

***Podospora appendiculata* PDD 111351 (= AEB 1303)**

Collection site: Routeburn Track near Lake MacKenzie Hut (northern Fiordland National Park, New Zealand). Latitude: E1218142, N5031519. Longitude: 44°46'3.7" S, 168°10'28.3" E. Altitude: 892 m

Collection date: 30 December 2016

Substrate: Brown hare (*Lepus europaeus occidentalis*) dung

Collector: Ann Bell

Identifier: Dan Mahoney

Voucher materials: dried herbarium specimen AEB 1303 (1 dung pellet), one SMF (Shear's mounting fluid) glass slide also accompanies the herbarium material; several in situ dissecting scope photos of the perithecia on the hare dung and numerous photos of microscopic detail (in water, SMF & aniline blue lactic acid).

Other fungi and myxobacteria also present on other hare pellets from this collection (some of which also appear on the dung pellet in the herbarium specimen): *Coniochaeta scatigena*, *Iodophanus carneus*, *Pilaira* sp., *Podospora pleiospora*, *P. tetraspora*, *Pseudorobillarda phragmitis*, *Sordaria fimicola*, *S. superba*, *Sporormiella intermedia*, *Thelebolus* sp., *Trichoderma viride* and an unidentified myxobacterium

Dung incubation. hare pellets in each of 4 loosely-glass-covered moist chambers, incubated on 6 September 2017. For incubation conditions, see 'Bell A. 1983. — *Dung Fungi: An Illustrated Guide to Coprophilous Fungi in New Zealand*. Wellington, Victoria University Press, 88 pp.'. *Podospora appendiculata* was present on roughly 10% of the pellets incubated.

Dan's comments: This distinctive species is characterized by numerous, evenly-spaced, hyaline-tipped stiff hairs over the surface of a 4-layered, pseudobombardioid (= coriaceous), perithecial peridium. Asci are 8-spored and ascospores biserially-arranged. Perithecia are mostly superficial and scattered over the dung surface.

Descriptions and various measurements of AEB 1303 agree with those provided in the following publications: **1)** Bell A & Mahoney DP. 1997. Coprophilous fungi in New Zealand. II. *Podospora* species with coriaceous perithecia. *Mycologia* 89(6): 908–915. **See description and illustrations on pages 2 & 3.** **2)** Doveri F. 2015. An update of *Podospora* sect. *Podospora*, with first descriptions from Italy of *P. appendiculata* and *P. perplexens*. *Ascomycete.org* 7(2): 45–53. **3)** Furuya K & Udagawa S-I. 1972. Coprophilous pyrenomycetes from Japan I. *J. Gen. Appl. Microbiol.* 18: 433–454. **See illustrations on page 4.** **4)** Lundqvist N. 1972. Nordic *Sordariaceae* s. lat. *Symbolae Botanicae Upsalienses* 20: 1-374. **See illustrations on page 4.**

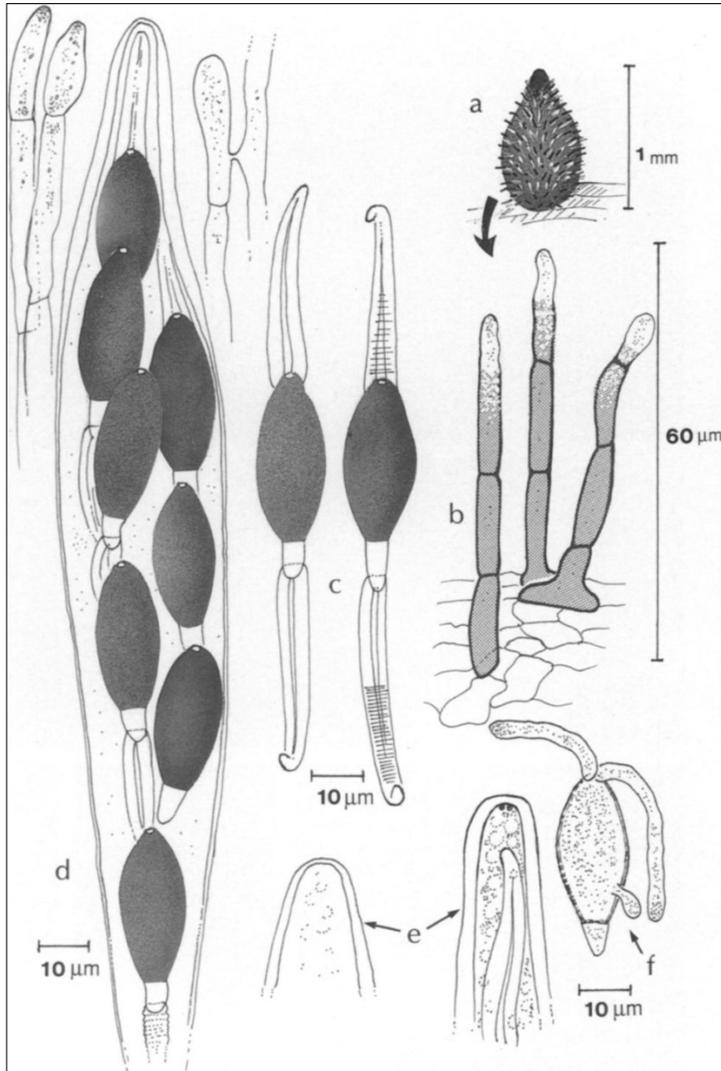
Worldwide, *P. appendiculata* is found principally on rabbit and hare dung. The 3 PDD New Zealand collections (prior to AEB 1303) are also from those substrates (PDD 73587, PDD 73631 & PDD 73642).

