

# Appendix A11: Draft Keys to Species of *Amanita* Subsection *Vittadiniae*

Rodham E. Tulloss, P. O. Box 57, Roosevelt, New Jersey 08555-0057, USA  
Last change - May 16, 2003 12:32 pm

## REVISED KEY TO THE STIRPES OF SUBSECTION VITTADINIAE

1. Basidia with clamps.
  2. Having a pileus suggesting that of *Strobilomyces floccopus* (Vahl:Fr.) P. Karst., a gray annulus that becomes progressively darker from the stipe attachment to its almost black edge, small spores (8 - 9 × 6 - 7 μm); fruiting bodies with dominantly 4-spored basidia, salmon colored lamellae, etc.; known only from the U.K. where it may have been introduced—possibly from New Zealand.....  
*A. inopinata* D. A. Reid & Bas.
  2. Not having this combination of characters.
    3. Spores broadly ellipsoid to elongate; **Q** = 1.2 - 1.5. Universal veil on stipe as scattered remnants or, more rarely, concentrated near base or indistinct.
      4. Remnants of universal veil on stipe scattered, indistinct or concentrated below and then forming scales or warts at top of basal bulb .....  
*Stirps Vittadinii.*
      4. Remnants of universal veil ocreate—forming a more or less distinct sock (in exsiccata sometimes even with a narrow, free limb) around base of stipe that is not, or barely, enlarged.....  
*Stirps Nana.*
    3. Spores globose or broadly ellipsoid or ellipsoid; **Q** = 1.05 - 1.34. Remnants of universal veil on stipe lanose-floccose to floccose-squamulose and concentrated at middle part of stipe, just below level where margin of pileus has touched stipe before expansion.....  
*Stirps Nauseosa.*
1. Basidia lacking clamps.
  5. Spores averaging ≤ 10 μm long.
    6. Universal veil floccose; from non-forest habitat; spores globose to subglobose, slightly thick-walled.....  
*Stirps Thiersii.*
    6. Universal veil as flattened warts on pileus and squamules on stipe; from montane *Quercus* forest; spores broadly ellipsoid to ellipsoid, thin-walled; known from Honduras.....  
*Amanita sp. Vitt1.*
  5. Spores averaging > 10 μm long, with **Q** = 1.75 - 1.85.....  
*Stirps Hesleri.*

## STIRPS HESLERI

1. Universal veil on pileus as thick, whitish warts; spores 12 - 15 × 7 - 8 μm, with est. **Q** = 1.8; known from South Africa and occurring there under *Quercus* *palustris*.....  
*A. veldiei* D. A. Reid & Eicker *nom. inval.*
1. Warts dark-colored; 95% of spore lengths under 12.5 μm; known from the eastern U.S.A. or eastern Asia (China and Japan).

2. Universal veil as brownish gray to dark gray to blackish, small to rather coarse, subconical to rather flat warts; spores (7.5-) 8.5 - 11.5 (-12.0)  $\times$  6.5 - 8.0 (-9.0)  $\mu\text{m}$ , with  $Q = 1.41 \pm 0.09$ ; known from forests in southern China (Hainan Prov.) and Japan.....  
*A. zangii* Zhu L. Yang, T. H. Li & X. L. Wu  
 = *A. areolata* T. Oda, C. Tanaka and Tsuda.
2. Universal veil on pileus as dense brown to dark brownish gray, low pyramidal warts; spores (8.5-) 9.5 - 12.5 (-16.1)  $\times$  5.2 - 6.6 (-7.5)  $\mu\text{m}$ , with  $Q = 1.75 - 1.84$ ; known from forests, including those with *Pinus*, from North Carolina and Tennessee to Mississippi, U.S.A.....  
*A. hesleri* Bas.

