Notes on the genus *Immotthia* (*Pleosporales*, *Ascomycetes*), including some type studies

WALTER JAKLITSCH
An den langen Lüssen 31/2
A-1190 Wien, Austria

HERMANN VOGLMAYR
Institut f. Botanik
Universität Wien
Rennweg 14
A-1030 Wien, Austria

CHRISTIAN SCHEUER
Institut f. Botanik
Karl-Franzens-Universität
Holteigasse 6,
A-8010 Graz, Austria

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Abstract: Austrian collections of *Immotthia atrograna*, a small pyrenocarpic ascomycete growing on stromata of *Hypoxylon* species are described and illustrated. Type studies showed that *Immotthia hypoxylon* is conspecific with *I. atrograna*, the single species of the mycoparasitic genus *Immotthia*. The genus and its systematic position are compared with other didymosporous genera of the *Pleosporales*.

Zusammenfassung: Von *Immotthia atrograna*, einem kleinen pyrenocarpen Ascomyceten, welcher auf Stromata von *Hypoxylon*-Arten wächst, werden österreichische Funde beschrieben und abgebildet. Typusstudien haben gezeigt, daß *Immotthia hypoxylon* ein Synonym von *I. atrograna*, der einzigen Art der mykoparasitischen Gattung *Immotthia*, ist. Die Gattung und deren systematische Stellung werden mit anderen didymosporen Gattungen der *Pleosporales* verglichen.

In recent years, various collectors have found *Immotthia atrograna* (COOKE & ELLIS) M. E. BARR in Austria. The small ascomata (pseudothecia) of this species grow on stromata of *Hypoxylon* spp. The species was originally described from North America, and only few European collections have been published so far. The fungus is often accompanied by its suspected anamorph, a coelomycetous form-species named *Coniothyrium parasitans* (BERK. & RAV.) TASSI. The conidiomata (pycnidia) of the latter are macroscopically indistinguishable from the ascomata of *Immotthia atrograna*.

We may assume that the known distribution of *Immotthia atrograna* in Europe now comprises northern Italy and Moravia (PETRAK 1958, as *Dimerium hypoxylon*), Austria (see also HÖHNEL 1920, as *Neopeckia episphaeria*; KAHR & al. 1996, KRISAI-GREILHUBER & al. 1997, as *I. hypoxylon*, HAUSKNECHT & al. 1999, DÄMON & al. 2000), The Netherlands (A. APTROOT, pers. comm.), and Sweden (ERIKSSON 1992, as *I. hypoxylon*). The distribution outside of Europe is, e.g., given by M. E. BARR (2002).

The genus *Immotthia* was described by BARR (1987 a) to accommodate *Amphisphaeria hypoxylon* ELLIS & EVERHART (1886). Some years later, BARR (1993) added another species to the genus, *Sphaeria atrograna* COOKE & ELLIS (1879). However,

when type specimens of both taxa were compared for the present study, it turned out that the ascomata do not show any convincing differences. The ascospore size given by ELLIS & EVERHART (1886, 1892, and on the sheet of the holotype specimen in NY) for *Amphisphaeria hypoxylon* is apparently incorrect (only 6-9 µm in length). It proved to be just the same as in *Sphaeria atrograna*. Differences in habit are probably due to the different conditions of the substrate. In the isotype specimen of *Sphaeria atrograna* in K the *Hypoxylon* stroma is apparently only represented by a very thin remnant, in the type of *Amphisphaeria hypoxylon* the substrate is a more effigurated stroma, possibly from a different species of *Hypoxylon*.

Sphaeria insidens SCHWEINITZ (1822) is the oldest name involved in the nomenclatural discussion and would clearly have priority over *Sphaeria atrograna* COOKE & ELLIS (1879). Unfortunately, SCHWEINITZ' (1822) short diagnosis in the protologue is purely macroscopic, and the conidiomata of the presumable anamorph *Coniothyrium parasitans* and the ascomata of the *Immotthia* teleomorph do not differ in macroscopic characters. In addition, the holotype in PH apparently contains only conidiomata of the anamorph (Y.-M. JU, annotation label, 1992), just like a doubtful isotype in K [K(M): 45863]. Although another isotype specimen of *Sphaeria insidens* in K [K(M): 9011] contains satisfactory material of the *Immotthia* teleomorph (Y.-M. JU, pers. comm.), the holotype in PH still exists and cannot be ignored. For these formal reasons, we prefer not to suggest a new combination.

BARR (1993) suggested that *Amphisphaeria pusiola* P. KARST. (see also SIVANESAN 1975, as *Coleroa p.*) may be another candidate for *Immotthia*. However, according to APTROOT (1995), this is a pyrenomycete with unitunicate asci (a "*Chaetosphaeria* with brown ascospores").

***Immotthia atrograna* (COOKE & ELLIS) M. E. BARR**, Mycotaxon **46** (1993): 71. Figs. 1-12

Basionym:
Sphaeria (*Psilosphaeria*) *atrograna* COOKE & ELLIS, Grevillea **8** (1879): 15.

Synonyms:
Amphisphaeria atrograna (COOKE & ELLIS) SACC., Syll. Fung. **1** (1882): 722.
Gibbera atrograna (COOKE & ELLIS) SIVAN., Trans. Brit. Mycol. Soc. **65** (1975): 396.
Melanomma atrogranum (COOKE & ELLIS) COOKE, Grevillea **16** (1887): 52.
Amphisphaeria confertissima ELLIS & EVERH., Proc. Acad. Nat. Sci. Philadelphia (1895): 418.
Gibbera confertissima (ELLIS & EVERH.) SIVAN., Trans. Brit. Mycol. Soc. **65** (1975): 395.
Amphisphaeria deformata [also spelled *deformis*] ELLIS & LANGL., J. Mycol. **4** (1888): 123.
?*Neopeckia episphaeria* HÖHNEL, Ann. Mycol. **17** (1920): 120.
Amphisphaeria hypoxylon ELLIS & EVERH., J. Mycol. **2** (1886): 41.
Dimerium hypoxylon (ELLIS & EVERH.) PETRAK, Sydowia **11** (1958): 338.
Immotthia hypoxylon (ELLIS & EVERH.) M. E. BARR, Mycotaxon **39** (1987): 504.