Bell A & Mahoney DP. 1997. Coprophilous fungi in New Zealand. II. *Podospora* species with coriaceous perithecia. *Mycologia* 89(6): 908–915.

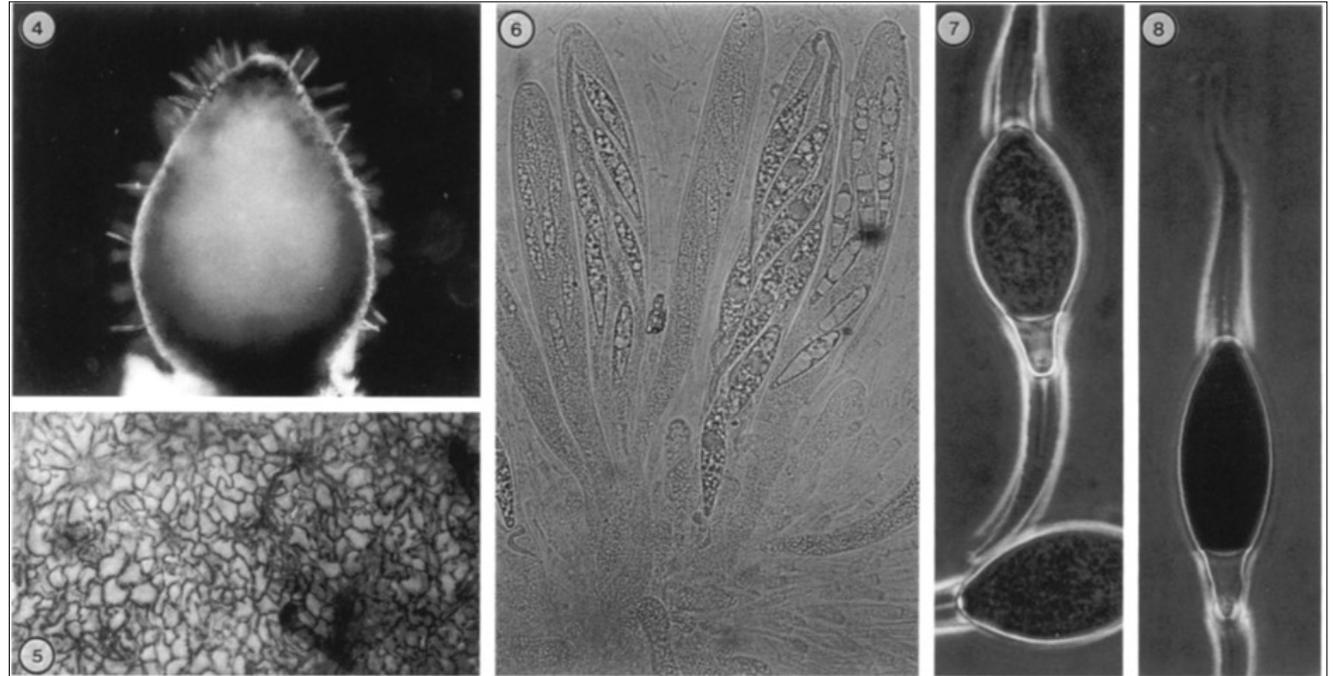
Podospora appendiculata (Awd.) Niessl, Hedwigia 22: 156. 1883. FIGS. 3, 4-8 (for synonymy see Lundqvist, 1972) Characteristics on dung. Perithecia superficial, scattered or in clusters, ovoid/ellipsoidal, without a prominent neck, blackish to purplish by reflected light, 400-750 × 290-550 µm (FIGS. 3a, 4). Perithecia evenly covered with simple short stiff hairs of uniform width and mostly 1-2 septate, yellowish brown at the base, hyaline at the tips (FIG. 3b). Hairs up to 100 × 3-4 µm. Peridium leathery (=coriaceous) in texture, neck blackish brown, venter lighter brown but often slightly violaceous to purplish when first observed on field collections in laboratory moisture chambers. Ripe ascospores just visible within by transmitted light. Outer layers epidermioid (FIG. 5). Paraphyses interspersed among the asci, composed of single chains of cells, free-ended with some lateral connections to adjacent paraphyses (FIG. 3d). Asci clavate, ca 280-320 × 40-50 µm, with a rounded to slightly truncate apex and a small inconspicuous apical ring (FIG. 3e). Ascospores eight per ascus, biserially arranged, at first one-celled, elliptic fusiform and densely vacuolate (FIG. 6), slow to mature but finally becoming two-celled prior to pigmentation of the upper cell. Dark cell ellipsoidal with a bluntly acute apex and truncate base (FIGS. 3cd, 7, 8), (27-)28-38(-40) × (12-)14-20(-22 µm; hyaline pedicel an elongated cone 6-10 × 6-8 µm, often partially collapsing at maturity; upper and lower caudae single, very adhesive and each with a single central channel, the upper one of which is positioned over the germ pore.

Herbarium specimens examined. NEW ZEALAND. N. ISLAND: Dundas Ridge track, Tararua Ranges, on hare dung, 4 Feb. 1985, P. Johnston (PDD 73587); Hooker Shelter, Mount Taranaki National Park, on hare dung, 22 Feb. 1988, D. Mahoney (PDD 73642); Ketetahi Springs, Tongariro National Park, on hare dung, 26 Oct. 1987, D. Mahoney and A. Bell (PDD 73631); Same as preceding but on brush-tailed opossum dung, slide only; Waitawhero Saddle, Kaimanawa Ranges, on hare dung, 8 Feb. 1992, A. Bell, slide only; S. ISLAND: Island Pass, on cattle dung, 14 June 1973, A. Bell, slide only.