STIRPS NAUSEOSA

1. Universal veil strongly yellow or yellow-orange from immature stage.
  2. Pileus white; universal veil pale to light yellow; partial veil white; pileipellis said to be a cutis and gelatinizing; spores globose; described from stands of bamboo (*Phyllostachys sp.*) in Japan.  
*Amanita flavofloccosa* Nagas. & Hongo.
  2. Pileus yellow; universal veil yellow-orange; partial veil yellow-orange; pileipellis lacking; spores (6.1-) 6.3 - 8.0 (-8.5)  $\times$  (4.8-) 5.3 - 6.6 (-7.4)  $\mu\text{m}$ , with  $Q = 1.16 - 1.17$ ; known from tropical forest in Mexico and Panama.....  
*Amanita sp. Vitt2.*
1. Universal veil white or pallid or pinkish at least at first, possibly staining yellow, brown, etc. with age or handling.
  3. Pileus yellowish brown to pale tawny brown; lamellae cream to whitish, sometimes with pinkish tint; stipe surface tawny brown, white and floccose below, bruising ochraceous buff; partial veil floccose-squamulose; universal veil on stipe as tawny brown squamules; spores 7.3 - 8.7  $\times$  5.7 - 8.0  $\mu\text{m}$ , with  $Q = 1.28$ ; described from Sri Lanka .....  
*Amanita manicata* (Berk. & Broome) Pegler.
  3. Partial veil membranous, although sometimes fragile and fugacious; spore shape tending to vary greatly within a species.
    4. Pileus, lamellae, stipe, annulus, and context tending to become *Cartridge Buff* to faintly pinkish; odor sweet like scented soap at first, like boiling glue in age; spores 7 - 9.2 (-10)  $\times$  6.75 - 9 (-9.5)  $\mu\text{m}$ , with  $Q = 1.05$  or 7.2 - 9  $\times$  6.2 - 7.2  $\mu\text{m}$ , with  $Q = 1.2$  or 10 - 11 (-16)  $\times$  7 - 9.75 (-12)  $\mu\text{m}$ , with  $Q = 1.25$ ; described from South Africa; occurring in fields.....  
*Amanita roseolens* (Pearson & Stephens) Bas.
    4. Pileus white to cream to pale creamy buff to buff prior to strong bruising reaction; surfaces and context becoming a shade of brown when bruised; partial veil membranous, but fragile and fugacious; odor foetid, not sweet and pleasant at first.
      5. Pileus occasionally with yellowish ocher tints, with marked sterile margin; stipe below annulus covered densely with buffy brown squamules, becoming orange-brown to reddish brown on bruising; spores said to be of two forms—7 - 9  $\times$  6.2 - 8  $\mu\text{m}$ , with est.  $Q = 1.15$  and 9 - 10  $\times$  6 - 6.2  $\mu\text{m}$ , with est.  $Q = 1.55$ ; spores from a paratype examined by me are (8.3-) 9.0 - 10.5 (-11.5)  $\times$  7.0 - 8.4 (-9.0)  $\mu\text{m}$ , with  $Q = 1.29$ ; described from South Africa; occurring in grassy areas such as playing fields .....  
*Amanita foetidissima* D. A. Reid & Eicker *nom. inval.*
  5. Pileus sometimes with pinkish or reddish tint, without sterile margin; stipe whitish at first, bruising yellow-brown to orange-brown to brown; spores (6.0-) 7.0 - 10.0 (-13.5)  $\times$  (4.9-) 6.1 - 8.3 (-11.1)  $\mu\text{m}$ , with  $Q = (1.08-) 1.09 - 1.33 (-1.34)$ ; known from the regions bordering on, as well as islands in, the Gulf of Mexico and the Caribbean Sea as well as from Botanical Gardens at Kew, Edinburgh, and Mexico City; reported from eastern Australia (??); naturally occurring in grasslands as well as in lawns and gardens.....  
*Amanita nauseosa* (Wakef.) D. A. Reid.

