

Lophiostoma quadrinucleatum var. *triseptatum* (Peck) Chesters & Bell – AEB 963 (= PDD 90057). Created as a new combination in ‘Chesters C.G.C. & Bell A. 1970. STUDIES IN THE LOPHIOSTOMATACEAE SACC. Mycological Papers #120, 55 pp., Publ. by the Imperial/Commonwealth Mycological Institute, Kew, Surrey, England.’.

Index Fungorum records it as follows: (accessed online in Sept. 2021)

Current Name:

[Thyridaria triseptata \(Peck\) M.E. Barr](#), *N. Amer. Fl.*, Ser. 2 (New York) **13**: 36 (1990)

Synonymy:

[Lophiostoma triseptatum Peck](#), in Ellis & Everhart, *N. Amer. Pyren.* (Newfield): 224 (1892)

[Navicella triseptata \(Peck\) Kuntze](#), *Revis. gen. pl.* (Leipzig) **3**(3): 500 (1898)

[Lophiostoma quadrinucleatum](#) var. [triseptatum \(Peck\) Chesters & A.E. Bell](#), *Mycol. Pap.* **120**: 36 (1970)

Substrate, collection site & collection date: decorticated *Populus* log lining the trail behind cabin #4 in the US Forest Service summer lease lot group on Snowbank Lake, Lake County (approx. 20 miles NE of Ely, MN); collected 15 August 2006

Collector: Ann Bell; **Identifiers:** Ann Bell & Dan Mahoney

Voucher material: dried herbarium material [AEB 963 (= PDD 90057)]; 1 Shear’s mounting fluid (SMF) slide; Dan’s photos from 2006 fresh material showing asci and ascospores in water mounts and his July 2021 in-situ photos of dried herbarium ascomata; Dan’s brief description

Brief description: **Ascomata** numerous, scattered, black, with slit-like ostioles. **Asci** cylindrical, bitunicate without any apical specialization and containing 8 ascospores arranged mostly uniseriately with some oblique overlapping. **Ascospores** were first hyaline and elongate with 4 prominent vacuoles, then transverse septa appeared first in the middle (which became indented) and then between that septum and each extremity. Mature ascospores were 4-celled, brown, concolorous, smooth, indented at the 3 equally spaced septa (especially at the middle septum) and 16.5-19 X 4.5-5.5 μm (n=8). Middle cells were barrel shaped and end cells more narrowly cone-shaped (and tapering to rounded apices).

Comments:

Ann identified this *Lophiostoma* as *L. quadrinucleatum* var. *triseptatum*. The description on pp. 35-38 of her Mycological Paper #120 fits this specimen very nicely. Her description of *L. quadrinucleatum* has larger ascospores (20-28 X 7-8 µm) but as Ann writes (p. 36) "...Ellis and Everhart stated that *Lophiostoma triseptatum* Peck was probably a small spored variety of *L. quadrinucleatum* Karst." Ann synonymizes *Lophiostoma triseptatum* Peck under her *L. quadrinucleatum* var. *triseptatum*.

See also the treatment and photos of *L. quadrinucleatum* Karst. in the Holm's 'Studies in the Lophiostomataceae with emphasis on the Swedish species', Symbolae Botanicae Upsalienses XXVIII:2 (1988, pp. 21,22, fig. 51 and especially fig. 87).

Treatments of the genera *Lophiostoma*, *Lophiotrema*, *Thyridaria* & *Massarina* continue to attract various followers and interpretations. Most of the recent work has centered around the sequencing of cultured species and few morphologically based keys are available. Recent comments by those doing phylogenetic work include the following:

- 1) Andreassen M, Skrede I, Jaklitsch WM, et al. 2021. Multi-locus phylogenetic analysis of lophiostomatoid fungi motivates a broad concept of *Lophiostoma* and reveals nine new species. *Persoonia* 46: 240–271. Comment at the close of their Abstract – "High intraspecific variability of several morphological traits is common within Lophiostomataceae."
- 2) Jaklitsch WM, Voglmayr H. 2016. Hidden diversity in *Thyridaria* and a new circumscription of the Thyridariaceae. *Studies in Mycology* 85, 35–64. Comment page 62: "Barr (1990) referred *Thyridaria* to the Platystomaceae and combined several species of *Lophiostoma* in *Thyridaria*. Probably none of those will remain in this genus. Later she (Barr 2003) changed her concept and referred *Thyridaria* to the Didymosphaeriaceae. It seems that most species of *Thyridaria* will find a different generic home."
- 3) Zhang, Y., Wang, H.K., Fournier, J., Crous, P.W., Jeewon, R., Pointing, S.B. and Hyde, K.D. (2009). Towards a phylogenetic clarification of *Lophiostoma* / *Massarina* and morphologically similar genera in the Pleosporales. *Fungal Diversity* 38: 225-251. Abstract comment: "*Lophiostoma*, *Lophiotrema* and *Massarina* are similar genera that are difficult to distinguish morphologically." Conclusion comments: "Both *Massarina* and *Lophiostoma* are polyphyletic." "This study also indicated that ascospore and apical morphology are morphological characters that have phylogenetic significance, though they are not fully reliable for generic level classification."

As a field collector and morphologically-based mycologist, I feel that nothing replaces good thoroughly described and illustrated collections. These, along with their lab cultures and ecological investigation, serve as the foundation for phylogenetic work. More collecting is necessary! As Zhang et al. 2009 point out in their Conclusions: "*Massarina* and *Lophiostoma* species are common in the tropics on submerged as well as terrestrial wood, however the correct identity of these taxa need confirmation using molecular techniques." **First, however, they need to be collected, cultured, described & illustrated!**

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Lophiostoma quadrinucleatum Karst., 1873, *Mycol. Fen.*, 2: 85.

Lophiostoma acervatum Karst., 1873, *Mycol. Fen.*, 2: 85.

?*Lophiostoma requienii* Fab., 1878, *Spher. Vaucl.*: 106, Fig. 54 (fide Sacc).

Lophiostoma fallacissimum Karst., 1884, *Hedwigia*, 23: 17.

?*Lophiostoma berberidis* Nits., 1886, in Lehm. *Syst. Berab. Pyr. Loph.*: 54, Fig. 34.

Lophiostoma quadrinucleatum Karst. and its variety (var. *triseptatum* Peck) are discussed below. Results suggest that a large number of named species should be placed under this one specific epithet, and because of this view the evidence supporting these reductions is presented in a slightly different form from that relevant to previously discussed species.

This species is found on *Rhamnus*, *Populus* and *Prunus*. The pseudothecia are immersed or semi-immersed in the host, the ostiolar necks aligned parallel to the grain of the wood. Asci and ascospores are illustrated in Fig. 9. The latter are biserial, elliptical, 20-28 x 7-8 u with three evenly spaced transverse septa. Spore walls are not constricted at the points of intersection of the septa. Branched septate pseudoparaphyses and branched periphyses are present in the pseudothecium.

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SPECIMENS EXAMINED

Ex Herb. H.

