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ON THE GENERA ASCOCORTICIUM AND ASCOSORUS (ASCOCORTICIACEAE).

W. JÜLICH* & B. DE VRIES**

The genera *Ascocorticium* and *Ascosorus* have been studied. For *Ascocorticium vermisporum* Hanerslev, the new genus *Ascocorticiellum* is described.

One of the most unusual Ascomycetes is *Ascocorticium anomalum* which forms whitish, corticioid patches on the substrate. The genus *Ascocorticium* was formerly placed in the Taphrinales, since a typical ascocarp is lacking and the asci are being formed on loosely arranged hyphae. In later years, a more distinct relationship with the Helotiales (inoperculate asci) became obvious. The type species, *A. anomalum*, has been described by various authors, e.g. by Schroeter (*1893*), Earle (*1902*), Svrček (*1954*), Oberwinkler, Casagrande & Müller (*1967*), Cooke (*1968*) and Malençon (*1979*). The imperfect state of that species, formerly assigned to the genus *Rhinotrichella* Arnaud (*1953*, not validly published), is now placed in the genus *Acrodontium* Hoog (*1972*).

The genus *Ascocorticium* has played an important role in phylogenetic discussions, which is particularly distinct in Gäumann's text-book (*1926*) where the Corticiaceae, Dacrymycetaceae, and related families are directly linked with *Ascocorticium*-like genera ('*Ascocorticium*gruppe'). A similar line is found in Roger's paper (*1934*) on the basidium: 'It is proper... to postulate the rise of the basidiomycetes from some such resupinate form as *Ascocorticium*.' Nowadays, however, the genus is placed in the Helotiales as a very specialized taxon with a unique fruit-body, and not as an ancestor of the Basidiomycetes. With *Ascocorticium albidum* Bref. placed in synonymy under *A. anomalum* (Ell. & Harkn.) Schroeter, the genus remained monotypic until Hauerslev (*1975*) described a second species under the name *A. vermisporum*. This species, which was found in Denmark growing on bark of *Pinus*, differs from *A. anomalum* in its larger asci and distinctly elongate, vermicular and septate spores. The shape of the fruit-body, i.e. whitish, very thin and corticioid, is the same in both species.

The second author found *A. vermisporum* in the Netherlands, which seems to be the first published account outside of Denmark. The well developed specimen, which grew on decorticated wood of *Pinus*, gave an excellent opportunity for a detailed study of this fungus. And since *A. vermisporum* shows some deviating characters, it has to be compared with *Ascocorticium anomalum* and with the genus *Ascosorus* P. Henn. & Ruhl., the second member of the Ascocorticiaceae.

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Ascocorticiaceae Schroet.

Ascocorticiaceae Schroet. in Cohn 1893, Krypt. Fl. Schles. 3 (2): 15.

Schroeter (*1893*) erected for the monotypic genus *Ascocorticium* the family Ascocorticiaceae and placed it in a special 'Unterabteilung' Ascocorticiinei of the Discomycetes, immediately behind the Taphriinei. One year later he (Schroeter, *1894*) placed both the Ascocorticiaceae and the Exoascaceae (incl. *Taphrina*) in the 'order' Protodiscineae. Korf (*1973*) included in this family also the genus *Ascosorus*.

ASCOCORTICIUM Bref.

Ascocorticium Bref. 1891, in Unters. Gesamtgeb. Mykol., vol. IX, p. 145.

Ascocarp resupinate, thin. Subiculum thin, with hyaline, cylindrical hyphae. Margin thinning out, not differentiated. Asci hyaline, cylindrical to narrowly clavate, often with a lateral outgrowth at the base, smooth, 15-25 μm long, 8-spored. Paraphyses hyaline, cylindrical. Spores hyaline, ellipsoid, aseptate, thin-walled, smooth, inamyloid. — On wood or bark of gymnosperms and angiosperms.

ASCOCORTICIUM ANOMALUM (Ell. & Markn.) Schroet.

Ascocorticium anomalum (Ell. & Harkn.) Schroet. in Engl. Prantl, Nat. Pfl. Fam. 1 (1): 161. 1894.

Ascomyces anomalum Ell. & Harkn. 1881, *in* Bull. Torrey Bot. Club **8**: 26. *Exoascus anomalus* (Ell. & Harkn.) Sacc. 1888, Syll. Fung. **8**: 820.
Ascocorticium albidum Bref. 1891, Unters. Gesamtgeb. Mykol. **9**: 145.

Ascocarp resupinate, forming rounded and often discrete patches (*c.* 1-2-5 mm in diam.) or confluent, whitish or pale greyish, thin but clearly visible, pruinose-waxy, the margin thinning out and becoming indistinct. Subiculum thin, loose, *c.* 15-25 μm thick. Hyphae hyaline, rather loosely arranged and more or less archnoid, cylindrical, thin- or slightly thickwalled, 1.5-2.5(-4) μm wide. Asci hyaline, cylindrical or narrowly clavate, often with a short lateral outgrowth at the base, with thickened wall toward the apex with a smooth surface, 15-25(-28) × 4.5-7 μm, inoperculate, 8-spored, inamyloid. Paraphyses hyaline, cylindrical or tapering often flexuous, not branched, 18-30 × 1.2-2 μm. Ascospores hyaline, ellipsoid, one-celled, thin-walled, smooth, 3.8-6(-8) × 1.8-3 μm, often bi-guttulate, inamyloid.

SUBSTRATE: Mainly found on bark of gymnosperms (*Pinus*, *Picea*, *Juniperus*, *Larix*), but also recorded from angiosperms (*Acacia*, *Betula*, *Calluna*). In two cases the species was found on a dead *Amylostereum*. *Juniperus* seams to be the preferred substrate in Europe.

DISTRIBUTION: Known from several parts of Europe, North America, and from North Africa.

IMPERFECT STATE: *Acrodontium* sp. (= *Rhinotrichella* sp.) Aerial hyphae yellowish to brownish, 1-2.5 μm wide, thin-walled, smooth. Conidiophores scattered, subulate with a denticulate rachis, up to 50 μm long, pale brown near the base, becoming hyaline towards the apex. Conidia hyaline, broadly ellipsoid, thin-walled, smooth or finelly verrucose, not septate, 3.5-5 × 3-3.5 μm.

Two varieties can be recognized, characterized by differences in substrate and in the size of spores and asci.

