozhuf, r. Stara Reka (vicinity), riparian vegetation, 18 July 2005, K. Rusevska, 05MCF5136, ITS sequence GenBank MK491319; Osogovski Planini, Stanci vill., deciduous forest (*Carpinus*, *Betula*, *Fagus*), 900–970 m asl, 13 May 2007, K. Rusevska, 07MCF6706, ITS and LSU sequences GenBank MK491317 and MK496884; *ibid.*, Ponikva, *Fagus* forest, 1500–1600 m asl, 11 July 2007, K. Rusevska, 07MCF8434, ITS sequence GenBank MK491322; *ibid.*, Sasa, *Quercus frainetto* forest, 685 m asl, 9 Apr. 2008, K. Rusevska, 08MCF10410, ITS and LSU sequences GenBank MK49318 and MK496885; Plachkovica, above Laki vill., Selska Reka, *Fagus* forest with *Pinus nigra*, 21 Oct. 2014, K. Rusevska, 14MCF11641, ITS sequence GenBank MK491323. — SERBIA, Vuchje (vicinity), edge of deciduous forest, 12 Sept. 2009, K. Rusevska, 09MCF11183, ITS and LSU sequences GenBank MK491316 and MK496886.

Additional materials examined of other Astraeus species from Macedonia. Herbarium number is indicated, as well as the ITS sequence GenBank between brackets: *Astraeus hygrometricus*. 05MCF5511 [MK491324]. — *Astraeus pteridis*. 06MCF5817 [MK491326]; 07MCF8009 [MK491327]; 09MCF10671 [MK491325]. — *Astraeus telleriae*. 83MCF7728 [MK491314]; 83MCF7729 [MK491297]; 83MCF7730 [MK491294]; 83MCF7731 [MK491307]; 87MCF9566 [MK491300 and MK491304]; 88MCF9574 [MK491295]; 98MCF6531 [MK491280]; 01MCF3439 [MK491303]; 03MCF2896 [MK491296];

Colour illustrations. Macedonia, Bistra mountain, beech forest, 1300 m asl, where the holotype species was collected (05MCF5221). *Basidiomata*; basidiospores and capillitium under LM; basidiospores under SEM. Scale bars = 1 cm (*basidiomata*), 10 µm (*basidiospores* and *capillitium*) and 5 µm (*basidiospores*).

04MCF4362 [MK491292]; 04MCF6532 [MK491288]; 05MCF911 [MK491310]; 05MCF4908 [MK491293]; 05MCF5329 [MK491284]; 05MCF5422 [MK491283]; 05MCF7977 [MK491275]; 06MCF1244 [MK491305]; 06MCF8811 [MK491309]; 07MCF6640 [MK491287]; 07MCF6887 [MK491281]; 07MCF6896 [MK491306]; 07MCF8028 [MK491282]; 07MCF8228 [MK491279]; 07MCF8549 [MK491290]; 08MCF9078, [MK491277]; 08MCF10109 [MK491285]; 08MCF10272 [MK491286]; 08MCF10282 [MK491299]; 09MCF9816 [MK491298]; 09MCF11502 [MK491313]; 09MCF11527 [MK491315]; 09MCF13788 [MK491302]; 10MCF12021 [MK491289]; 10MCF12678 [MK491308]; 11MCF9817 [MK491291]; 11MCF12654 [MK491276 and MK491278]; 12MCF14080 [MK491311]; 12MCF13532 [MK491312]; 13MCF14623 [MK491301].

Notes — *Astraeus macedonicus* is known from deciduous forests in four Macedonian localities (the mountains located in the west, north, south and east part of the country). Morphologically, this species is very similar to *A. hygrometricus*, *A. pteridis* and *A. telleriae*, not only in its habitat but also in its microscopic characters, such as capillitium and spores; therefore all records (collected up to 2007) were previously published as *A. hygrometricus* (Karadelev et al. 2008). However, the Bayesian analyses, based on 53 collections from Macedonia, and a number of published sequences mainly from Phosri et al. (2007, 2013, 2014), Fangfuk et al. (2010) and Ryoo et al. (2017), clearly grouped eight Macedonian collections as a sister clade of *Astraeus ryoocheoninii*, a species described from Japan and Korea, and separated *A. hygrometricus*, *A. pteridis* and *A. telleriae*.



The 50% majority rule Bayesian tree inferred from ITS nrDNA sequences with the GTR+I+G model and using MrBayes v. 3.1.2 (Ronquist & Huelsenbeck 2003) for 2 M generations. Posterior probabilities values > 0.90 are marked as thick branches. In every collapsed clade, the number of sequences is indicated in or close to the triangle. *Astraeus macedonicus* holotype in **bold**. *Pisolithus arhizus* (GenBank AJ629887) and *Scleroderma verrucosum* (GenBank AJ629886) were included as outgroup.

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