

MYCOTAXON

Volume 90, pp. 69-76

July-September 2004

A new species of *Pseudobaeospora* from California

DENNIS E. DESJARDIN

ded@sfsu.edu

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

Abstract – *Pseudobaeospora stevensii* sp. nov. is described from cypress and redwood forests in northern California. Diagnostic features include dark brown basidiomes lacking violet colors, conspicuous cheilocystidia, clamp connections, and tissues that turn olive to grass green or bluish green in alkaline solution. Notes on type studies of several temperate North American species referable to *Pseudobaeospora* are provided.

Key words – agarics, Basidiomycetes, taxonomy

Introduction

The genus *Pseudobaeospora* was established by Singer (1942, 1963) to accommodate *Baeospora oligophylla* Singer, a small, violet species described from the Altai Mountains of central Asia (Singer 1938). Since then, numerous species have been described in or transferred to *Pseudobaeospora*. The generic circumscription was redefined recently by Bas (2002, 2003), wherein he provided a key, full descriptions and illustrations of all known European species. Very few species attributable to *Pseudobaeospora* have been described or reported from temperate North America, and a critical study of North American taxa has not been published. It should be noted that all reported North American *Pseudobaeospora* form violet-colored basidiomes that do not discolor (red, green, blue or yellow-green) in KOH solution.

Recently, an undescribed species with basidiomes that lack violet or purple colors and that turn olive to grass green or bluish green in KOH solution was discovered in northern California, USA. The new species is associated with Monterey cypress (*Cupressus macrocarpa* Hartw. ex Gord.) and redwood (*Sequoia sempervirens* (D. Don) Endl.), two tree species endemic to coastal California. The species is described

below and compared with phenetically similar taxa. Color terms and notations are from Kornerup and Wanscher (1978). Spore statistics include: \bar{x} , the arithmetic mean of the spore length by spore width (\pm SD) for n spores measured; Q , the quotient of spore length and spore width in any one spore, indicated as a range of variation in n spores measured; Q_m , the mean of Q values.

Pseudobaeospora stevensii Desjardin sp. nov.

Figures 1-7

Pileus 4-20(-26) mm latus, obtuse conicus vel campanulatus, siccus, glabrus vel subrugosus, brunneus vel obscure castaneus, 3% KOH ope azureo-viridis. *Lamellae* subliberae, angustae, brunneae vel pallide aurantiobrunneae. *Stipes* 20-35 X 1-3 mm, cylindricus, siccus, apicaliter ex furfuraceo scabrosus, basin versus squamulis brunneis vel aurantiogriseis instructus, basaliter albidulostrigosus. *Colores* violacei desunt. *Basidiosporae* 3.2-4 X 2.8-3.2 μ m, ovoideae, subgloboae vel late ellipsoideae, leves, hyalinae vel pallide stramineae (in aqua), forte dextrinoideae, haud metachromaticae, membrana subincrassata instructae. *Basidia* 4 spora. *Cheilocystidia* 27-38 X 3.5-8 μ m, cylindrica vel clavata, hyalina, tenuitunicata. *Pleurocystidia* nulla. *Pileipellis* ex hyphis cylindricis appressisque, 3-8(-10) μ m diam. cutem formantibus, haud gelatinosis, membrana dextrinoidea, hyalina vel brunnea (pigmento intraparietali vel incrustato) instructis. *Hypodermium* subcellulare, haud gelatinosum. *Caulocystidia* 40-80 X 4-7 μ m, cylindrica vel clavata. *Fibulae* praesentes. *Caro* 3% KOH ope olivacea vel azureo-viridis. *Ad frustula dejecta sub Cupresso et Sequoiae. USA (California). Holotypus hic designatus: A.W. Wilson #133 (SFSU).*