FIG. 3. *Podospora appendiculata*. a. Habit sketch of perithecium. b. Perithecial hairs. c. Mature ascospores. d. Ascus, ascospores and paraphyses. e. Two ascus tips, one with small apical ring. f. Germination of a partially pigmented ascospore.



FIGS. 4–8. *Podospora appendiculata*. Photographed from water mounts. 4. Perithecium × 84. 5. Epidermoid peridium of FIG. 4. × 336. 6. Asci and interspersed paraphyses. Showing various stages of ascospore ontogeny × 336. 7-8. Ascospores. Showing apical germ pores, basal pedicels and apical and basal caudae with a central channel × 840. 7. Characteristic of strains with broader, shorter ascospores; slightly immature as shown (not fully pigmented). PDD 73631. 8. Characteristic of strains with longer, narrower ascospores. Pedicel collapsing slightly. From South Island, Arthur's Pass, on hare dung, 2 Feb. 1995, A. Bell and D. Mahoney, slide only. FIG. 6 was from a perithecium on a steam-sterilized rabbit dropping in an axenic CMA slant culture.



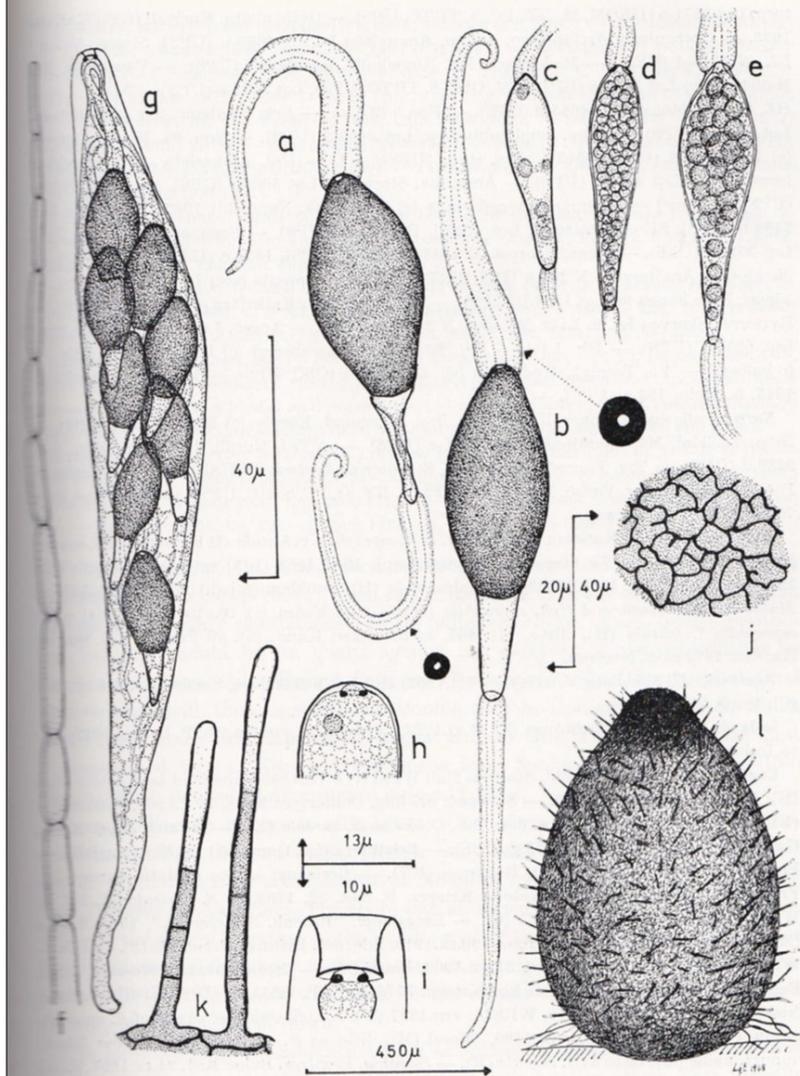


Fig. 17. *Podospora appendiculata*, Lqt 5906-f (UPS). Drawn from living specimens. a, b: Mature spores, showing i.a. hollow caudae in cross-section. c-e: Young, hyaline spores at various stages of development. f: Paraphysis. g: Mature ascus with spores. h: Young ascus tip; note the subapical plasma globule. i: Invaginated ascus tip. j: Peridium in horizontal view. k: Perithecial base. l: Perithecium.