Melanomma hypoxylon (ELLIS & EVERH.) COOKE, Grevillea **16** (1887): 53.
Otthia hypoxylon (ELLIS & EVERH.) SHEAR ined.
Otthia hypoxyloides (ELLIS & EVERH.) ELLIS & EVERH., North American Pyrenomycetes, p. 249 (1892).
?*Sphaeria insidens* SCHWEIN., Schriften Naturforsch. Ges. Leipzig **1** (1822): 39.
Hypoxylon insidens (SCHWEIN.) ELLIS & EVERH., North American Pyrenomycetes, p. 653 (1892).
?*Jahnula parasitica* KIRSCHST. ined. (PETRAK 1958).
Amphisphaeria pilosella ELLIS & EVERH., Proc. Acad. Nat. Sci. Philadelphia (1895): 418.
Gibbera pilosella (ELLIS & EVERH.) SIVAN., Trans. Brit. Mycol. Soc. **65** (1975): 395.

Presumed anamorph:
Sphaeropsis parasitans BERK. & RAVENEL, Grevillea **2** (1874): 180.
Coniothyrium parasitans (BERK. & RAVENEL) TASSI, Bull. Lab. Orto Bot. Siena **5** (1902): 23.
Cicinnobella parasitans (BERK. & RAVENEL) PETRAK, Sydowia **11** (1958): 338.

Description:
Hypostroma: dark brown to black crust below the ascomata, covering the surface of young widely effuse stromata of *Hypoxylon* without perithecia in their entirety, whereas mature stromata are often covered only in limited areas; 50-300 µm thick; in section a textura angularis of cells similar to those of the outer layer of the ascomatal wall, dark brown, thick-walled (0.5-1.5 µm), 6-11 µm diameter. Dark brown hyphae are present in the lowest layer in direct contact with the wood, penetrating it. These hyphae are interpreted to belong to the *Hypoxylon* host (see below).

Ascomata (Figs. 1, 2): superficial on the hypostroma, densely aggregated in large groups or loosely scattered, globose to obpyriform, often laterally compressed by mutual pressure, 120-270 µm in diameter, 150-310 µm in height, black, carbonaceous, glabrous, surface verrucose by protruding cells. Treatment with 10% KOH does not cause changes to the morphology of the ascomata.

Ostioles: pallid, cream to reddish-brown, circular pore area in the centre of the apical region, 30-50 µm diameter, inconspicuous, sometimes minutely papillate; replaced in old ascomata by a circular perforation, which is sometimes surrounded by triangular or stellate fissures. The interior of the ostiolar region is filled with short, elongate to subclavate, hyaline to yellow-brown cells with broadly rounded apices, 8-18 x 2-3 µm in size, converging to the centre of the ostiolum.

Peridium: soft-textured, three-layered, 30-50 µm thick, of equal thickness or slightly thickened in apical region; outer layer 10-15 µm thick, in surface view of small, thick-walled (0.5-1.5 µm), angular, dark reddish-brown cells with a diameter of 6-10 µm, in section cells more compressed, in several rows, very dense; central layer: 6-15 µm thick, of 2-4 rows of cells similar to those of the outer layer, but more distinct, compressed and lighter coloured; inner layer: 10-20 µm thick, of yellowish to subhyaline, slightly compressed to nearly isodiametric cells with a diameter of 3-8 µm; in

some ascomata a (sub-)hyaline, indistinctly cellular tissue (up to 80 µm high) is present between the basal part of the peridium and the hymenium.

Hamathecium (Fig. 9): numerous branched pseudoparaphyses filling the pseudothecial cavity, exceeding asci in length, easily separable from the peridium in squash mounts; hyaline, filiform, septate, 1.5-3 µm thick, usually multiguttulate in fresh material.

Asci (Fig. 9): in a broad basal or central fascicle, oblong to cylindrical, fissitunicate, thick-walled, up to 3 µm thick at apex, with 8 (obliquely) uniseriate spores, 60-86 x 6-10 µm.

Ascospores: (8-)9-14(-18) x 5-6 µm, brightly pigmented (deep yellow-brown to ferruginous), ellipsoid to biconical, generally slightly inaequilateral, 2-celled, constricted; septum in the middle or slightly eccentric, 1 µm thick, thicker and stronger pigmented (deep reddish-brown) than the walls, often upper cell slightly shorter and broader than the lower, ends rounded to subacute, 1-3 guttules per cell, smooth to slightly verruculose in light microscopy, distinctly verrucose in SEM (Figs. 3, 4, 10), surrounded by a hyaline perispore, up to 1 µm thick, non-dehiscent in 10% KOH. In KOH pigmentation changes to dark brown.

Presumed anamorph (studied on natural substrate): pycnidia (Figs. 5, 6) similar to ascomata, with sizes in their lower range. Conidiophores absent. Conidiogenous cells (Fig. 12) enteroblastic, phialidic, discrete, determinate, irregularly ampulliform to doliiform, hyaline, smooth, (8-)10(-14) x 5(-7) µm, collarette and aperture minute, periclinal wall markedly thickened. Conidia ellipsoid, one-celled, light to medium brown, smooth to finely verruculose in light microscopy and SEM (Figs. 7, 8, 11), usually with two guttules, 6-8(-9) x 3-5 µm.

Due to the phialidic nature of the conidiogenous cells the putative anamorph belongs to *Microsphaeropsis* rather than to *Coniothyrium* (see SUTTON 1980).

Cultural experiments using single ascospores and malt extract agar were carried out in order to elucidate the connection of the teleomorph and this anamorph present in some specimens. However, in none of the experiments germination of ascospores was observed.

