***Microascus longirostris* Zukal – PDD 124546 (= AEB 1391)** See comments below on the similar new species *Microascus pseudolongirostris*.

Collected: 24 August 2024
Substrate: brush-tailed possum (*Trichosurus vulpecula*) dung – the dung was impregnated with pine pollen
Incubated in moist chamber: 19 September 2024 – white mites & their eggs became numerous on the incubating dung.
Collection site: rural farm batch near Hunterville, New Zealand
Collector: Stu Bisset; **Identifier:** Dan Mahoney

Voucher materials: 3 dried possum-dung pellets accompanied by 2 Shear's mounting fluid (SMF) semi-permanent microscope slides; Zeiss SV 11 Stereo-zoom dissecting microscope in-situ photos of the fruiting bodies using a MC80 camera & Olympus BX51 microscopic slide photos of morphological detail using a DP28 camera; see references consulted below.
Other fungi on the possum dung: *Ascobolus crenulatus*, *Coemansia erecta*, *Cephalotrichum stemonitis*, *Sordaria humana* (sparse and overly mature with no intact asci) & *Penicillium claviforme (*also known as *Penicillium vulpinum*). See new PDD records for *Ascobolus crenulatus* PDD 124545 (= AEB 1390) & *Coemansia erecta* PDD 124544 (= AEB 1389).

References consulted: Listed in descending chronological order.
1. Jagielski T. et al. 2016. Molecular taxonomy of scopulariopsis-like fungi with description of new clinical and environmental species. Fungal Biology 120(4): 586–602. The ex-type strain of *Microascus pseudolongirostris* Jagielski, Sandoval-Denis, Krzyściak & Gené, sp. nov. was originally identified as *Microascus cirrosus*, but both species are phylogenetically very distant and morphologically the latter mainly differs by its larger ascospores (5–6 × 3–4 µm), the presence of an asexual morph and by its ability to grow at 40°C. The new species is phylogenetically very close to *M. longirostris* – and therefore, its epithet *pseudolongirostris.* It differs from *M. longirostris* solely by having paler colonies and the absence of an asexual morph. Its perithecium neck is also shorter than those typical of *M. longirostris* and not unlike those of AEB 1391. The question then "Is the new species only a variant of *M. longirostris* (the type species of the genus) and known to be quite variable and to have perithecia with shorter necks – or not?" I am not aware of any published work on the new species since 2016 so I am treating it as a variant of *M. longirostris* until proven otherwise.
2. Sandoval-Denis M. et al. 2016. Redefining *Microascus, Scopulariopsis* and allied genera. Persoonia 36: 1–36. Published just prior to reference 1 above, with the most recent key to *Microascus* species that doesn't include *M. pseudolongirostris*.

References continued on the next page.

References continued from the previous page:

3. Von Arx J.A. 1975. Revision of *Microascus* with the description of a new species. Persoonia 8: 191–197. History of the Microascaceae & a key to species based on a study of all cultures present in the CBS-collection (reproduced below)

4. Corlett M. 1966. Developmental studies in the Microascaceae. Can. J. Bot. 44: 79–88.

5. Morton F.J. & Smith G. 1963. The genera *Scopulariopsis*, *Microascus* and *Doratomyces*. Mycol. Pap. 8: 96 pp.

6. Corlett M. 1963. The developmental morphology of two species of *Microascus*. Can. J. Bot. 41: 253–266. See his comments and drawings of ascogenous hyphae and ascus formation as they relate to the photo of ascogenous hyphae later in this pdf.

7. Udagawa S-I. 1962. *Microascus* species new to the mycoflora of Japan. Journal of General and Applied Microbiology 8: 39–51. Includes a classic history of the genus and a key to species (reproduced below).

8. Barron G.L., Cain R.F. & Gilman J.C. 1961. The genus *Microascus*. Can. J. Bot. 39:1609–1631. Provides descriptions of *Microascus* species.

Von Arx J.A. 1975

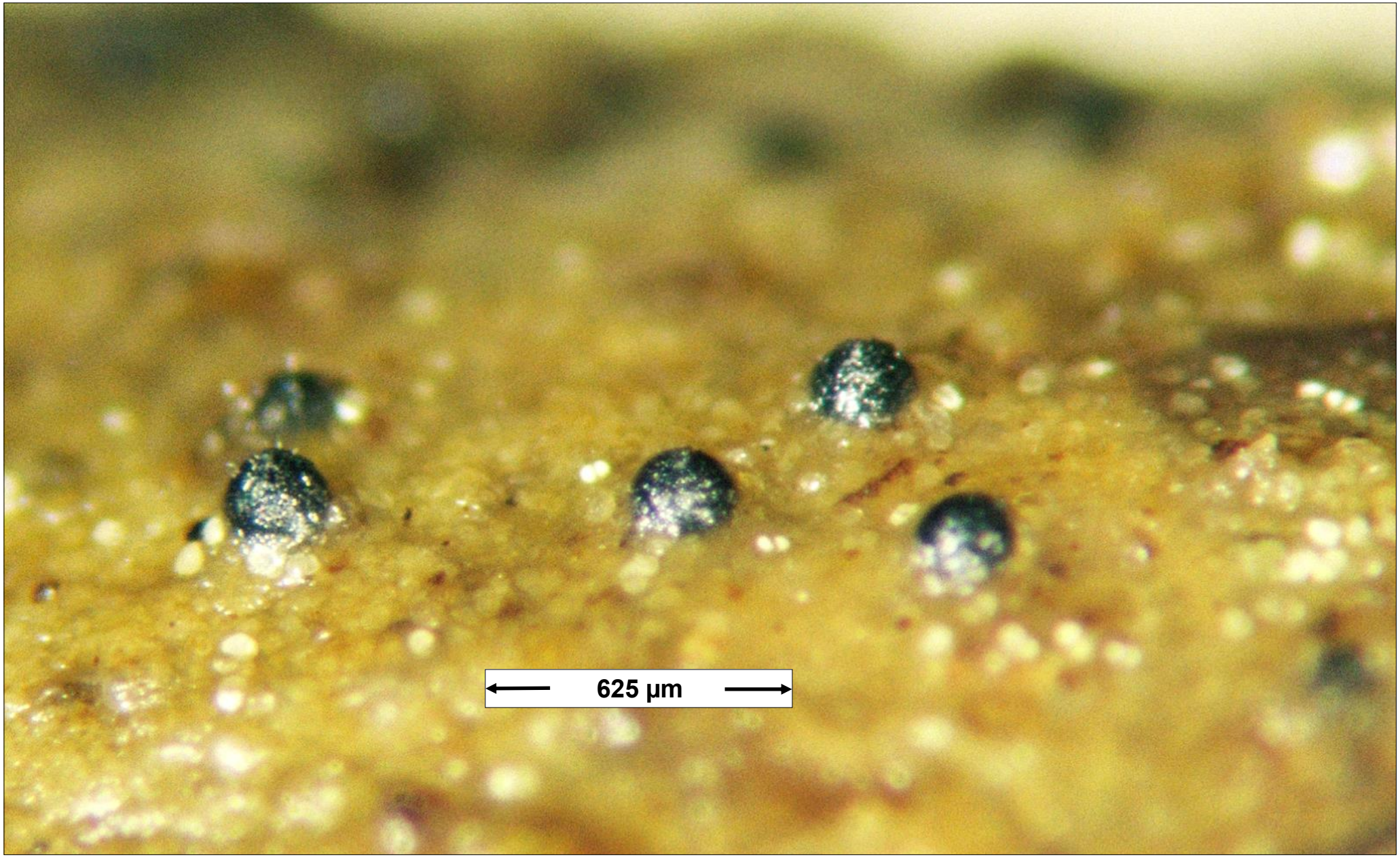
KEY TO THE SPECIES (derived from Barron & al., 1961)