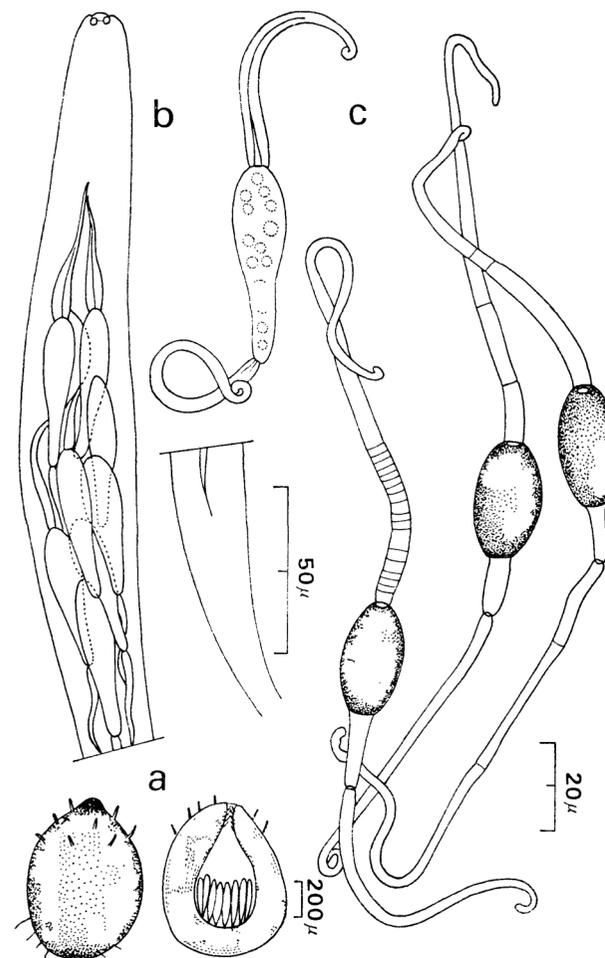
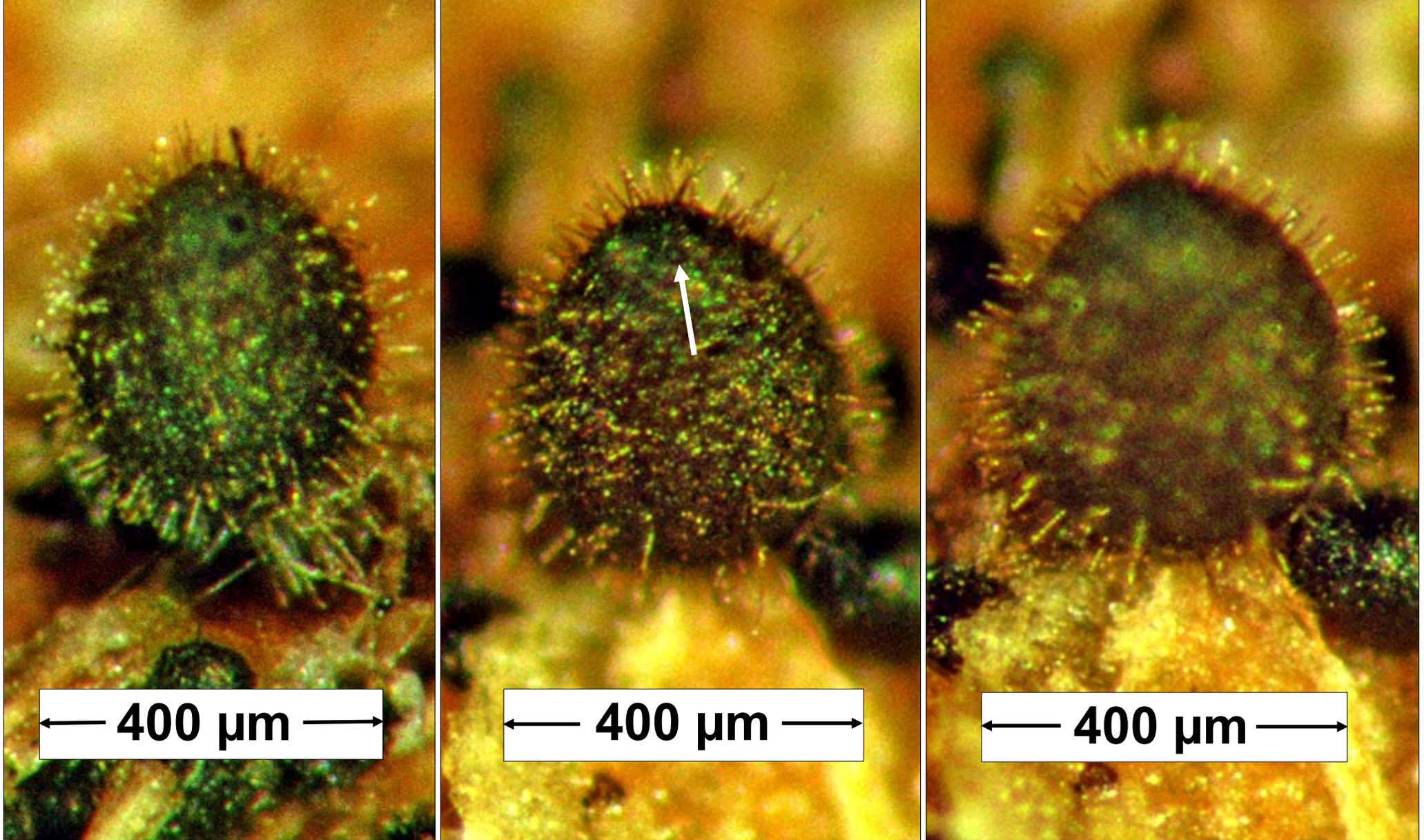


Fig. 1. *P. appendiculata* (Auersw.) Niessl. a, Perithecia; b, Ascus; c, Ascospores.

