Zeitschrift: Mycologia Helvetica
Herausgeber: Swiss Mycological Society
Band: 2 (1986-1987)
Heft: 1

Artikel: A new species and two new combinations in the genus Sowerbyella
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DOI: https://doi.org/10.5169/seals-1036411

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MYCOLOGIA HELVETICA

Vol. 2 No 1 pp. 93—102 1986

(Manuscript received on 12th May 1986)

A NEW SPECIES AND TWO NEW COMBINATIONS IN THE GENUS SOWERBYELLA

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Summary: *Sowerbyella kaushalii* spec. nov. is described according to a collection from India and two new combinations, *Sowerbyella parvispora* (Trigaux) comb. nov. and *Sowerbyella rhenana* (Fuckel) comb. nov. are proposed.
The species are compared to other species of the genus and their differences and taxonomic value are discussed. Ascospore ornamentation of the type specimens of *S. kaushalii* and *S. parvispora* is illustrated by line drawings and SEM photomicrographs.

Zusammenfassung: Aufgrund eines Fundes in Indien beschreibt der Autor die neue Art *Sowerbyella kaushalii* spec. nov., und er schlägt die folgenden zwei Neukombinationen vor: *Sowerbyella parvispora* (Trigaux) comb. nov. und *Sowerbyella rhenana* (Fuckel) comb. nov. Diese Arten werden mit anderen Arten der Gattung verglichen; ebenso werden ihre Unterschiede sowie ihr taxonomischer Wert besprochen. Strichzeichnungen und EM-Aufnahmen illustrieren die Ascosporenornamentation der Typenexemplare von *S. kaushalii* und *S. parvispora*.

Résumé: A partir d'une récolte en Inde, l'auteur décrit l'espèce nouvelle *Sowerbyella kaushalii* spec. nov.; il propose de plus les deux combinaisons nouvelles *Sowerbyella parvispora* (Trigaux) comb. nov. et *Sowerbyella rhenana* (Fuckel) comb. nov.
Ces espèces sont comparées à d'autres espèces du genre; leurs différences et leur valeur taxonomique sont discutées. Des dessins au trait et des photographies au MEB illustrent l'ornamentation des ascospores des exemplaires-types de *S. kaushalii* et de *S. parvispora*.

Nine species of the genus *Sowerbyella* were recognized in my previous taxonomic revisions of the genus (J.Moravec 1985a, 1985c). In the present paper, after additional examinations, I consider further three discomycetes members of *Sowerbyella*.

Sowerbyella kaushalii J.Moravec spec. nov.
Apothecia usque 62 mm diam. et 65 mm alta, gregaria vel solitaria, stipitata, irregulariter cupulata, ad basi incisa; thecio griseo-luteo; pars externa apotheciorum laete badia, pustulata: stipes usque 10 mm crassus et 32 mm altus, cylindricus, cavus, laete badius, leniter foveolatus, tomentosus. Excipulum externum textura globulosa-angularis; pars externa apotheciorum e cellulis globosis, luteo-brunneis et hyphis hyalinis, septatis constat; parte inferiore (medulla) e hyphis septatis, saepe inflatis (textura intricata) constat. Paraphyses filiformes, apice sensim incrassatae et valde curvatae, granulis impletae. Asci cylindracei, octospori, non amyloidei. Ascosporae 12.7-17.5 x 6.5-9 µm (sine ornamento) ellipsoideae vel elongato-ellipsoideae, guttulis 2-5 (saepe binis) instructae, dense irregulariter spinosae vel echinatae.
Habitat: ad terram inter lignum putridum in silva frondosa, Batasi, Darjeeling, West Bengal, India, 6.IX.1979 leg. Rishi Kaushal. Holotypus PAN 18169 et duplicatum holotypi in herbario privato J. Moravecii asservantur.
Apothecia up to 62 mm diam. and 65 mm high, gregarious to caespitose or scattered, stipitate, irregularly cupulate and asymmetrically split downwards the cup (but not down the stipe); hymenium greyish-yellow, external surface light brown, pustulate. Stipe up to 10 mm thick and 32 mm long, hollow, light brown with occasional longitudinal pits, hairy. Ectal excipulum textura globulosa angularis, cells 7.5-30-55 µm diam., external surface covered with smaller globose, ellipsoid or pyriform cells containing yellow-brown pigment, mixed with septate hyphae (6-12 µm thick). Medulary excipulum textura intricata consisting of septate hyphae (6-12 µm thick), which are often inflated. Hairs of the surface of the stipe are hyaline in form of clusters. Paraphyses filiform, 2.5-3 µm thick, with hooked or curved, slightly enlarged apices (up to 4.5 µm), with granular contents, septate. Asci 170-220 x 9.5-13 µm, cylindrical, eight-spored but occasionally with only 2 or 4 or 6 mature ascospores developed in one ascus. (Such ascospores are usually larger than in eight-spored asci). Ascospores ellipsoid to elongate-ellipsoid or of an irregular shape, (12.7)- 14-16.5-(17.5) x 6.5-9 µm, usually with two guttules but also with 3-5 guttules; perisporium irregularly densely erinaceous to spiny;

