MYCOTAXON

Vol. XI, No. 1, pp. 165-172 April-June 1980

ARNIUM APICULATUM (SORDARIACEAE S. LAT.) REDISCOVERED

C.A. SHEARER

Department of Botany, University of Illinois, Urbana, Illinois 61801

D.L. HAWKSWORTH

Commonwealth Mycological Institute, Kew, Surrey TW9 3AF

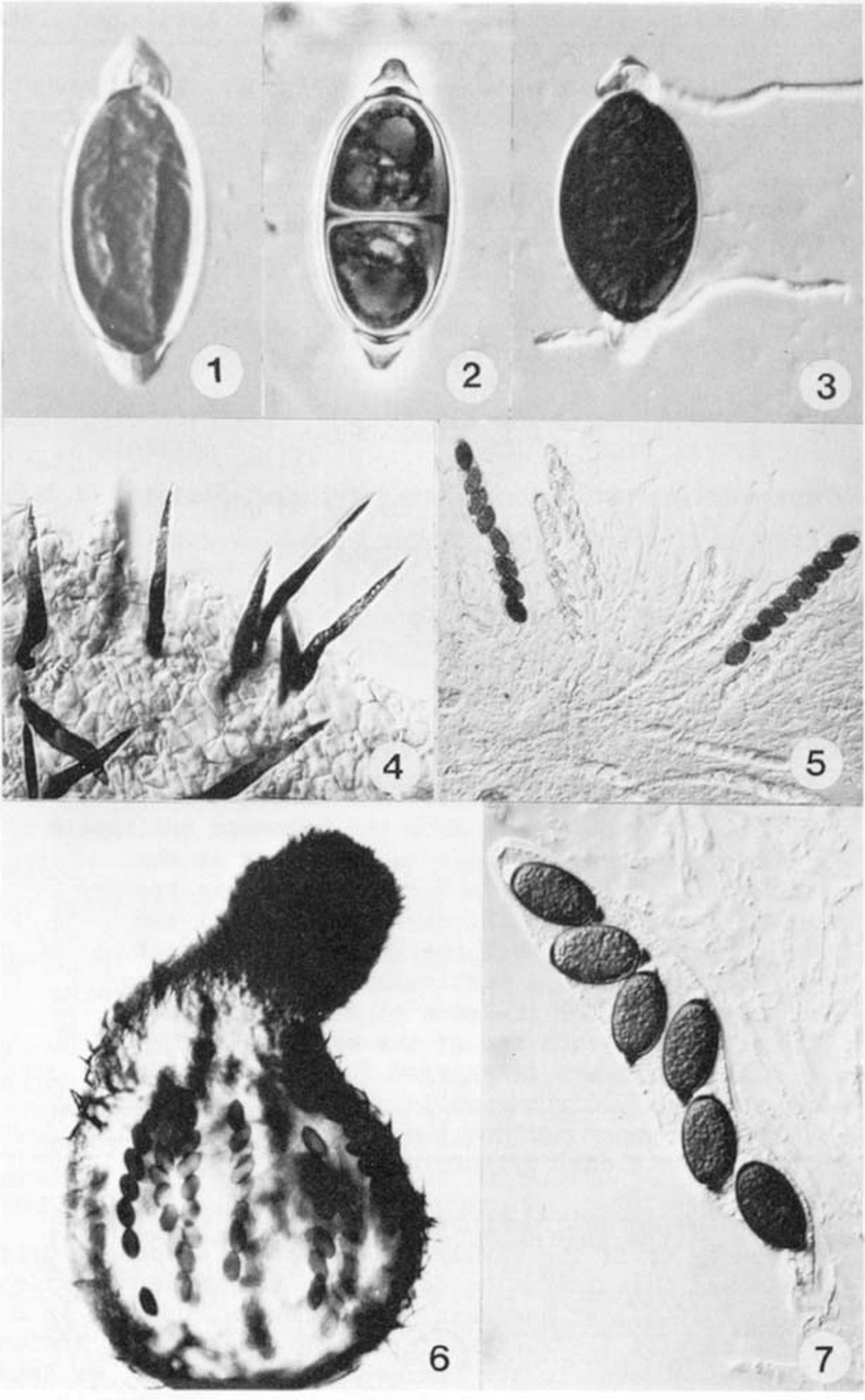
S. VON BODMAN

Department of Botany, University of Illinois, Urbana, Illinois 61801

SUMMARY

Arnium apiculatum (Griffiths) Lundq., a species hitherto known only from the holotype collection made in 1898, has been rediscovered in the British Isles and in N. America. This species is described and illustrated in detail and compared with other species of *Arnium* sect. *Murnia* Lundq. A particular feature of this species is the presence of a conical apical process at each end of the spore. The ascospores are discharged forcibly by a subapical, circumcissile splitting and shedding of the upper part of the ascus (inclusive of a non-functional cylindrical apical apparatus).