1a. Ascospores triangular or quadrangular in planar view 2
b. Ascospores reniform, falcate or heart-shaped in planar view 5
2a. Ascospores triangular or quadrangular in planar view, often nearly square; colonies spreading, becoming dark . . . . . *M. pyramidus*, p. 193
b. Ascospores triangular in planar view; colonies rather restricted. 3
3a. Ascospores 8–12 µm long, brown. . . . . *Chaetomium trigonosporum*, p. 193
b. Ascospores shorter than 7 µm, yellow. 4
4a. Ascospores 3–5 µm in size . . . . . *M. trigonosporus*, p. 193
b. Ascospores 5–7 µm in size. . . . . *M. trigonosporus* var. *macrosporus*, p. 193
5a. Ascospores about twice as long as broad, usually planoconvex 6
b. Ascospores less than twice as long as broad, usually concavo-convex 7
6a. Ascospores 5–7 × 2.5–4 µm; conidia 3.5–5 × 2–3 µm, thin-walled . . *M. cinereus*, p. 194
b. Ascospores 7–9 × 4–4.5 µm; conidia 4.5–5.5 × 3.5–4.5 µm, rather thick-walled, brown *M. senegalensis*, p. 194
7a. Ascospores 3–4 × 2.5–3.5 µm . . . . . *M. longirostris*, p. 193
b. Ascospores 4–7 µm long 8
8a. Ascomata 500–700 µm in diameter, with an elongated beak; conidial state belonging to *Wardomyces* . . . . . *M. giganteus*, p. 193
b. Ascomata smaller; conidial state belonging to *Scopulariopsis* 9
9a. Ascomata non-ostiolate; conidia narrow, 4–12 × 2–4 µm. . . *Kernia hippocrepida*, p. 194
b. Ascomata usually ostiolate; conidia usually wider or shorter 10
10a. Conidia finely striate, 4–7 × 3–4 µm; ascospores heart-shaped in planar view, 5–7 × 5–7 µm, ascomata with an often inconspicuous ostiolum . . . . . *M. singularis*, p. 193
b. Conidia not striate; ascospores usually smaller; ascomata with a distinct ostiolum 11
11a. Colonies greyish; ascospores 4–6 × 3.5–5.5 µm; conidia broadly pyriform or nearly spherical, 3–5 µm in diameter . . . . . *M. cirrosus*, p. 193
b. Colonies usually white; conidia 6–10 µm long 12
12a. Ascomata 200–500 µm in diameter; conidia 7–10 × 2–3.5 µm . *M. albo-nigrescens*, p. 194
b. Ascomata less than 200 µm in diameter; conidia 6–8 × 5–6 µm . . *M. manginii*, p. 194