spinae 0.5-1.5 µm high, irregularly arranged, forming a fine and very irregular sculpture. (Oil immersion 1600 x + CB and SEM 5000-10000 x, compare figs.1 and 3-7).
Habitat: On soil mixed with decayed wood in an angiospermous forest, Batasi, Darjeeling, West Bengal, India, 6.IX. 1979 leg. Rishi Kaushal. (Holotype PAN 18169, isotype J.Moravec).
As it was previously noted (J.Moravec 1985c p.433), this Indian fungus has all features of the genus *Sowerbyella*.
Sowerbyella polaripustulata J.Moravec (1985a) and *Sowerbyella pallida* (Spooner)J.Moravec (J.Moravec 1985c) have spiny ascospores but the perisporium of *S. kaushalii* has a very different ornamentation.

Sowerbyella parvispora (Trigaux) J.Moravec comb. nov.
Basionym: *Discina parvispora* Trigaux, Doc. mycol. 16 (61):7-15, 1985.
Originally described from rich soil of a manured ploughed field at a border of a deciduous wood near a river bank of the Vesle river in Montigny-sur Vesle, France, 4.II.1984 leg.Ginette Trigaux, under the name *Discina parvispora* Trigaux (1985). However, according to the detailed description and illustrations (Trigaux 1985) it has been clear that the fungus is congeneric with *Sowerbyella*. My reexamination of the holotype fully confirmed this opinion.
Later, I examined another collection from France: collected in the marshy lowland of the Loire river, on old cow dung and on manured soil of a cattle pasture near Le-Ponts-de-Cé, south of Angers, February 1979 leg. Jean Mornard, Berger and Till.R.Lohmeyer. Dr. Lohmeyer kindly sent me a part of the specimen labelled as *Sowerbyella* spec. nov., and one colour photograph of fruitbodies. I have found this collection identical with *S. parvispora*. The ascospores have the same ornamentation of the perisporium and are only slightly smaller than ascospores of the type. I have found the ascospores of the type smaller than given by the author. Without the ornamentation they measure 11.5-13.5-(14) x 6.7-7.5-(8.3) µm and only when the number of mature ascospores is reduced to 1-2 ascospores in one ascus they reach 15.5 x 8.5 µm. The ascospores of the collection from Angers measure 10.5-13-(13.5) x 6.2-7.5-(7.8) µm without the ornamentation and may reach up to 15 x 8 µm in asci with a reduced number of ascospores.
S.parvispora is a species closely related to *Sowerbyella radiculata* (Sow.) Nannf. and *Sowerbyella crassisculpturata* J.Mor., but differs clearly by the smaller ascospore size, different ascospore sculpture and unusual habitat and fruiting time. The perispore warts are smaller and more densely arranged than in *S. crassisculpturata*. The warts of the perisporium of *S. parvispora* are 0.3-0.8-(1) µm diam. and 0.2-0.7-