STIRPS *THIERSII*

1. Basidiocarp pale yellow to golden yellow at maturity; partial or universal veil orange-yellow to orange; stipe lacking a bulb.
2. Pileus and stipe pale yellow to golden yellow; universal veil as orange-yellow, floccose-squamulose covering; spores (6-) 7 - 8.5 (-9) × (6-) 6.5 - 8.5 μm, with **Q** = 1.0 - 1.1; described from dry forest central Africa .....  
*Amanita aureofloccosa* Bas.
2. Entire fruiting body exterior white at first; pileus becoming pale yellow with cinnamon volval scales; lamellae pale cream; annulus membranous, but disintegrating, white at first, becoming orange; spores 7.3 - 9.6 × 6.4 - 7.7 μm, with **Q** = 1.07; described from Maharashtra state, India .  
*Amanita albofloccosa* A. V. Sathe & S. D. Deshp.
1. Basidiocarp white, whitish, or yellow or with pink tinges, and (in one case) with pale gray universal veil; neither partial veil nor universal veil orange-yellow or orange; stipe having a bulb.
3. Odor strong and unpleasant in mature material. Pileus with rather indistinct wart to patch-like remnants of felted-subpulverulent universal veil, glabrescent with age; stipe with rather large bulb; spores 8 - 9.5 × 7.5 - 9.0 - 1.1 (-1.2) μm, with **Q** = 1.0 - 1.1 (-1.2); described from Argentina .....  
*Amanita foetens* Singer var. *foetens*.  
and *Amanita foetens* var. *grassii* Raithel.
3. Odor indistinct; pileus of young specimens covered with lanose-floccose universal veil; stipe subbulbous.
4. Basidiocarp thickset; taste not bitter; flesh subflavescent; spores 8 - 9.5 (-10) × 8 - 9 (-10) μm, with **Q** = 1.0 - 1.05; described from South Africa .....  
*Amanita praeclara* (Pearson) Bas.
4. Basidiocarp slender; taste bitter or not; context of pileus white, unchanging.
5. Universal veil white; taste bitter; spores (7.3-) 7.8 - 9.8 (-11.0) × (7.0-) 7.3 - 9.0 (-10.0) μm, with **Q** = 1.05 - 1.07; described from lawns in Texas, U.S.A.; occurring in lawns and open places from states bordering on the southern Mississippi River westward into Kansas, Oklahoma and Texas and in central Mexico .....  
*Amanita thiersii* Bas  
≡ *Amanita alba* Thiers non Pers.
5. Universal veil pale gray; taste indistinct; spores 6.9 - 9.0 (-9.3) × 6.4 - 8.5 (-9.2) μm, with **Q** = 1.08; occurring in tropical forest in Panama.....  
*Amanita* sp. *Vitt3*.

STIRPS *VITTADINII*

1. 95% of spores with length ≤ 9.5 μm or with **Q** rarely > 1.45 and then 95% of spores with length ≤ 11.5 μm.
2. Spores with length ≥ 10.0 μm common—considerably greater than 5% of spores.
3. Stipe with bulb at base.
4. Stipe having subnapiform bulb; pileus white to grayish brown; spores (6.5-) 7.2 - 10.8 (-13.5) × (6.0-) 6.2 - 8.5 (- 9.5) μm, with **Q** = 1.14 - 1.22 (-1.27); known from wet savanna in Dpto. Meta, Colombia .....  
*Amanita savannae* Tulloss & Franco Molano *nom. prov.*
4. Stipe having narrow, fusiform bulb; fruiting body small and entirely white; spores 9.2 - 11.2 (-12.0) × (7.2-) 7.8 - 9.0 (-10.2) μm, with **Q** = 1.15 - 1.30; known from botanical garden of worldwide desert flora, Arizona, U.S.A .....  
*Amanita* sp. *Vitt5*.
3. Stipe lacking bulb.