Ascocorticium anomalum var. *anomalum* is known mainly from bark of *Pinus*. This variety has rather small spores (*c.* 3.5–4.5 × 1.5–2.2 μm) and small asci (*c.* 15–23 × 5–6 μm). The second variety was often collected on bark of *Juniperus* and differs in its larger spores (*c.* 4.5–8 × 2–3 μm) and larger asci (*c.* 16–28 × 5.5–7 μm). It is called

Ascocorticium anomalum (Ell. & Harkn.) Schroet. **var. juniperi** Jülich & Vries, *var. nov.* Differt a varietate anomala ascis sporisque majoribus. Typus: Denmark, Jutland, Silkeborg, Vissingkloster, 26.X.1980, *B. de Vries 4284* (L).

ASCOSORUS P. Henn. & Ruhl. in P. Henn. 1900

Ascosorus P. Henn. & Ruhl. in P. Henn. 1900, Bot. Jb. **28**: 276.

Ascocarp resupinate, small, ochraceous. Subiculum thin, with hyaline, cylindrical hyphae. Margin not differentiated. Asci hyaline, clavate, smooth, somewhat thick-walled, with 4–8 spores. Paraphyses rare, hyaline, cylindrical. Ascospores hyaline, septate, somewhat thick-walled, smooth, inamyloid. — On living leaves of angiosperms.

ASCOSORUS FLORIDANUS (Ellis & Martin) P. Henn. & Ruhl.

Ascosorus floridanus (Ellis & Martin) P. Henn. & Ruhl. in P. Henn. 1900, Bot. Jb. **28**: 276.

Ascomycetella floridana Ellis & Martin 1884, *in* Amer, Naturalist **18**: 1148.

Ascocarp resupinate, 0.2–0.5 mm wide, thin, ochraceous, with indistinct margin. Subiculum thin, rather loose, *c.* 15–30 μm thick. Hyphae hyaline, cylindrical, thin- to somewhat thickwalled (*c.* 0.4 μm), 2–3 μm wide. Asci hyaline, clavate, with short stipe, a regularly thickened wall and smooth surface, 70–100 × 16–20 μm, inoperculate, with 4–8 spores. Paraphyses rare, hyaline, cylindrical, thin-walled, not branched, *c.* 60–110 μm long. Ascospores hyaline, elongate, with (3–)5–7 thickened septa, somewhat thick-walled (0.5 μm), smooth, 50–70 × 5.5–6.5 μm.

SUBSTRATE: on living leaves of *Quercus laurifolia*.

DISTR.: southern parts of U.S.A.

There is no doubt that *Ascocorticum anomalum* and *Ascosorus floridanus* should be kept in different genera, but '*Ascocorticium*' *vermisporum* presents more difficulties. It is certainly not congeneric with *Ascocorticium anomalum*, since it differs in size and shape of the asci, and in the number, form and septation of the spores; the only charcaters in common are the thin, pruinose ascocarps and the substrate (saprophytic on wood or bark). On the other hand, there seems to be also no closer relationship to *Ascosorus floridanus*, from which '*Ascocorticium*' *vermisporum* also differs in a number of characters: the asci are shorter with a rather wide apical opening (at least when immature) and with 16 spores per ascus while the spores are very narrow and thin-walled. There is another deviating character rarely found (or reported) in Ascomycetes: the asci of '*Ascocorticium*' *vermisporum* are clearly warty under the scanning electron microscope and appear to be somewhat uneven or even scaly under the light microscope; asci are completely smooth in both other taxa.

These differences are tabulated below.

	Ascocorticium anomalum	*Ascosorus floridanus*	'*Ascocorticium*' *vermisporum*
ASCI			
form	± cylindrical	clavate	broadly clavate
size	15-25(-28) × 4.5-7	70-100 × 16-20	20-40 × 15-18
opening	small	small	wide
surface	smooth	smooth	warty
spores	8	4-8	16
SPORES			
form	ellipsoid	elongate	elongate
size	3.8-6(-8) × 1.8-3	50-70 × 5.5-6.5	20-30 × 1.2-1.5
wall	thin	thick	thin
septa	0	(3-)5-7	*c.* 3
SUBSTRATE	saprophytic on (wood or) bark	parasitic (?) on living leaves	saprophytic on wood or bark

Ascocorticiellum Jülich & Vries, *gen. nov.*

Carposomata resupinata, tenuia, pallida, pruinosa. Subiculum tenue, margo tenuescens vel indistincta. Asci hyalini aut pallide lutei, late clavati, superficie aspra, 16-spori. Paraphyses hyalinae, cylindraceae, haud septatae. Ascosporae hyalinae, elongatae, vermiformes, tenuiter tunicatae, laeves, 3-septatae.
Typus: *Ascocorticium vermisporum* Hauerslev 1975 *in* Friesia **10**: 317.

Ascocarp resupinate, light coloured, thin, pruinose. Subiculum thin, margin thinning out or indistinct. Hyphae hyaline, cylindrical, often slightly thick-walled. Asci hyaline or slightly yellowish, broadly clavate, with uneven surface, 16-spored. Paraphyses hyaline, cylindrical, not branched.
Ascospores hyaline, elongate, more or less vermiform, thin, smooth, 3-septate.

Ascocorticiellum vermisporum (Hauerslev) Jülich & Vries, *comb. nov.*

Basionym: *Ascocorticium vermisporum* Hauerslev 1975, *in* Friesia **10**: 317.

Ascocarp forming resupinate, rounded patches up to a few millimeters in diameter, very thin, hardly visible, pruinose, whitish or light greyish. Subiculum very thin, arachnoid, producing fascicles of asci. Margin thinning out or indistinct. Hyphae hyaline or pale yellowish-brownish near the substrate, 1-2 μm or 2-3.5 μm wide, thin-walled or often slightly thickwalled (0.3-0.4 μm), smooth, septate. Asci broadly clavate, 20-40 × 15-18 μm, hyaline or with slightly yellowish, thickened walls, the surface somewhat uneven under the light microscope, distinctly warty under the SEM, after pressure with a very wide apical opening (no fully mature asci observed), 16-spored. Paraphyses hyaline, cylindrical or with narrowly clavate apical part, 25-30 × 5-8 μm.

Ascospores hyaline, vermiform, thin-walled, smooth, 20-30 × 1.2-1.5 μm, with three (or four?) septa.

SUBSTRATE: saprophytic on bark or wood of *Pinus*.

DISTRIBUTION: known only from Denmark and the Netherlands.

Ascocorticiellum is tentatively placed in the Ascocorticiaceae (Helotiales), a family characterized by resupinate, corticioid ascocarps. It is, however, believed that the three genera of that family have not much in common except their growth habit, and it is not unlikely that these taxa with strongly reduced and modified ascocarps but quite different asci are not closely related.

The ascus of the genus *Ascocorticiellum* deviates from a typical Helotiales-ascus in several respects. After pressure on the cover glass of a microscopic preparation, there appears a wide apical opening at the ascus and the whole cytoplasma is pressed out which seems to be surrounded by some kind of an endoascus since it keeps its form; a swelling, hyaline body is observed on the upper part of the cytoplasma (preparations in KOH). In lactophenol, a small porus-like structure can be seen in the apex of the ascus.