Lophiostoma acervatum Karst., on *Prunus padus*, Mustiala, leg. P. Karsten, 25/7/1869 (type material). *Lophiostoma quadrinucleatum* Karst., on *Rhamnus*, Mustiala, leg. P. Karsten, 25/7/1869 (type material).

Ex Herb. NY.

Lophiostoma quadrinucleatum Karst., on *Populus tremula*, No. 13, July 18 ? (no signature).

L. quadrinucleatum var. **triseptatum** (Peck) Chesters & Bell, comb. nov.

Sphaeria surrecta Cooke, 1876, *Grev.*, 5: 94 (fide Ell. & Ev.).

Lophiostoma pruni Ell. & Ev., 1888, *Journ. Mycol.*, 4(7): 64.

Lophiostoma triseptatum Peck, in Ell. & Ev., 1892, *N. Am. Pyrenom.*: 224.

Lophiostoma triseptatum var. *pleuriseptatum* Ell. & Ev., 1892, *N. Am. Pyrenom.*: 225.

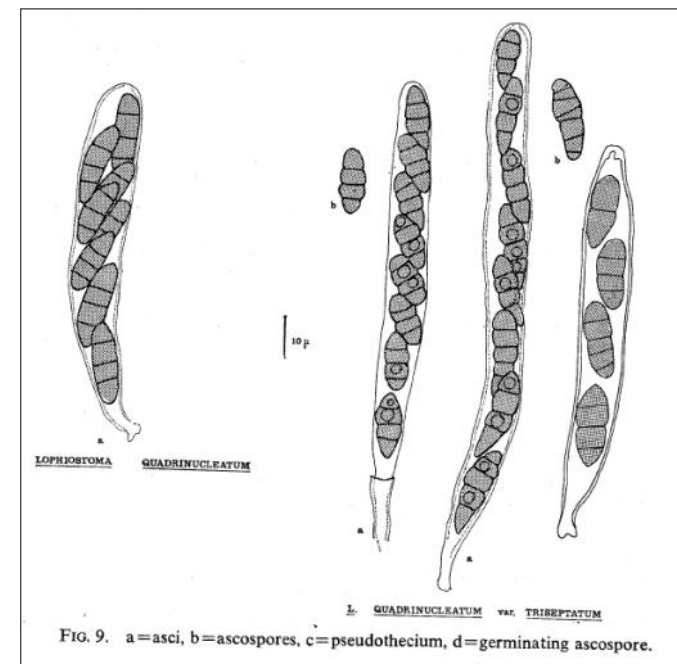


FIG. 9. a=asci, b=ascospores, c=pseudothecium, d=germinating ascospore.

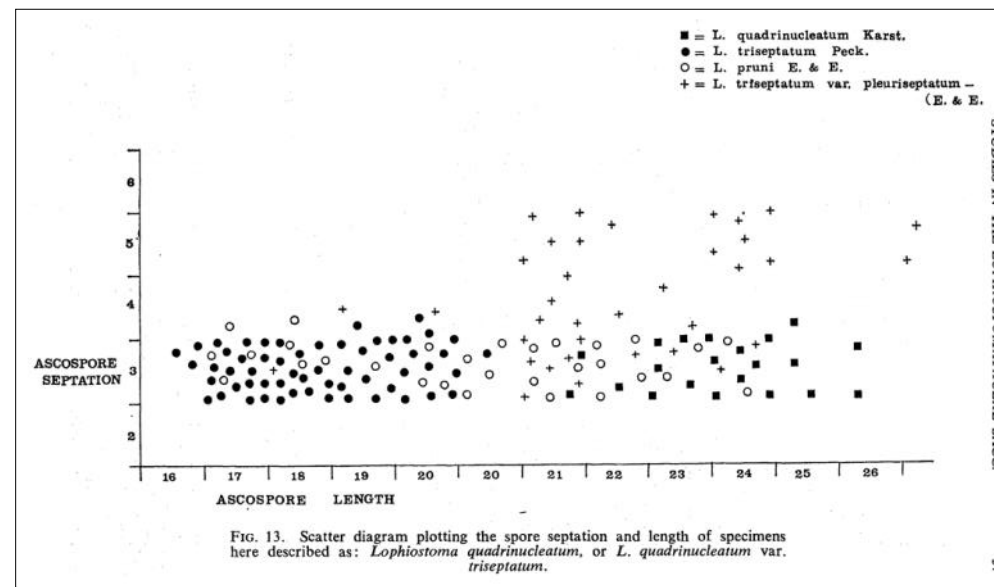
The species listed above (on the previous page) do not all match, but the differences between them are so slight that they do not warrant specific rank. The ascospore measurements of the type material *Lophiostoma triseptatum* Peck fall within the range 17-20(25) X 6-8 u.

According to Ellis and Everhart, the distinction between *Lophiostoma triseptatum* Peck and their variety *pleuriseptatum* relates to spore septation alone. The spore lengths of these two fungi are precisely similar but the var. *pleuriseptatum* has 3-5 transverse septa. In fact the differences between these two fungi are not real and break down as soon as more specimens are examined. Some of these additional specimens (e.g. DAOM 109650) match the type material of *L. triseptatum*, but others are intermediate, having the uniseriate arrangement of ascospores of *L. triseptatum* but having a small percentage of 4-5 septate ascospores (e.g. *Lophiostoma turritum*, No. 2040, Herb. NY).

Concerning *Lophiostoma pruni* Ell. & Ev., the distinguishing feature of this species is the variable number (usually 4) of ascospores in the asci. Additional specimens have been seen which have a smaller proportion of 4 spored asci than the type specimen. It becomes impossible to place these specimens under the present arrangement of species, unless a new specific epithet were proposed for each sample.

The authors of these various species themselves noted the similarities between their type specimens and those of species already in existence. For example, Ellis and Everhart stated that *Lophiostoma triseptatum* Peck was probably a small spored variety of *L. quadrinucleatum* Karst. Saccardo stated that *Lophiostoma pruni* had affinities with *L. quadrinucleatum*.

The evidence so far available suggests to us that the specimens discussed here (pp. 35-36) are examples of a variable genotype which at one extreme gives Peck's *Lophiostoma triseptatum* and at the other Karsten's *L. quadrinucleatum*. These two fungi appear linked by numerous other specimens which include *L. pruni* Ell. & Ev. and *L. triseptatum* var. *pleuriseptatum* Ell. & Ev. The scatter diagram (Fig. 13), where only the type material is represented, indicates that no two "species" are separable by a clear discontinuity, which (as mentioned in the introduction), has been used as a method of deciding upon specific limits throughout this work. **Page 37**



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An emended description of var. *triseptatum* reads as follows: Pseudothecia immersed or semi-immersed in the host (*Salix*, *Acer*, *Ulmus*). The asci are cylindrical or slightly clavate with a short basal stalk, each containing 4-8 uniseriate or irregularly biseriate ascospores which are oval with obtuse ends, (16)17-25 (30) x 5-7 u, with 3-5 transverse septa (Fig. 9) and very occasionally a vertical septum. The spores are usually constricted at the central septum and sometimes at all the septa. Branched septate pseudoparaphyses are present and the paraphyses lining the ostiole may also be branched.