5. Elements of universal veil on pileus largely periclinally oriented where present, but moderately frequently also in anticlinally oriented in isolated tufts; lamellae salmon to pinkish to cream; spores (6.0-) 7.5 - 11.0 (-15.4)  $\times$  (4.5-) 4.9 - 7.5 (-9.5)  $\mu\text{m}$ , with  $Q = 1.23 - 1.42 (-1.60)$ ; described from Argentina, additional material examined from France, also reported from Italy and South Africa.....  
*Amanita singeri* Bas.
5. Elements of universal veil on pileus entirely periclinally oriented; lamellae, when pinkish, becoming yellowish cream in age; spores with  $Q$  usually  $< 1.35$  and with plentiful spores having width  $> 8.0 \mu\text{m}$ .
6. Basidiocarp suggesting an *Agaricus*, pileus 30 - 80 mm wide; lamellae off-white to pinkish cream to cream, becoming yellowish cream in age; spores (7.2-) 8.0 - 11.2 (-13.0)  $\times$  (6.2-) 6.8 - 9.0 (-10.0)  $\mu\text{m}$ , with  $Q = 1.19 - 1.25$ ; known from coastal central California, U.S.A.....  
*Amanita sp. Vitt6.*
6. Basidiocarp suggesting an "armillariod" species of *Tricholoma*; pileus up to 150 mm wide; lamellae white to dirty cream to watery pale yellowish to pale ochraceous; spores (6.8-) 8.0 - 11.2 (-14.0)  $\times$  (5.8-) 6.5 - 9.0 (-11.2)  $\mu\text{m}$ , with  $Q = 1.17 - 1.31 (-1.35)$ ; known from Oregon, U.S.A.; occurring with Sudan grass.....  
*Amanita pruittii* A. H. Sm. ex Tulloss & J. Lindgren *nom. prov.*
2. 95% of spores with length  $\leq 9.5 \mu\text{m}$ .
7. Fruiting body completely white.
8. Stipe with distinct annulus, strongly radicating, but lacking a distinct bulb; spores 7 - 8.5  $\times$  6 - 7  $\mu\text{m}$ , with  $Q = 1.2$ ; described from Argentina.....  
*Amanita lilloi* Singer in Singer & Digilio.
8. Stipe exannulate, with narrow fusiform bulb; spores 8 - 9.5  $\times$  6.5 - 7.5  $\mu\text{m}$ , with  $Q = 1.2 - 1.25$ ; described provisionally from Bolivia .....  
*Amanita boliviana* Bas *nom. prov.*
7. Fruiting body not completely white.
9. Fruiting body large; pileus uniformly dark brown to paler grayish brown; lamellae white at first, then cream, finally yellow to golden yellow; spores 7.5 - 9.6  $\times$  5.6 - 6.9  $\mu\text{m}$ , with  $Q = 1.25 - 1.44$ ; known only from tropical rain forest lacking ectotrophic trees in Brazil .....  
*Amanita grillipes* Bas & de Meijer.
9. Pileus not a uniform shade of brown.
10. Basidiocarp entirely pale ochraceous to avellaneous; stipe with distinct basal bulb; spores (6.5-) 7 - 9 (-9.5)  $\times$  5 - 6.5  $\mu\text{m}$ , with  $Q = 1.3 - 1.35$ ; described from Argentina.....  
*Amanita bubalina* Bas.
10. Stipe white, lacking basal bulb; pileus white to pale ochraceous; lamellae very pale ochraceous, sometimes with pinkish tints; spores (6.2-) 6.3 - 8.8 (-11.2)  $\times$  (5.0-) 5.4 - 7.1 (-8.4)  $\mu\text{m}$ , with  $Q = 1.19 - 1.32$ ; described from Martinique .....  
*Amanita lilloi sensu* Pegler.
1. Significantly more than 5% of spores with length  $> 11.5 \mu\text{m}$  and with  $Q$  frequently  $> 1.45$ .
11. Pileus with pinkish or salmon tint during some stage of development; elements of universal veil on pileus arise directly from pileus context and, for the most part, have an anticlinal orientation.
12. Universal veil with distinct purple cast over pileus disc; lamellae ochraceous, becoming gray with age; spores 10 - 14  $\times$  7 - 9.5  $\mu\text{m}$ , with  $Q = 1.50$  [spores from gills (Reid and Eicker, 1996): 9 - 11.5  $\times$  6.2 - 8  $\mu\text{m}$ , with est.  $Q = 1.45$ ; spores from print (*ibid.*): 10 - 12 (-13)  $\times$  7.5 - 9 (-11)  $\mu\text{m}$ , with  $Q = 1.35$ ; described from South Africa; occurring in open grassland, in grass under Jackaranda tree, in fairy rings on *Cynodon* lawn, and under indigenous *Acacia* species.....  
*Amanita pleropus* (Kalchbr. & MacOwan) D. A. Reid.
12. Universal veil lacking purple cast; lamellae not ochraceous; with 90% of specimens having  $Q < 1.35$ .