Arnium apiculatum (Griffiths) Lundq. was first described by Griffiths (1901) as *Delitschia apiculata* Griffiths. He collected this fungus on dead stems of Russian thistle (*Salsola kali* L.) at Aberdeen, South Dakota, U.S.A., in March 1898. Lundqvist (1972) transferred this species to *Arnium* sect. *Murnia* Lundq. in the Lasiosphaeriaceae Chen. ex Nannf. (Sordariaceae s. lat.). *Arnium* Nitschke ex Winter is


1
2
3
4
5
6
7

distinguished from *Podospora* Ces. nom. cons. primarily by the ellipsoid to fusiform shape of the young ascospores; in sect. *Murnia* the spores are finally transversely 1-septate and bicaudate. Lundqvist noted that only three of the original slides, which are in poor condition, remain of the type material of *Arnium apiculatum*. This species was, however, isolated from ascospores of a perithecium on a dead stem of *Equisetum* sp. collected from an Illinois stream in 1978 and then incubated in a moist chamber. A further collection, evidently conspecific with these specimens, was discovered on dead *Heracleum sphondylium* L. stems in a marsh in Devon, England, the same year.

This paper records the discovery of this species and, with the additional material available, provides a fuller description and discussion of the affinities of this fungus than has hitherto been possible.

Arnium apiculatum (Griffiths) Lundq., *Symb. bot. upsal.* 20 (1): 243 (1972).

Delitschia apiculata Griffiths, *Mem. Torrey bot. Club* 11: 104 (1901).

Figs 1-18. Colonies on half-strength Emerson's yeast, peptone, soluble starch agar (YpSs/2) floccose, white, turning grey to blackish. Perithecia superficial, scattered or aggregated into small clusters, pyriform to subglobose, ostiolate, 0.4-1.3 x 0.2-0.5mm, covered with brown, thick-walled, straight or slightly curved, 0-1 septate hairs, 25-115 x 10-15µm, hairs more numerous in the neck region, with subhyaline to brown flexuose hyphae at the base. Peridium membranous, hyaline to greyish brown, semitransparent except for the dark brown opaque neck; peridial cells angular, pseudoparenchymatous, thin-walled, measuring about 2.5-15µm diam. Neck cylindrical to conical, periphysate, positively phototrophic, 200-550 x 150-250µm. Paraphyses hyaline, filiform, thin-walled, septate, often

---

Figs 1-13, 15-18. *Arnium apiculatum* (ILLS). *Fig.* 1. Aseptate ascospore with appendages at both ends, x 1300. *Fig.* 2. Mature septate ascospore, x 1000. *Fig.* 3. Germinating ascospore, x 900. *Fig.* 4. Perithecial hairs and angular peridial cells, x 700. *Fig.* 5. Fascicle of asci and paraphyses, x 120. *Fig.* 6. Perithecium with a bent neck produced when under a unidirectional source of light, x 100. *Fig.* 7. Ascus containing non-septate ascospores and illustrating the thickened ascus tip, x 450.