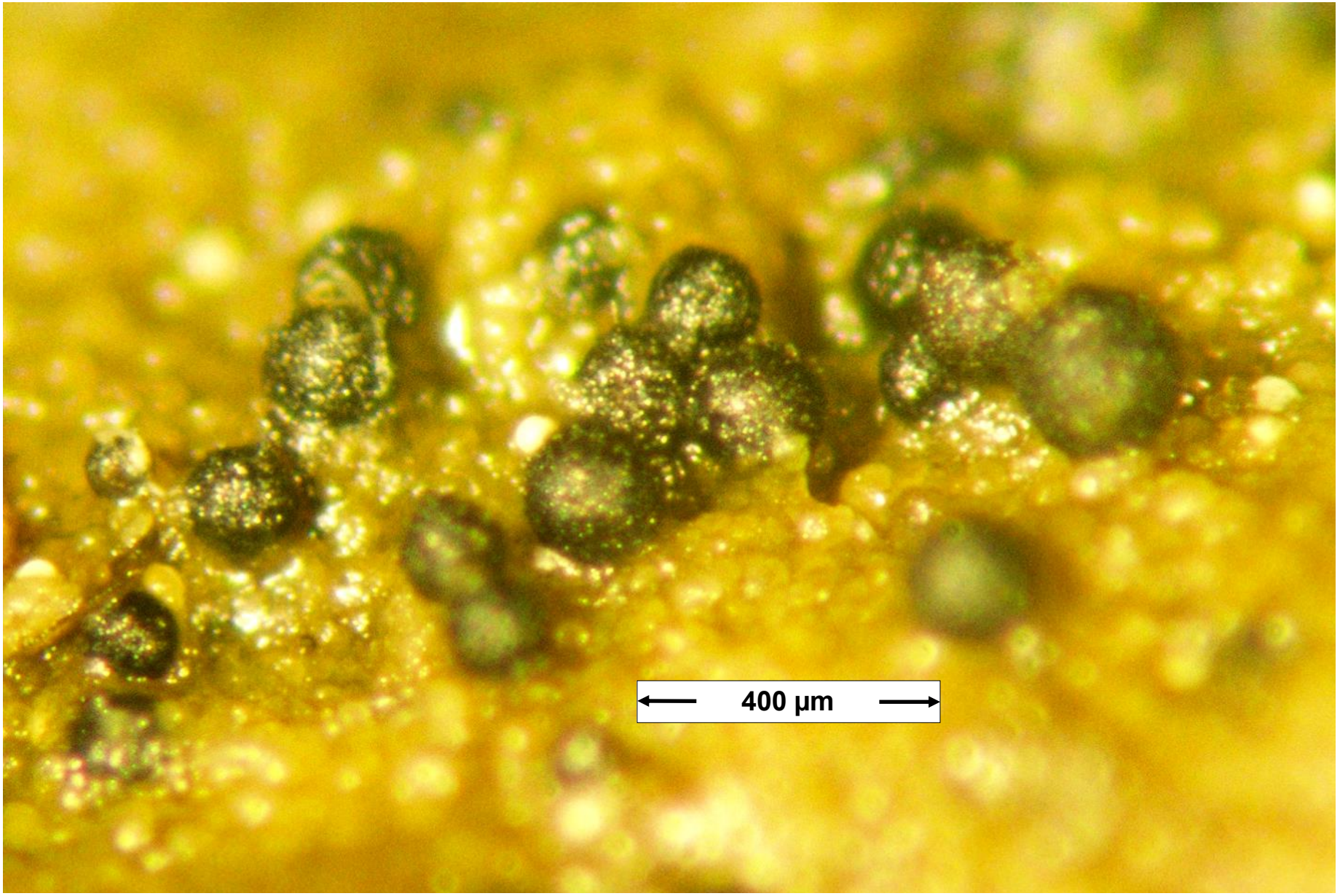
Udagawa S-I 1962

KEY TO THE SPECIES

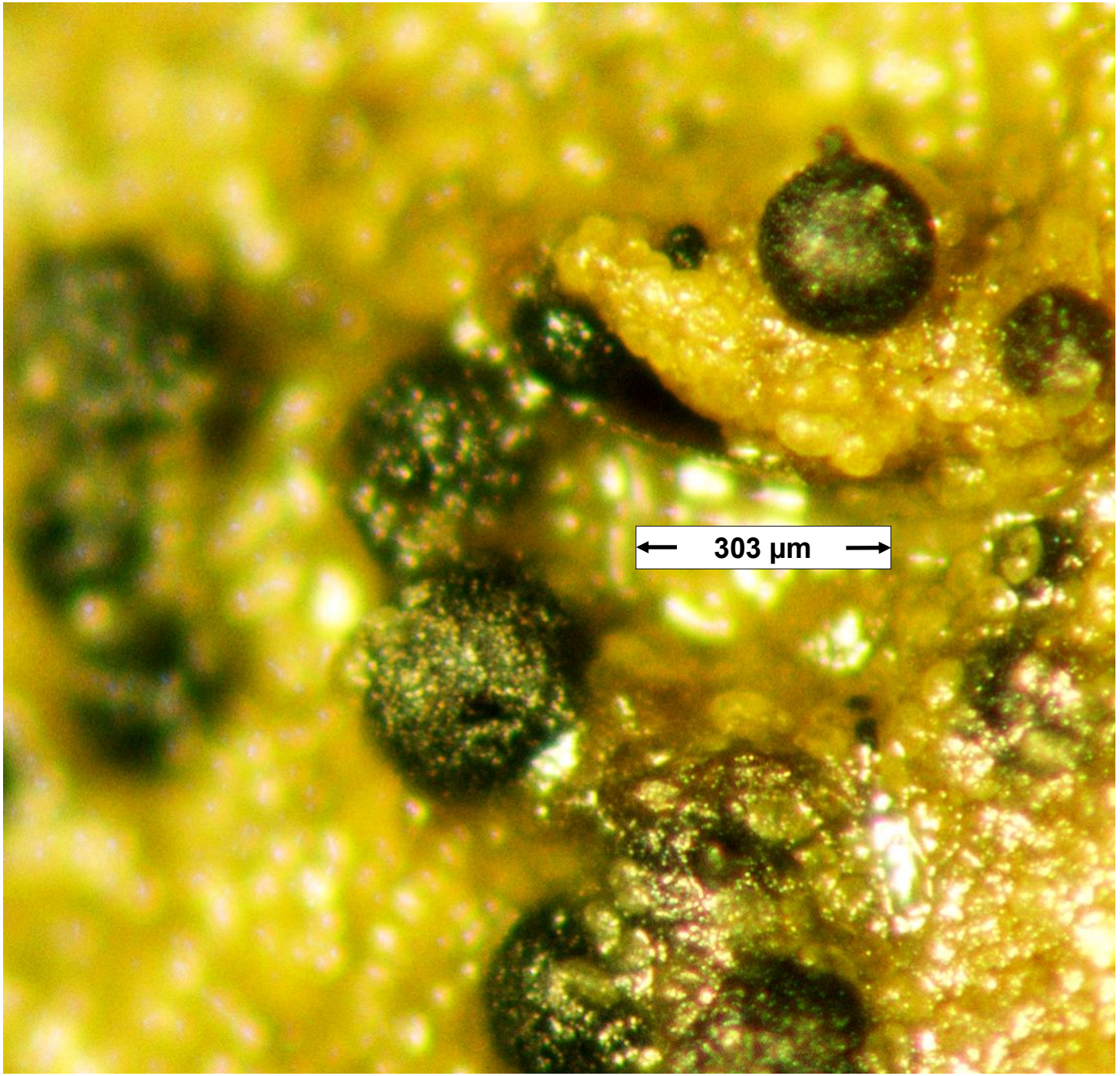
A. Ascospores light-colored, mostly small; asexual reproduction (when present) by annellated characteristic of the form genera *Scopulariopsis* and *Stysanus* (except in the case of the *Sporotrichum* stage of *M. stysanophorus*) ....B
A. Ascospores dark-colored; asexual reproduction forming blastospores or phialospores of the form genera *Sporotrichum* or *Graphium*.....probably to the genus *Petriella* sensu Barron, Cain, and Gilman (*Petriella sordida* (syn. *P. asymmetrica*), *P. guttulata*, *P. setifera*, *P. lindforsii*, and *P. boulangeri*)
B. Ascospores essentially triangular C
B. Ascospores strictly concavo-convex .....D
B. Ascospores commonly plano-convex to asymmetrically convex .....H
B. Ascospores ovoid L
C. Ascospores 3.5-5.5×2.5-4.5 µ .....*M. trigonosporus*
C. Ascospores 5.5-7.5×5-6.5 µ.....*M. trigonosporus* var. *macrosporus*
D. Colonies persistently white .....E
D. Colonies in shades of dark gray.....G
E. Ascospores 5-6×4-5 µ, heart-shaped .....*M. manginii*
E. Ascospores 3-5×2-3.5 µ, abruptly concave to lunate .....F
F. Ascospores abruptly concave, not guttulate .....*M. variabilis* (? *M. longirostris*)
F. Ascospores lunate, guttulate .....*M. lunatus*
G. Ascospores heart-shaped to broadly concavo-convex, 5-7.5×3.5-7 µ; conidia striate.....*M. doguetii*
G. Ascospores broadly concavo-convex, 4-6×2-5.5 µ; conidia not striate..*M. cirrosus*
H. Ascospores less than 6.5 µ in length I
H. Ascospores more than 6.5 µ in length .....J
I. Scopulariopsis stage unknown .....*M. intermedius*
I. Scopulariopsis stage present; colonies white.....*M. albo-nigrescens*
I. Scopulariopsis stage present; colonies dark gray .....*M. cinereus*
J. Ascospores narrow, less than 2 µ in diameter .....*M. nidicola*
J. Ascospores thick, 2.5-6 µ in diameter .....K
K. Ascospores guttulate .....*M. schumacheri*
K. Ascospores not guttulate .....*M. stysanophorus*
L. Ascospores 4-5×3 µ.....*M. desmosporus*
L. Ascospores 7×5 µ .....*M. niger*



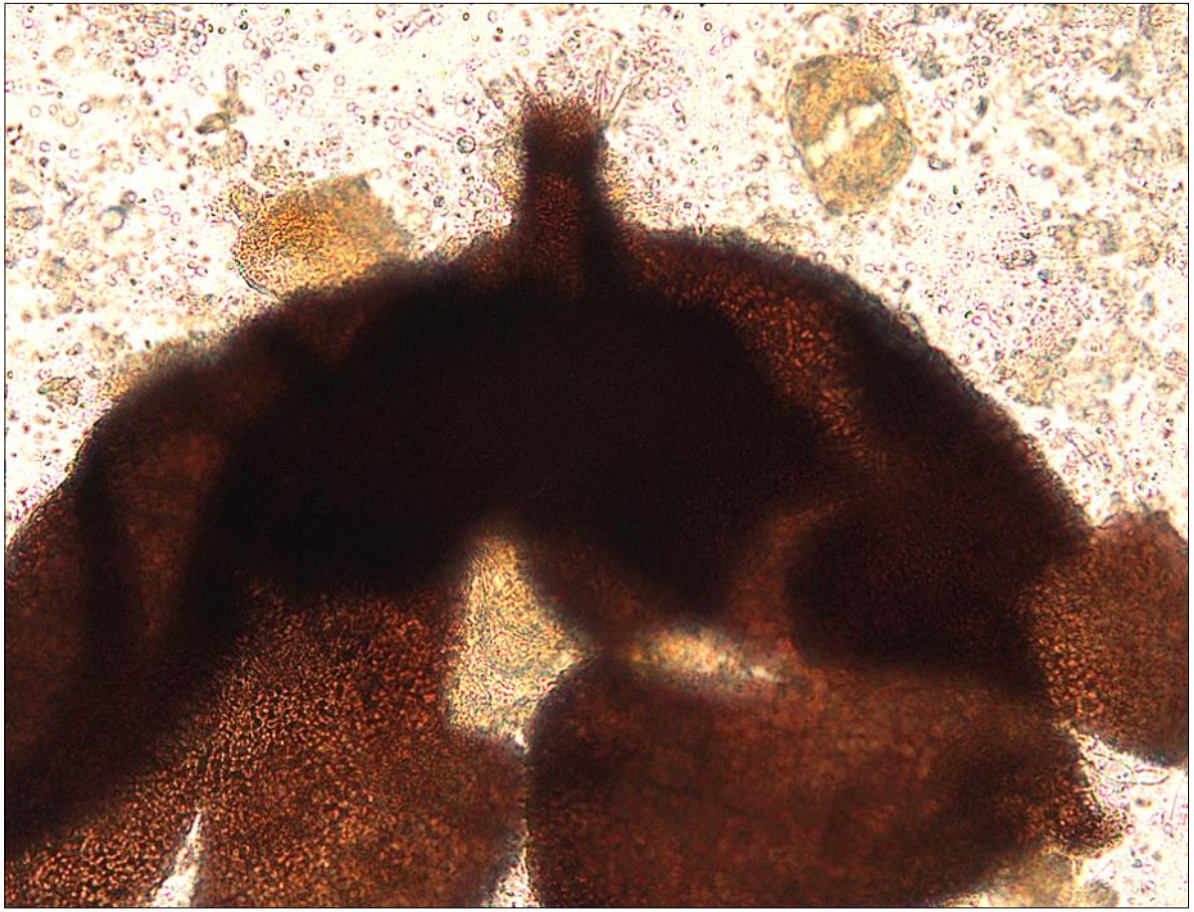
AEB 1391. An in-situ photo of fertile short-necked perithecia on possum dung in a moist incubation chamber. Perithecial venters were usually partially submerged in the dung but whole ascomata were easily removed with a pin.