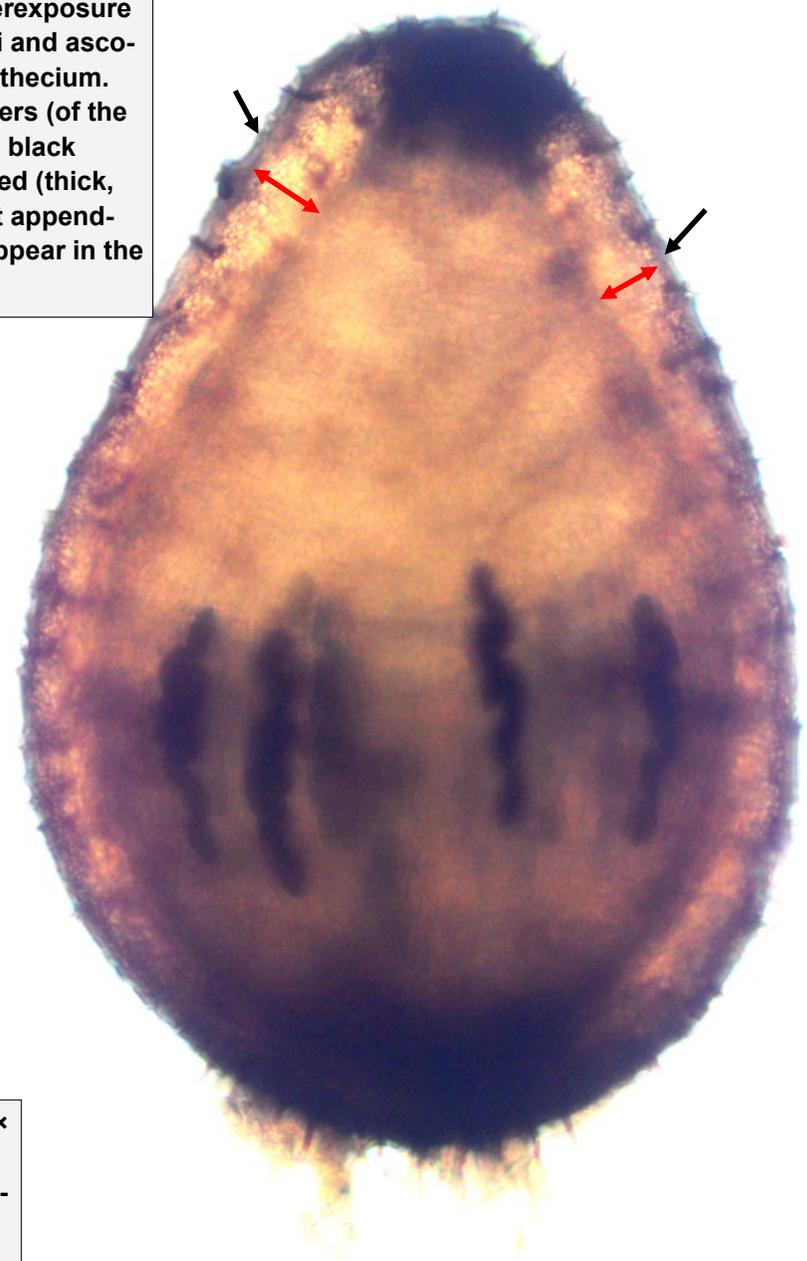


Setose, ostiolate perithecia (arrowed). Showing the scattered, typically not abundant, perithecia in situ on one dung pellet. Insert A at the lower left is a separate higher magnification photo of the smaller area A in the main photo.