Habitat: on stromata of *Hypoxylon*, mostly *Hypoxylon rubiginosum* and *H. perforatum* on *Fraxinus*, *Salix*, *Acer*, and other hardwoods, most abundant in vegetations along rivers and in swamps.

Ecology: The fungus seems to be an obligate parasite, attacking and blackening stromata of *Hypoxylon* in all stages of development. Thin patches of stromata of *Hypoxylon* in early stages covered by the densely aggregated ascomata of the parasite can easily lead to the interpretation, that the crustose hypostroma grows directly on wood, particularly if specimens collected and examined consist only of small fragments of the infested colony. Attacking immature stromata *Immotthia atrograna* impedes their further growth and development. SIVANESAN (1975) described basal crustose hypostromata with dark brown hyphae which penetrate the host tissues. Examination of both parasitized and non-parasitized *Hypoxylon perforatum* and *H. rubiginosum* by the first author showed that the stromata are always accompanied by dark brown hyphae with 2-3 µm diameter penetrating the stromatized wood tissues, independent of the presence of *Immotthia*.

The parasitic nature of *Immotthia* might be supported by the inability of the ascospores to germinate on artificial media.

Type material examined: *Sphaeria* (*Denud.*) *atrograna* C. & E., on *Liquidambar*, Fungi New Jersey. USA, No. 3179, Newfield; J. B. ELLIS, Herb. K(M): 42170, Isotype [as *Gibbera atrograna*]. *Otthia hypoxyloides* E. & E. ["*Amphisphaeria hypoxylon*" E. & E. deleted, but still legible], gregarious black fungus on a granulated black stroma, under branch of *Carya olivaeformis* laying on the ground in grass. Pointe a la Hache, Louisiana, 30 Dec. 1885, LANGLOIS 138, Herb. NY, Holotype. *Sphaeria insidens* SCHW., H. W. RAVENEL's Herbarium, ex herb. SCHW.!, confl., no fruit, Herb. K(M): 45863, Isotype? [as *Hypoxylon insidens*]. *Sphaeria insidens* L. v. S., North Carolina, Salem & Pennsylvania, Bethlehem. Syn. Fung. 1436; Herb. PH, Holotype.

Additional collections examined: Austria: Kärnten: St. Margareten im Rosental, Trieblach/Drau-Auen (400-450 m s. m.), MTB 9452/2, auf *Hypoxylon rubiginosum* s. l., 24. 11. 1994, W. JAKLITSCH (WJ 298); - - 25. 3. 1995, W. JAKLITSCH (WJ 530); - - auf *Hypoxylon* sp./*Acer pseudoplatanus*, 14. 4. 2001, W. JAKLITSCH (WJ 1737); - St. Margareten im Rosental, Drau-Auen (400 m s. m.), MTB 9452/1, auf *Hypoxylon rubiginosum* s. l./*Fraxinus excelsior*, 23. 12. 1997, W. JAKLITSCH (WJ 1119); - - auf *Hypoxylon rubiginosum* s. l./*Salix alba*, 26. 10. 1998, W. JAKLITSCH (WJ 1255); - - 15. 10. 2000, W. JAKLITSCH (WJ 1635).

Niederösterreich: Zöbern, MTB 8462/4, *Hypoxylon*/*Fraxinus*, 15. 8. 1999, W. JAKLITSCH (WJ 1359); - Klosterneuburg, Donau-Auen, MTB 7664/3, *Hypoxylon rubiginosum*/*Fraxinus*, 9. 4. 2000, W. JAKLITSCH (WJ 1447).

Salzburg: Pinzgau, Nationalpark Hohe Tauern, Obersulzbachtal zwischen Hopffeldboden (1067 m s. m.) und der Kampriesenalm (1415 m s. m.), MTB 8839/2, 47°11'N/12°16'E, 22. 7. 1992, C. SCHEUER (3181, GZU; *Coniothyrium parasitans* only); - [nahe Stadt Salzburg] Wals-Siezenheim, NWR Saalach-Altarm, MTB 8243/2, *Hypoxylon* sp./*Fraxinus excelsior*, 20. 3. 1996, W. DÄMON & W. JAKLITSCH (WJ 1698, RP049/96).