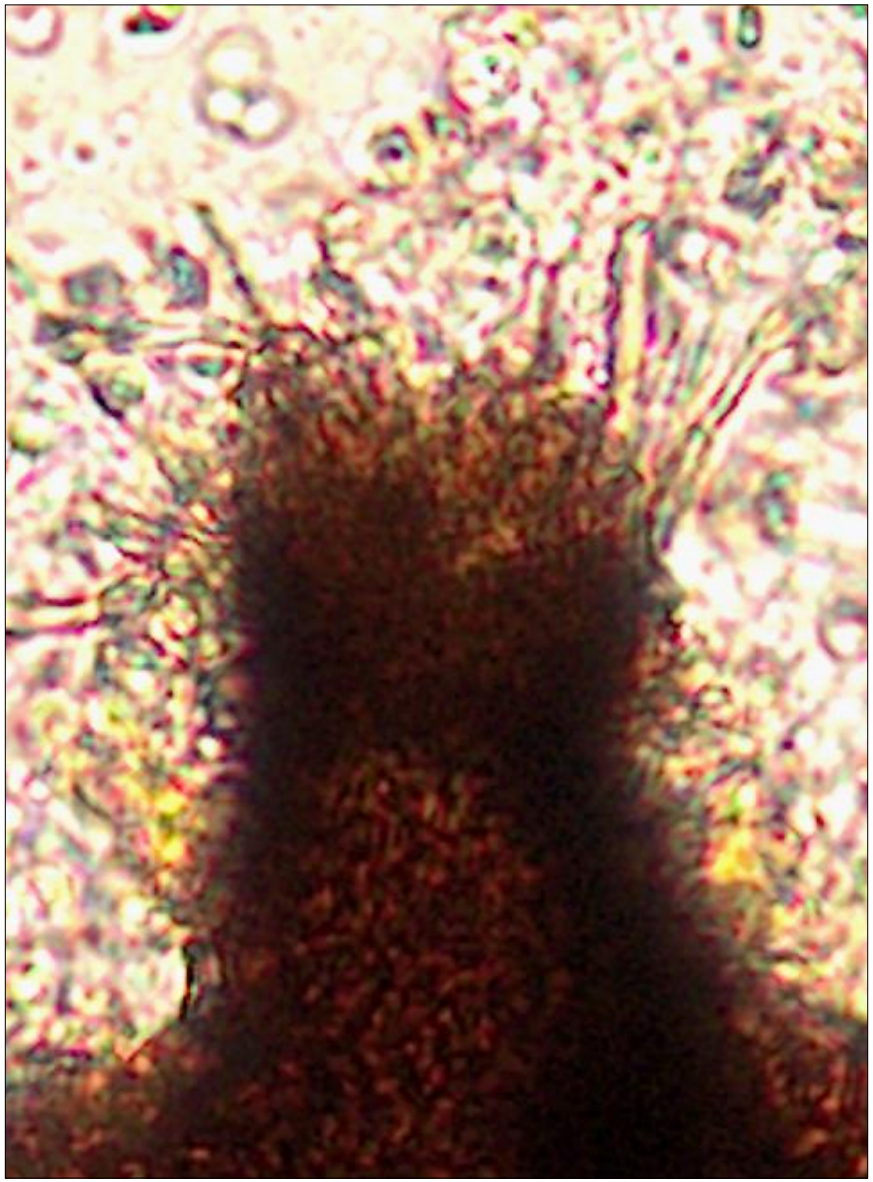


AEB 1391. Another in-situ photo of fertile short-necked perithecia on possum dung in a moist incubation chamber. Note the size variation among globular perithecia in this cluster. I found that the smaller ascomata contained more intact globose 8-spored asci than the larger ascomata where most evanescent asci had released their ascospores.