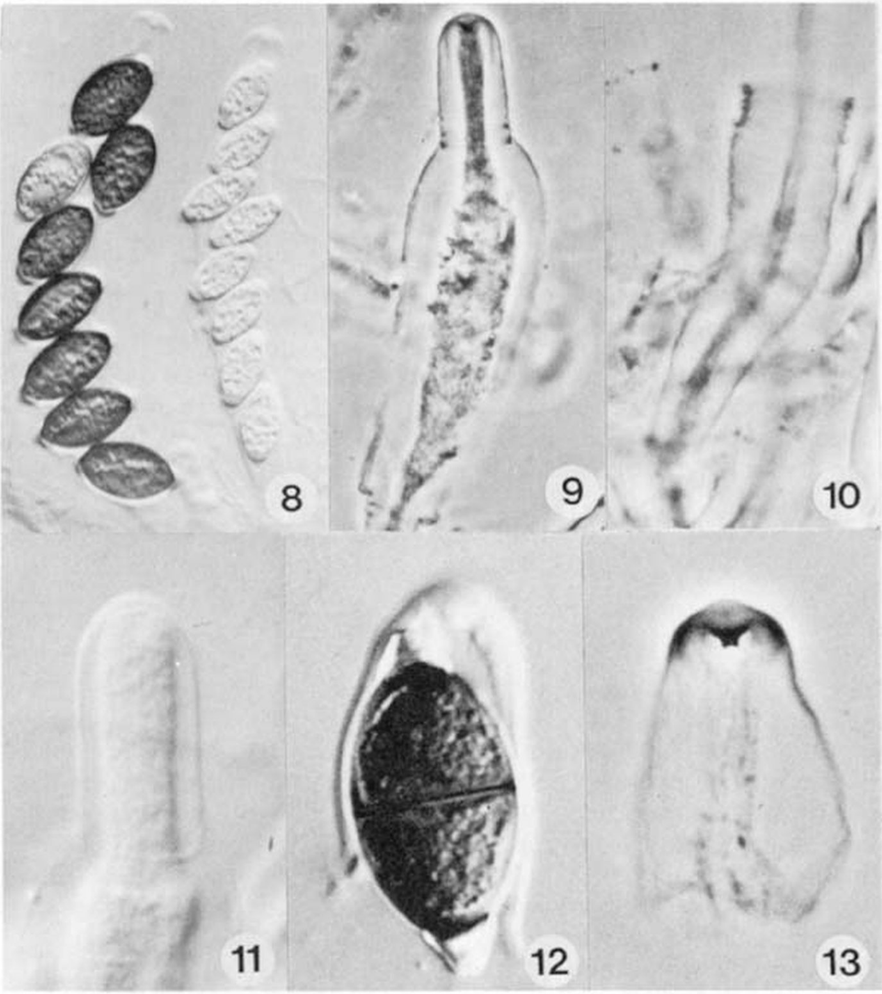


Fig. 8. Mature and immature asci, x 425. *Fig.* 9. Developing ascus illustrating the area of the ascus tip that will rupture, x 650. *Fig.* 10. Ascus after rupture of ascus tip and ejection of ascospores, x 900. *Fig.* 11. Ascus tip showing line of rupture, x 1200. *Fig.* 12. Ejected ascospore carrying the ascus tip, x 1500. *Fig.* 13. Ruptured ascus tip, x 1500.

longer than and mixed with the asci. Asci eight-spored, 150-250 x 15-50µm, unitunicate, cylindrical, narrowed and

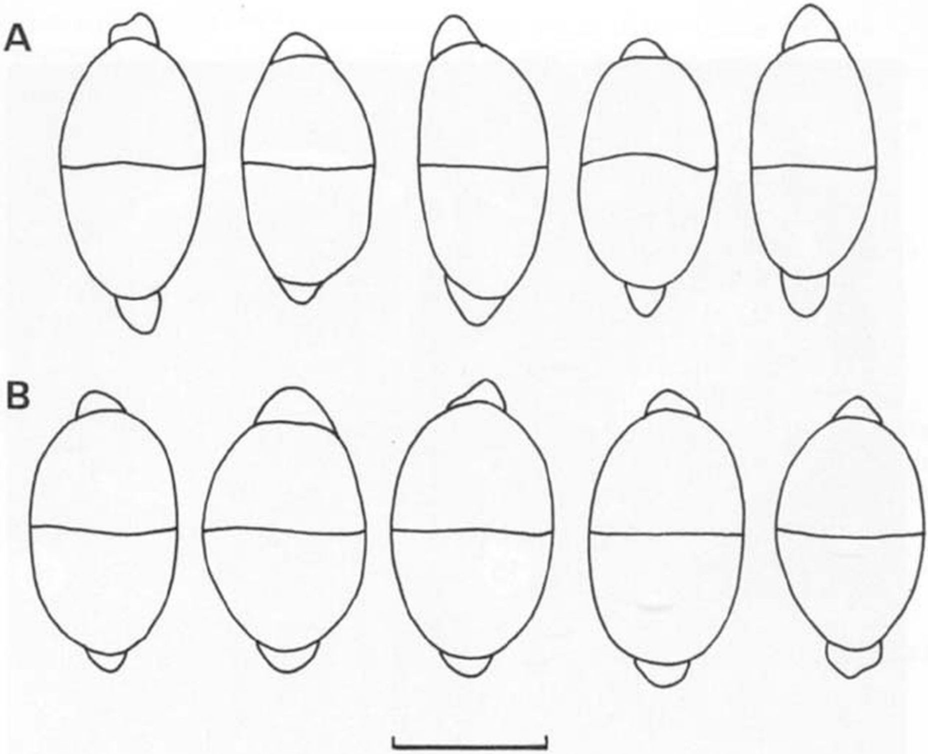


Fig. 14. Ascospore outlines. A, Illinois collection (IMI 238683). B, Devon collection (IMI 232650). Scale = 25µm.