SPECIMENS EXAMINED

Ex Herb. NY.

Lophiostoma triseptatum Peck, on *Acer*, Lyndonville, leg. Fairman, No. 184, 1/8/1890, (this is one of the specimens mentioned by Ellis & Everhart). *Lophiostoma triseptatum* var. *pleuriseptatum* Ell. & Ev., on *Acer*, leg. Fairman, No. 134, 1890 (type material). *Lophidium nobile*, on *Acer* (no signature), No. 1804. *Lophiostoma requienii* Fab., on Cotton wood, leg. Bartholomew, No. 2115, 14/4/1896. *Lophiostoma triseptatum* Peck, on *Liriodendron tulipifera*, leg. Fairman, No. 50, 1884. *Lophiostoma lophis*, sp. nov., on *Pinus*, leg. F. E. & E. S. Clements, No. 463, 23/7/1907. *Lophiostoma pruni* Ell. & Ev., on *Prunus serotina*, leg. Fairman, No. 11 (no date). *Lophiostoma turritum*, on *Salix longifolia*, leg. J. Dearness, No. 2040, 1904. *Lophiostoma macrostomoides*, on *Salix*, leg. J. F. Brenckle, No. 147, 1911. *Lophiostoma caespitosum* Fuckel, on *Ulmus*, leg. Fairman, No. 52, 1889. *Lophiostoma pruni* Ell. & Ev., on *Viburnum*, leg. Dearness, No. 1380, 1892. *Lophiostoma triseptatum* Peck, leg. Fairman, No. 180, 25/7/1890. *Lophiostoma quadrinucleatum*, leg. Dearness, No. 546, 1890.

Ex Herb. DAOM (Fresh portions of these collections were brought to Ann by G. Morgan-Jones during her Ph.D. work. She then cultured, sectioned, described and illustrated them in her thesis – some of these illustrations are reproduced in the following pages. Due to expense and time considerations, this culture work and her colored illustrations were not included in her Mycological Paper #120.

Lophiostoma triseptatum Peck, on *Populus* (?), Ontario, coll. G. Morgan-Jones, det. R. A. Shoemaker, 18/5/1965, DAOM 109650. *Lophiostoma triseptatum* Peck, leg. G. Morgan-Jones, 25/6/1965, DAOM 110342 (record mistakenly omitted). *Lophiostoma*, on *Quercus*, det. G. Morgan-Jones, DAOM 110233.

Ex Herb. IMI.

Lophiostoma triseptatum, on *Populus*, IMI 31227. *Lophiostoma* sp., West Pakistan, leg. S. Ahmad, 26/6/1962, IMI 98432. *Lophiostoma triseptatum*, on *Symphoricarpos occidentalis*, leg. J. F. Brenckle, 1931, IMI 31226. *Lophiostoma triseptatum*, on *Symphoricarpos*, leg. G. R. Bisby, 1931, IMI 26879.

Ex Herb. B.

Lophiostoma triseptatum, on *Cornus stolonifera*, leg. J. F. Brenckle, 1920.

Page 73 Mention should be made here of one particularly interesting sample : (DAOM 110233). The ascospores are within the range 20 - 28 x 8 - 10 μ . The spores become pigmented very late in development with the result that some remain completely hyaline even

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until germination (Fig.81). This is deceptive, for if all the spores were brown earlier in development there would be little hesitation in placing this specimen with L. quadrinucleatum var. triseptatum. The pseudothecial section of the particular specimen is illustrated in Fig.82. Here all the ascospores were quite hyaline. This sample could, however, be further proof of the complex and variable genotype encountered throughout L. quadrinucleatum var. triseptatum.

CULTURAL OBSERVATIONS

Two fresh samples of L. quadrinucleatum var. triseptatum were obtained; (DAOM.109650 & DAOM. 110342). The former sample is illustrated in Fig. 79, the latter in figs. 83A & B. Both samples fit the writers concept of var. triseptatum. Ascospore isolation from both sources produced similar grey/white sterile mycelia. When placed under 'black light' conditions, large numbers of pycnidia were produced. The pycnidia and phialides of both samples were identical, and are illustrated in Fig. 84 & 85. The phialides were cylindrical, unbranched or loosely branched. A number of annellations were observed on a few of the conidiophores, (Fig.85).

After inoculation on to sterilised twigs, sample DAOM. 110342 produced a few irregular pseudothecia containing a very few ascospores. These spores are illustrated in Fig.83 G & D, side by side with those of the original collected sample. The cultured pseudothecia contained a variable number of ascospores in each ascus. The spores were quite hyaline and uniseptate whilst within the asci. The few fully mature spores seen, were fuscus, with punctate walls. The measurements

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of the spores matched those of the original sample.

This example offers perhaps the soundest proof for placing little importance upon spore colour when considering the natural relationships between the Lophiostomaceae. Even under such artificial laboratory conditions, if colour was a stable diagnostic feature it should surely have been made manifest.

SPECIMENS EXAMINED

Ex Herb. (NY).

Lophiostoma triseptatum Peck, on Acer Lyndonville, Leg. Fairman, No.184. 1-8-1890 - (this is one of the specimens mentioned by Ellis & Everhart) Lophiostoma triseptatum Peck, Leg. Fairman, No.180.25-7-1890. Lophiostoma triseptatum var. pleuriseptatum Ell & Ev. on Acer, Leg. Fairman, No.134, 1890. (type). Lophiostoma triseptatum Peck, on Liriodendron tulipifera, Leg Fairman No.50, 1884, Lophiostoma tunitum on Salix longifolia, London, Leg. J. Dearness No. 2040,1904. L. macrostomoides, on Salix, Leg. J.F. Brenckle No.147, 1911. Lophiostoma quadrinucleatum, Leg Dearness, No. 546, 1890. Lophidium nobile on Acer, (no signature), Lophiostoma fluviatile Ell. & Ev. Leg. L.A. Fritch, 1892. Lophiostoma caespitosum Fuck, on Ulmus, Leg. Fairman, No.52, 1889. Lophiostoma pruni Ell. & Ev. on Prunus serotina, Leg. Fairman, No.11. (Type) Lophiostoma pruni Ell. & Ev. on Viburnum Leg. Dearness, No.1380, 1892. Lophiostoma reguieii Fab. on Cottonwood, Leg. Bartholomew, No.2115, 14-4-1896. Lophiostoma Lophis sp. nov, on Pinus, Leg. F.E. & E.S. Clements, No. 463. 23-7-1907.

Ex Herb. (D.A.O.M.)

Lophiostoma triseptatum Peck, on Populus (?) Ontario, coll. G. Morgan-Jones, det. R.A. Shoemaker, 18-5-1965. DAOM. No. 109650. Lophiostoma triseptatum Peck, Leg. G. Morgan-Jones, 25-6-1965. Lophiostoma, on Quercus det. G. Morgan-Jones. DAOM No. 110233.