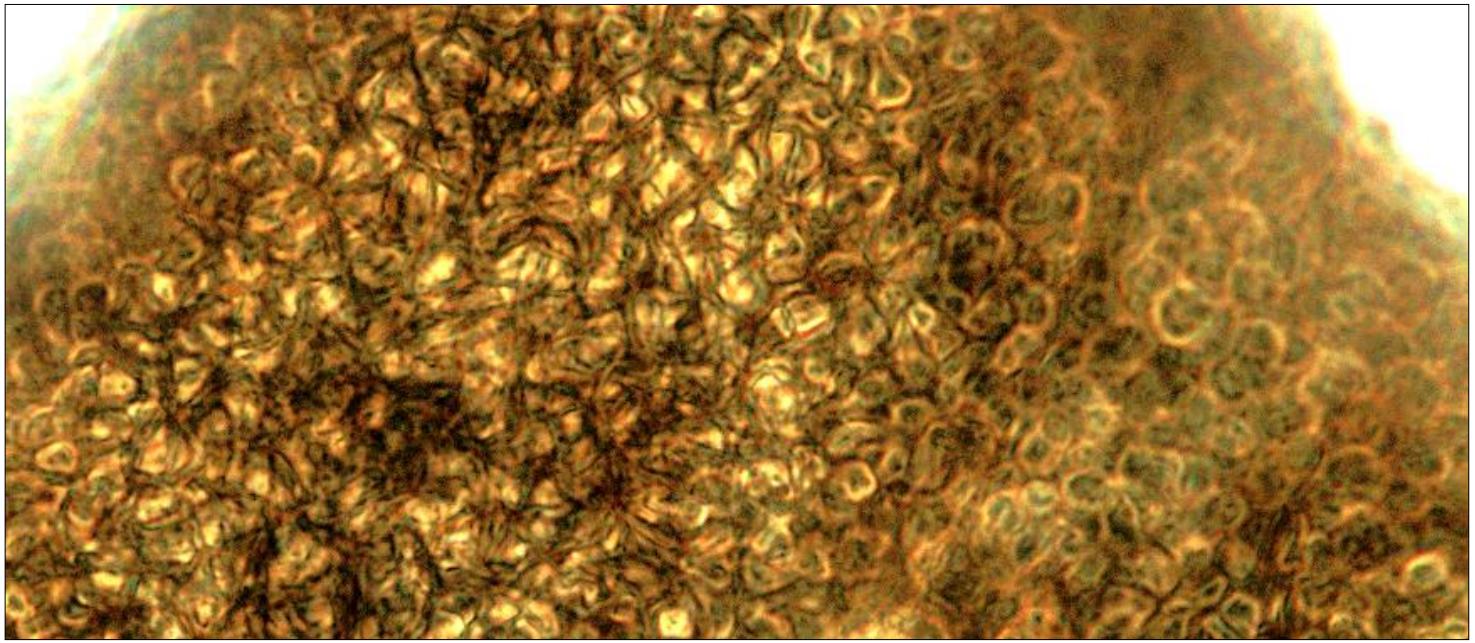


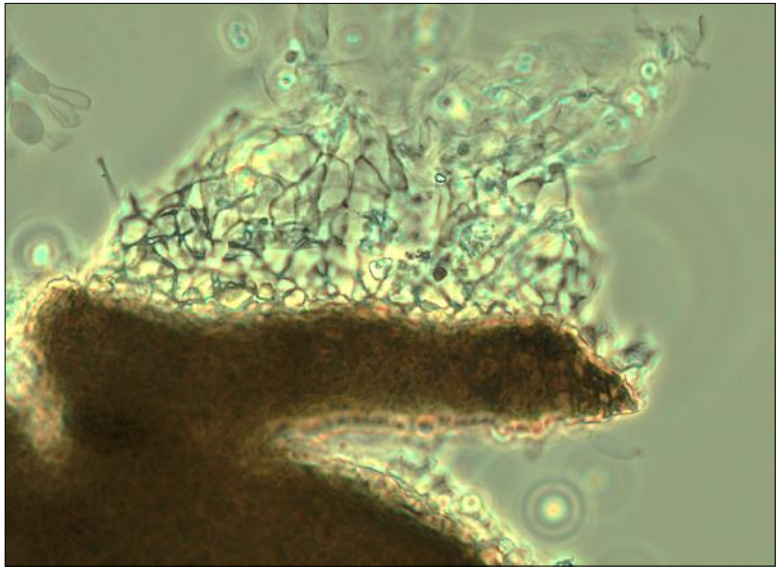
AEB 1391. Another in-situ photo of fertile slightly longer-necked perithecia on possum dung in a moist incubation chamber. Even longer-necked perithecia were occasionally seen but these were still much shorter-necked than those typical of *M. longirostris*. See p. 1 of this pdf for comments on the similarity between these shorter-necked perithecia and those of the recent new species *M. pseudo-longirostris*.



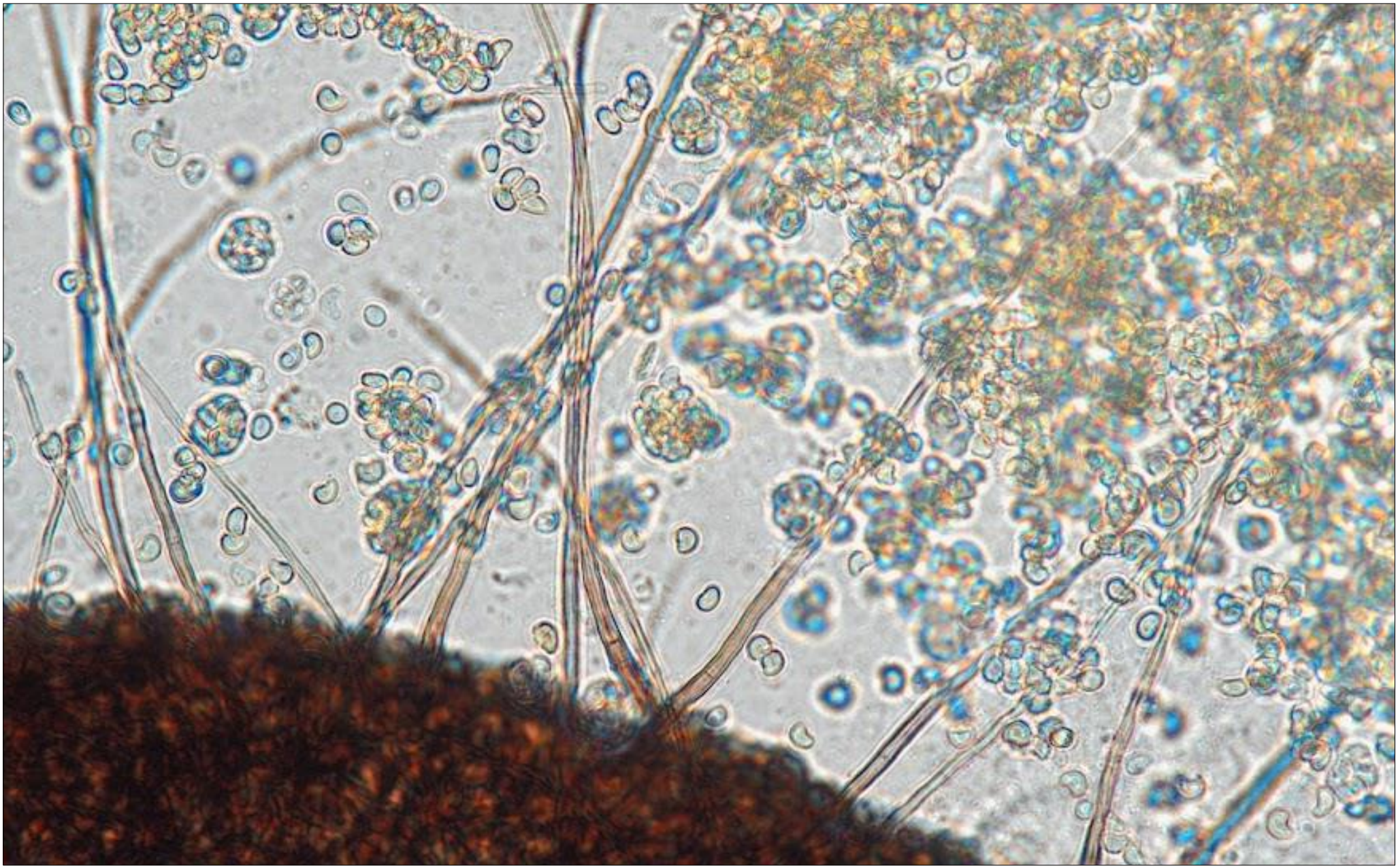


AEB 1391. Photos of the same squashed perithecium in a SMF slide mount, emphasizing the short hairy (somewhat bristle-like) neck. Note the highly magnified neck view in the right-hand photo.

