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Morchella tomentosa*, a new species from western North America, and notes on *M. rufobrunnea

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Abstract — A new species of *Morchella*, *M. tomentosa*, is described from western North America; the range of *M. rufobrunnea*, previously documented from Mexico's Gulf Coast, is extended to California and Oregon; the history of taxonomic names applied to *M. rufobrunnea* on the West Coast is discussed.

Key words — morels, taxonomy

Introduction

Over 500 North American collections of *Morchella* were solicited from amateur collectors or made by the author from 2002 to 2007 as part of an effort known as the Morel Data Collection Project (MDCP). Preliminary molecular results (see Kuo 2005, 2006) revealed over a dozen genetically distinct morels among the collections. While several of these putative species are morphologically cryptic, as yet poorly documented, or otherwise insufficiently understood, two morels from western North America are easily distinguished morphologically and ecologically. One is *M. rufobrunnea*; the other, *M. tomentosa*, has been informally described (Kuo 2005, 2006, McFarlane et al. 2005, Pilz et al. 2004, 2007) but not previously given formal taxonomic status.

Taxonomy

Morchella tomentosa M. Kuo, sp. nov.

PLATE 1

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Ascomata (40)50–120 mm alta; capitulum subconicum vel subcylindricum vel ovoideum; costae tomentosae, canae vel atrae, interdum pallescens; hymenium atrum, interdum pallescens; stipes tomentosus, ater, interdum pallescens; pili 100–400 × 7–28 μm; bruni in 2% KOH.

HOLOTYPE. *Biotopium in silvis coniferibus incensis*; 1,200 m. altitudinis; USA, in Montanaense, ad Mineral County; S. Engstrom col.; MDCP 06150405; specimen typicum in Herb. F. conservatum.

ASCOMATA (40)50–120 mm high. HYMENOPHORE (20)30–110 mm high; (15)30–50 mm wide at the widest point; subconic to subcylindric or ovoid; pitted and ridged; with 18–26 primary vertical ridges and numerous shorter, secondary vertical ridges and transecting horizontal ridges; attached to stipe with a sinus about 1–2 mm deep and 1–2 mm wide. RIDGES densely tomentose; black, silvery black, brownish black, brownish gray, watery gray, brown, or brownish when young; becoming gray, grayish, pale tan, or whitish with maturity; bluntly rounded when young, but with age often flattened or eroded, revealing the whitish context beneath. PITS primarily vertically elongated by maturity but irregularly shaped when young; glabrous; opening and deepening with development; progressing from gray or nearly black when immature to gray, watery gray, brown, yellowish tan, or nearly white (especially when exposed to prolonged sunlight) at maturity. STIPE 20–60 mm high; 10–40 mm wide; often basally clavate to subclavate; flared slightly to apex; densely tomentose and gray to black when young, becoming finely tomentose or nearly glabrous and gray to tan, watery brownish, or nearly white, with brownish tufts of separated tomentum. CONTEXT whitish; 1–5 mm thick in the hollow hymenophore; in the stipe chambered or layered. STERILE INNER SURFACE whitish and pubescent.

CHEMICAL REACTIONS (tested on MDCP 08070404, two days after collection): Ammonia very pale orange, then grayish on sterile inner surface and context, negative on hymenium; KOH (5%) negative on all surfaces; FeSO₄ negative on all surfaces.

ASCOSPORES elliptical; smooth; contents homogeneous; (15)18–20(22.5) × (7.5)8–12.5(15) μm; average Q=1.87. ASCI 8-spored; 225–290 × 12.5–20 μm; cylindrical; hyaline. PARAPHYSES cylindrical to subclavate; apices rounded to subacute; with 2–5 septa; hyaline or with brown to brownish homogeneous contents in KOH (2%); (125)150–175(225) × 5–10(15) μm. RESIDUAL PARAPHYSES on sterile ridges similar to paraphyses; hyaline or with brownish contents; bundled. HAIRS ON STERILE RIDGES projecting from residual paraphyses; variable in shape (cylindric, clavate, subclavate, lageniform, or subcapitate); 120–250(400) × 7.5–15(25) μm; abundant; with brown to brownish contents in KOH (2%); septate; often with thickened walls. HAIRS ON STIPE SURFACE abundant; cylindrical to subclavate; septate; 100–275 × 10–17 μm; with brown walls in KOH (2%); contents hyaline to brownish.

