

Galerina Earle: A polyphyletic genus in the consortium of dark-spored agarics

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Abstract: The basidiomycete genus *Galerina* Earle accommodates more than 300 small brown-spored agarics worldwide, predominantly described from the Northern hemisphere. The delimitation of species and infrageneric units hitherto has been based on morphological and, to some extent, ecological characters. In this study we have analyzed nuclear ribosomal LSU and ITS sequences to reveal infrageneric phylogeny and the phylogenetic placement of *Galerina* among the dark-spored agarics. Sequences from 36 northern hemisphere *Galerina* species and 19 other dark-spored taxa were analyzed, some of them obtained from EMBL/GenBank. Our results, received from Bayesian and distance methods, strongly suggest that *Galerina* is a polyphyletic genus. The LSU analysis shows that *Galerina* is composed of three or four separate monophyletic main groups. In addition, a few species cluster together with other dark-spored agarics. The same groups are recognized in the ITS tree and they correspond roughly to previously recognized subgenera or sections in *Galerina*. With high support our LSU analysis suggests that *Gymnopilus* is a monophyletic genus and that *Gymnopilus* and one of the *Galerina* lineages ("mycenopsis") are sister groups. The analyses further indicate that the *Galerina* lineages, as well as the genus *Gymnopilus*, could be referred to a strongly emended family Strophariaceae, which corresponds largely to the family as circumscribed by Kühner (1980). Our results affirm that morphological characters often are highly homoplastic in the agarics. At the present stage formal taxonomic consequences or nomenclatural changes are not proposed.

Key words: Basidiomycota, Agaricales, brown-

spored agarics, Cortinariaceae, *Galerina*, *Gymnopilus*, Strophariaceae

INTRODUCTION

The genus *Galerina* (Basidiomycota, Agaricales) has more than 300 species (Horak 1994), predominantly described from the Northern hemisphere. Most species have basidiocarps associated with living bryophytes, probably as saprophytes on dead parts, whereas others are confined to woody material or other plant debris. The delimitation of species and infrageneric units hitherto has been based on morphological and, to some extent, ecological characters. The basidiocarps of *Galerina* are small and mycenoid, although sometimes they are slightly fleshier and occasionally the stipe is provided with a membranous annulus. Important gross-morphological characters separating the species include ecology, fruit body size, veil conditions, surface features of the pileus, insertment of the lamellae, color and lepto-organic characters (flavor and odor). In the majority of the species, the spores are ornamented and have a "plage" (a delimited smooth area on the adaxial side above the apiculus), but in some species they are ornamented also over the plage area or smooth. The spores in species provided with a plage are exceptional by having an inner wall layer, endospore, which inflates after successive exposure to diluted base and acid solutions, and furthermore this endospore is strongly dextrinoid and cyanophilic (the "ammonia-co-acetic treatment," Kühner 1972, 1980). A rich assortment of cystidia of different shapes and locations constitutes, in combination with spore characters, a fundament for recognition of the various *Galerina* species. In most cases microscopic examination is needed for species recognition and high quality optics often are required, and even then identifications may remain doubtful.

Current circumscription of the genus *Galerina* largely follows that of Kühner (1935), who excluded groups now placed in *Coscybe* s. lat. and included *G. marginata* and related annulate species that previously were referred to *Pholiot* (TABLE 1). This circumscription of *Galerina*, followed by a later segregation of the *G. stegani* group, has been generally accepted. However, Watling and Gregory (1993) in-

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Monograph On The Genus Galerina Earle

**Alexander Hanchett Smith, Vera Stucky
Evenson, Duane H. Mitchel**

Monograph On The Genus Galerina Earle:

A Monograph on the Genus Galerina Earle Alexander Hanchett Smith, Rolf Singer, 1964 *Monograph on the Genus Galerina Earle* Alexander H. Smith, Rolf Singer, 1970-01-01 **a monograph on the genus galerina earle** alexander smith, rolf singer, 1964 **Arctic and Alpine Mycology II** Gary A. Laursen, Joseph F. Ammirati, Scott A. Redhead, 2013-03-09