Steiermark: Grazer Bergland, Schöcklgebiet N von Graz, Göttelsberg bei St. Radegund b. Graz (47°10'N/15°29'E), MTB 8858/2, 18. 12. 1999, A. DRAXLER & W. MAURER; - Grazer Bergland, Graz, Bezirk Mariatrost, im Bereich der Wenisbucher Straße, ca. 440-460 m s. m., 47°06'N/15°29'E, MTB 8858/4, feuchter Wald mit mehreren kleinen Wasserläufen, 4. 9. 1994, LAR. N. VASILYEVA & C. SCHEUER (SCHEUER 3167, 3168; GZU); - - 18. 10. 2000, C. SCHEUER (3896); - Oststeirisches Hügelland, nordöstliche Umgebung von Graz, ca. 2 km WNW von Eggersdorf b. Graz, Volkersdorf (47°07'N/15°34'E), MTB 8859/3, 16. 2. 2001, A. DRAXLER & W. MAURER, det. C. SCHEUER; - Steirisches Randgebirge, Teigitschgraben S Voitsberg, E bis SE von St. Martin am Wöllmißberg, ca. 430-600 m s. m., 47°00'N/15°08'E, MTB 8956/4, 17. 8. 1993, C. SCHEUER (3165, 3170; GZU); - Steirisches Randgebirge, Teigitschgraben S Voitsberg, am orographisch linken Ufer der Teigitsch, zwischen der Brücke (420 m s. m.) und der Brücke kurz unterhalb vom Gehöft „Leitenweber" (480 m s. m.), 47°00'N/15°08'E, MTB 8956/4, Aceri-Fraxinetum, 8. 8. 1994, LAR. N. VASILYEVA & C. SCHEUER (SCHEUER 3169; GZU); - [Steirisches Randgebirge,] Stubalpe, Teigitschgraben SW Voitsberg, knapp unterhalb der Hirzmann-Sperre, 46°59'N/15°05'E, 680 m s. m., MTB 9056/2, 6. 11. 1995, C. SCHEUER (3171; GZU); - Koralpe, Höllgraben NW Marhof, NW Stainz, 650-800 m s. m., MTB ?9057/3, nährstoffreicher Schluchtwald, 29. 9. 1988, J. POELT (SCHEUER 3162, 3163; GZU); - Oststeiermark, Katzlergraben bei Fehring, MTB 9062/3, 26. 9. 1994, W. MAURER (SCHEUER 3176; GZU); - Oststeiermark, Erlen-Au an der Lafnitz bei Wagendorf, MTB 8662/3, 8. 12. 1994, W. MAURER (SCHEUER 3175; GZU); - [Südliche Oststeiermark,] kurz N von Ehrenhausen, Auwald am Ost-Ufer der Mur an der Straße nach Obervogau, ca. 250 m s. m., MTB 9259/3, 46°44'N/15°34'E, 5. 9. 1996, C. SCHEUER & W. MAURER (SCHEUER 3164; GZU); - [Südliche] Oststeiermark, NW Bad Radkersburg, E an der Straße von Halbenrain nach Klöch, Steinriegelwald ca. 3 km N Halbenrain, stark mäandrierender Bachlauf, ca. 230 m s. m., 46°44'N/15°57'E, MTB 9261/4, 7. 9. 1994, W. MAURER, LAR. N. VASILYEVA & C. SCHEUER (SCHEUER 3173; GZU); - Südliche Oststeiermark, bei Halbenrain, MTB 9261/4, 8. 9.1996, W. MAURER (SCHEUER 3174); - [Südliche Oststeiermark,] ca. 3 km NE von Bad Radkersburg, S von Zelting im Bereich des Kutschenitza-Baches an der Grenze zu Slowenien, 46°42'N/16°01'E, 205 m s. m., MTB 9262/3, Auwald-ähnliche Bestände, 21. 1. 1998, W. MAURER, D. PRELICZ & C. SCHEUER (SCHEUER 3161; GZU); - [Südliche] Oststeiermark, Bad Radkersburg, im Auwald bei Sicheldorf, MTB 9362/1, 6. 12. 1994, W. MAURER (SCHEUER 3180; GZU); - [Südliche] Oststeier-

mark, Bad Radkersburg, Auwälder der Mur S Laafeld, MTB 9362/1, ca. 205 m s. m., 46°40'N/ 16°00'E, 22. 2. 1995, C. SCHEUER (3166, 3172; GZU).

Tirol: [Osttirol], Lavant, Wacholderhain, Auenlaue, MTB 9243/1, *Hypoxylon* spec./*Fraxinus excelsior*, 25. 8. 2000, T. BARDORF & W. JAKLITSCH (WJ 1530).

Vorarlberg: Rheintal, SW Meiningen, „Rote Au" zwischen Ill und Spirsbach, ca. 430 m s. m., 47°17'N/09°33'E, MTB 8723/1, 5. 9. 1995, C. SCHEUER (3177, 3178, 3179; GZU).

Wien: 22. Bezirk, Lobau, nahe Ölhafen (150 m s. m.), MTB 7865/1, *Hypoxylon rubiginosum* (s. l.) /*Fraxinus excelsior*, 5. 4. 1997, W. JAKLITSCH (WJ 1037); - - 9. 1. 1999, W. JAKLITSCH (WJ 1284).

USA: *Dimerium hypoxylon* (ELL. & EVERH.) PETR., auf *Hypoxylon* spec., auf *Robinia* spec., Maryland, Beltsville, an der Bahn Ohio–Pennsylvania, 15. 7. 1950, F. PETRAK (Reliquiae Petrakianae 1433; GZU). *Cicinnobella parasitans* (BERK. & RAV.) PETR., auf *Hypoxylon* spec., auf *Carya* spec., Maryland, Beltsville, Ufer des Little Paint Branch, 21. 5. 1950, F. PETRAK (Reliquiae Petrakianae 948; GZU). *Sphaeria insidens* L. v. S., Pennsylvania, Bethlehem. Syn. Fung. 1436-288, COLLINS Collection no. 180, Herb. PH [annotated by Y.-M. JU, 2. 3. 1992: "immature stromata of *Hypoxylon*, possibly *H. perforatum* (SCHW.: FR.) FR., parasitized by a coelomycetous fungus"].

Systematic position of *Immotthia* and delimitation from other genera

BARR (1987 a, b) assigned the genus *Immotthia* to the *Dacampiaceae*, a family characterized by obpyriform to globose ascomata with a broad apex, 3-layered peridium, relatively wide in upper regions, narrowly cellular pseudoparaphyses, cylindric or oblong asci, and coelomycetous anamorphs with one- or two-celled conidia (like *Chaetophoma*, *Coniothyrium*, *Pyrenochaeta*). Currently (BARR 2002) *Immotthia* is a member of the *Teichosporaceae*, a family with basically the same characteristics as used for the *Dacampiaceae* in 1987 (BARR 1987 b), with *Dacampiaceae* removed and used in a restricted sense for lichenicolous fungi with otherwise similar characteristics.