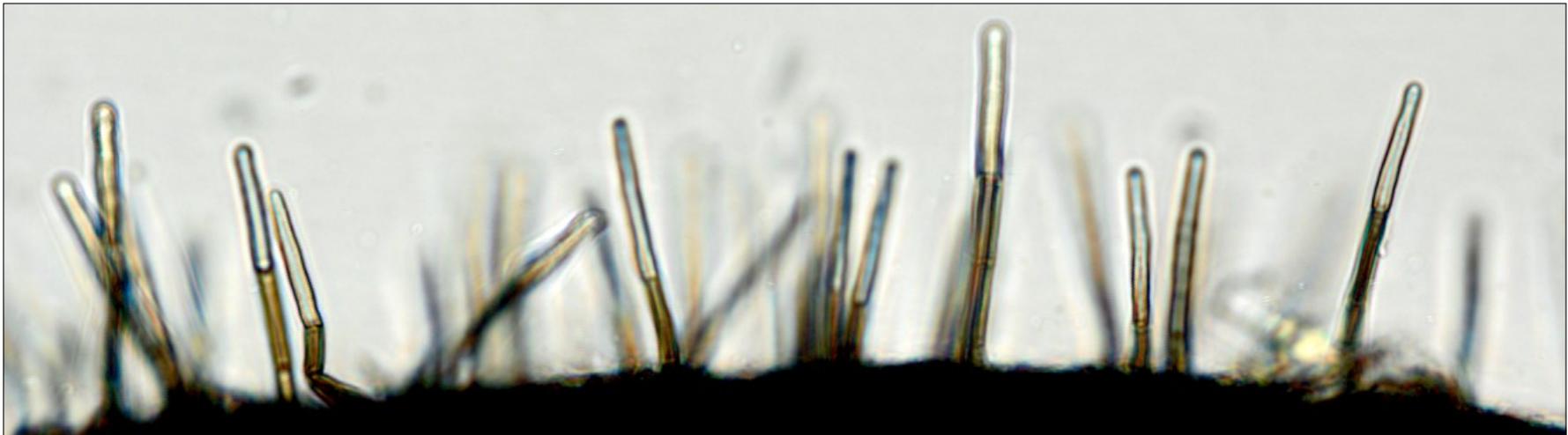
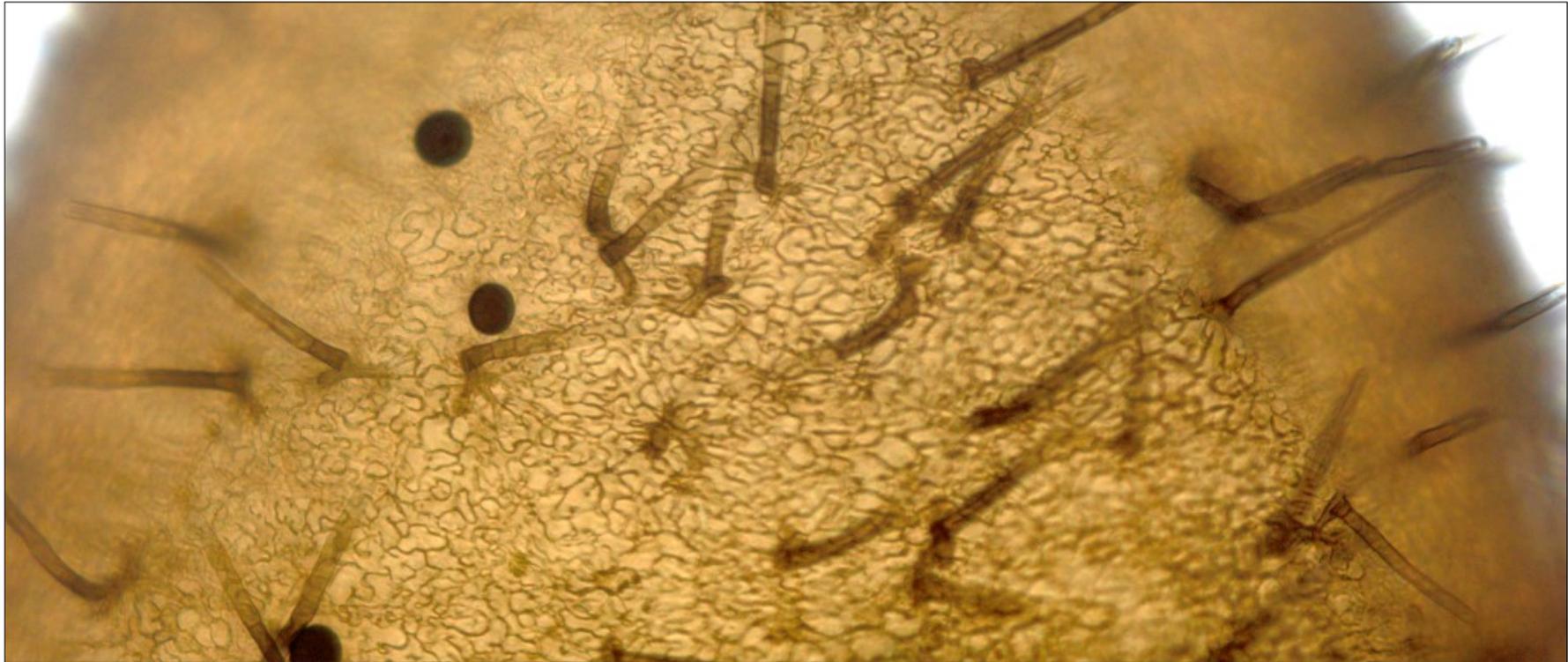


Perithecia in situ on hare dung. Two at right are different foci of the same perithecium, the left of which emphasizes the small raised area with its central ostiole (arrowed) while the one to its right emphasizes the short straight stiff hairs - the apices of which are hyaline. The perithecium photo at the far left better illustrates the slightly elevated apex with its central ostiole.

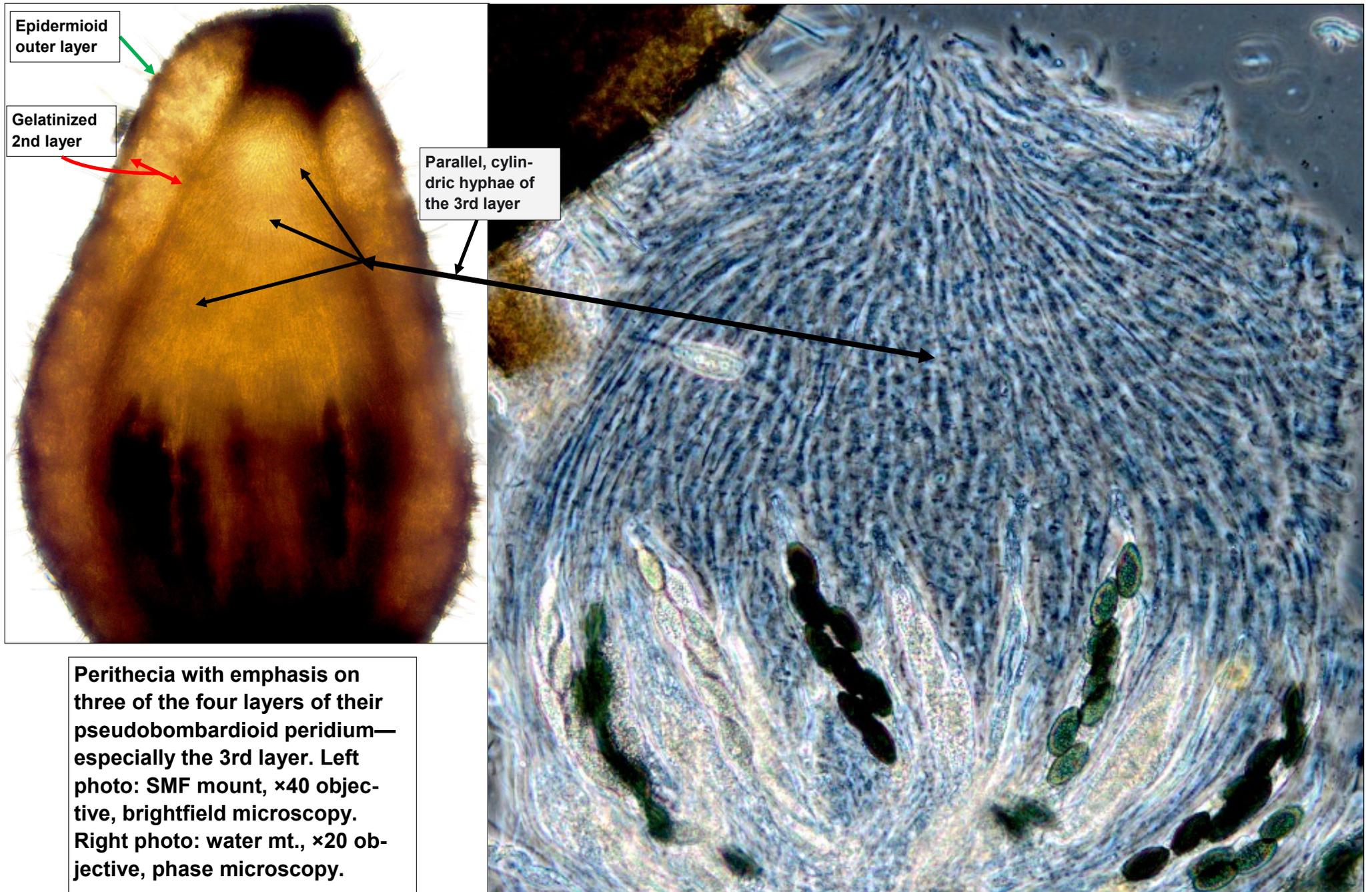
Whole perithecium ('normal' exposure on the left and an overexposure, of the same perithecium, on the right). The overexposure enables a view of asci and ascospores inside the perithecium. Two outer peridial layers (of the 4 layers) are arrowed: black (thin, epidermoidea; red (thick, gelatinous). The short appendages completely disappear in the overexposure.