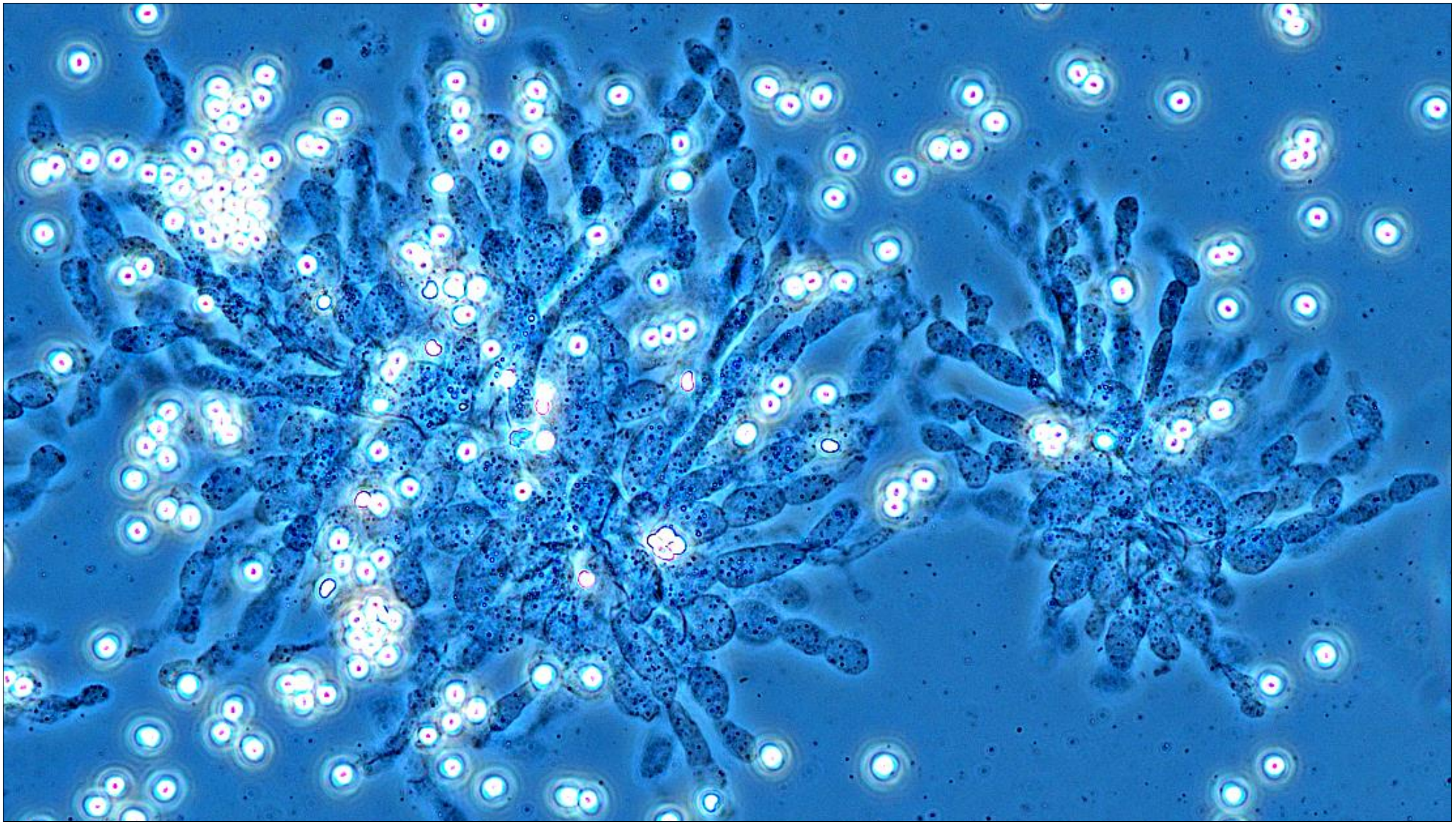




AEB 1391. Various photos of the perithecium neck and venter peridium. <u>Left brightfield photo:</u> overexposed longer neck from a Melzer's mount using the X100 objective. Note the apical bristle/spinose extensions (arrowed) of vertically oriented hyphae in the neck peridium. <u>Top right water/ Melzer's, X100 obj., brightfield photo:</u> venter peridium, textura angularis tissue. <u>Lower right, water, X40 obj., phase photo:</u> dark venter peridium and above that a seemingly squashed wall-portion of the outermost angularis tissue.



AEB 1391. Hairs on the dark upper-venter peridium with globular 8-spored asci and free lunate ascospores among the hairs. Water mount using the X100 objective and brightfield microscopy.



AEB 1391. Ascogenous hyphae and scattered (out-of-focus) ascospores seen in a slide water mount using the X40 objective (image enlarged) and phase microscopy. Initially, what I now recognize as ascogenous hyphae was a mystery. The answer is provided in the illustrations by Corlett, 1963, although Barron et al., 1961 (pp. 1610–1611) describe general ascocarp, centrum and ascus development with a record of related earlier historical thinking on these for *Microascus* species. **See Corlett's illustrations on the next page.**

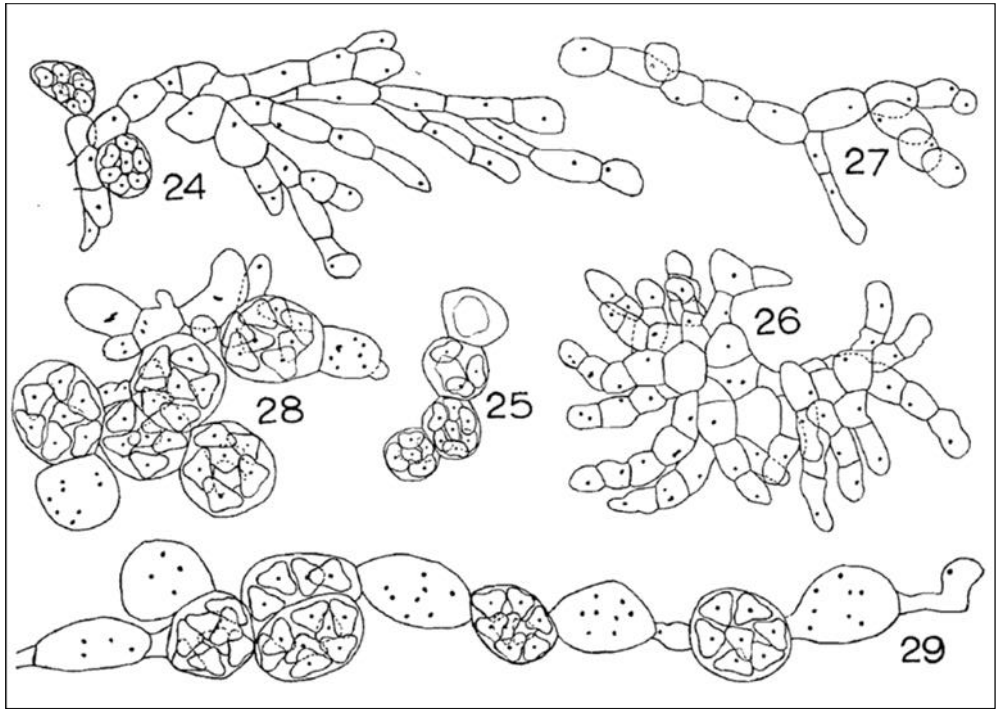
Corlett M. 1963. The developmental morphology of two species of *Microascus*. Can. J. Bot. 41: 253–266.
Selected comments and illustrations are reproduced below.

p. 253: The ontogeny of the perfect stage in *Microascus longirostris* and *M. trigonosporus* has been investigated. Sexuality has also been examined in *M. longirostris, M. trigonosporus, M. cinereus*, and *M. doguetii*. Results show that all these species are homothallic, and that perithecial formation in *M. longirostris* and *M. trigonosporus* follows the general pattern outlined by previous workers. The author has been able to clarify at least three important developmental phases which had either been ignored or insufficiently described by earlier investigators. These are the formation of the perithecial primordium; the development of the sterile hyphae of the centrum; and the structure and nuclear condition of the ascogenous system.

p. 256: The ascogenous hyphae of both species (i.e., *M. longirostris* & *M. trigonosporus*) radiate out from the ascogonium, growing fanwise toward the perithecial base until they reach the pseudoparenchyma layer lining the peridium.