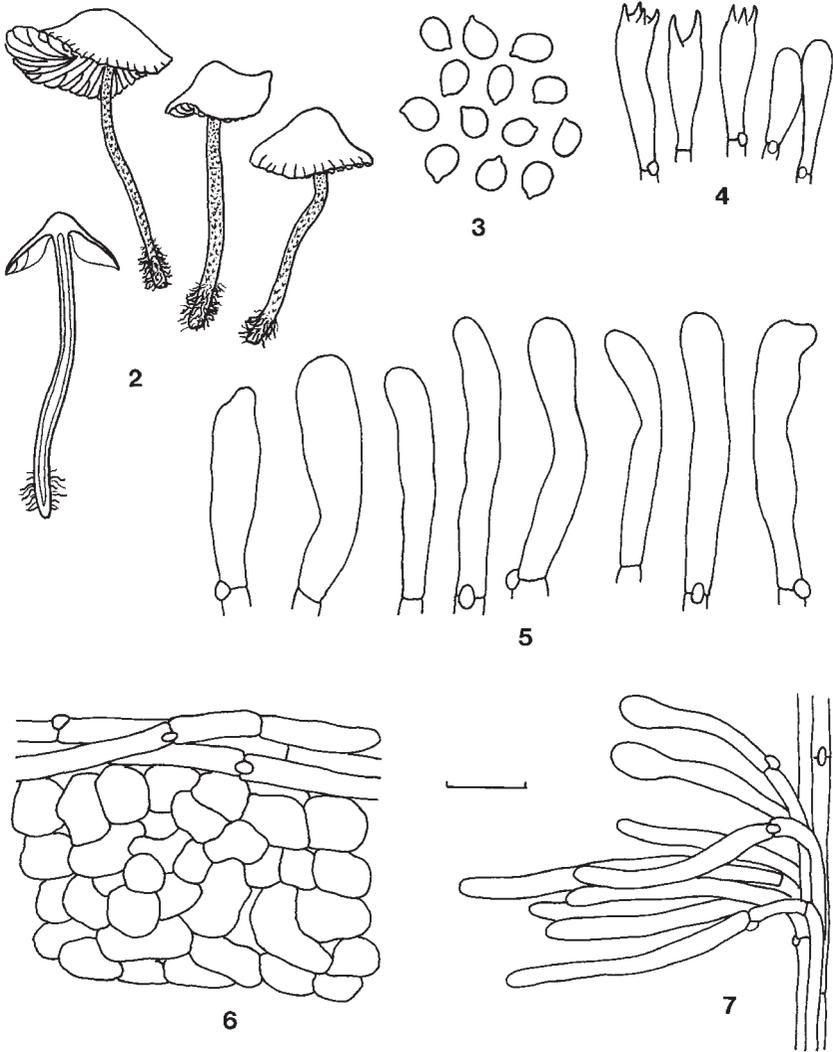
Etymology: Named in honor of Fred Stevens who discovered the new species and who has been instrumental in documenting the fleshy fungi of California.

Pileus (Figs. 1-2) 4-20(-26) mm diam, obtusely conical to campanulate, sometimes broadly campanulate at maturity with uplifted margins; margin even to striate or short-sulcate in age; surface dry, glabrous, smooth to wrinkled; when young disc dark brown to dark reddish brown (8-10F5-7) with a slightly paler reddish brown margin (8-9D5-7), in age becoming paler overall to light brown (7D5-6) or retaining a dark brown margin (5-8F8), lacking any violet or lavender tones; drying dark brown (7F5-8) overall; 3% KOH on pileus surface turning bluish green. **Context** 0.5-1 mm thick, pallid. Odor fungal. Taste slightly acrid and peppery. **Lamellae** subfree, close with 3-4 series of lamellulae, broad (3-4.5 mm), convex to ventricose, brownish orange (7C5) to brown (7D4-5), lacking violet or lavender tones; drying brown (7D-E5). **Stipe** 20-35 X 1-3 mm, central, cylindrical, fistulose, dry, apex furfuraceous to scabrous, squamulose elsewhere, base covered with long, strigose, off-white to pale orangish white (5-6A-B2) hairs; apex brown (7E7-8), base dark brown (7F7-8), with greyish orange (6B3) to pale brownish grey (6C3) squamules.



FIG. 1. Basidiomes of *Pseudobaespora stevensii* (AWW 133– Holotype). Scale: Twice natural size. A color photograph of this specimen may be viewed at www.mykoweb.com.