(0.9)µm high. A certain number of ascospores have an irregularly reticulate perisporium but the reticulum is more irregular than that in the majority of ascospores of *S. radiculata*. A similar irregular reticulum occurs also in a certain number of ascospores of *S. crassisculpturata* and is also, though rarely, seen in ascospores of *S. rhenana* and more often in ascospores of *S. reguisii* (Quél.) J.Mor., species which are very different in other features. The SEM revealed that the reticulum of *S. parvispora* is "wavy" as it is formed by densely connected warts and so the ornamentation is also similar to that in *S. imperialis* (Peck) Korf. (Compare illustrations figs.2 and 8-11 with illustrations in J.Moravec (1985a,1985b,1985c).
Very interesting and outstanding is the winter fruiting time of the two collections of *S. parvispora* and the remarkable coprophilous habitat of the collection from Angers. However, also the type collection was found on a rich manured soil. In macrofeatures, according to the photograph made by Dr. Lohmeyer, the apothecia of *S. parvispora* are of a very similar shape and colour as apothecia of *S. radiculata* having often a long stipe but without the conspicuous underground root-like base. The detailed description and illustration including the macrofeatures have been given by Trigaux (1985).

Sowerbyella rhenana (Fuckel) J.Moravec comb. nov.
Basionym: *Aleuria rhenana* Fuckel, in Symb. mycol., Jahrb. Nass. Natur., (Wiesbaden), 23-24:325, 1869.
In accordance with a note in my previous paper (J.Moravec 1985c) and after further examinations I am convinced that *Aleuria rhenana* Fuck. is a member of the genus *Sowerbyella*. Its stipitate apothecia with yellow external surface, excipular structure, long external hairs, hooked paraphyses and reticulate ascospores represent characteristic features of all other species of the genus. The genus *Aleuria* Fuck. differs by the shape of apothecia, a whitish colour of their external surface, which is not hairy but consists of shorter external hyphae, paraphyses which are never hooked or even dentate above, and ascospores with a sculpture or reticulum forming apiculi on the ascospore poles.
Though generally considered conspecific with *Aleuria rhenana* Fuck., *Peziza splendens* Quélet has been treated as an independent taxon by several authors, especially for its difference in ascospore size. According to Heim (1961),who examined the type specimens of *Aleuria rhenana* Fuck. and *Peziza splendens* Quél., there is no difference in ascospore ornamentation of the two taxa though the ascospore size differs. He measured the ascospore size of the type of A. *rhenana*

17-20 x 8-9.8 µm, while the ascospore size of the type of *P. splendens* was 19.5-24 x 9-12.5 µm (measured without the reticulum). I have reexamined ascospores of the Slovakian collection described and illustrated in J.Moravec (1985b). The reticulum of the perisporium is coarse and high and the ascospore size (16.3)-17.5-21 x 9-11 µm better agrees with that of the type of *A. rhenana*, and also with a collection from Nepal described by Otani (1982). On the other hand, Rifai (1968), Benkert (1984) and Kristiansen & Marstad (1985) give larger ascospores. Therefore, I have examined a collection originally deposited in Boudier's herbarium, collected and determined by Quélet as *Peziza splendens* Quél., now deposited in PC : "In montibus Juranis, en sept. 1881 misit D.Quélet". The ascospores of Quélet's collection, which we may consider a part of the type, are really longer and their size corresponds with that measured by Heim (1961). Without the ornamentation, they measure 19-22.5-(24) x 9-12-(12.7) µm and may reach up to 26 x 13.5 µm in asci with a reduced number of mature ascospores (in 2-4-6-spored asci, which occasionally occur). However, the ascospore ornamemtation consists of the same coarse and high reticulum as that in ascospores of *S. rhenana* (the ribs of the reticulum are 0.4-1.2-(1.5) µm wide and 0.3-1.8-(2.3) µm high). Therefore, I agree with Heim (1961) and consider *Peziza splendens* Quél. a synonym of *S. rhenana*. Rifai (1968) examined an authenticated specimen: "France, Hérimoncourt, s. dat., Quélet", probably a part of the type specimen of *Peziza splendens* Quél., and found the ascospores of the same larger size, shape and ornamentation as ascospores of the collection from PC noted above. My own reexamination of this specimen (K) has confirmed this identity. I have examined two collections from Norway: one of them reported and illustrated by Kristiansen & Marstad (1985), the second from Vestfold, Sande, Bjorkoya, under a pine tree on decayed needles and bark, 12.IX.1985 leg. Arne Hov (deposited in O and in herbarium of Roy Kristiansen). The apothecia of the second collection (also according to a color photograph) rather resembled *S. imperialis*. The two specimens have the same coarse and high ascospore ornamentation typical for *S. rhenana* and the variable size.