Ex Herb. (IMI)

Lophiostoma triseptatum, on Populus, IMI No. 312271. Lophiostoma sp. West Pakistan, Leg. S. Ahmed, 26-6-1962. IMI No. 98432. Lophiostoma triseptatum, on Symphoricarpos occidentalis, Leg. J.F. Brenckle, 1931 IMI. No. 31226. Lophiostoma triseptatum, on Symphoricarpos Leg. G.R. Bisby, 1931, IMI No. 26879.

Ex Herb. (B).

Lophiostoma triseptatum on Cornus stolonifera, Leg J.F. Brenckle, 1920.

FIG. 79.

Lophiostoma quadrinucleatum var. *triseptatum* (Peck,) Ell. & Ev.

(D.A.O.M. 109650.)

Mature pseudothecium.

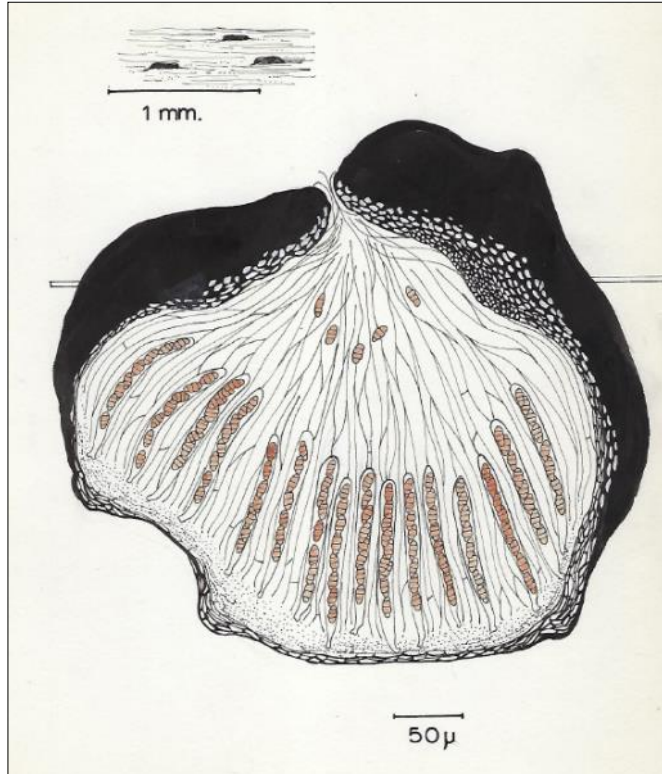


FIG. 83.

Lophiostoma quadrinucleatum var. *triseptatum* Ell. & Ev.

(D.A.O.M. 110342.)

A = Young ascus. } From herbarium sample.
 B = Mature ascus. }
 C & D = Asci and spores produced in culture.

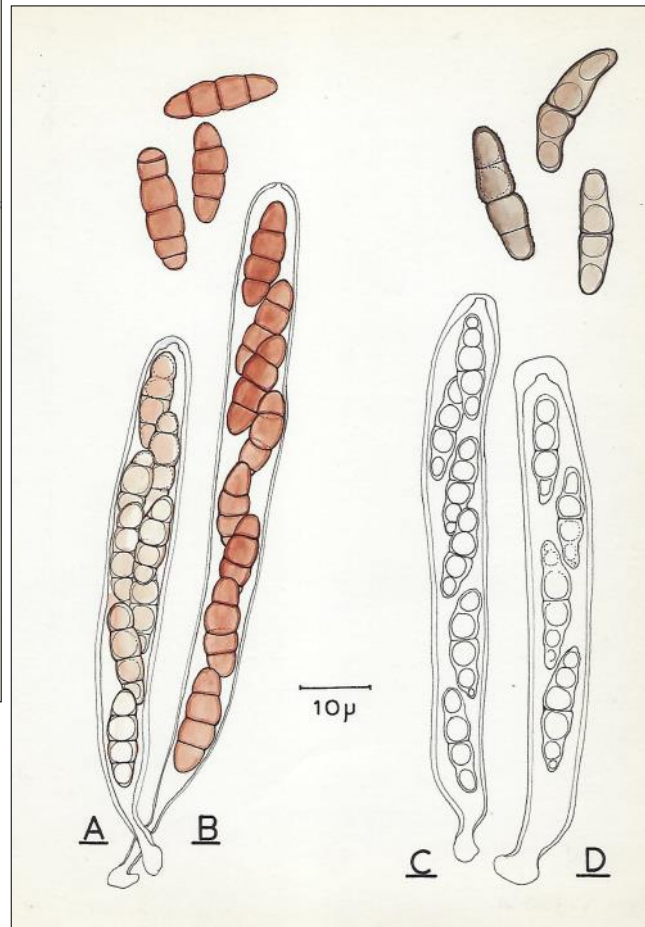
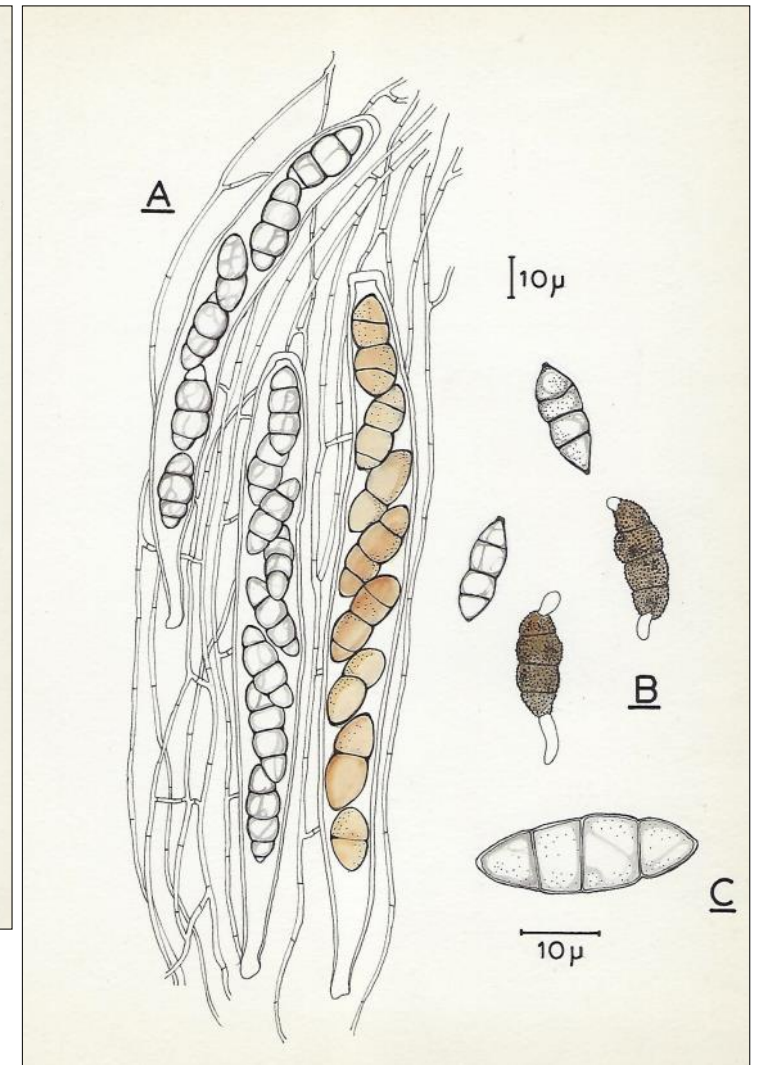


FIG. 81.