somewhat rounded at the apices, tapering to a slender stipe 50-100µm long, non-amyloid, apical apparatus a cylinder with slightly concave sides, 7-21 x 4-9µm, thicker discharged, upper portion of the ascus rupturing from the basal portion along a predetermined circumcissile line. Ascospores obliquely uniseriate, sometimes biseriate, broadly ellipsoidal, (26-)30-35(-43) x (16-)17-23(-26)µm, hyaline with conspicuous oil droplets when immature, becoming dark brown and (0-)1-septate at maturity, ornamented with small rounded warts (SEM) but appearing smooth by LM; conical processes covering germ pores at both ends, 2.3-7.0µm long.

Specimens Examined: BRITISH ISLES, England: S. Devon, Mamhead, on dead *Heracleum sphondylium* stems, 1 September 1978, *M.B.* & *J.P. Ellis* (IMI 232650). -- U.S.A., Illinois: Vermilion Co., Jordon Creek, on submerged *Equisetum* sp., 29 May 1978, *C.A. Shearer J-4-1* (ATCC 38020, ILLS, IMI 238683, NY). South Dakota: Aberdeen, on *Salsola kali*, March 1898,

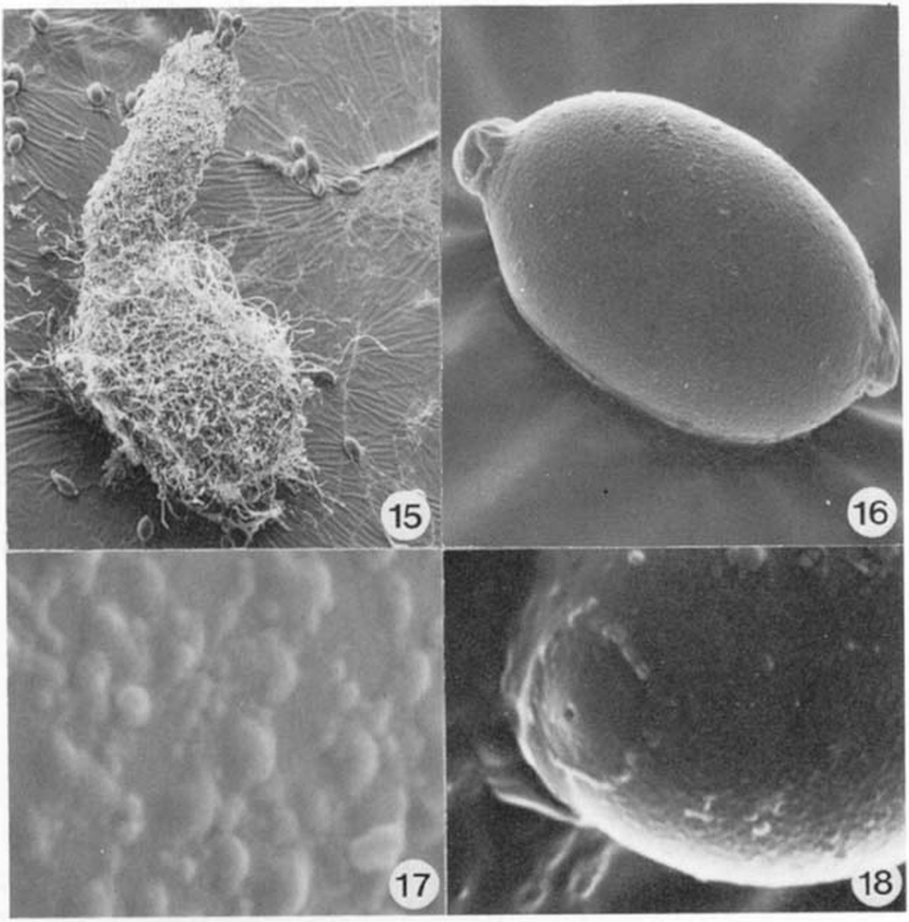


Fig. 15. Perithecium, SEM, x 95. *Fig.* 16. Ascospore, SEM, x 1030. *Fig.* 17. Ascospore surface ornamentation, SEM, x 6350. *Fig.* 18. Ascospore germ pore, the apical process removed, SEM, x 2600.