During the summer of 1980 the First International symposium on Arctic and Alpine Mycology ISAM I was held at the then extant Naval Arctic Research Laboratory near Barrow Alaska U S A well within the Arctic Circle Laursen and Ammirati Arctic and Alpine Mycology The First International symposium on Arctic Alpine Mycology Univ Wash Press 1982 The facility is currently owned and operated by the Utkeagvik Inupiat community and is named the National Academic and Research Laboratory thus retaining its acronym NARL Twenty five scientists participated in that historic first meeting Their interests in the fungi spanned a vast geographic area of cold dominated habitats in both the northern and southern hemispheres that included four continents N and S America Eurasia and Antarctica nine countries and numerous islands ranging from Greenland to Jan Mayen in the Svalbard group ISAM I helped to develop ongoing interests and initiate others This is what ISAM I founders hoped would happen As a result the organizing committee for ISAM II was formed Its mandate was to involve a maximum of one third new participants in future ISAM meetings divide the responsibility for organizing future meetings at sites located in areas of interest to research thrusts in Arctic and alpine environments keep the number of participants small enough to ensure manageability taking full advantage of field collecting opportunities with minimal complications and cost

Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan Michael A.

Castellano, 2003 This handbook is a companion to the Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan Gen Tech Rep PNW GTR 476 published in October 1999 It includes 73 record of decision ROD listed fungal species not contained in the first handbook as well as updated site field and collecting forms an expanded set of artificial keys to all fungal species from both handbooks and an updated partially illustrated glossary The main purpose of this handbook is to help facilitate the survey collection and handling of potential ROD listed fungal species by USDA Forest Service and USDI Bureau of Land Management employees Each species is represented by a condensed description a set of distinguishing features and information on substrate habitat and seasonality We also present a list of known sites within the range of the northern spotted owl a distribution map and additional references to introduce the available literature on a particular species

Ainsworth & Bisby's Dictionary of the Fungi Geoffrey Clough Ainsworth, 2008 This 10th edition of the acclaimed reference work has more than 21 000 entries and provides the most complete listing available of generic names of fungi their families and orders their attributes and descriptive terms For each genus the authority the date of publication status systematic position number of accepted species distribution and key references are given Diagnoses of families and details of orders and higher categories are included for all groups of fungi In addition there are biographic notes information on well

known metabolites and mycotoxins and concise accounts of almost all pure and applied aspects of the subject including citations of important literature Co published by Commonwealth Scientific and Industrial Research Organisation CSIRO

General Technical Report PNW-GTR ,2002 *The Macrofungus Flora of China's Guangdong Province* Zhishu Bi,1993

This is a comprehensive record of all the macrofungus found in Guangdong China in which 1 058 species under 239 genera 56 families 20 orders and 4 classes of Basidiomycotina and Ascomycotina are identified *The Veiled Species of Hebeloma*

in the Western United States Alexander Hanchett Smith,Vera Stucky Evenson,Duane H. Mitchel,1983 The most comprehensive study of the subgenus Hebeloma in the world **California Mushrooms** Dennis E. Desjardin,Michael G.

Wood,2025-05-01 Winner of the CBHL Award of Excellence California is one of the most ecologically rich and diverse regions of North America and home to hundreds of species of mushrooms In California Mushrooms mycologist experts Dennis Desjardin Michael Wood and Fred Stevens provide over 1100 species profiles including comprehensive descriptions and spectacular photographs Each profile includes information on macro and micromorphology habitat edibility and comparisons with closely related species and potential look alike Although the focus of the book is on mushrooms of California over 90% of the species treated occur elsewhere making the book useful throughout western North America This complete reference covers everything necessary for the mushroom hunter to accurately identify over 650 species

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