Lophiostoma quadrinucleatum var. *triseptatum* Ell. & Ev.

(D.A.O.M. 110233.)

A = Asci containing hyaline and brown ascospores.
 B = Mature hyaline ascospores, two of which have germinated.
 C = Mature hyaline ascospore.



Pages from Ann's 1966 Ph.D. thesis. The histograms mentioned in the text have been omitted. These, Ann's original thesis and most of her original mycological drawings are now archived at Landcare Research in Auckland. Figures on the next page are outlined in red.

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Lophiostoma quadrimucleatum Karst, and its variety (var. triseptatum Peck) are discussed below. This has involved the reduction of a large number of named species under this one specific epithet, and the presentation of the evidence supporting these reductions will take a slightly different form from the previously discussed species.

Lophiostoma quadrimucleatum Karst, Myc. Penn. II, p.85, 1873.
Syn: Lophiostoma acervatum Karst, Myc. Penn. II, p.85, 1873 & Sacc. Syll. Fung II, p.683, 1883.
? Lophiostoma requienii Fab. Spher. Vauc. p.106, Fig. 54, 1878 (fide Sacc.)
Lophiostoma fallacisium Karst, in Hedwig, p.1. 1884.
Lophiostoma berberidis Mits In Lehm. Syst. Bearb. Pyr. Loph. p.54, Fig. 34, 1886.

This species is found on the wood of Rhamnus, Populus and Prunus. The pseudothecia may be immersed or semi-immersed in the host, the ostiolar necks aligned parallel to the grain of the wood. The asci and ascospores of the type material are illustrated in Fig. 75A. The spores are biserial elliptical 20 - 28 x 7 - 8 μ (histogram A, Fig. 76) with three evenly spaced transverse septa. The spore wall is not constricted at the points of intersection of the septa. The histograms: B, C, and D of Fig. 76 are constructed from the spore measurements of samples which match Karsten's type specimen of L. quadrimucleatum. Histogram K, in fig. 76 shows a combination of the lengths measured for A, B & C, and from this it can be seen that most spores are 24 - 25 μ in length. The section through the mature pseudothecium of L. quadrimucleatum (Fig. 77), was taken from the material whose spore length is represented in histogram C of Fig. 75. The morphology of the pseudothecium is similar to the Lophiostomaceae in general, with the addition of some

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branched periphyses lining the ostiole.

Fabre states that L. requienii has irregularly uniseriate spores and maintains it as a separate species from L. quadrimucleatum Karst, although Saccardo considers them to be synonyms. Unfortunately Fabre's material has not been seen during this investigation.

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SPECIMENS EXAMINED

Ex Herb. (H).

Lophiostoma quadrimucleatum Karst, on Rhamnus, Mustiala, Leg. P. Karsten, 25-7-1869 (type). Lophiostoma acervatum Karst, on Prunus padus, Mustiala, Leg. P. Karsten, 1-5-1877 (type).

Ex Herb. (NY)

Lophiostoma quadrimucleatum Karst, on Populus tremula No. 13 July 18 ?
Var triseptatum (Peck). Ell. & Ev. N. Amer. Pyr. p. 224, 1892.
Syn: Sphaeria surrecta Cooke, in Grev. V p. 94 (fide Ell. & Ev.)
Lophiostoma pruni Ell. & Ev. in Journ. Myc. p. 64, 1888 & N. Amer. Pyr. p. 225, 1892.
Lophiostoma triseptatum var. pleuriseptatum Ell. & Ev. N. Amer. Pyr. p. 225, 1892.

The species listed above do not all match, but the differences between them are so slight that they do not warrant specific rank. The type material of Lophiostoma triseptatum (Peck) Ell. & Ev. is illustrated in Fig. 78A. The ascospore measurements fall within the range: 17 - 20 (25) x 6 - 8 μ (histogram E, Fig. 76). Comparisons between Figs. 75A and 78A show that L. quadrimucleatum Karst., is morphologically distinguishable from the type of L. triseptatum (Peck) Ell. & Ev.

According to Ellis and Everhart, the distinction between L. triseptatum Peck. and their variety: pleuriseptatum; is of

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septation only. The type material of var. pleuriseptatum Ell. & Ev. is illustrated in Fig. 78B, in which the number of transverse septa varies between three and five. The histogram G in fig. 76 shows the spore lengths of var. pleuriseptatum, to be much the same as L. triseptatum (histogram E, Fig. 76). In fact the differences between these two fungi is not real and breaks down as soon as more specimens are examined. Some of these additional specimens, (i.e. DAOM. 109650, fig. 79) match the type material of L. triseptatum, but others are intermediate, having the uniseriate arrangement of ascospores as in L. triseptatum, but a small percentage of these spores have four or five transverse septa, (e.g. L. turritum No. 2040, Herb. NY)

The type material of L. pruni Ell. & Ev. is illustrated in Fig. 75B. The spore measurements, (histogram J, fig. 76) cover the same range as L. triseptatum and var. pleuriseptatum; the distinguishing feature of this species being the variable number (usually four) of ascospores in the asci. This distinction is not real. Additional specimens have been seen which have a smaller proportion of four spored asci than the type specimens of L. pruni, and it becomes impossible to

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place these samples under the present arrangement of species, unless a new specific epithet were erected for each sample.

The authors who erected these various species themselves noted the similarities between their type specimen and those of species already in existence. For example, Ellis and Everhart stated that L. triseptatum Peck. was probably a small spored variety of L. quadrimucleatum Karst. Saccardo stated that L. pruni had affinities with L. quadrimucleatum.

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The evidence suggests that the above mentioned "species" represent a very variable genotype. Lophiostoma triseptatum, (Fig. 78A) representing on extreme, L. quadrimucleatum, the other extreme, these two fungi being linked by numerous other specimens which include L. pruni and L. triseptatum var. pleuriseptatum. The histograms in Fig. 78 illustrate the overlap in spore lengths in some of the samples seen, whilst the scatter diagram in Fig. 80 (where only the type material is represented), indicates that no two "species" are separable by a clear discontinuity, which, (as mentioned in the introduction), has been used as a method of deciding upon specific limits throughout this piece of work.