13. Universal veil on pileus white, then dingy brown; lamellae white or pallid, sometimes with greenish tint; basidia dominantly bisterigmate; spores (10.0-) 10.2 - 12.8 (-14.8) × (7.8-) 8.0 - 10.0 (-10.8) μm, with **Q** = 1.26 - 1.30; described from Argentina .....  
*Amanita ameghinoi* (Speg.) Singer.
13. Universal veil on pileus pinkish brown to *Cinnamon-Rufus* to *Hazel*; lamellae cream to off-white to pale yellowish white; basidia dominantly 4-sterigmate; spores (8.5-) 9.3 - 13.0 (-15.0) × (6.2-) 6.5 - 10.2 (-11.5) μm, with **Q** = 1.22 - 1.44 (-1.48); described from California and Texas (as *A. salmonea*) and also known from Colorado, U.S.A.; occurring in lawns, with shrubbery, and in prairie .....  
*Amanita subcaligata* (A. H. Smith & P. M. Rea) A. H. Smith ex Tulloss  
 = *Amanita salmonea* Thiers.
11. Universal veil elements all having periclinal organization.
14. Pileus white to buff with reddish brown to brown pyramidal warts or scales that fade with exposure; partial veil felted-membranous and rather thick; stipe subcylindric, lacking bulb, not rooting, with incomplete girdles of submembranous scales; spores (8.0-) 8.2 - 11.0 (-13.5) × 5.5 - 7.5 (-9.5) μm, with **Q** = 1.42 - 1.51; described from Texas, U.S.A.....  
*Amanita silvifuga* Bas.
14. Spores with lengths > 11.0 μm plentiful; partial veil not felted, often membranous (one exception).
15. Basidiocarp robust; partial veil large, membranous; stipe sometimes swollen slightly near base; hymenium sometimes including refractive pseudocystidia; spores (8.8-) 10.2 - 15.0 (-17.0) × (6.0-) 6.6 - 8.9 (-11.3) μm, with **Q** = (1.39-) 1.56 - 1.79; described from Idaho and Oregon, U.S.A. and also known from Alberta, Canada and Colorado, U.S.A.; occurring without nearby ectotrophic plants (e.g., in desert or in open lawn areas in parks) or in areas with *Populus tremulooides*, *Pseudotsuga menziesii*, or *Salix*.....  
*Amanita armillariiformis* Trueblood & Dav. T. Jenkins.
15. Hymenium lacking refractive pseudocystidia; partial veil rather narrow and with thickened edge or floccose, submembranous, and, then, often evanescent; stipe not swollen near base.
16. Partial veil floccose to submembranous, and often evanescent; spores (8.8-) 10.2 - 13.2 (-14.5) × (6.8-) 7.5 - 9.2 (-10.8) μm, with **Q** = 1.39 - 1.40; known from Arizona and California, U.S.A. and in the states of Baja California Norte and Morelos<sup>2</sup>, Mexico .....  
*Amanita* sp. Vitt7.
16. Partial veil membranous, narrow, with thickened edge.
17. Universal veil very thin or absent, sometimes mistaken for a pileipellis; lamellae lacking any green tint; spores (8.0-) 10.0 - 14.1 (-19.2) × (5.2-) 6.4 - 10.0 (-12.2) μm, with **Q** = (1.30-) 1.33 - 1.75 (-1.85); described from northern central Kansas and also known from Oregon, Idaho, Wyoming, Colorado, and Arizona, U.S.A.; occurring in open prairie, in high desert without ectotrophic plants, and, occasionally, in city lawns.....  
*Amanita prairicola* Peck  
 = *Amanita malheurensis* Trueblood, O. K. Mill. & Dav. T. Jenkins.
17. Universal veil on pileus comprising distinct scales and warts especially over disc; lamellae often with green tint; known from Europe and North Africa.
18. Pileus diameter and stipe length approximately equal; universal veil remains over disc pale brown to dark brown, felted-subfibrillose warts; lamellae sometimes greenish, turning reddish-brownish when bruised; spores (7.6-) 8.9 - 13.0 (-16.5) × (6.4-) 6.8 - 9.4 (-11.0) μm, with **Q** = 1.29 - 1.43 [-1.6]; described from Spain; material examined from southern France, also known from Morocco; occurring both in fields and woods.....  
*Amanita codinae* (R. Maire) Singer.
18. Stipe length considerably exceeding pileus diameter; universal veil remains over disc white to pinkish-brownish to grayish-brownish; lamellae often with green tint, not reported to bruise; spores (9-) 10 - 13 (-15) × (6.5-) 7.5 - 10 (-11) μm, with **Q** = 1.2 - 1.4; described from Italy and known from Mediterranean region north to the Netherlands and eastward to Hungary; occurring in fields, open woods, gardens, parks, etc .....  
*Amanita vittadinii* (Moretti) Vitt.



NOTES