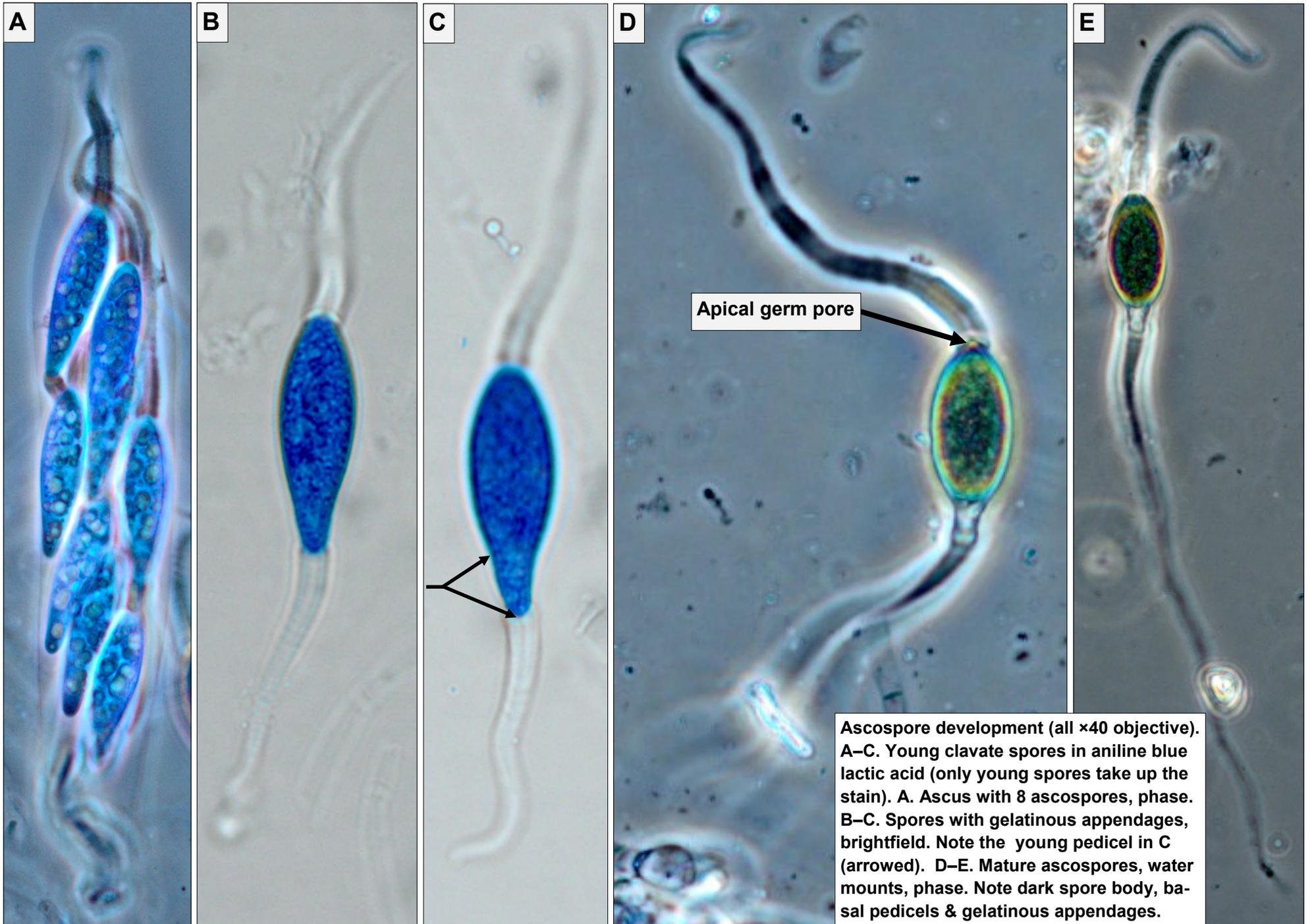


Perithecium 600 × 400 μm. Water mount, ×10 objective, brightfield microscopy.