I am convinced that *A. rhenana* and *P. splendens* are identical and represent one species of *Sowerbyella*. In fact, the ascospore size varies only slightly as the majority of mature ascospores, regularly developed in 8-spored asci, does not exceed 23 x 12 µm and only the ascospores developed in asci with a reduced number of mature ascospores are larger. The ecology and macrofeatures are variable too, but the main feature of *S. rhenana* is the coarse, high and almost regular reticulum of the ascospores.

I have examined the three collections from GDR introduced by Benkert (1984) under the name *Aleuria rhenana*. I have found that the fungus is not conspecific with *S. rhenana*. The ascospores of the three collections from GDR are ellipso-fusoid, 21-23.5 x 9-10.5 µm (measured without the ornamentation), with a fine, mostly complete and regular, occasionally incomplete and irregular reticulum which is conspicuously different, especially much lower than the coarse and high reticulum of *S. rhenana*. (Compare also the SEM in J.Moravec (1985b) and SEM in Benkert (1984), which clearly show the differences). The three collections from GDR, collected in pine forests, have the same ecology and a similar size and shape of ascospores as in *Sowerbyella reguisii* (Quél.) J.Moravec (1985c). The ascospores are only slightly narrower and of a more irregular and incomplete ornamentation in *S. reguisii*, which has been known from the type collection only. I have found that the ascospore ornamentation of the type of *Peziza splendens* var. *reguisii* Quél. is more complete in a majority of mature ascospores but of the same size of ribs as in the collections from GDR. The ribs of the reticulum of ascospores of the collections from GDR are 0.2-0.7-(0.9) µm wide and 0.2-0.8-(1) µm high and though the reticulum is mostly complete and regular, a certain number of ascospores has the irregular ornamentation, which is characteristic for the majority of ascospores of *S. reguisii* . On the other hand, ascospores with the regular reticulum occur , though rarely, in *S. reguisii* too. (See also fig.1 and SEM figs.6-7 in J.Moravec (1985c)). It is important that the three collections from GDR have the same low ascospore ornamentation as the ascospores of the type of *S. reguisii*, which was described with a yellow-olivaceous hymenium. The colour of hymenium of the collections from GDR was described as dirty orange by Benkert (1984). The fungus from GDR represents a species of the genus *Sowerbyella* and, in my opinion, as *S. reguisii* is known from a single collection of the type only, we may consider the three collections from GDR conspecific with this taxon, which clearly differs from *S. rhenana* by the lower ascospore ornamentation.

As it was already noted (J.Moravec 1985c), many species of *Sowerbyella* are not confined to a specific substrate and their ecology is not a valuable feature for specific delimination. Moreover, several species are known from a single collection only. They occur on decayed needles, leaves and debris of wood, bark etc. in both coniferous woods and deciduous forests, with the exception of one species which was found on manured soil and excrements.

ACKNOWLEDGEMENTS

I thank Dr.Rishi Kaushal (Abohar), Dr. Ginette Trigaux (Jonchery sur Vesle), Dr. Roger Cailleux (Paris) and Dr. B.M.Spooner (Kew) for the type specimens sent immediately on my request, and I am also obliged to Drs.Dieter Benkert (Berlin), Till R. Lohmeyer (Gladbach), Ann Torkelsen (Oslo) and Roy Kristiansen (Torp) for other collections. I am also grateful to Mr. Jiří Lhotecký who kindly prepared the SEM photomicrographs of ascospores by SEM microscope Tesla BS 300 in the University of Agriculture Brno.