Basidiospores (Fig. 3) $3.2\text{--}4 \times 2.8\text{--}3.2 \mu\text{m}$ [$x = 3.45 \pm 0.26 \times 3.0 \pm 0.1 \mu\text{m}$, $Q = 1.1\text{--}1.3$, $Q_m = 1.14 \pm 0.08$, $n = 25$ spores), ovoid to subglobose or broadly ellipsoid with an eccentric hilar appendage, smooth, hyaline to pale yellow in H_2O , strongly dextrinoid, non-metachromatic, with relatively thick walls. **Basidia** (Fig. 4) $16\text{--}20 \times 4.5\text{--}5 \mu\text{m}$, clavate, 4-spored, rarely 2-spored, clamped. **Basidioles** (Fig. 4) clavate. **Cheilocystidia** (Fig. 5) common, lamellar edge sterile or heteromorphous with clusters of cheilocystidia, $27\text{--}38 \times 3.5\text{--}8 \mu\text{m}$, cylindrical to narrowly clavate or irregular in outline, hyaline, thin-walled, greenish in 3% KOH. **Pleurocystidia** absent. **Pileipellis** (Fig. 6) two-layered: suprapellis a thin (up to $30 \mu\text{m}$ thick) cutis of appressed, radially arranged, cylindrical hyphae $3\text{--}8\text{--}(10) \mu\text{m}$ diam, with repent to erect, cylindrical to clavate or fusoid terminal cells; walls non-gelatinous, dextrinoid, hyaline to brown in H_2O and 3% KOH; pigment intraparietal and incrusting; suprapellis overlaying a well-developed subpellis. **Subpellis** (Fig. 6) composed of inflated to irregular or puzzle-like hyphae (subcellular) $6\text{--}24 \mu\text{m}$ diam, forming a layer up to $100 \mu\text{m}$ thick; hyphae non-gelatinous, dextrinoid, hyaline to pale yellowish brown in H_2O , olive to grass green or bluish green in 3% KOH, pigment intraparietal. **Pileus trama** of interwoven, elongated, cylindrical hyphae $2.5\text{--}6 \mu\text{m}$ diam, non-gelatinous, weakly dextrinoid, hyaline to yellow in H_2O , vaguely green in 3% KOH.



FIGS. 2-7. *Pseudobaeospora stevensii* (AWW 133—Holotype). 2. Basidiomes. 3. Basidiospores. 4. Basidia and basidioles. 5. Cheilocystidia. 6. Pileipellis and hypodermium. 7. Caulocystidia. Scale bar: 2 = 10 mm; 3-5 = 10 μ m; 6-7 = 20 μ m.

Hymenophoral trama regular; hyphae 3-9 μm diam, similar to those in pileus trama. **Stipe tissues** monomitic. **Stipitipellis** a cutis of repent hyphae with clusters of erect caulocystidia; cortical hyphae 2.5-4 μm diam, non-gelatinous, dextrinoid, hyaline to pale brown in H_2O , olive to green in 3% KOH; medullary hyphae 2.5-10 μm diam, similar to cortical hyphae. **Caulocystidia** (Fig. 7) common, 40-80 X 4-7 μm , cylindrical to narrowly clavate, similar to the cheilocystidia, hyaline, thin-walled. **Clamp connections** present in all tissues.

Habit, habitat and distribution – Scattered to gregarious in leaf litter under Monterey cypress (*Cupressus macrocarpa*) or rarely under redwood (*Sequoia sempervirens*). Aug.-Dec. California.

SPECIMENS EXAMINED – UNITED STATES. CALIFORNIA: Marin Co., Audubon Canyon Ranch, Galloway Canyon, 11 Dec. 1979, *C. Calhoun* 79-1255. San Mateo Co., San Bruno, Skyline College campus, 1 Sept. 2001, coll. by F. Stevens, *AWW 133* (Holotype); same location, 26 Aug. 2001, *Stevens 8-26-01*; same location, 10 Sept. 2001, *Stevens 9-10-01*. All specimens deposited in SFSU.