Ascus Formation

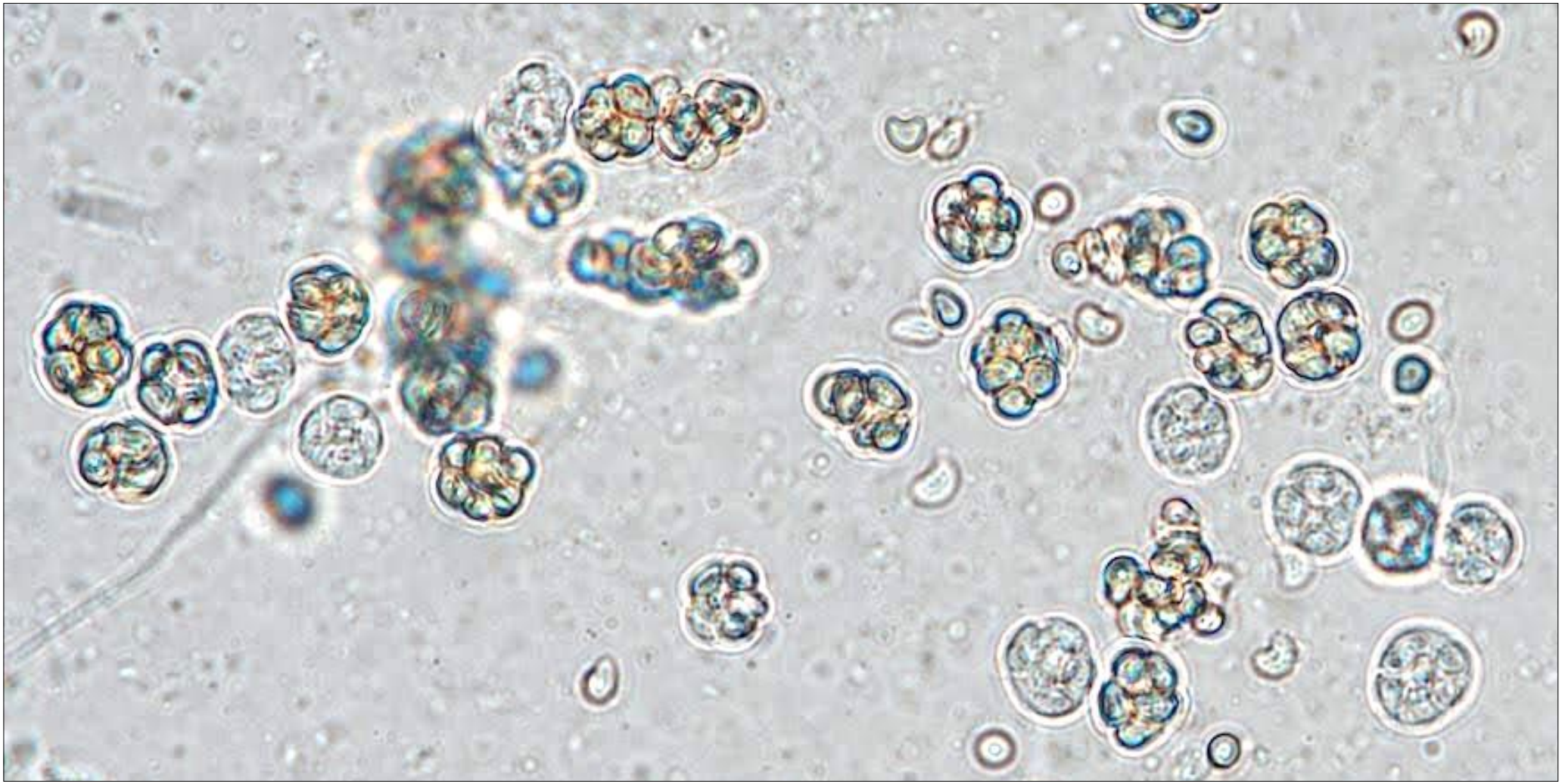
This begins in the region of the ascogonium and gradually extends toward the more distal portions of the ascogenous system. There is no evidence of croziers, individual ascogenous cells simply enlarging to form asci. The latter are eight-spored in both species (i.e., *M. longirostris* & *M. trigonosporus*) and are borne terminally or laterally and either singly or in chains (Figs. 24-29).



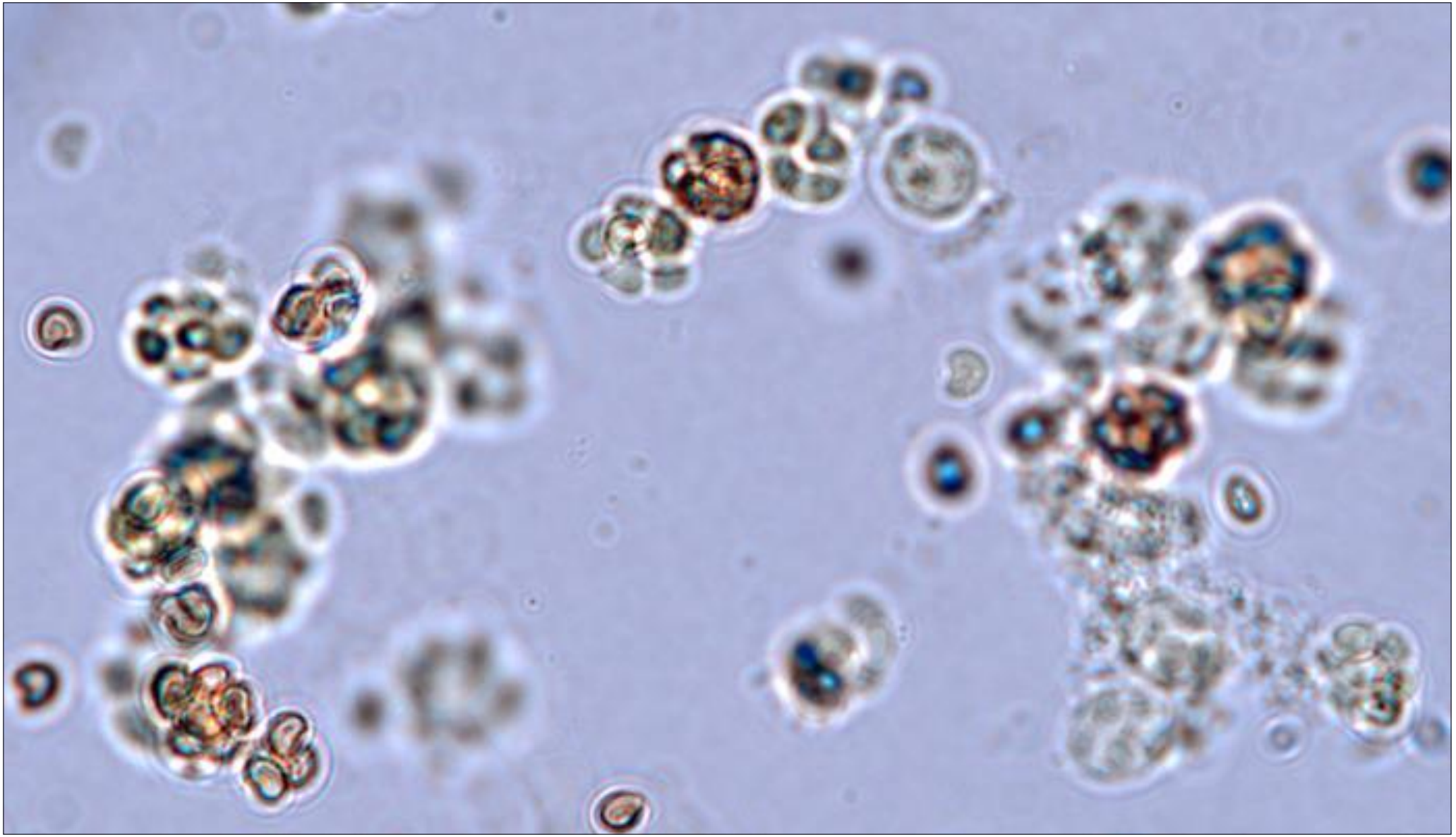
pp. 262 & 266

***M. longirostris* Figs. 24–26**
24 = lateral asci from the ascogenous hyphae
25 = catenulate asci from the ascogenous hyphae
26 = ascogenous hyphae – as seen in my photograph on the previous page. As yet no asci.