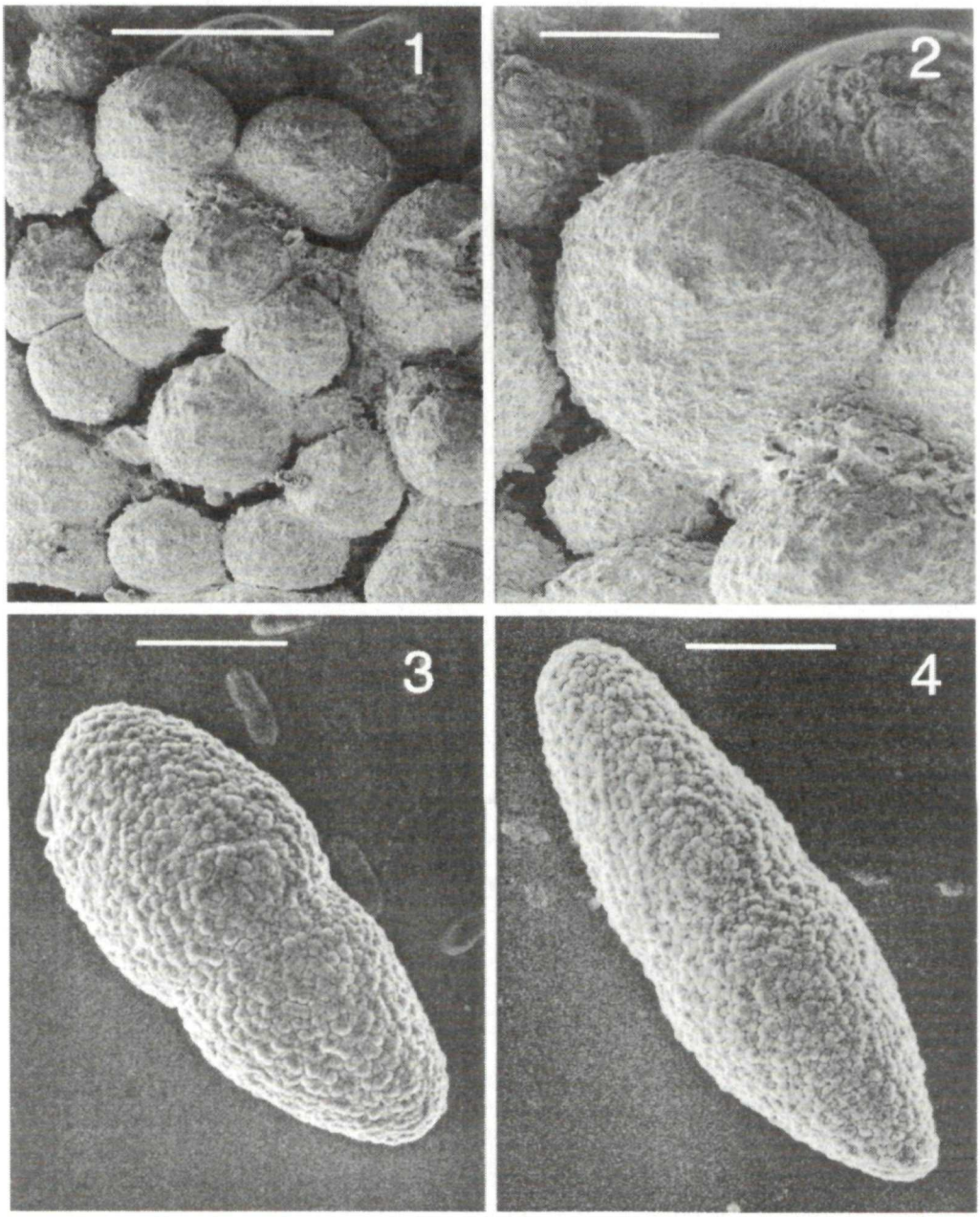
The most striking feature of the genus *Immotthia* is the entirely superficial and mycoparasitic habit. Clearly this genus is a representative of *Pleosporales* (sensu BARR 1987 b), based on the numerous septate pseudoparaphyses. Therefore mainly genera of pleosporaceous families are included in the following discussion outlining the differences to *Immotthia*. In addition, a few comments to genera with 2-celled brown ascospores of other groups are given. Most of the data are compiled from the literature, some are based on studies of material collected in Austria.

The comparison is confined mainly to genera with the following characteristics, as far as known:

Stroma: absent or only hypostroma present
Ascoma: perithecioid
Hamathecium: cellular pseudoparaphyses
Asci: bitunicate with fissitunicate dehiscence
Ascospores: 1-septate, brown
Ecology: non-lichenized

Arthopyreniaceae: e.g., *Jarxia* D. HAWKSW., *Mycomicrothelia* KEISSL.: differ by dimidiate ascomata, erumpent from smooth bark of vascular plants, often covered by a clypeus or involucrellum, by obpyriform-clavate asci, etc. (HAWKSWORTH 1985 a, 1989).

Botryosphaeriaceae: *Dothidotthia* HÖHN.: ascomata are immersed (often under a clypeus), or erumpent from bark; asci are short, clavate to ellipsoid, with wide upper exoascus and biseriate to crowded ascospores; the peridium is stout, large-celled (BARR 1989 a, HYDE & al. 1999).



Figs. 1-4. SEM micrographs of the teleomorph of *Immotthia atrograna*. Figs. 1, 2. Ascomata. Figs. 3, 4. Ascospores. Bars: Fig. 1: 300 µm, Fig. 2: 100 µm, Figs. 3 and 4: 3 µm.

Cucurbitariaceae: *Otthia* NITSCHKE ex FUCKEL: large ascomata on a subiculum, erumpent from bark, peridium very stout and thickened in upper region, ascospores large, dark brown and broadly ellipsoid; anamorphs belong to *Diplodia* (BOOTH 1958).

Byssolophis CLEM. (treated also in *Lophiostomataceae* by HOLM & HOLM 1988 and having some resemblance with *Hysteriaceae*) differs by ellipsoid ascomata opening by a longitudinal slit, a well-developed subiculum, and pale brown ascospores with hyaline appendages when immature. (MÜLLER & ARX 1962, HOLM 1986).

Dacampiaceae: *Clypeococcum* D. HAWKSW. and *Polycoccum* SAUT. ex KÖRB. (HAWKSWORTH 1985 a, HAWKSWORTH & DIEDERICH 1988): ascomata immersed in lichens, covered by a clypeus in *Clypeococcum*, ascospores asymmetric, asci clavate. *Munkovalsaria* APTROOT: ascomata immersed under a clypeus, ascospores asymmetric, asci pedunculate, on vascular plants (APTROOT 1995, HYDE & al. 1999).