The ascus wall in many operculate Discomycetes is covered by a periascus which forms a granular or wrinkled surface (Brummelen, *1981*). In Helotiales, however, asci are usually smooth. The development of the ascocarps of the three treated genera is distinctly eugymnohymenial: the hymenium is exposed from the first stages through the maturation of the asci, with the paraphyses free at the top and not interconnected (Kimbrough, *1981*).

A fourth genus, viz. *Karstenella* Harmaja, has to be mentioned in this connection. This genus was described as belonging to the operculate Discomycetes (Harmaja, *1969*; Korf, *1972*, *1973*) but was recently placed in the inoperculate Discomycetes (Kimbrough, *1981*). *Karstenella* is well characterized by its narrow, rather long asci (150-190 × 8-12.5 μm) and ellipsoid, one-celled spores (12-15 × 5.5-7.2 μm). Furthermore, it differs from the other three genera in its brownish red ascocarps which are roundish, 3-12 mm wide and 0.4-0.7 mm thick.

COLLECTIONS EXAMINED.

(a) *Ascocorticium anomalum*

SWEDEN: Hallandsaosen, Frestensfälla, 21.X.1972, *B. de Vries 1351* (WAG-W); Hallandsaosen, Hulrugered, 20.X.1972, *B. de Vries 1352* (WAG-W).

DENMARK: Bornholm, Paradisbakkerne, 10.X.1964, *M. P. Christiansen* (L); — Frederikshavn, Gerum Kirke, 15.X.1980, *B. de Vries* (L); 24.X.1980, *B. de Vries 4286* (WAG-W); — Frederikshavn, 13.X.1972, *B. de Vries 1354* (WAG-W); 11.X.1980, *B. de Vries 4280* (WAG-W); — Frederikshavn, Hestvang, 10.X.1972, *B. de Vries 1355* (WAG-W); 17.X.1980, *B. de Vries 4283* (WAG-W); — Femmöller, 13.X.1979, *J. Schreurs 365* (WAG-W); — Holstebro, 30.X.1980, *B. de Vries 4282* (WAG-W); — Silkeborg, Höjkol, 28.X.1980, *B. de Vries 4285* (WAG-W); — Silkeborg, Vissingkloster, 26.X.1980, *B. de Vries 4284* (WAG-W); — Hirtshals, Tolne-Bakker, 17.X.1980, *B. de Vries 4281* (WAG-W); — Hjörring, Bjaergby kirke, 23.X.1980, *B. de Vries 4163* (WAG-W).

GERMAN DEMOCRATIC REPUBLIC: Rügen, Hiddensee, Fährinsel, 18.X.1975, *B. de Vries 3114* (WAG-W).

GERMEN FEDERAL REPUBLIC: Schleswig-Holstein, Sachsenwald bei Friedrichsruh, 21.IX., 18.X.1908, *O. Jaap* (=Jaap, Fung. sel. exs. 306) (L); — Lingen-Brögbern, 5.XI.1975, *B. de Vries 3115* (WAG-W) — Alstätte, Hörsteloe, 24.1971, *B. de Vies 1961* (WAG-W) — Meppen, 20.X.1978, *B. de Vries 3696* (WAG-W) — Emlichheim, 30.IX.1971, *B. de Vries 1033* (WAG-W) — Lüneburger Heide, Steingrund, 17.IX.1979, *B. de Vries 3877*; Niederhaverbeck, 9.X.1974, *B. de Vries 2059*; Wilsederberg, 13.IX.1979, *B. de Vries 3875* (WAG-W) — Groß-Jörl, Rimmelsberg, 2.X.1972, *B. de Vries 3003* (WAG-W).

THE NETHERLANDS: Prov. Drenthe: Westerbork, Mantingerzand, 20.XI.1979, *B. de Vries* (L); — Wijster, 22.XI.1978, 29.XI.1978, *B. de Vies 4135, 3691* (WAG-W); — Holthe, 13.X.1978, *B. de Vries 3693* (WAG-W); — Mantinge, 20., 21., 29.XI.1979, *B. de Vries 4136, 4137, 3690* (WAG-W); — Rolde, 16.X.1978, *B. de Vries 3695* (WAG-W); — Prov. Overijssel: Hengevelde, 22.X.1979, *B. de Vries 3879* (WAG-W); — Marienberg, 25.X.1978, *B. de Vries 3694* (WAG-W); — Ommen, Eerderveld, 9.X.1978, 10.X.1979, *B. de Vries 3692, 3878* (WAG-W).

(b) *Ascosorus floridanus*

U.S.A.: Florida, Green Cove Springs, on living leaves of *Quercus laurifolia*, .II.1885, *G. Martin* (= Ellis et Everh., North Amer. Fungi 2069) (L).

(c) *Ascocorticiellum vermisporum*

DENMARK: Sjaelland, Tisvilde Hegn, 29.VIII.1965, *K. Hauerslev 2376* (type) (C) — Falster, Distr. 37, Bøtø, 8.X.1956, *K. Hauerslev 1525* (C).

THE NETHERLANDS: Prov. Drenthe, Diever, Berkenheuvel, 3.XI.1980, *B. de Vries* (L).

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HAUERSLEV, K. (1975) New or rare resupinate fungi. *In* Friesia **10**: 315-322.

HENNINGS, P. (1900). Fungi japonici. *In* Bot. Jb. **28**: 259-280.

HOOG, G. S. DE (1972). The genera *Beauveria, Isaria, Tritirachium* and *Acrodtonium* gen. nov. *In* Stud. Mycol. **1**: 1-41.

KIMBROUGH, J. W. (1981). The Discomycete centrum. *In* Reynolds, D. R. (ed.), Ascomycete Systematics, pp. 92-101.

KORF, R. P. (1972). Synoptic key to the genera of the Pezizales. *In* Mycologia **64**: 937-994.

—— (1973). Discomycetes and Tuberales. *In* G. C. Ainsworth F. K. Sparrow & A. S. Sussman (eds.), The Fungi, vol. IV A: pp. 249-319.

MALENÇON, G. (1979). Nouvelles contibutions à la flore mycologique du Marox — II. *In* Bull. Soc. mycol. France **95**: 119-137.

OBERWINKLER, F., F. CASAGRANDE & E. MÜLLER (1967). Über *Ascocorticium anomalum* (Ell. et Harkn.) Earle. *In* Nova Hedw. **14**: 283-289.

ROGERS, D. P. (1934). The basidium. *In* Univ. Iowa Stud. Nat. Hist. **16**: 160-181.