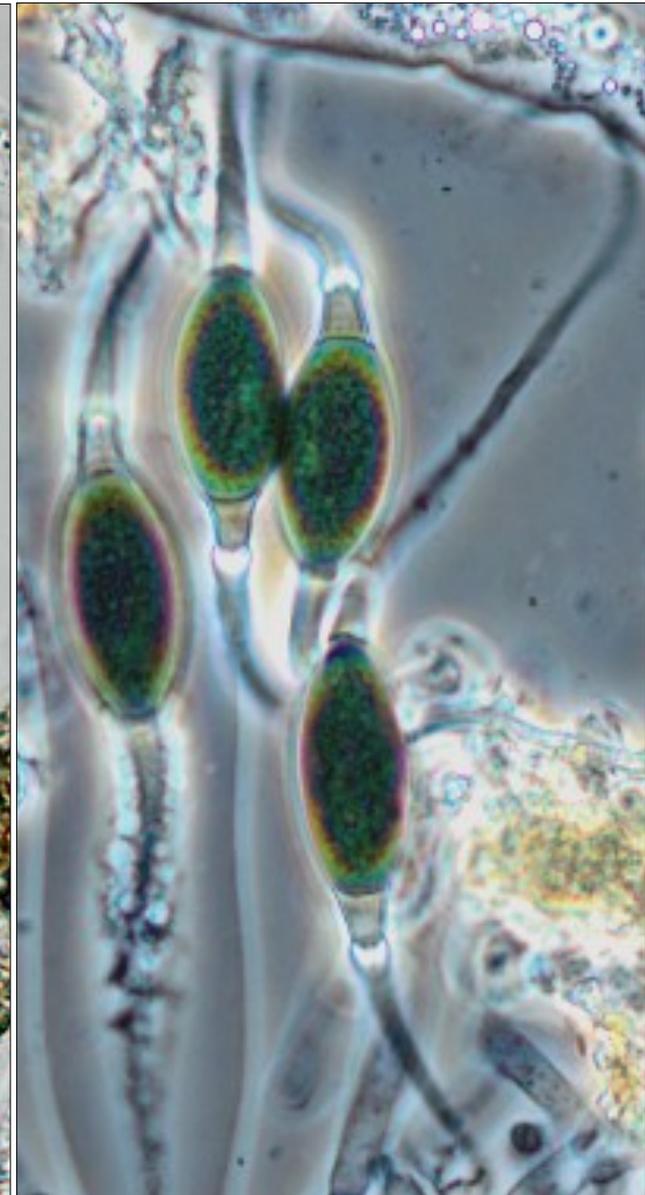
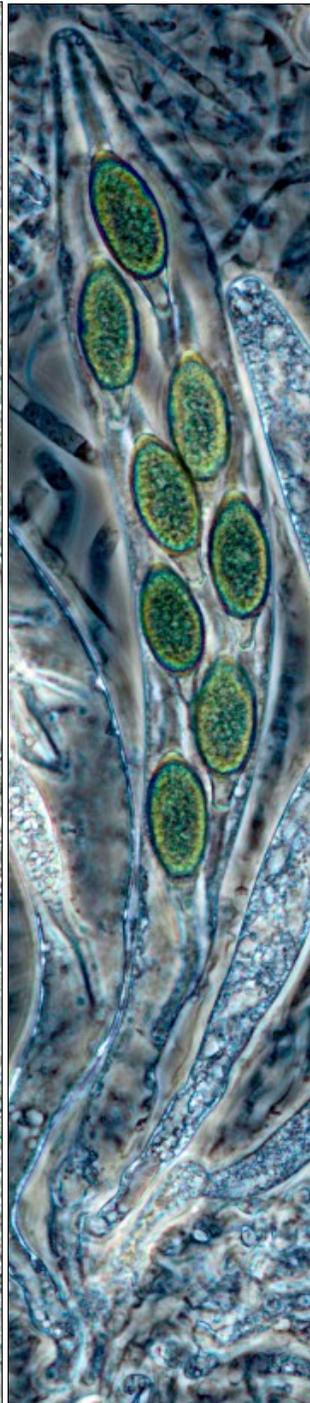


Perithecial peridium outermost layer and its appendages. Water mounts, ×40 objective, brightfield microscopy. The upper photo shows the epidermoidea outermost layer with its (rather squashed here) appendages. The lower photo shows the peridial appendages. Appendages smooth, simple, straight, 1–3 septate, basal cells brownish, apical cells hyaline, 37.5–62.5 × 3 μm.





Ascospore development (all ×40 objective).
A–C. Young clavate spores in aniline blue lactic acid (only young spores take up the stain). A. Ascus with 8 ascospores, phase. B–C. Spores with gelatinous appendages, brightfield. Note the young pedicel in C (arrowed). D–E. Mature ascospores, water mounts, phase. Note dark spore body, basal pedicels & gelatinous appendages.



Asci and mature ascospores (all $\times 40$ objective and water mount). Left 2 photos same field of view, likewise the right 2. The left of each pair, brightfield and the right of each pair, phase. Note the ascus shape & ascospore arrangement in left 2 and the dark ascospore bodies with hyaline basal pedicels & gelatinous appendages in all.