Commentary – *Pseudobaeospora stevensii* is characterized by basidiomes that are dark brown overall (lacking any violet, lilac or lavender colors), and have very small, dextrinoid basidiospores, a two-layered pileipellis (with filamentous suprapellis and subcellular subpellis), 4-spored basidia, conspicuous narrowly clavate cheilocystidia and caulocystidia, and abundant clamp connections. It has been collected only in association with cypress and redwood in California. Within the genus *Pseudobaeospora*, the new species is unusual in forming dark brown basidiomes with tissues that turn olive to grass green or bluish green in 3% KOH. This microchemical reaction is reminiscent of that exhibited by a number of *Gymnopus* species allied with *G. alkalivirens* (Singer) Halling (cf. Halling 1979, 1981, 1990), and *Leucoagaricus* species (E. Vellinga, pers. comm.). Bas (2002, 2003) reports five other alkaline-virescent species of *Pseudobaeospora*; viz., *P. dichroa* Bas, *P. pallidifolia* Bas, A. Gennari & Robich, *P. pyrifera* Bas & L.G. Krieglst., *P. jamonii* Bas, Lalli & Lonati, and *P. mutabilis* Adamcık & Bas. The latter five species differ from *P. stevensii* by the following features. *Pseudobaeospora dichroa* differs in forming basidiomes with purplish brown to violet pilei and lamellae, lacks the two-layered pileipellis, and more importantly has a KOH reaction that is initially red, fading to yellowish green in time (Bas 2002, 2003). *Pseudobaeospora pallidifolia* differs in forming violet brown pilei with white to pinkish cream lamellae, larger basidiospores (4.5-6 X 3-4.5 μm), lacks cheilocystidia and lacks the two-layered pileipellis (Bas et al. 1997; Bas 2003). *Pseudobaeospora pyrifera* differs in forming dark purplish to vinaceous brown or pinkish brown pilei, reddish violaceous lamellae, a dark reddish brown stipe, has broader cheilocystidia (up to 13 μm diam.), and also lacks the two-layered pileipellis (Bas and Krieglsteiner 1998; Bas 2003). *Pseudobaeospora jamonii*, shares with *P. stevensii* the two-layered pileipellis, narrowly clavate cheilocystidia and

small basidiospores, but differs significantly in forming greyish purple to violaceous brown pilei, lilac to yellowish grey lamellae, a lilac to purplish brown stipe, has a paler green KOH reaction, and is associated with *Alnus*, *Fraxinus*, *Fagus*, *Corylus* and *Picea* (Bas et al. 2002; Bas 2003). *Pseudobaespora jamonii* is known at present only from northwestern and central Italy. *Pseudobaespora mutabilis* differs in forming dark violaceous grey-brown pilei with pinkish grey margins, violet lamellae, broadly clavate cheilocystidia 7-11(-18) μm in diam., and a hymeniform pileipellis of erect chains of inflated cells. The latter species is associated with *Molinia*, *Frangula* and *Betula* and is known at present only from the type locality in Slovakia (Adamcák and Bas 2002; Bas 2003).

Notes on North American *Pseudobaespora* – Few species of *Pseudobaespora* have been reported from temperate North America. Coker (1929) reported *Prunulus syringeus* Murrill from North Carolina. It was described originally from Jamaica, and is now known as *Pseudobaespora murrillii* E. Horak (1964; a new name, non *Pseudobaespora syringea* Singer). Smith (1947) mentioned this species (as *Mycena syringea* (Murrill) Murrill) and suggested that it was similar to *Tricholoma microsporum* Ellis, which he collected in Michigan, New York, Ontario and California. Although Smith studied the type specimen of *Pr. syringeus* (NY), the holotype packet is now empty so I was unable to obtain any microscopic data (pers. obs.). I have collected numerous specimens of what Coker (1929) called *Pr. syringeus* from North Carolina, Tennessee and other areas in the Appalachian Mts., and the latter species forms deep violet basidiomes with abundant clamp connections, no cheilocystidia, has a cutis-type pileipellis of hyphae 5-12 μm diam, lacks a subcellular hypodermium, and does not discolor in KOH. Whether this is the same species as that from Jamaica cannot be determined at present. The type of *Tricholoma microsporum* was distributed as part of the Ellis and Everhart, North American Fungi Exsiccata, as #2003, from Newfield, New Jersey. I have studied several representative specimens (K, NY, SFSU) and this species forms violet basidiomes with a thin cutis-type pileipellis that overlays a subcellular hypodermium, has dextrinoid basidiospores 4-5 X 3.5-4.5 μm , lacks cheilocystidia, lacks clamp connections, and does not discolor in KOH. Clearly, it is distinct from *Pr. syringeus* sensu Coker.

Agaricus fuscolilacinus Peck (1886) was described from the Adirondack Mts. of New York, and was reported to form watery-brown to lilac-brown, glabrous pilei, close, adnexed, brownish lamellae, and a brown stipe with pruinose apex and white, villose hairs at the base. An analysis of the holotype specimen (NYS!) revealed the following features: *Basidiospores* 4.2-6.8 X 3.2-4 μm [\bar{x} = 5.2 \pm 0.6 X 3.5 \pm 0.2 μm , Q = 1.2-2, Q_m = 1.5 \pm 0.2, n = 30], ellipsoid to lacrymoid, thick-walled, smooth, inamyloid to weakly dextrinoid. *Basidia* 16-20 X 4-5 μm , 2-spored. *Cheilocystidia* absent. *Pileipellis* a hymeniform layer of broadly clavate cells 12-26 X 7-14 μm , sometimes in chains, thin-walled, subhyaline to pale ochraceous in KOH, inamyloid. *Tramal hyphae* 4-12 μm