SCHROETER, J. ('1908', publ. 1893). Die Pilze Schlesiens. *In* F. Cohn (ed.), Kryptogamen-Flora von Schlesien, **3** (2).

—— ('1897', publ. 1894). Protodiscineae. *In* Engler und Prantl, Nat. Pfl. Fam. **1** (1): 156-161.

SVRČEK, M. (1954). *Ascocorticium anomalum* (Ell. et Harkn.) Earle, a resupinate Ascomycete, in Bohemia. (in Czech). *In* Ceská Mykol. **8**: 58-60.

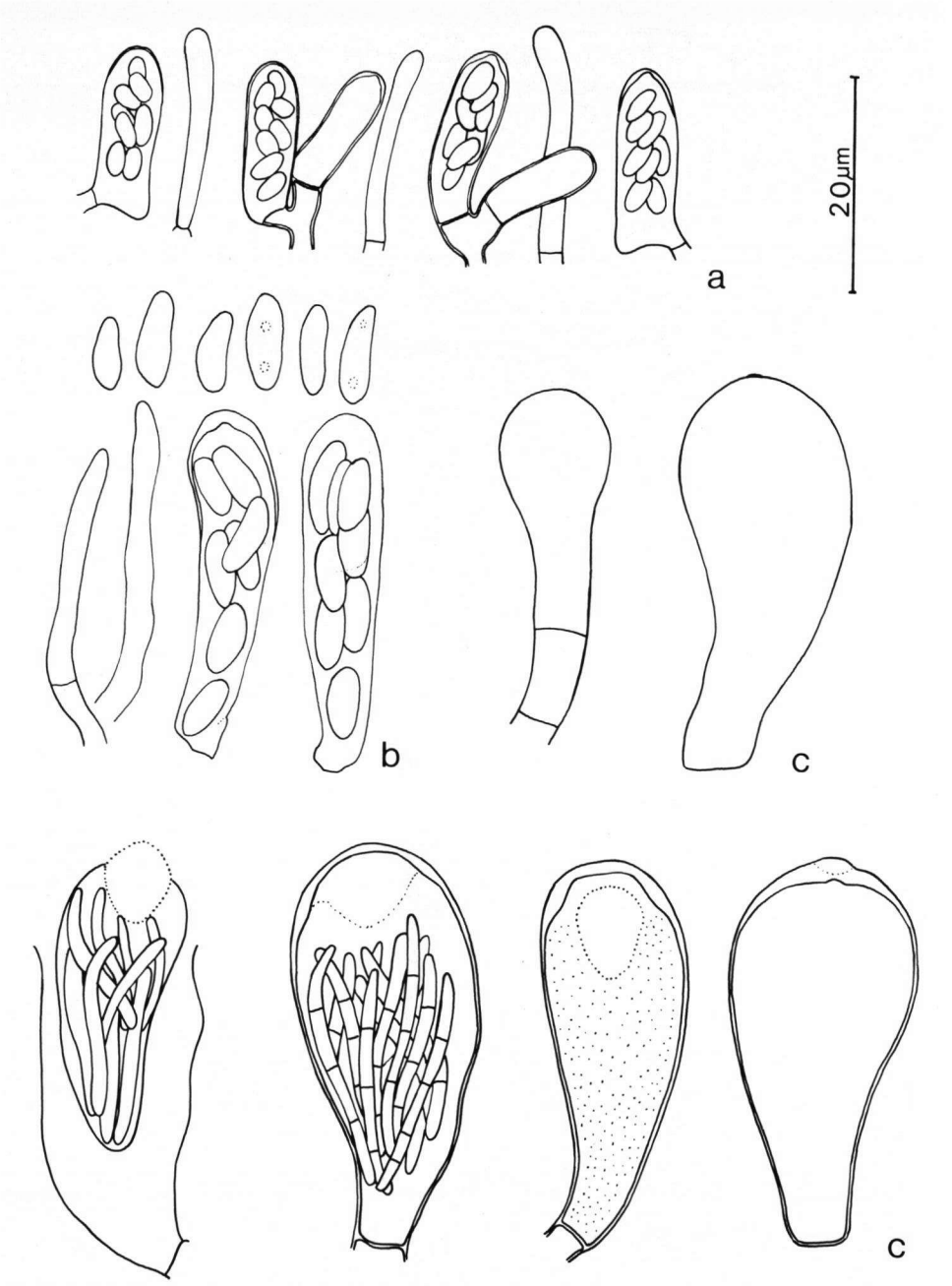

Fig. 1a. *Ascocorticium anomalum* var. *anomalum*. Jaap, Fung. sel. exs. 306. — b. *Ascocorticium anomalum* var. *juniperi*. Denmark, *B. de Vries 4284* (type). — c. *Ascocorticiellum vermisporum*. Netherlands, 3.XI.1980, *B. de Vries*.