ECOLOGY — Appearing at altitudes of 1,000–3,400 m in lightly to moderately burned conifer forests including forests dominated by *Pseudotsuga menziesii* (Mirb.) Franco on the West Coast and forests dominated by *Picea engelmannii* Parry and *Abies lasiocarpa* (Hook.) Nutt. or *Pinus contorta* var. *latifolia* Engelm. in the Rocky Mountains. Found primarily in years following forest fires but

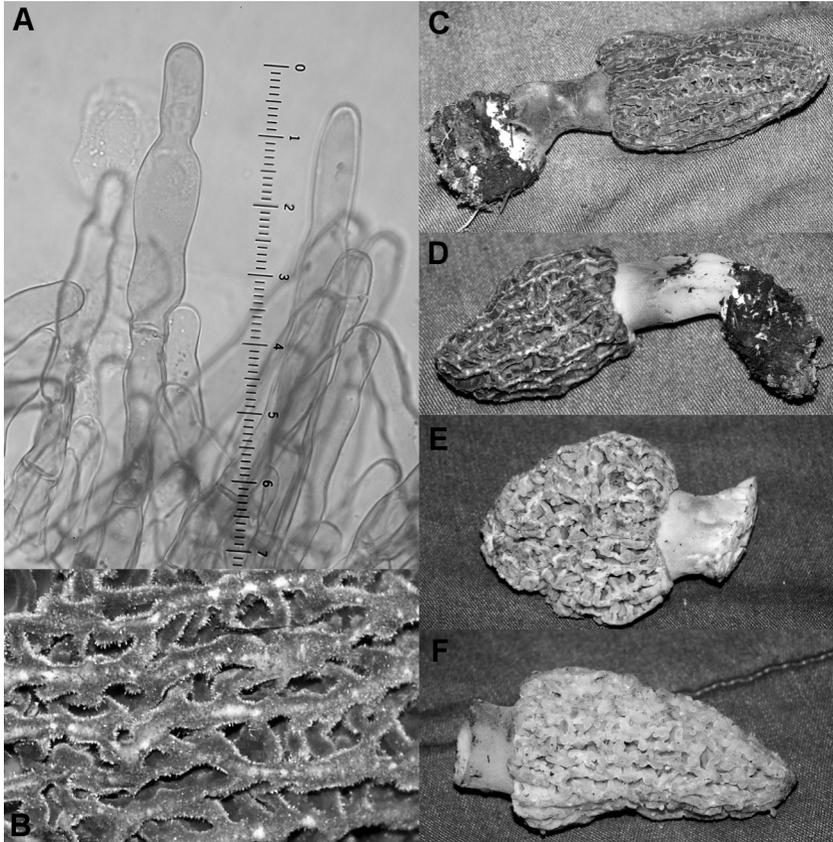


PLATE 1. *Morchella tomentosa*. A: Pigmented hairs on stipe surface (scale: $\times 2.5 \mu\text{m}$). B: Tomentose ridges of young hymenophore. C: Holotype specimen (about half life size). D, E, F: Isotype specimens (about half life size), demonstrating morphological variability.

often appearing in dwindling numbers for several seasons thereafter; Alaska, the Yukon Territories, Montana, Idaho, Oregon, and Colorado; May through August.

SPECIMENS EXAMINED — UNITED STATES OF AMERICA: MONTANA—05300402 (May 30, 2004; Ravalli County, S. Schwartzman); 06100102 (June 10, 2001; Ravalli County, J. Holmes); 06150402, 06150403, 06150405 HOLOTYPE, 06150406, 06150407, 06150409 (June 15, 2004; Mineral County, S. Engstrom); 06170402 (June 17, 2004; Missoula County, S. Engstrom); 06180401, 06180402, 06180403, 06180404, 06180405, 06180406, 06180407, 06180408, 06180409, 06180413, 06180414, 06180415, 06180420, 06180421 (June 18, 2004; Mineral County, S. Engstrom); 06300401, 06300402, 06300403, 06300404, 06300406, 06300408 (June 30, 2004; Missoula County, S. Engstrom); 07010401, 07010402, 07010403, 07010404 (July 1, 2004; Missoula County, S. Engstrom); 07070402, 07070403, 07070407 (July 7, 2004; Missoula County, S. Engstrom); 07130401,

07130406, 07130407, 07130408, 07130409 (July 13, 2004; Missoula County, S. Engstrom); 07140401, 07140402, 07140403 (July 14, 2003; Missoula County, S. Engstrom). IDAHO—06040401 (June 4, 2004; Valley County, K. Greger); 06180423 (June 18, 2004; Valley County, K. Greger); 06190401 (June 19, 2004; Valley County, K. Greger). OREGON—04070402 (April 7, 2004; Lane County, M. Sheller); 08070404 (August 7, 2004; Jefferson County, M.C. Carter). COLORADO—08310301 (August 31, 2003; La Plata County, G. Fitzgerald). Accession numbers are from the Morel Data Collection Project. All collections are housed in the Mycology Collection of the Field Museum of Natural History (F), Chicago.

COMMENTS — The densely tomentose (and frequently black) surfaces of young specimens of *Morchella tomentosa* separate it easily from other species of *Morchella*—though older specimens (especially those that have been exposed to prolonged sunlight) may have eroded ridges and paler colors that approximate the colors of *M. esculenta*-like yellow morels, leading to confusion. However, pale and less tomentose specimens still demonstrate pigmented hairs on the sterile ridges and stipe surface and can thus be separated microscopically. *Morchella tomentosa* is known as the “gray morel” by commercial collectors in western North America; eastern and Midwestern collectors, however, use the same term for immature forms of *M. esculenta*-like yellow morels.