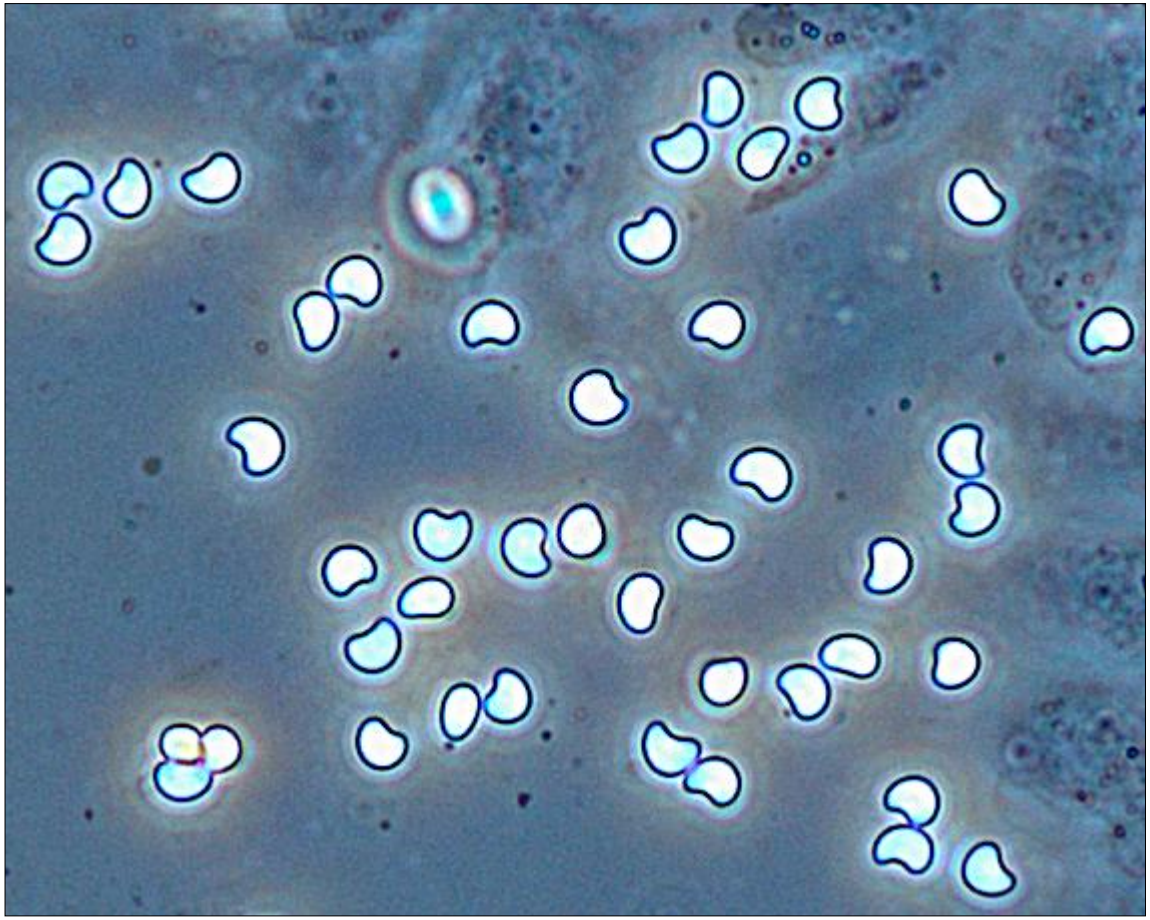
***M. trigonosporus* Figs. 27–29**

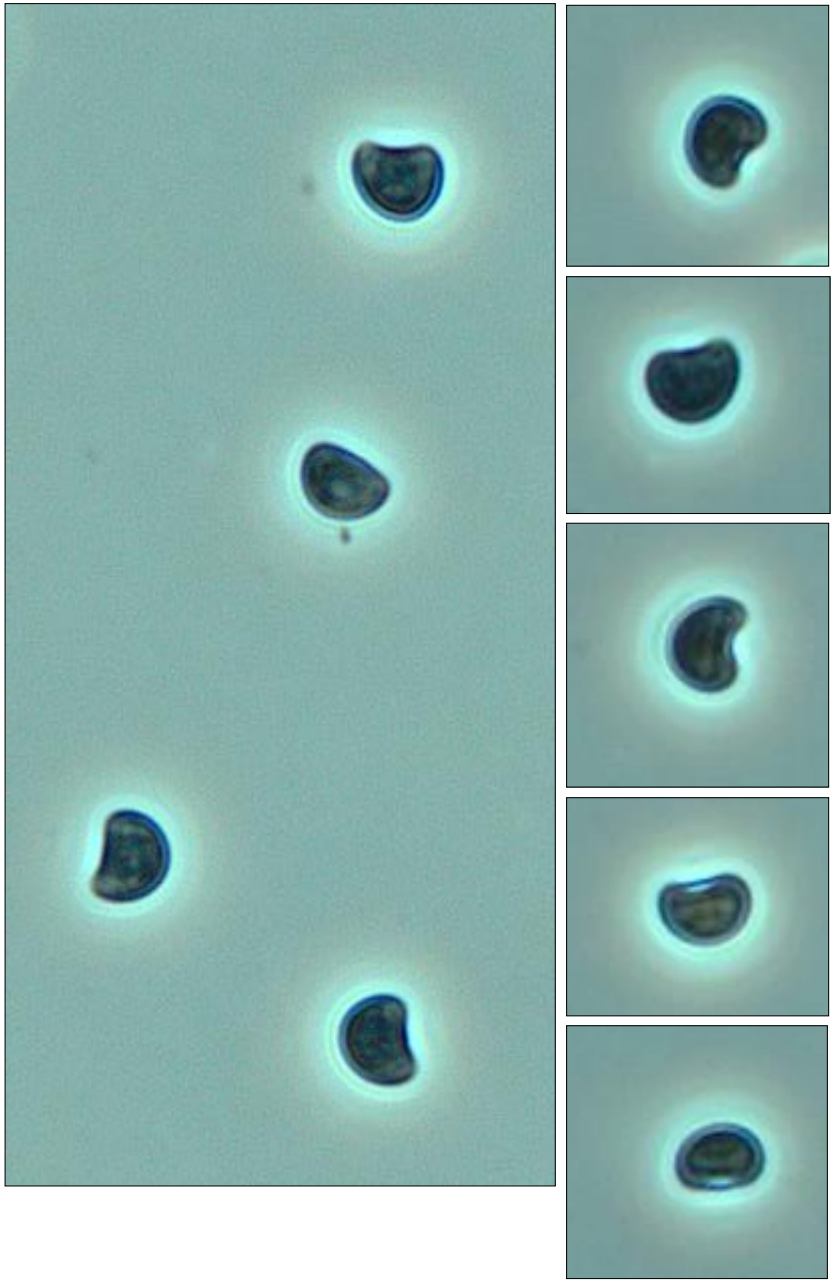


AEB 1391. Globose 8-spored asci and free lunate ascospores. Water mount using the X100 objective and brightfield microscopy.



AEB 1391. Globose 8-spored asci and lunate ascospores. Melzer's mount using the X100 objective and phase microscopy. Note the ascospores, normally pale yellow-brown to straw-colored, have a slight reddish "dextrinoid" color in Melzer's.





AEB 1391. Lunate ascospores. [lunula (pl.: lunulae); from Latin 'little moon' or described as crescent-shaped, reniform or concavo-convex]
Left photo: water mount, X40 objective enlarged, phase microscopy.
Other photos: all water mounts, X100 obj. phase.
All ascospores measured were 3.5–4 × 2.5–3 µm