An amended description of var. triseptatum reads as follows:-

Pseudothecia immersed or semi-immersed in the host; (Salix, Acer, Ulmus) The asci are cylindrical or slightly clavate with a short basal stalk, each containing 4 - 8 uniseriate, or irregularly biserial ascospores. The spores are oval with obtuse ends, (16) 17 - 25 (30) x 5 - 7 μ with 3 - 5 transverse septa, and very occasionally a vertical septum (Fig. 3, tab. vi. Berlese l cones, Fung I, 1890 & Fig. 78C). The spores are usually constricted at the central septum, and sometimes at all the septa. Branched septate pseudoparaphyses are present, the periphyses lining the ostiole may also be branched.

Mention should be made here of one particularly interesting sample: (DAOM 110233). The ascospores are within the range 20 - 28 x 8 - 10 μ. The spores become pigmented very late in development with the result that some remain completely hyaline even

FIG. 75.

A = *Lophiostoma quadrinucleatum* Karst.

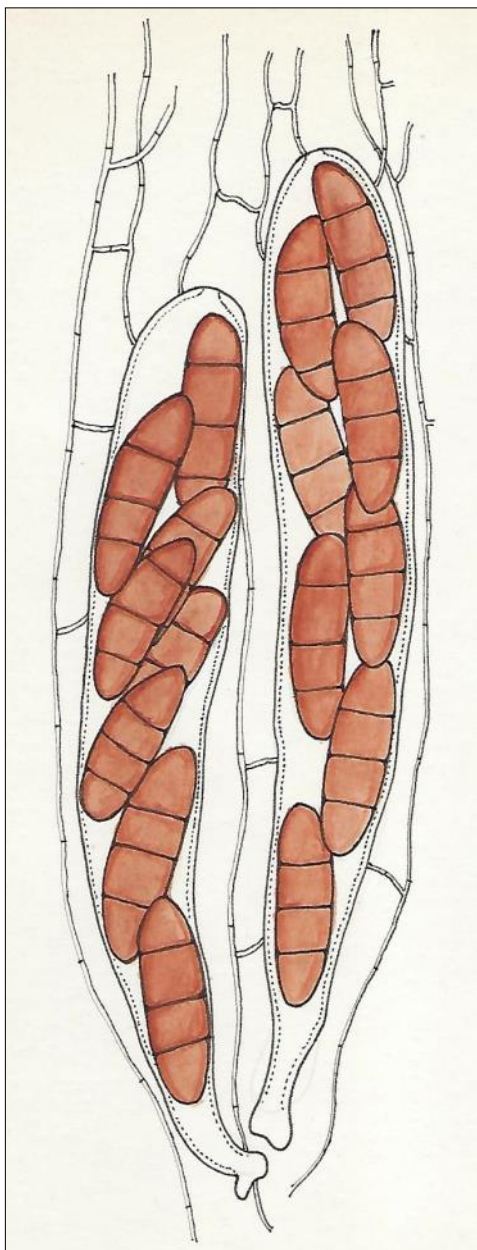


FIG. 77.

Lophiostoma quadrinucleatum Karst.

Mature pseudothecium.