diam, hyaline, inamyloid, thin-walled, non-gelatinous. *Stipe vesture* a tangled layer of hyaline to pale yellow hyphae 2-5 μm diam, cylindrical, inamyloid, with a few erect, cylindrical to vesiculose caulocystidia. *Clamp connections* present. This species belongs in *Pseudobaeospora* where it is allied with *P. mutabilis*. A formal transfer will not be made until more specimens from the Adirondack Mts. referable to *A. fuscolilacinus* are collected for comparison. The latter species differs from *P. stevensii* in forming larger basidiospores on 2-spored basidia, in lacking cheilocystidia, and in lacking a two-layered pileipellis.

Pseudobaeospora pillodii (Quél.) Wasser was reported from British Columbia, Canada by Redhead (1982). Bas (2003) suggested that Redhead's material may represent *P. oligophylla* (Singer) Singer, a species accepted by Redhead as a synonym of *P. pillodii*. These two taxa differ only subtly in pileipellis anatomy. Nonetheless, both taxa are quite distinct from *P. stevensii* in forming lilac to purple basidiomes that lack cheilocystidia, lack clamp connections, and do not discolor to green in KOH.

Acknowledgments

I would like to thank Dr. Fred Stevens for bringing this new species to my attention and for all of his fine contributions to mycology in California. I thank Andrew Wilson for taking notes on fresh material of the holotype specimen, Dr. Egon Horak for correcting the Latin diagnosis, and Dr. Else Vellinga and Brian Perry for reviewing the manuscript and for providing helpful comments and obscure literature.

Literature Cited

- Adamec S, Bas C. 2002. *Pseudobaeospora mutabilis*, a new species discovered in Slovakia. Mycotaxon 84: 272-275.
- Bas C. 2002. A reconnaissance of the genus *Pseudobaeospora* in Europe I. Persoonia 18: 115-122.
- Bas C. 2003. A reconnaissance of the genus *Pseudobaeospora* in Europe II. Persoonia 18: 163-199.
- Bas C, Gennari A, Robich G. 1997. *Pseudobaeospora pallidifolia* Bas, Gennari & Robich. Una nuova specie dall'Italia. Riv. Micol. 40(3): 195-199.
- Bas C, Kriegelsteiner L. 1998. *Pseudobaeospora pyrifer*, a new species found in southern Germany and The Netherlands. Z. Mykol. 64(2): 203-206.
- Bas C, Lalli L, Lonati G. 2002. *Pseudobaeospora jamonii*, una nuova specie in Italia. Micol. Veget. Medit. 17(1): 31-35.
- Coker WC. 1929. Notes on fungi. J. Elisha Mitchell Sci. Soc. 45: 164-178.
- Halling R. 1979. Notes on *Collybia*. I. *Collybia alkalivirens*. Mycotaxon 8: 453-458.
- Halling R. 1981. Notes on *Collybia*. II. Additional taxa that are green in alkaline solution. Mycologia 73: 634-642.
- Halling R. 1990. *Collybia fuscopurpurea* in the Americas. Mycol. Res. 94: 671-674.
- Horak E. 1964. Notes sur *Pseudobaeospora* Singer. (1942), excl. *Lepiota*, sect. *Sericellae*. Rev. Mycol. France 29: 72-81.

- Kornerup A, Wanscher JH. 1978. Methuen handbook of colour. 3rd Ed. Eyre Methuen, London. 252 p.
- Peck CH. 1886. Report of the botanist. Ann. Report N.Y. State Mus. 39: 30-73.
- Redhead SA. 1982. *Pseudobaeospora pillodii*. Fungi Canadensis 217.
- Singer R. 1938. Notes sur quelques Basidiomycètes. Rev. Mycol. France 3: 187-199.
- Singer R. 1942. Type studies on agarics. Lloydia 5: 97-135.
- Singer R. 1963. The delimitation of the genus *Pseudobaeospora*. Mycologia 55: 13-17.
- Smith AH. 1947. North American species of *Mycena*. Univ. of Michigan Press, Ann Arbor, Michigan. 521 p.