



Towards a better understanding of *Tetrapyrgos* (Basidiomycota, Agaricales): new species, type studies, and phylogenetic inferences

AMY H. HONAN^{1,2*}, DENNIS E. DESJARDIN¹, BRIAN A. PERRY³, EGON HORAK⁴ & TIMOTHY J. BARONI⁵

¹Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132, USA

²Department of Biology, Western State Colorado University, 600 N. Adams St., Gunnison, CO 81231, USA

³Department of Biology, California State University East Bay, 25800 Carlos Bee Blvd., Hayward, CA 94542, USA

⁴Schlossfeld 17, A-6020 Innsbruck, Austria

⁵Department of Biological Sciences, SUNY College at Cortland, PO Box 2000, Cortland, NY 13045, USA

Abstract

Tetrapyrgos (Basidiomycota, Agaricales) is recognized as a genus characterized by basidiomes with a central or eccentric, well-developed stipe with a black to bluish black stipe base arising from a basal pad or disc; hyaline, inamyloid, distinctly tetrahedral basidiospores; non-gelatinous or weakly gelatinous pileipellis and pileus tramal tissues; and apically bulbous cheilocystidia with diverticulate central axis. It is distinguished from *Campanella*, which has basidiomes that are sessile or with a pseudostipe that lacks black or bluish black pigmentation, and does not arise from a pad or basal disc; basidiospores ellipsoid or bulging slightly on one side; strongly gelatinous pileipellis and pileus tramal tissues; and cheilocystidia typically with central portion of axis non-diverticulate. Analyses and taxonomic status of 16 species placed in *Tetrapyrgos* (and their reported synonyms) are provided, based on examinations of 80 recently collected specimens and 85 exsiccata. Nine species are recognized here in *Tetrapyrgos*, supported by morphological and molecular data, including two new species, *T. longicystidiata* and *T. parvispora*. The remaining 7 species are recognized as belonging in *Campanella* or are of uncertain taxonomic placement. Comprehensive descriptions for all accepted species, type studies, and phylogenetic inferences derived from ITS analyses are provided.

Key Words: agarics, fungal diversity, *Marasmiellus*, *Marasmius*, taxonomy

Introduction

The genus *Tetrapyrgos* originated as the monotypic genus *Pterospora* Métrod, based on *P. atrocyanea* Métrod described from Madagascar (Métrod 1949). Horak (1983) published a preliminary account of *Pterospora*, accepting 16 species, mainly transfers from the genus *Campanella*, and he included one new species. Horak (1987) later introduced the genus name *Tetrapyrgos* to replace *Pterospora* because the latter represented a homonym (non *Pterospora* Nuttall, Pyrolaceae). *Tetrapyrgos* is characterized, in part, by small basidiomes with pilei rarely greater than 10 mm diameter, a central to eccentric, black to bluish black stipe arising from a basal pad, a cutis-type pileipellis of loosely interwoven, diverticulate hyphae, cystidia with an often bulbous apex and diverticulate central axis, and hyaline, inamyloid, tetrahedral basidiospores. Members of *Tetrapyrgos* are reported to be saprotrophic (Horak 1987), with one unpublished report suggesting pathogenicity. The genus contains mostly species described from single collections, showing subtle morphological variation within species and limited morphological variation between species.

Singer (1986) did not recognize the genus *Pterospora*, retaining members either in *Marasmiellus* sect. *Nigripedes*, or in *Campanella* sect. *Campanella* subsect. *Campanella*. Pegler (1986) followed Singer's taxonomy, also retaining members of *Pterospora* as *Campanella* and *Marasmiellus*. Debate continues about the correct generic placement of species with some authors (Segedin 1993, May & Wood 1995) following Singer's (1986) taxonomy and others (Bulakh 2003, Petersen & Gordon 1994) following Horak's. Several molecular analyses have evaluated the phylogenetic placement of *Tetrapyrgos* using nLSU rDNA sequences. The euagarics phylogeny by Moncalvo *et al.* (2002) of 877 sequences indicated 3 species of *Tetrapyrgos* to be monophyletic and sister to the genus *Campanella*; together these were sister to what is currently accepted as the Marasmiaceae, but with low support (48% BS). Bodensteiner *et al.*