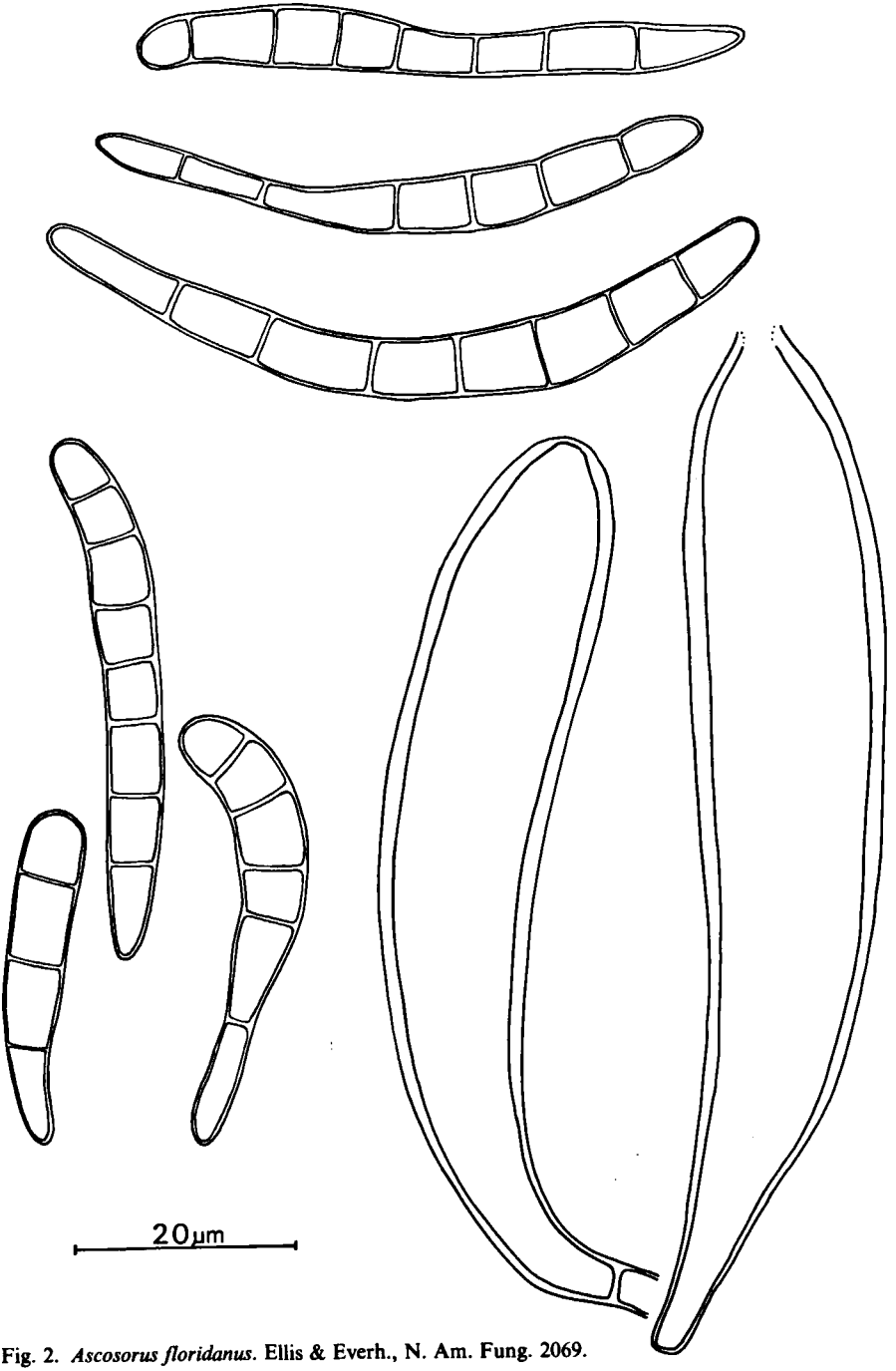

Fig. 2. *Ascosorus floridanus*. Ellis & Everh., N. Am. Fung. 2069.

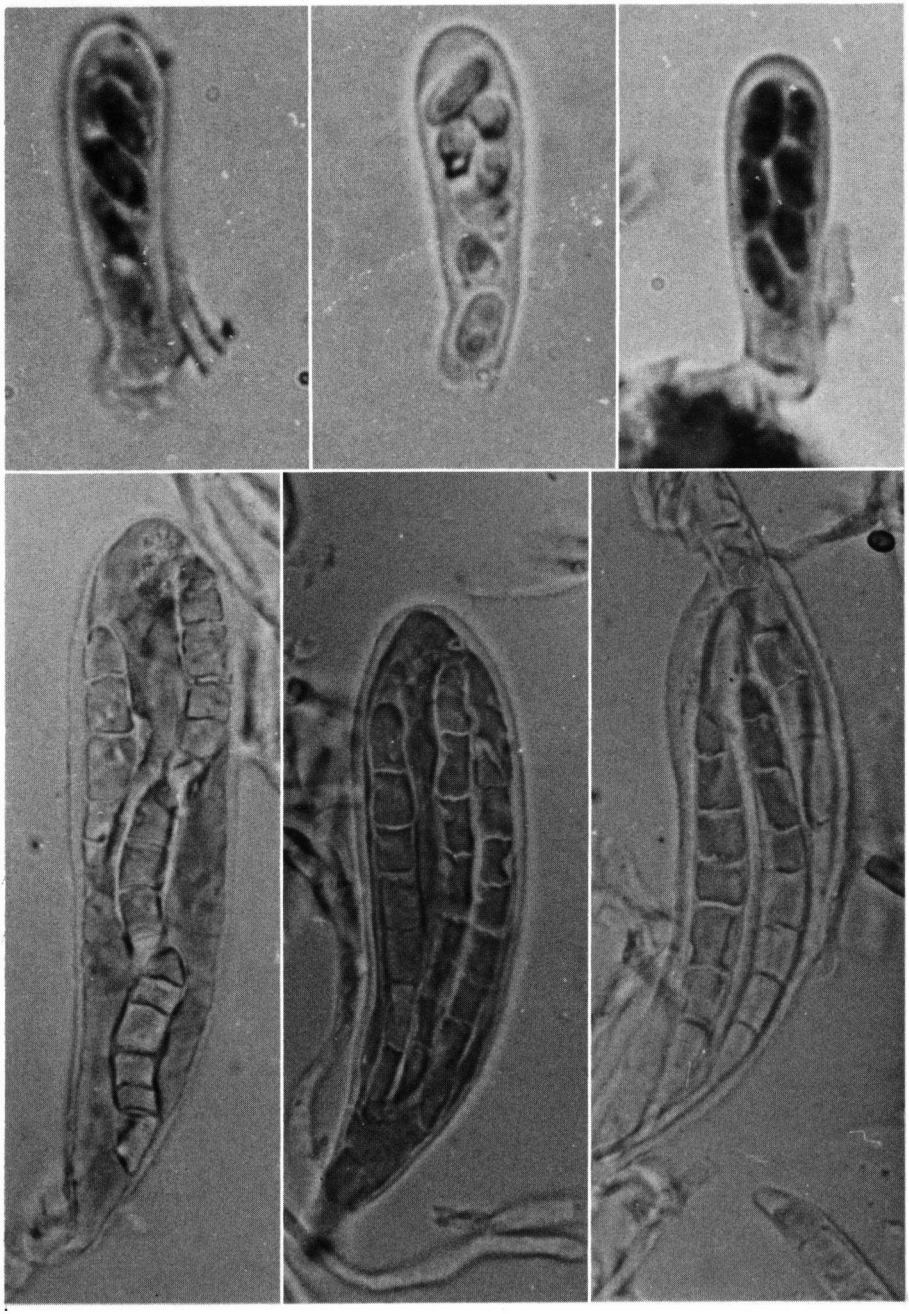

Fig. 3. Above. *Ascocorticium anomalum.* Denmark, Bornholm, *M. P. Christ.* (×2600). — Below. *Ascosorus floridanus.* Ellis & Everh., N. Am. Fung. 2069 (×1000).