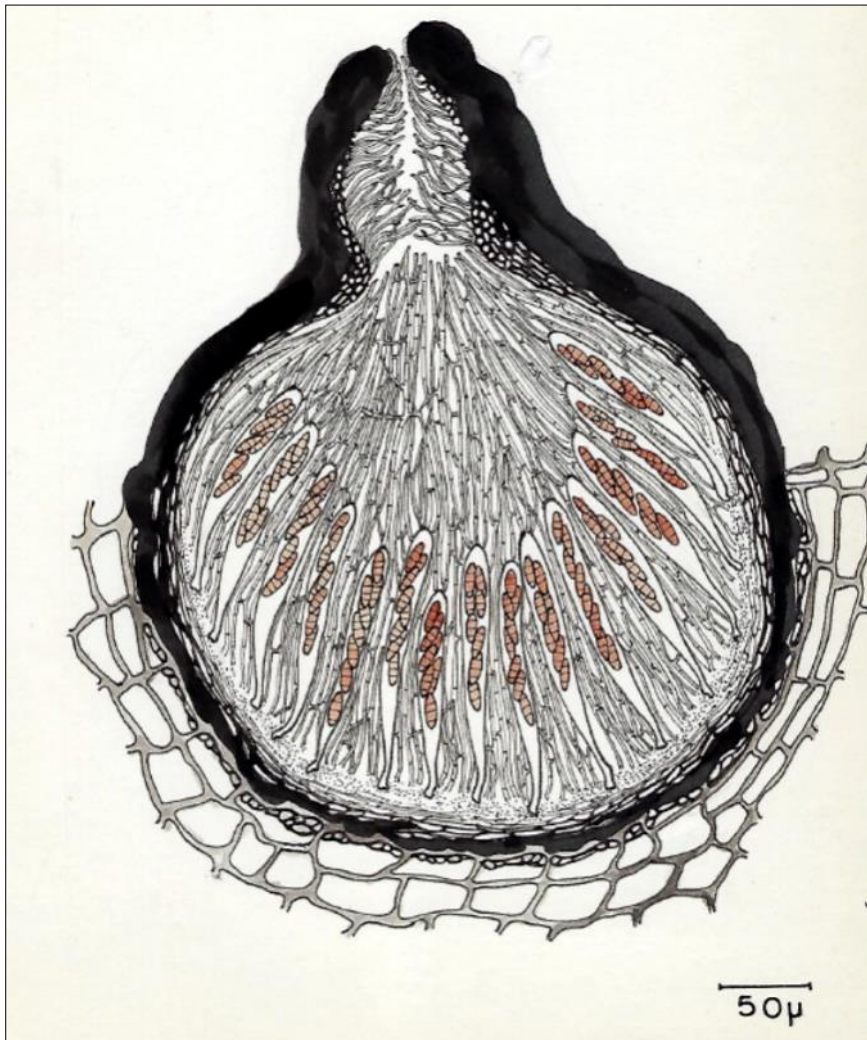
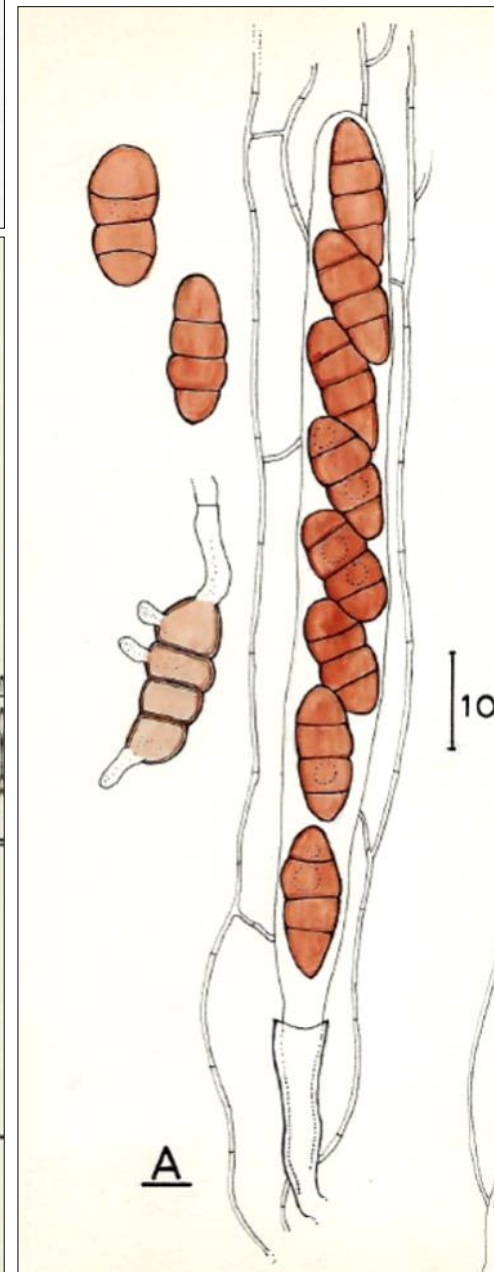
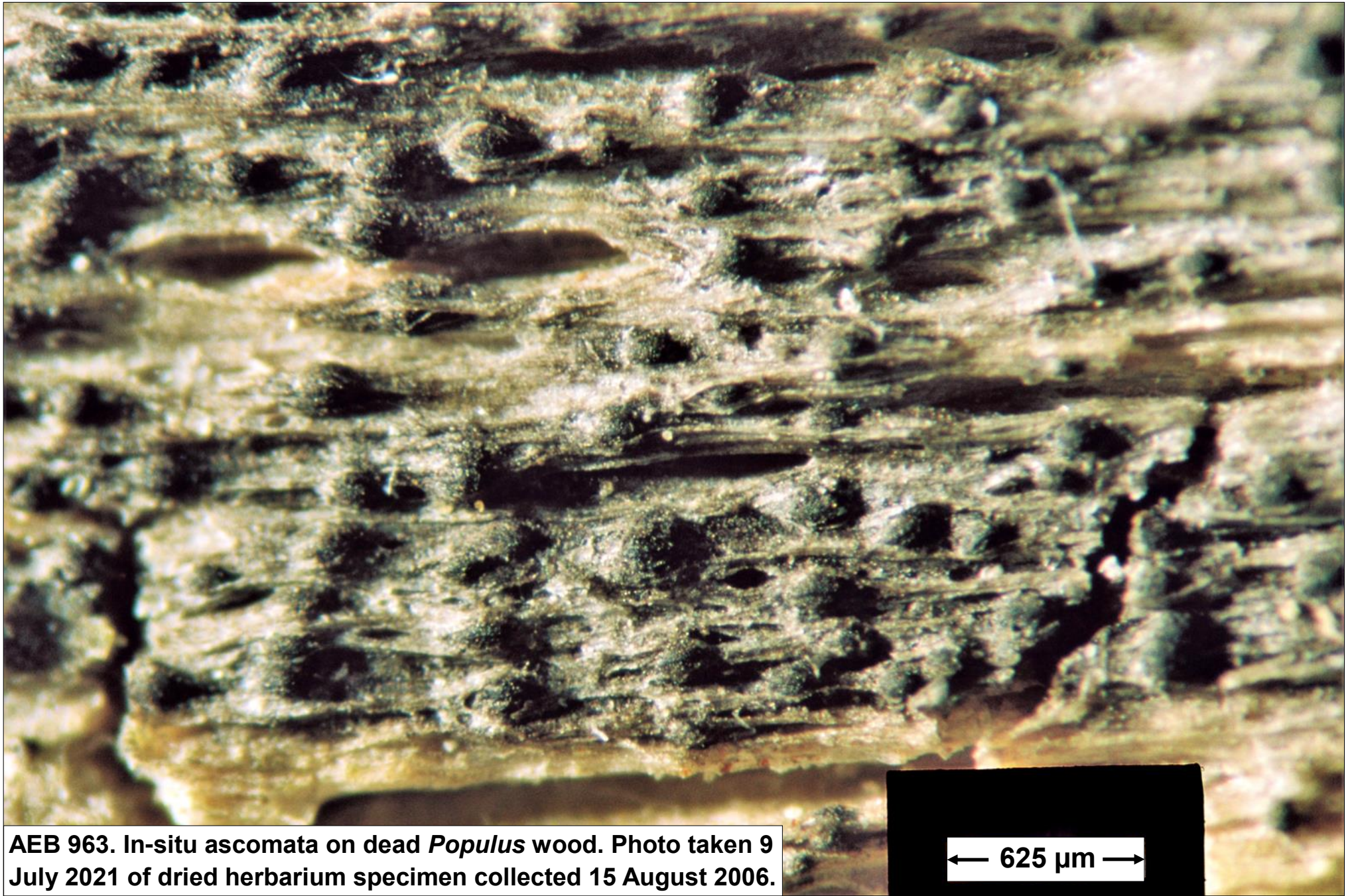


FIG. 78.

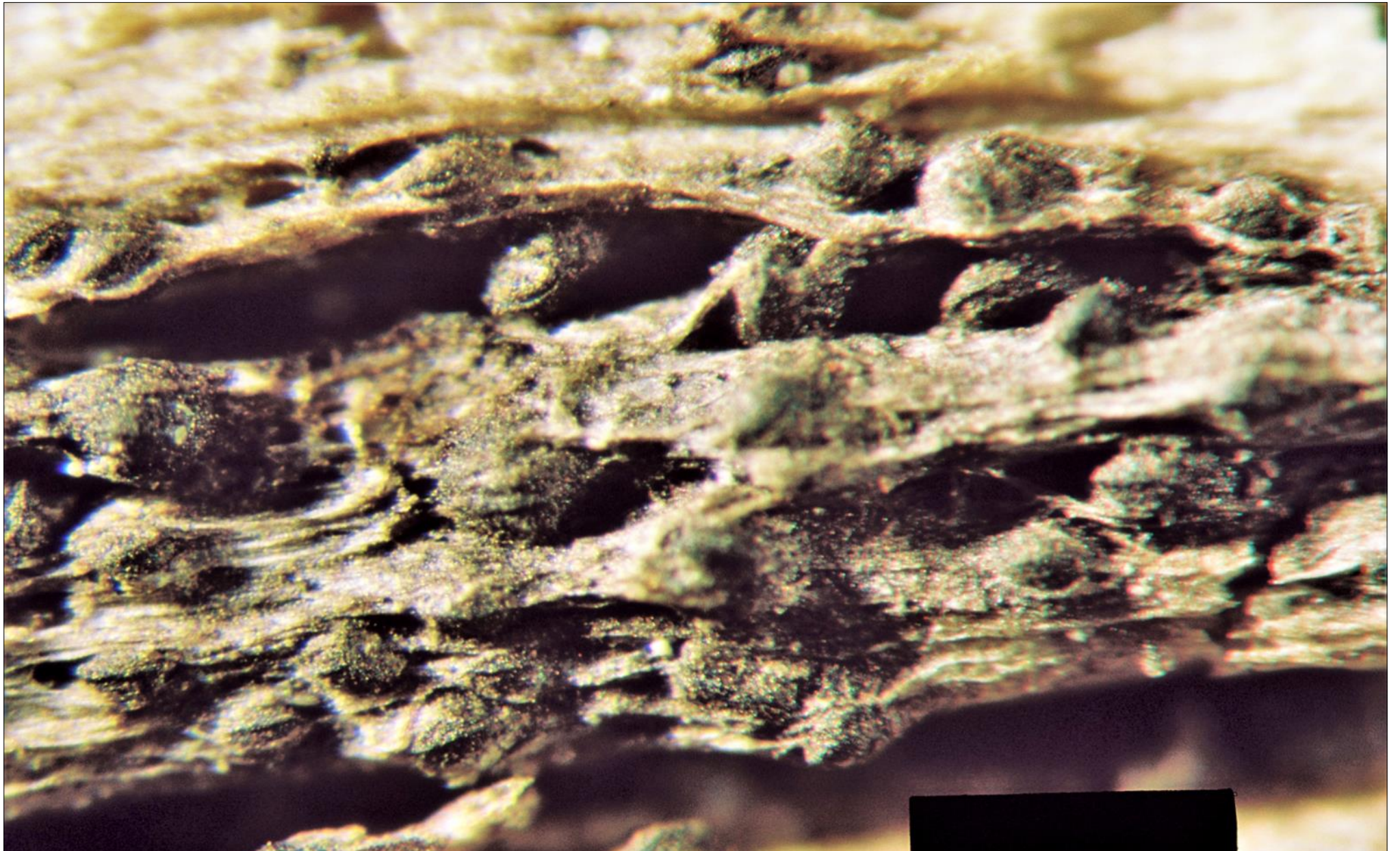
A = *Lophiostoma triseptatum* (Peck.) Ell. & Ev.