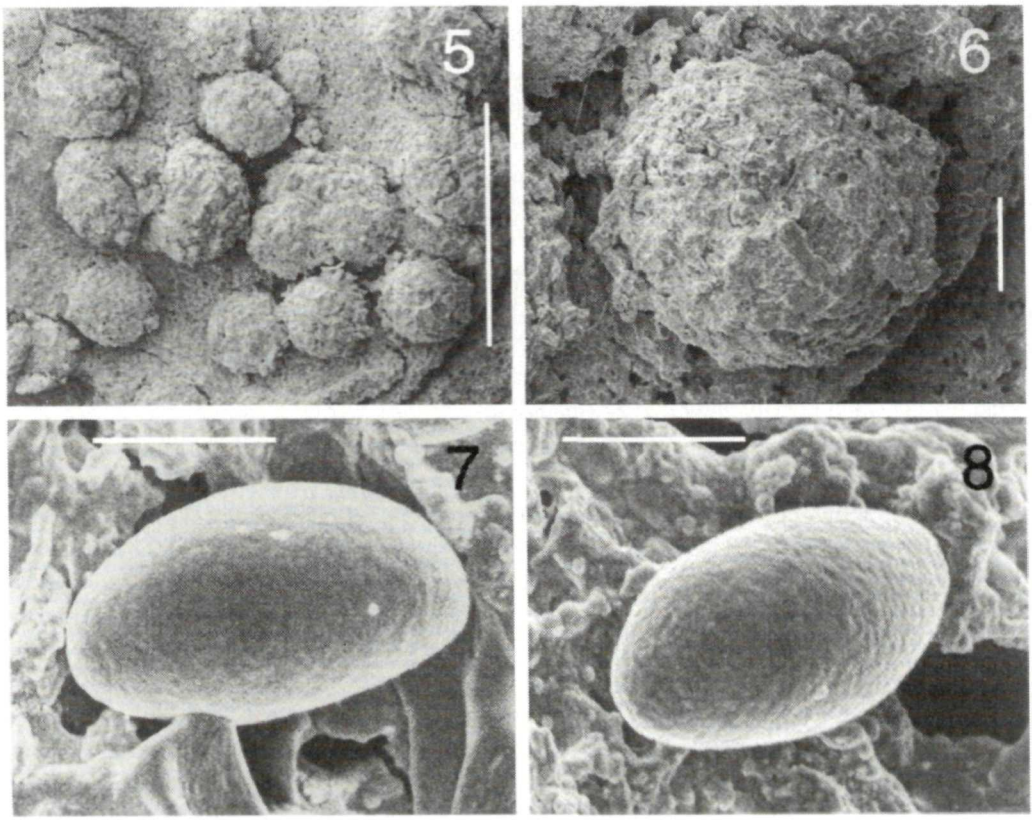
Leptosphaeriaceae: *Didymolepta* MUNK (earlier available names *Haplotheciella* HÖHNEL and *Mycosphaerellopsis* HÖHNEL): ascomata with laterally thickened peridium and clavate asci, immersed in herb stems, ascospores pale brown; controversial, either a synonym of *Didymella* SACC. (ERIKSSON & HAWKSWORTH 1988) or a genus of *Leptosphaeriaceae* (BARR 1987 b, 1993).

Lophiostomataceae: *Herpotrichia* FUCKEL (see, e.g., BARR 1984): differs from *Immotthia*, e.g., by hyphal appendages on ascomata, clavate asci, and mostly light-coloured ascospores. Species of *Lophiostoma* CES. & DE NOT. (see, e.g., HOLM & HOLM 1988) are characterized by ascomata with laterally thickened peridium, slitlike ostioles, ascospores biseriate in narrowly clavate asci. They are immersed(-erumpent) in wood or large herb stems and show only rarely 1-septate, brown ascospores. Other genera formerly included in this family, which have brown, 1-septate ascospores and superficial ascomata, e.g., *Ostropella* (SACC.) HÖHNEL, *Xenolophium* SYD. or *Trematosphaeria* FUCKEL, differ at least by trabeculate hamathecium and have therefore been transferred to *Melanommatales* (BARR 1990).

Montagnulaceae: *Montagnula* BERL.: conceived by APTROOT (1995) in a very wide sense; BARR (2001) separated didymosporous taxa into *Didymosphaerella* COOKE, which differs from *Immotthia* primarily by clypeate ascomata immersed in vascular plants, and by stipitate asci.

Parodiellaceae: *Parodiella* SPEG. (see, e.g., MÜLLER & ARX 1962): (sub-)tropical leaf parasites with obclavate asci and biseriate arrangement of hyaline to pale brown, striate ascospores. *Neopeckia* SACC.: generally regarded as a synonym of *Herpotrichia* FUCKEL, but accepted by BARR (1984, 1987 b) as a distinct genus, differs from *Immotthia* by the presence of a subiculum plus hyphal appendages, by ovoid ascospores and its habit on conifer leaves and twigs. *Pododimeria* E. MÜLL.: develops basally elongated and apically flattened ascomata on a superficial mycelium; asci are oblong-clavate with biseriately arranged ascospores; the habit is epiphytic on conifers (LUTTRELL & BARR 1978).

Phaeosphaeriaceae: characterized, e.g., by thin-walled ascomata. *Barria* Z. Q. YUAN: ascomata immersed in conifer leaves with thin peridium and broadly ellipsoid, greenish-brown ascospores (YUAN 1994). *Eudarluca* SPEG. (see, e.g., ERIKSSON 1966): parasitic on rusts, immersed in the substrate, often surrounded by cellular stroma, ascospores usually hyaline when 1-septate, showing biseriate arrangement in the asci.



Figs. 5-8. SEM micrographs of the presumed anamorph of *Immotthia atrograna*. Figs. 5, 6. Conidiomata. Figs. 7, 8. Conidia. Bars: Fig. 5: 300 µm, Fig. 6: 30 µm, Figs. 7 and 8: 3 µm.