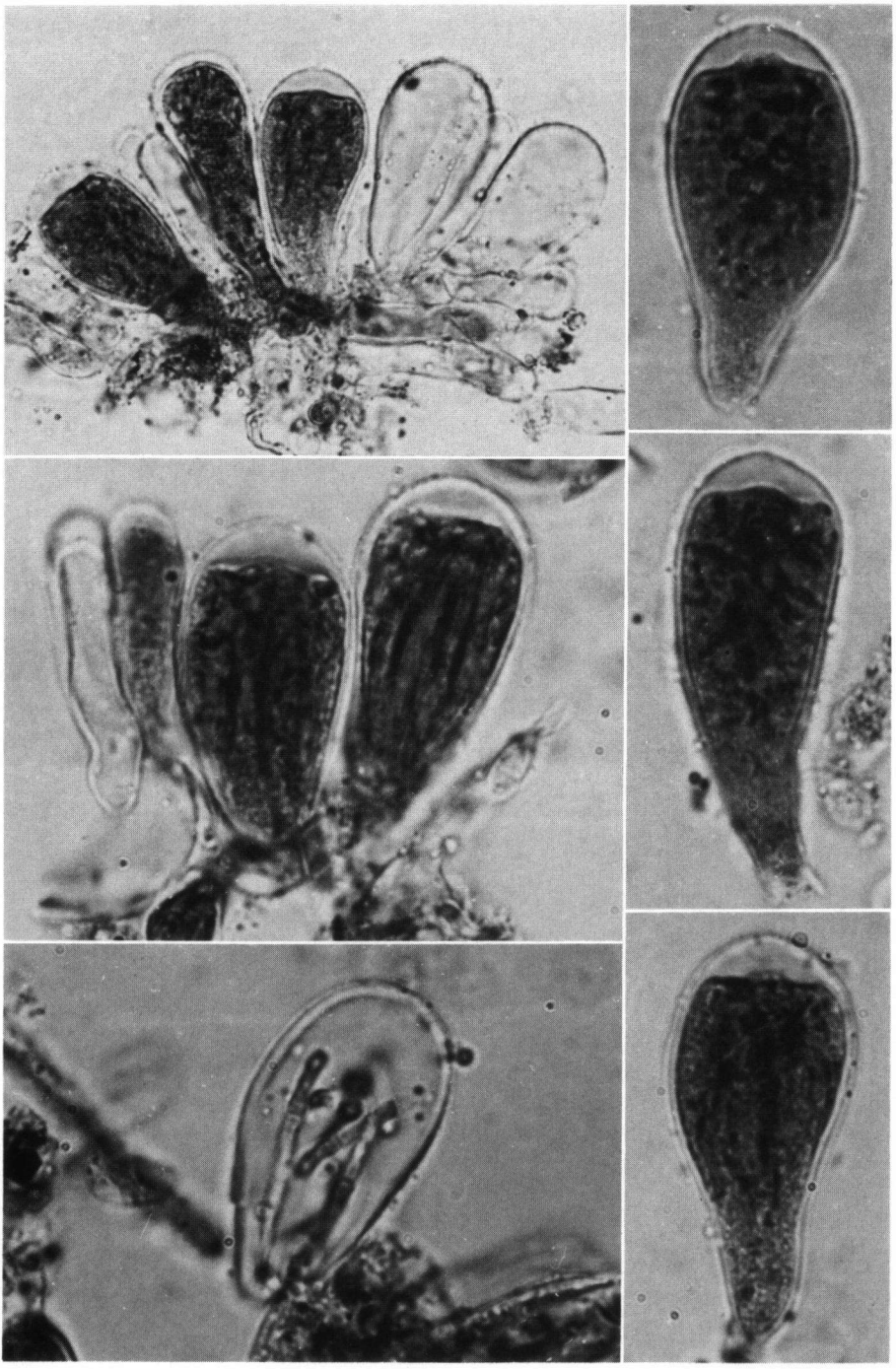

Fig. 4. *Ascocorticiellum vermisporum*. Denmark, *Hauerslev 2376* (type). (Above left: ×990, all others ×1580.)