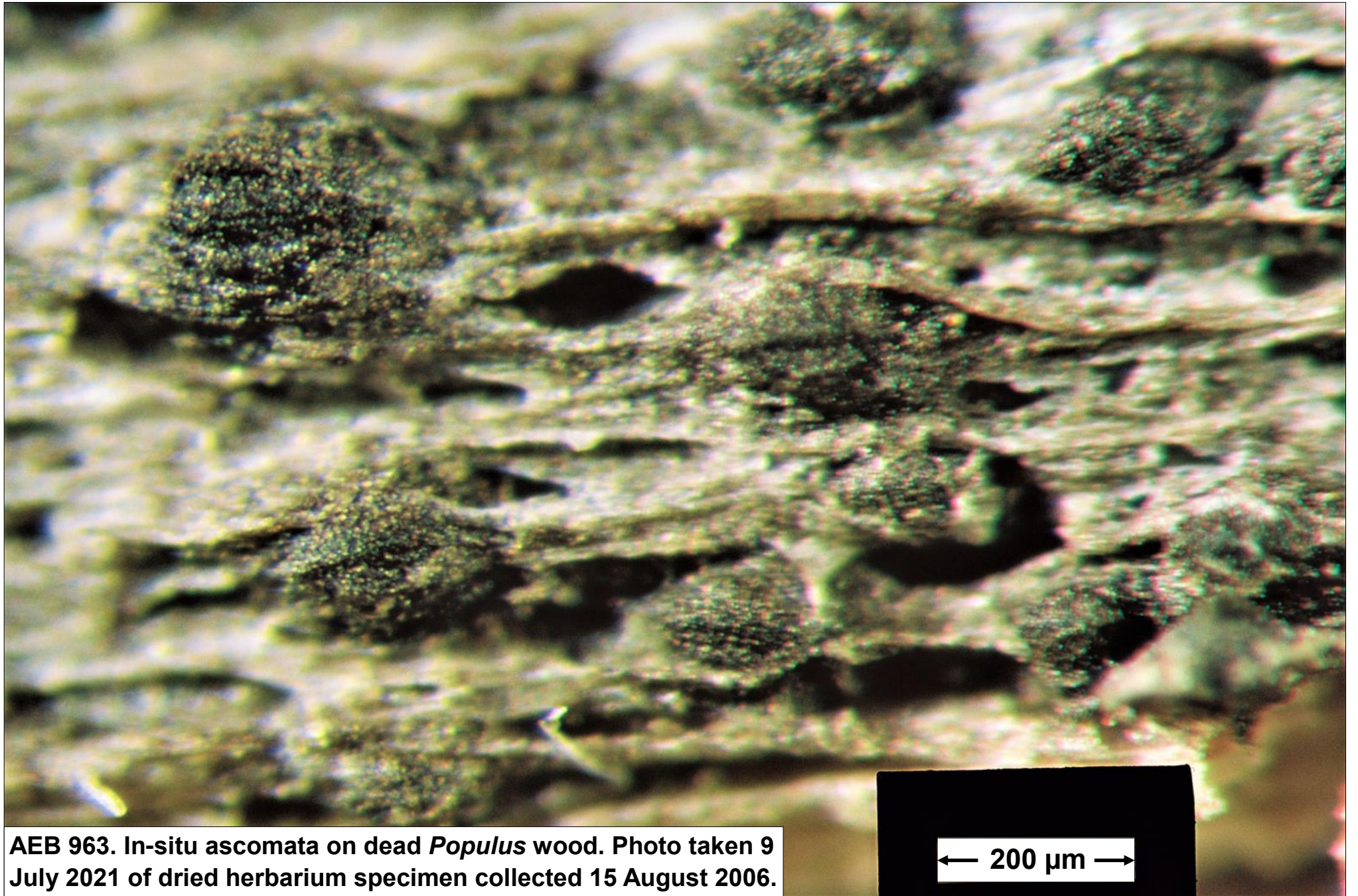
AEB 963. In-situ ascomata on dead *Populus* wood. Photo taken 9 July 2021 of dried herbarium specimen collected 15 August 2006.

← 625 μm →



AEB 963. In-situ ascomata on dead *Populus* wood. Photo taken 9 July 2021 of dried herbarium specimen collected 15 August 2006.

← 400 μm →



AEB 963. In-situ ascomata on dead *Populus* wood. Photo taken 9 July 2021 of dried herbarium specimen collected 15 August 2006.

← 200 μm →



**AEB 963. Asci, ascospores & pseudoparaphyses in water mount.
Collection of *Lophiostoma quadrinucleatum* var. *triseptatum* 15 August 2006 on dead *Populus* wood.**



AEB 963. Asci, ascospores & pseudoparaphyses in water mount.
Collection of *Lophiostoma quadrinucleatum* var. *triseptatum* 15 August 2006 on dead *Populus* wood.



AEB 963. Asci, ascospores & pseudoparaphyses in water mount.
Collection of *Lophiostoma quadrinucleatum* var. *triseptatum* 15 August 2006 on dead *Populus* wood.