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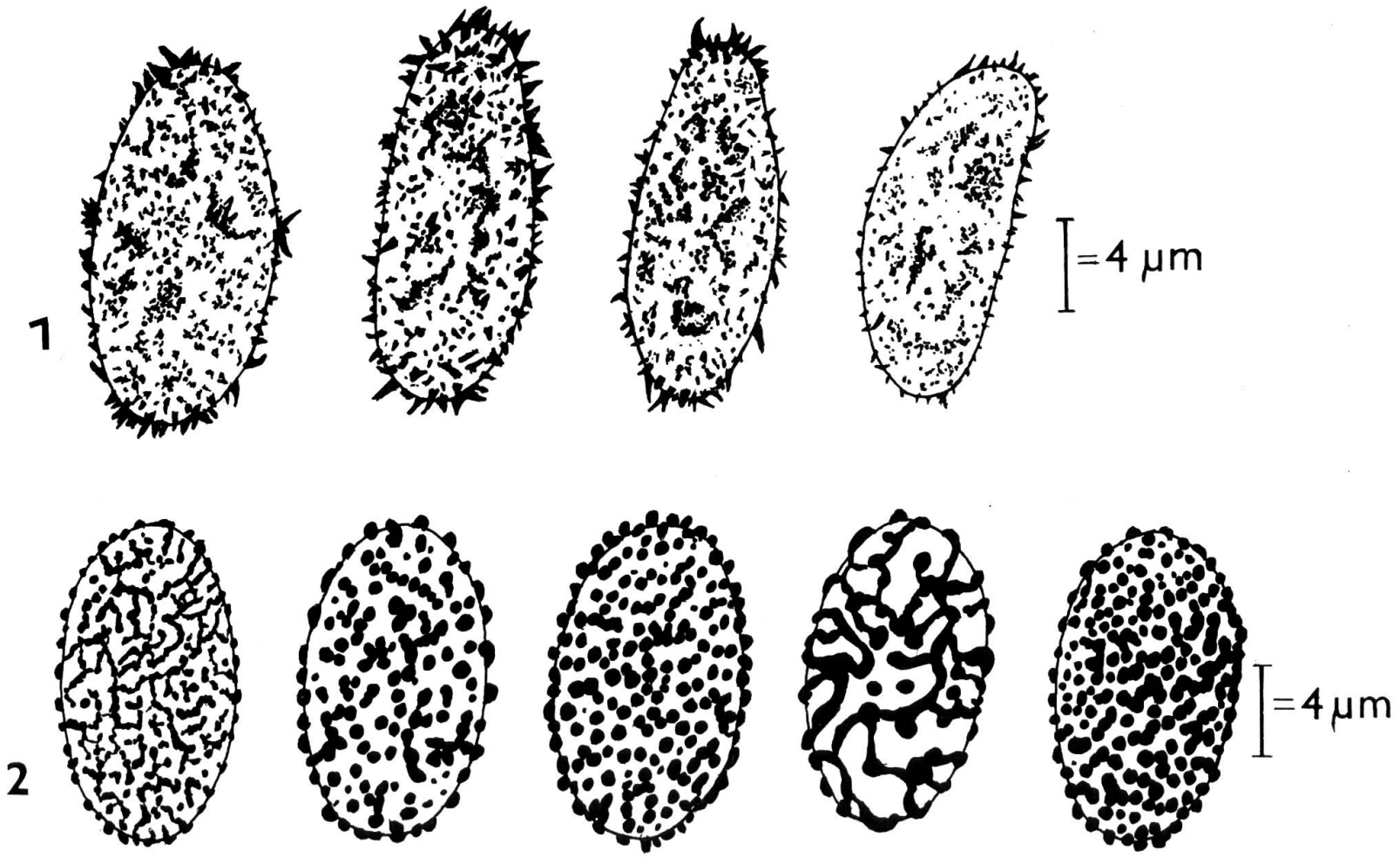
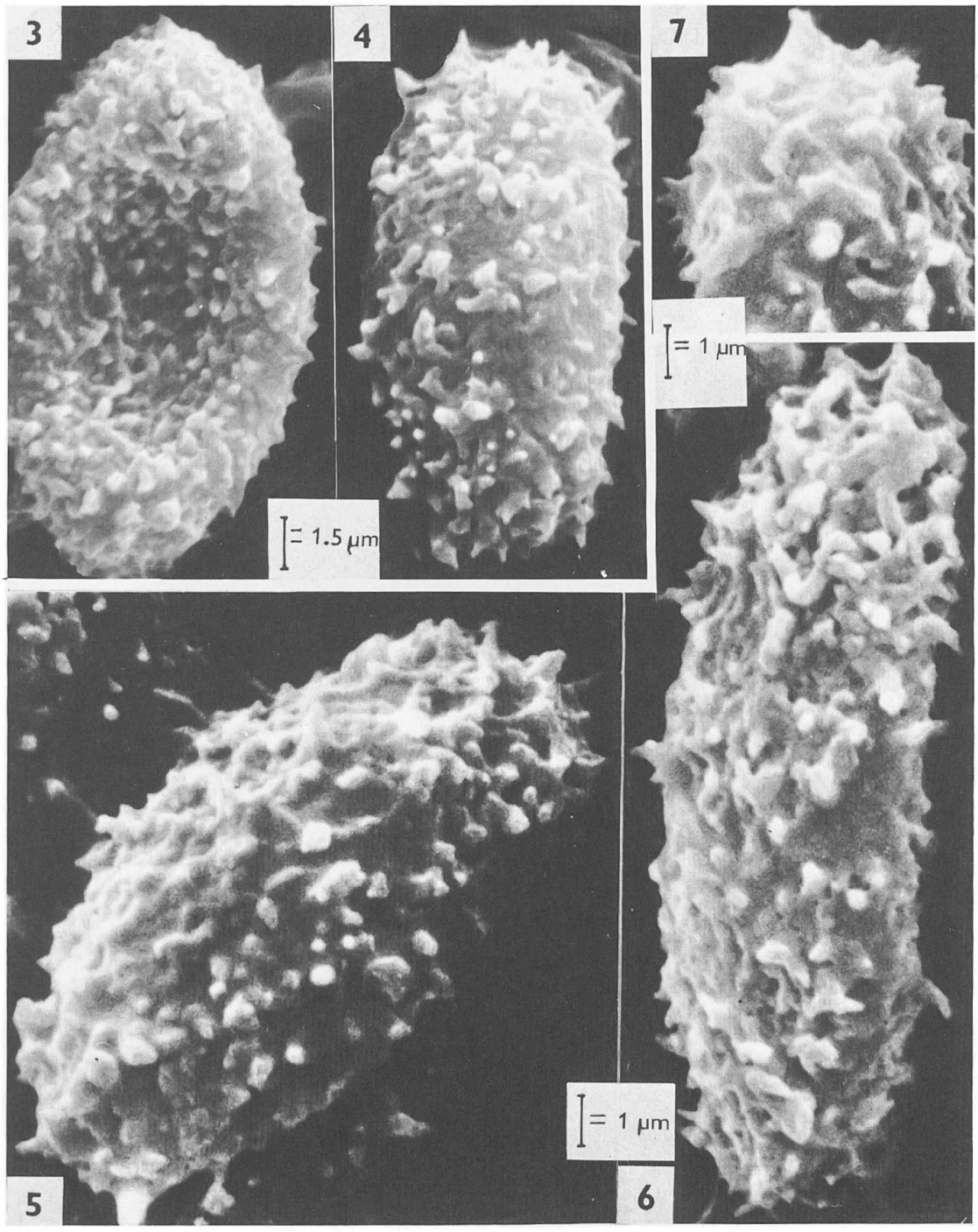
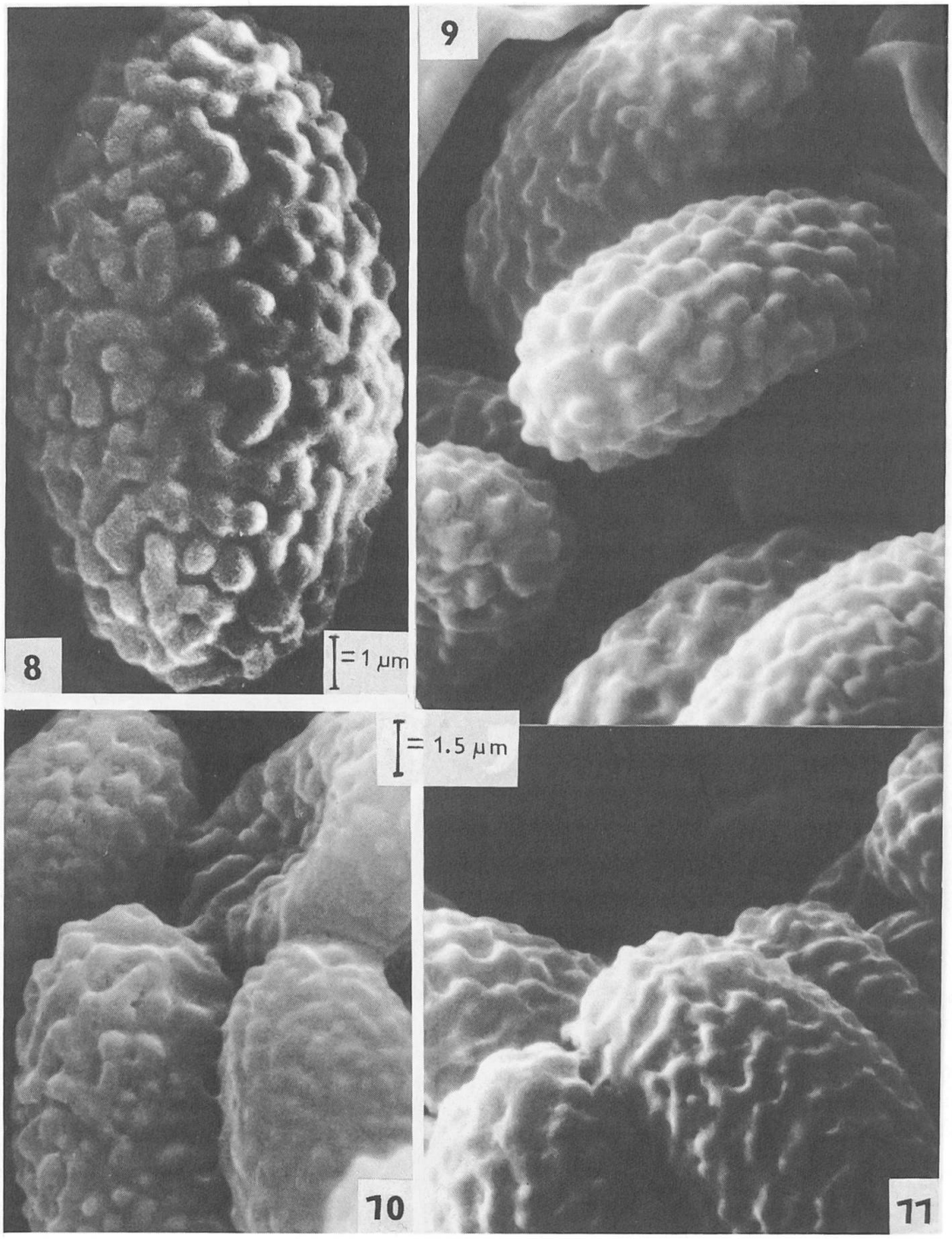


Figs. 1-2. Ascospores under oil immersion, 1600 x + CB:
1. *Sowerbyella kaushalii* (Holotype PAN). 2. *Sowerbyella parvispora* (Holotype Trigaux).



Figs. 3-7. SEM of ascospores of *Sowerbyella kaushalii* (Holotype PAN).



Figs. 8-11. SEM of ascospores of *Sowerbyella parvispora* (Holotype)