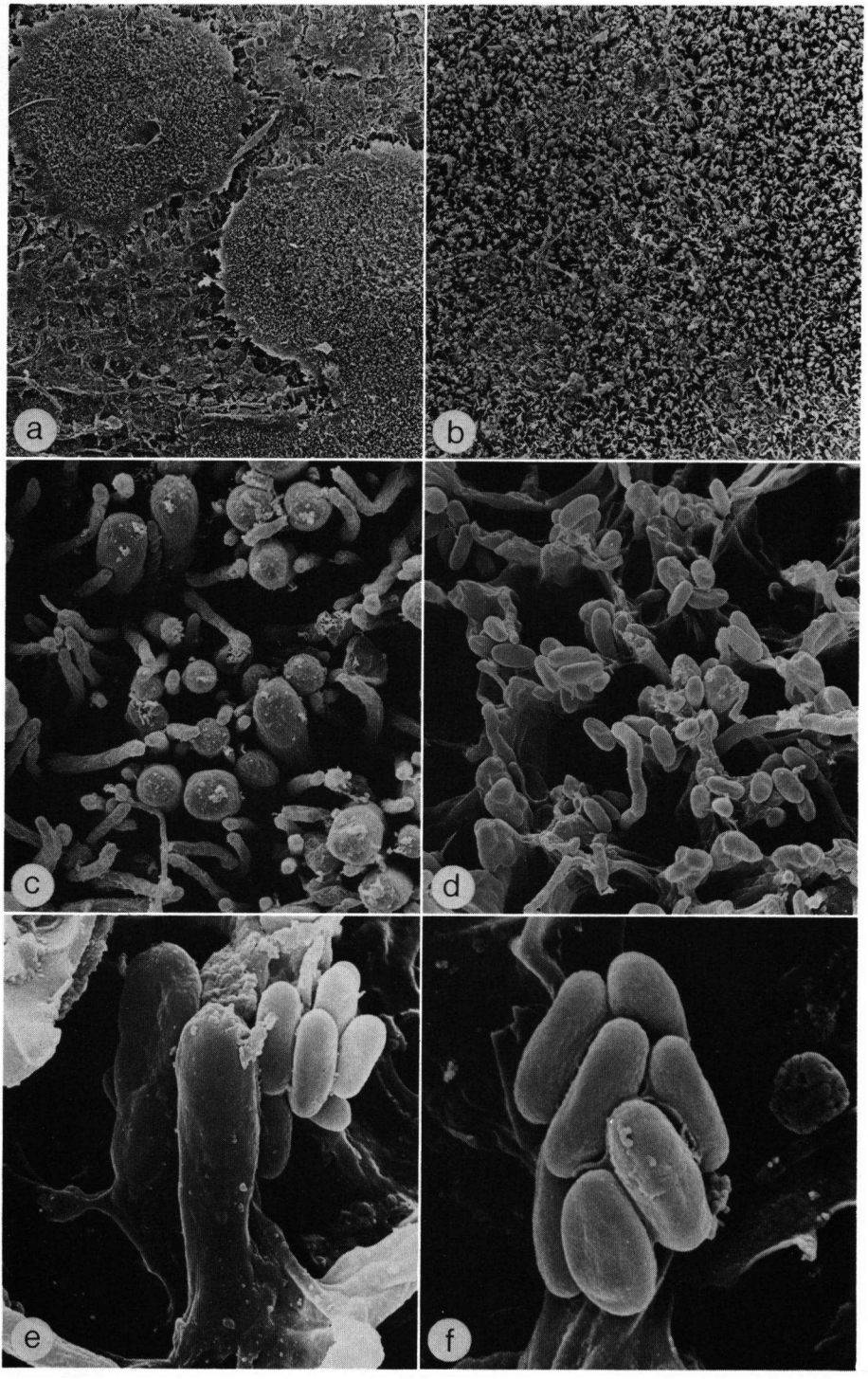

Fig. 5. *Ascocorticium anomalum.* — a–c. Denmark, *B. de Vries 4164.* (a, × 60; b, × 160; c, × 1600). — d–f. Germany, Jaap, Fung. sel. exs. 306. (d, × 1600; e, × 4000; f, × 6800.)

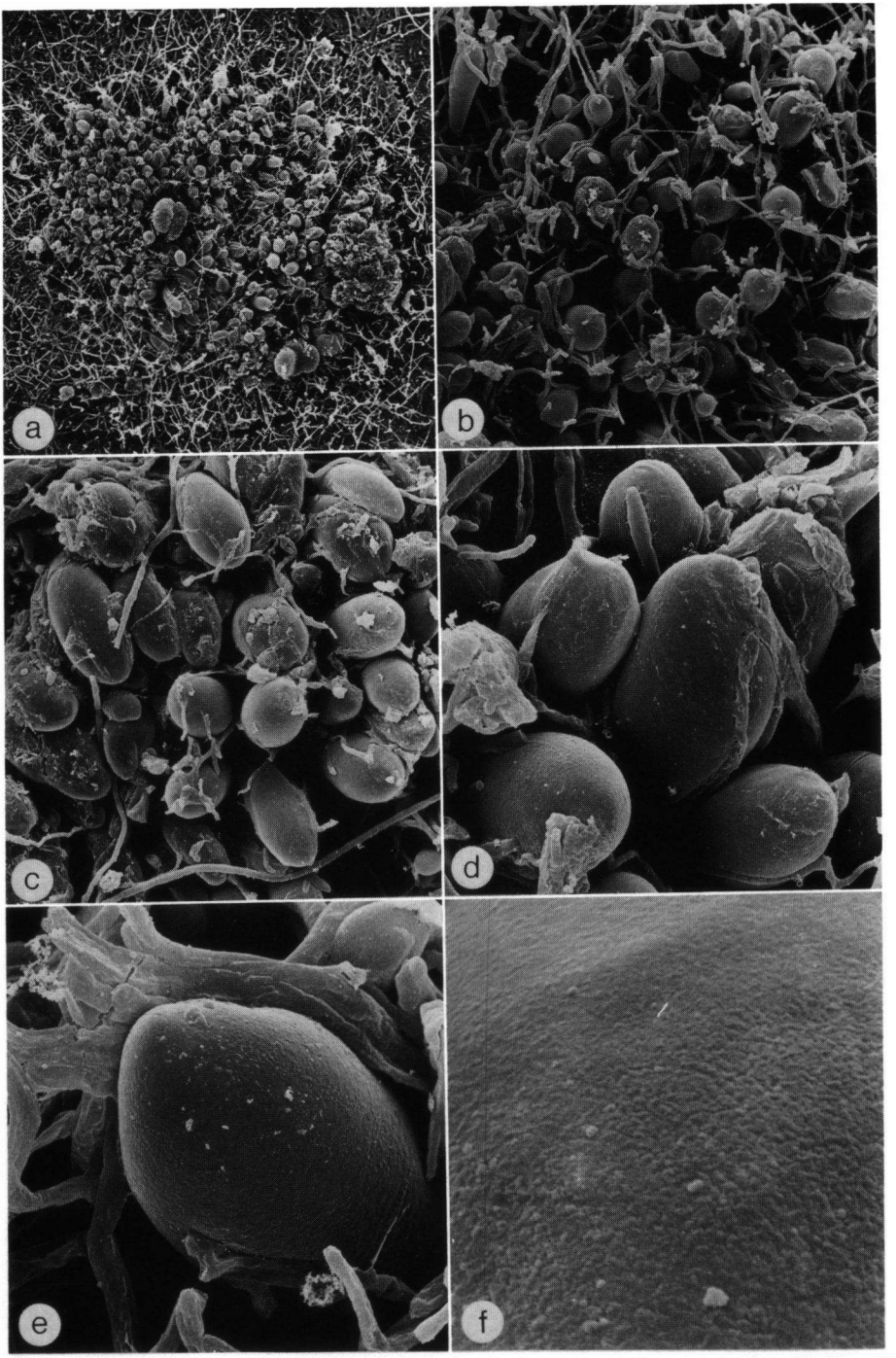

Fig. 6. *Ascosorus floridanus*. Ellis & Everh., N. Am. Fung. 2069 (type) (a, ×100; b, ×360; c, ×450; d, ×1200; e, ×1800; f, ×9000).