Phaeodothis SYDOW: develops ascomata with dark, papillate to cylindric ostioles, usually immersed in vascular plants, spores biseriate in narrowly clavate and stipitate asci. APTROOT (1995) cites specimens for *P. winteri* with superficial ascomata on pyrenomycetes like, e.g., *Hypoxylon* on *Fraxinus*, a typical substrate of *Immotthia atrograna*. There are many similarities between these species. Therefore it seems likely that he included *Immotthia atrograna* in his extremely wide concept of *P. winteri*. Austrian collections of *P. winteri* on *Atropa belladonna* and *Sambucus racemosa* show immersed-erumpent ascomata without stromatic tissues, clothed by sparse brown hyphae, with phaeosphaeriaceous peridium, numerous pleosporalean pseudoparaphyses, narrowly clavate asci, biseriate arrangement of ascospores, at least in upper part of asci, and 1-septate, fusoid, often curved, dark reddish-brown ascospores, with the upper cell larger than the lower, 8-12 x 3-4 µm.

Teratosphaeria SYD. & P. SYD.: ascomata immersed in living leaves in stellate arrangement, ascospores large, cylindric, biseriate in ellipsoid asci (MÜLLER & OEHRENS 1982).

Wilmia DIANESE, INÁCIO & DORNELO-SILVA: ascomata immersed in leaves, with intraostiolar setae, evanescent pseudoparaphyses, and biseriate arrangement of ascospores (see DIANESE & al. 2001). Apart from the intraostiolar setae, this genus seems to be very close to *Phaeodothis*.

Phaeotrichaceae: *Trichodelitschia* MUNK: setose ascomata with coriaceous peridium developing on dung, ascospores have terminal germ pores and a gelatinous sheath (LUNDQVIST 1964, BARR 2000).

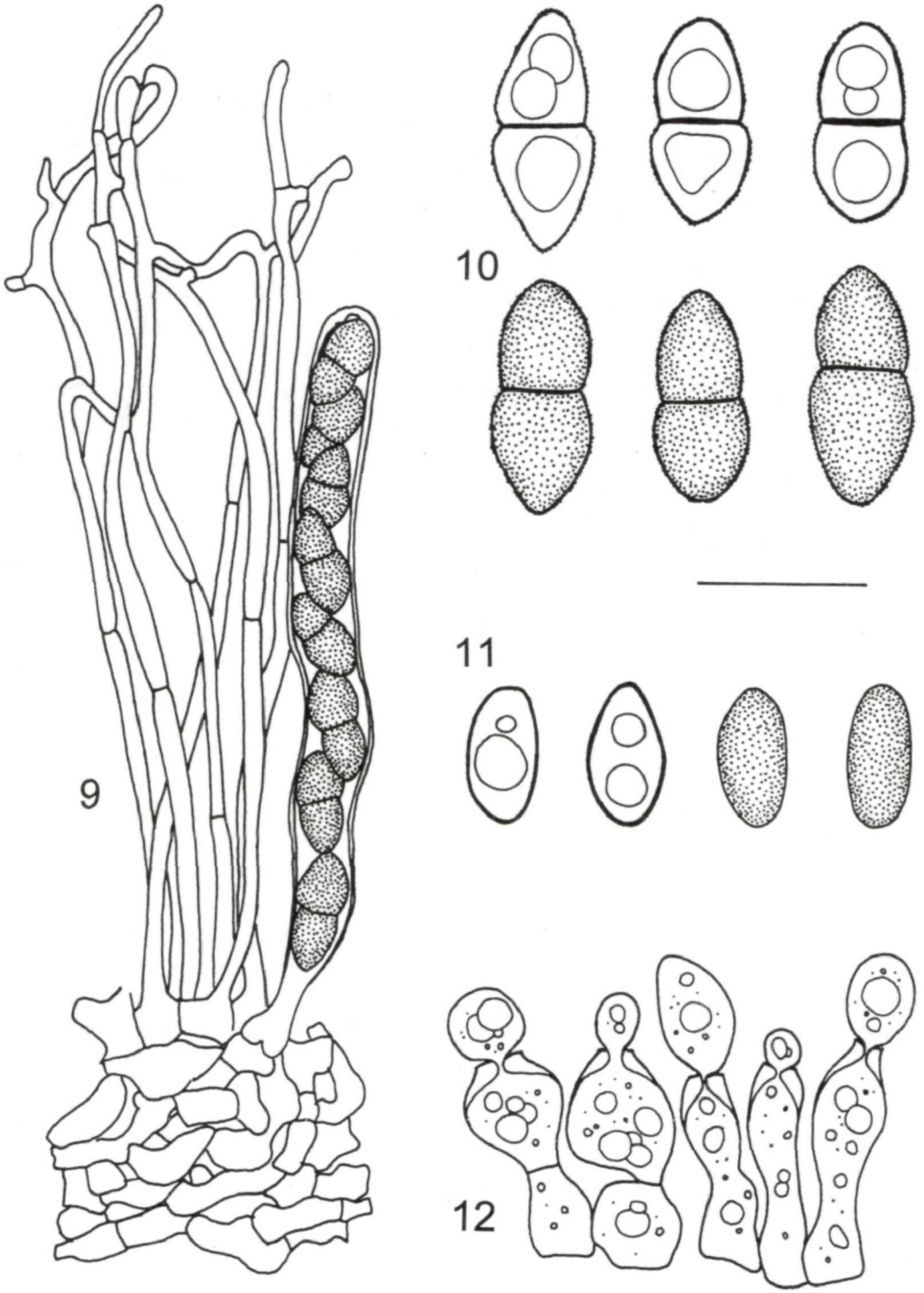
Pleomassariaceae: *Kirschsteiniothelia* D. HAWKSW. (1985 b): ascomata erumpent from wood, mostly with applanate base, asci are subcylindric-clavate, thick-walled, elastic, with biseriate arrangement of ascospores, which are large, mostly asymmetric, show sometimes a gelatinous sheath, and when immature often with bluish or olive tinge, and with a hyphomycetous anamorph. *Peridiothelia* D. HAWKSW. (HAWKSWORTH 1985 a), similar to *Kirschsteiniothelia*, differs also in an amyloid centre and consistently sheathed ascospores. *Splanchospora* VASILYEVA (see VASILYEVA 1998, MÜLLER & ARX 1962 under *Pteridiospora*, or BARR 1982, under *Splanchnonema*): contains only one species, *S. ampullacea*, with large, asymmetric, excentrically 1-septate ascospores, surrounded by a gel coating, biseriately arranged in large, thick-walled, oblong-clavate asci; ascomata are large and immersed in bark of woody substrata.