In North America *Morchella tomentosa* has been described by Pilz et al. (2004) as “PS D” (putative species D); by Kuo (2005) as the “black foot morel”; by Kuo (2006) as the “fuzzy foot morel”; and by Pilz et al. (2007) as the “gray morel.” Additionally, the name *M. atrotomentosa* has been applied (McKnight & McKnight 1987) to a western North American burn-site morel that arguably meets the description of *M. tomentosa*. However, *M. atrotomentosa* is an invalid taxon (McFarlane et al. 2005, Pilz et al. 2007); the basionym was originally published by Moser (1949) as a temporary (ad interim) taxon. No type collection was designated for Moser’s “*Morchella esculenta* (L.) var. *atrotomentosa* nov. var. ad. [sic] int.,” which Moser (1949) documented fairly rigorously as a burn-site morel from the Alps that shares many of the morphological features emphasized for the present species—including the dark, tomentose hymenophore and stipe and the pigmented hairs. Thus the epithet *tomentosa* is chosen in part to reflect potential continuity with Moser’s invalid taxon while also acknowledging that the North American species, while always tomentose, is not always black-tomentose. Moser described only a black to blackish brown hymenophore and stipe.

Jacquetant (1984) described and illustrated “*Morchella atrotomentosa* (Moser) Bride.” While the watercolor illustrates a species similar to *M. tomentosa*, the description is inadequate for thorough comparison, and Jacquetant does not document any material examined. Further, no reference is provided for the Bride authority. Attempts to locate a publication by Bride, or a citation for a publication by Bride, have been unsuccessful. Moreover, the combination “*M.*

atroto mentosa (Moser) Bride” is built on an invalid basionym. Validation of Moser’s name would have required a proposal to conserve—a conspicuous maneuver that would be easily discovered in standard taxonomic references.

***Morchella rufobrunnea* in California and Oregon**

Morphological analysis and preliminary molecular results (see Kuo 2005, 2006) indicate that the winter-fruiting yellow morel from West-Coast landscaping sites is *Morchella rufobrunnea* Guzmán & F. Tapia. This species is quite distinct and well characterized by its ecology, its abruptly conical young cap with pale ridges and nearly black pits, and its rufescence.

Guzmán & Tapia (1998) described *Morchella rufobrunnea* based on Mexican collections from Xalapa, Veracruz, on Mexico’s Gulf Coast, made along a roadbed and in a garden. Collections from landscaping and similar disturbed-ground sites in California and Oregon matching the *M. rufobrunnea* isotype (MDCP 06059601) have been studied (see Specimens Examined, below). All specimens demonstrate a morphology consistent with the original description of the species.

Since *Morchella rufobrunnea* is so visually distinct it can often be recognized in photographs; the species appears to have been described as “*M. deliciosa*” and as “*M. esculenta*” by western North American authors. Arora (1986) depicts a “coastal Californian form of *Morchella deliciosa*” growing “in gardens and other suburban habitats” that appears to match *M. rufobrunnea*. Photographs of California collections of “*M. deliciosa*” in Wood & Stevens (2007) also match *M. rufobrunnea*; the authors describe a mushroom occurring “in bark/wood chips of fresh landscaping or in disturbed locations, e.g. near compost heaps, fire pits, dirt basements, logging roads etc.” Additionally, photographs of “*M. esculenta*” in Ower (1982) suggest that the species cultivated by Ower (and, later, others) was *M. rufobrunnea*. I have examined cultivated morels from Diversified Natural Products (MDCP 03110601, produced in Michigan) that also match *M. rufobrunnea*, and represent an original California collection (G. Mills, pers. comm.)

SPECIMENS EXAMINED — MEXICO: VERACRUZ—06059601 (June 5, 1996; Xalapa, G. Guzmán; ISOTYPE). UNITED STATES OF AMERICA: CALIFORNIA—03180301 (March 18, 2003; Solano County, W. Andrew); 03300302 (March 30, 2003; Sacramento County, D. Kimberling); 03180401 (March 18, 2004; Ventura County, R. Sharman); 12110401 (December 11, 2004; San Diego County, C. Nielsen); 03060501 (March 6, 2005; Santa Clara County, M. Munch); 03270501 (March 27, 2005; Siskiyou County, J. Plischke); 03290501 (March 29, 2005; Tulare County, J. Plischke). OREGON—03080501 (March 8, 2005; Jackson County, J. Petersen). MICHIGAN—03110601 (March 11, 2006; produced in Mason County, M. Kuo). Accession numbers are from the Morel Data Collection Project. All collections are housed in the Mycology Collection of the Field Museum of Natural History (F), Chicago.

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