D. Griffiths (NY (3 slides only), holotype of *Delitschia apiculata* Griffiths).

The Illinois isolate appears to be identical to the type specimen, at least in ascospore morphology and size, although it should be noted that many immature spores in which the central septum has not yet developed occur in the type slides. The perithecia and asci of the type specimen are not well preserved but measurements and general morphology of this isolate agree well with those of the protologue. This isolate grows very well in culture on Emerson's YpSs/2 agar but reproduces much more abundantly when some type of plant substrate is incorporated into the medium.

Studies of the species in culture also showed that the neck of the perithecium is positively phototophic and will bend towards a unidirectional source of light (Fig. 6). Ascospores are forcibly discharged, usually in groups of eight. Griffiths (1901) described the asci as 'very evanescent' but did not discuss the process of ascospore discharge, which proves to be of particular interest. A circumcissile rupture occurs well below the ascus apex as the spores are forcibly discharged in a mass, often carrying the ascus cap with them (Figs 9, 11). The wall of the ascus is thicker above this line than below it (Fig. 7). Fig. 10 shows an ascus from which the tip has been ruptured, and Fig. 13 a ruptured ascus tip. A distinct apical cylinder can be seen in the tip of the ascus before and after discharge (Figs 7-9, 13). Discharging asci were observed more frequently when perithecia were allowed to dry slightly.

The British collection agrees in most details with the North American specimens, but the length:width ratios of the spores are slightly lower (Fig. 14). Spore measurements of the British material are 31-38 x 20-26µm, and of the N. American 26.5-43 x 15-23µm.

The processes at the ends of the spores were interpreted as gelatinous by Lundqvist (1972). However, they are apparently laid down at a very early stage of spore formation prior to the formation of the rounded ends which include the germ pore. Although rather constant in size and shape, these processes never seem to contain any protoplast material at ascospore maturity, and so we feel that they should not be regarded as cellular. By SEM, the outer covering of the processes appears discontinuous with that of the dark body of the spore (Fig. 16). The development of these processes is perhaps similar to that in other members of the Lasiosphaeriaceae Chen. ex Nannf., e.g. *Zopfiella lundqvistii* Shearer & Crane (Shearer & Crane, 1979). No TEM studies of appendage development in the Lasiosphaeriaceae appear to have been carried out but it would clearly be of interest to ascertain if the caudate appendages originated in a similar way in all genera of the family.

Arnium apiculatum was compared with the extant material of other species placed in sect. *Murnia* by

Lundqvist (1972), viz. *A. imitans* Lundq. (BP, holotype; UPS, isotype; BP and O, paratypes) and *A. septosporum* Lundq. (UPS, holotype; UPS, paratype). Neither of these species is known in culture and it proved impossible to deduce the method of ascus discharge from the slide preparations and very limited material available. The apical cylinder in the ascus tip of *A. apiculatum* is, however, identical to that in *A. imitans*; in *A. septosporum* rather few asci were in a suitable stage to observe the maturing asci in detail, but the apical cylinder appears to be shorter in that species. The appendages in both *A. imitans* and *A. septosporum* appear to lack a distinct internal channel. Further, as in *A. apiculatum* (Fig. 18), the appendages cover the apical germ pores (a single pore in the case of *A. septosporum*). All three species have similar perithecia, perithecial hairs, and spores in which the central dark cell becomes 1-septate at maturity.

These fungi clearly form a reasonably well circumscribed group within *Arnium* distinguished by (a) the apical cylinder of the asci, (b) the septate dark cell, (c) apical rather than excentric germ pores, and perhaps also (d) the unchannelled appendages (seen also in a few species of *Arnium* s. str.), and (e) the ornamented ascospore walls (Fig. 17). If the asci also discharge in a distinctive manner, it could be argued that the group might justify recognition at the generic level. However, we feel that it would be premature to do this until more information is available on the nature of the apical processes and discharge mechanisms in the family.

ACKNOWLEDGEMENTS

We are indebted to Dr N. Lundqvist for reading the manuscript and for his extremely helpful comments on our material, and further to the curators of the herbaria cited in the text (BP, O, UPS) for allowing us to study material in their care.

REFERENCES

Griffiths, D. (1901) The North American Sordariaceae. *Mem. Torrey bot. Club* 11: 1-134.

Lundqvist, N. (1972) Nordic Sordariaceae s. lat. *Symb. bot. upsal.* 20 (1): 1-374.

Shearer, C.A. & Crane, J.L. (1978) Illinois fungi IX. *Zopfiella lundqvistii* sp. nov., a new ascomycete from submerged wood. *Trans. Br. mycol. Soc.* 70: 456-459.