Pleosporaceae: *Zeuctomorpha* SIVAN., P. M. KIRK & GOVINDU: ascomata superficial on a subiculum on leaves, ascospores arranged bi- to triseriately in clavate asci, constricted at the septum, anamorph hyphomycetous (SIVANESAN 1984).

Pseudoperisporiaceae: revised by BARR (1997). All genera considered by her to belong in this family have only sparse pseudoparaphyses. Additional features differing from *Immotthia* are either development of superficial hyphae with stomatopodia or haustoria or ascomata are setose or bear other characteristic appendages. Only three genera develop more or less glabrous ascomata: *Lizonia* (CES. & DE NOT.) DE NOT. (parasitic on and confined to the bryophyte genus *Polytrichum*, on a subiculum of brown hyphae, ascospores are biseriate in the ascus; see DÖBBELER 1987), *Eudimeriolum* SPEG. (biotrophic on vascular plants, small, on brown subiculum, ascospores biseriate in ovoid-saccate asci), and *Phaeodimeriella* SPEG. *Phaeodimeriella* in the sense of BARR (1997) includes species of *Dimerium* (SACC. & P. SACC.) MCALPINE, to which genus PETRAK (1958) had assigned *Immotthia hypoxylon*, i.e. *I. atrograna*. The species of *Phaeodimeriella* are hyperbiotrophic on asterinalean and meliolalean fungi, and differ from *Immotthia* by development of superficial mycelium, sparse pseudoparaphyses, and oblong to basally inflated asci.

Tubeufiaceae: e.g., *Letendraea* SACC. (see, e.g., MÜLLER & ARX 1962), *Letendraeopsis* K. F. RODRIGUES & SAMUELS (RODRIGUES & SAMUELS 1994): differ mainly by light coloured ascomata.

Venturiaceae: parasitic on vascular plants, anamorphs hyphomycetous, in many genera ascomata are either setose, immersed in the substrate or distinctly stromatic; ascospores are often yellowish- or greenish-brown and asymmetrically septate. Relevant genera which contain species with glabrous ascomata superficial on the hosts and symmetric brown ascospores are as follows:



Figs. 9-12. Line drawings of selected features of *Immotthia atrograna*. Fig. 9. Part of hymenium showing hamathecium and asci. Fig. 10. Ascospores. Fig. 11. Presumed anamorph: conidia. Fig. 12. Presumed anamorph: conidiogenous cells. Bars: Fig. 9: 20 µm, Figs. 10-12: 10 µm.

Gibbera FRIES: conceived by some authors in a very wide sense (SIVANESAN 1975, MÜLLER & ARX 1962). SIVANESAN (1975) included hyperbiotrophs and saprobes, and erected two superfluous names for *Immotthia atrograna* in *Gibbera*. BARR (1989 b) reduced *Gibbera* to species parasitic on vascular plants forming ascomata superficial on an erumpent pulvinate hypostroma. Most of the species occuring on *Ericaceae* (e.g., PETRAK 1947, BARR 1968) have setose ascomata, biseriate arrangement of ascospores, which differ also in pigmentation from *Immotthia*.

The following genera of *Melanommatales* (sensu BARR 1990), which could be confused with *Immotthia* in a widest sense, differ at least by the hamathecium, which is usually made of trabeculae (filaments, which are very thin, indistinctly septate, and richly branched above the asci).

Acrocordiopsis BORSE & HYDE (marine, on mangroves), *Anomalemma* SIVAN. (hyphal hypostroma, *Exosporiella*-anamorph, on *Corticiaceae*), *Astrosphaeriella* SYD. & P. SYD., *Bicrouania* KOHLM. & VOLKM.-KOHLM. (marine), *Bimuria* HAWKSW., CHEA & SHERIDAN, *Byssosphaeria* COOKE, *Caryospora* DE NOT., *Caryosporella* KOHLM. (marine, on mangroves), *Lojkania* REHM, *Melanomma* NITSCHKE ex FUCKEL, *Mycopepon* BOISE, *Ohleria* FUCKEL (disarticulating ascospores), *Pseudotrichia* KIRSCHST. (brightly coloured vestiture), *Trematosphaeria* FUCKEL, and *Xenolophium* SYD.

Chaetothyriales, *Herpotrichiellaceae*: species of *Capronia* SACC. occur frequently on other fungi. They differ from *Immotthia*, e.g., by small setose ascomata, the absence of interascal tissues, and differently shaped asci (see, e.g., MÜLLER & al. 1987).

Loculoascomycetes incertae sedis (not assigned to families or orders in HAWKSWORTH & al. 1995).

Aaosphaeria APTROOT: saprophytic on herb stems, differs, e.g., by nearly unbranched trabeculate hamathecium (VAN DER AA 1989, APTROOT 1995).

Licopolia SACC., SYD. & P. SYD. (see MÜLLER & ARX 1962): on leaves, superficial on pulvinate hypostroma bearing brown hyphae on surface, biseriate arrangement of ascospores; nature of hamathecium (pseudoparaphyses/trabeculae) unclear.

Maireella SYD. ex MAIRE: assigned by BARR (1997) to *Coccoideaceae*, is a leaf parasite, developing small, black, often laterally fused, collapsing ascomata, containing peripherally arranged clavate asci with biseriately arranged, 2-celled, hyaline to light brown ascospores (see JENKINS & al. 1941).

Tyrannosorus UNTEREINER, STRAUS & MALLOCH (1995): setose ascomata superficial on conifer wood, ascospores biseriate, hamathecium trabeculate.

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