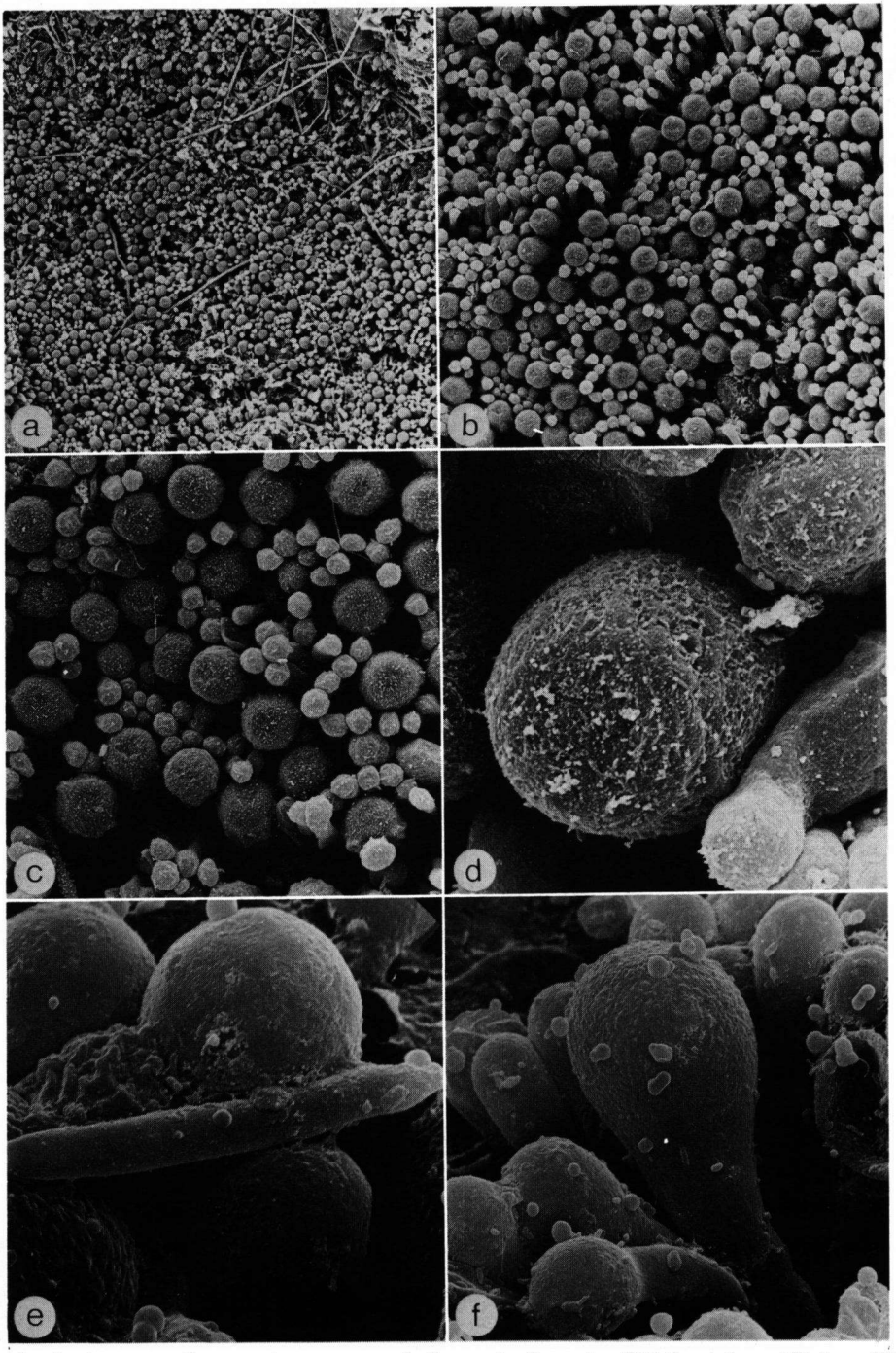

Fig. 7. *Ascocorticiellum vermisporum*. — a–d. Denmark, *Hauerslev 2376* (type) (a, ×160; b, ×400; c, ×750; d, ×4000). — e–f. Netherlands, 3.XI.1980, *B. de Vries* (e, ×3300; f, ×1600).

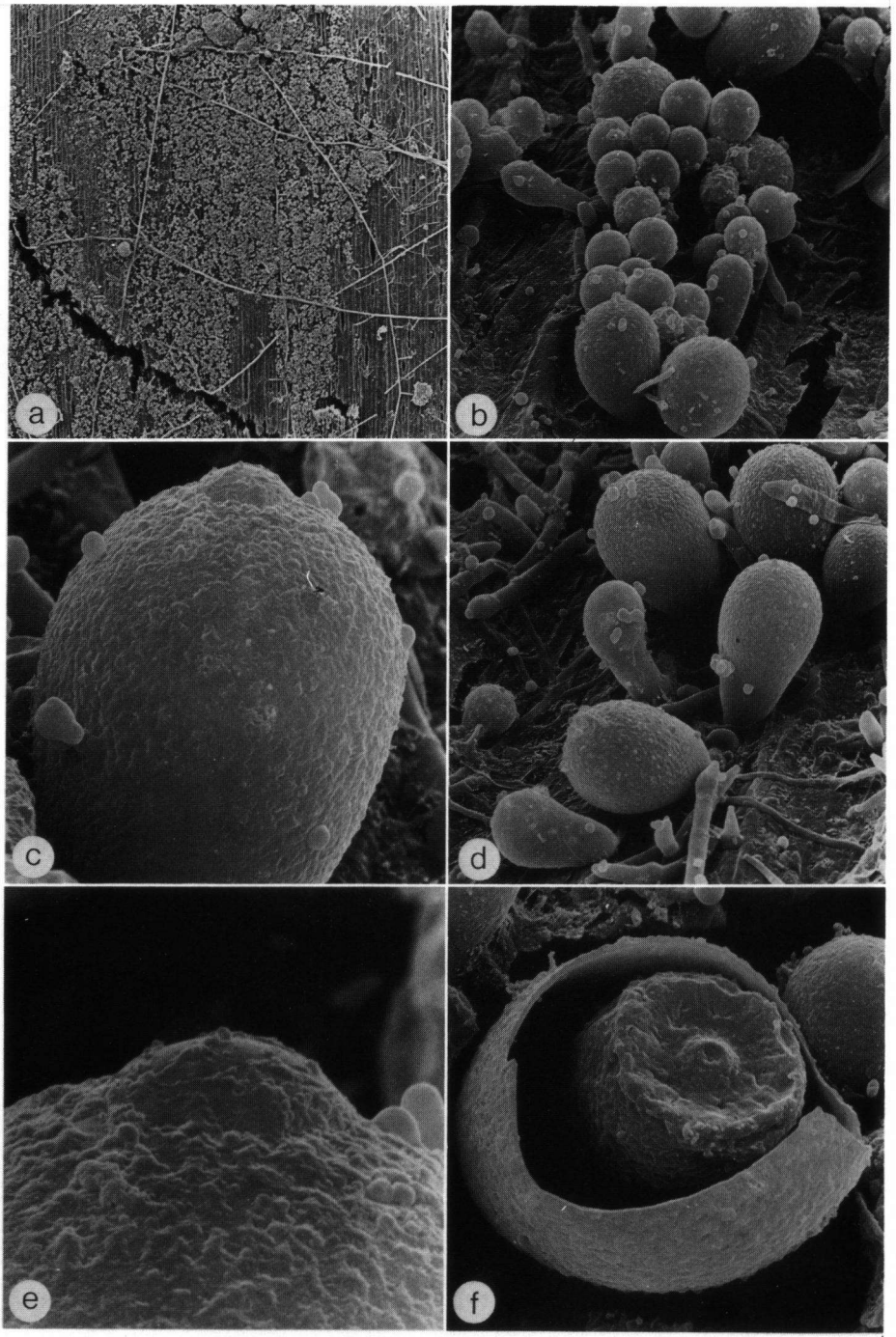

Fig. 8. *Ascocorticiellum vermisporum*. Netherlands, 3.XI.1980, *B. de Vries* (a, × 25; b, × 900; c, × 3300; d, × 2000; e, × 8000; f, × 3300).