Synoptic keys to the inoperculate stromatic discomycetes in the Nordic countries

Sclerotiniaceae & Rutstroemiaceae

by Trond Schumacher and Arne Holst-Jensen

The key is an extended and revised version of a printed key to the family Sclerotiniaceae (Schumacher, 1997). The preparation of keys for internet publication is done by Arne Holst-Jensen.

Last update: February 16th. 1998. First release: September 24th. 1997. This page is maintained by Arne Holst-Jensen (arne.holst-jensen@vetinst.no). Please send us a note if you find errors, if you have update information, or just used the key and wanted to tell us that it was useful.

Link to the Ascomycete Research group of Oslo, Norway (ARON) home page

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About the synoptic keys

Purpose:
The keys include updated information about the inoperculate stromatic discomycetes of the families Sclerotiniaceae and Rutstroemiaceae, known to occur in the Nordic Countries (Denmark, Finland, Norway and Sweden). The generic concepts as presented here, are not always in accordance with the concepts found in current taxonomic literature (e.g., the Dictionary of the Fungi, Systema Ascomycetum). Only characters important for discrimination of the pertinent Nordic taxa have been included; it is not our intention to provide characters and keys to

discriminate all world taxa of the families. The keys are based on a combination of scientific evidence and the authors´ subjective opinion about the taxa. In several cases we have indicated that a taxon is misplaced in a genus. However, in the lack of concluding evidence about "correct" positions, the taxon has been retained in its traditional genus. The provided keys will continuously be updated by us; be sure that you use the latest version available (preferably avoid printing it out; the advantages of the electronic media such as clicking text, using links, viewing color photographs etc. will then be lost).

Using and interpreting the keys:
For identification work you can use one out of three alternative keys:
KEY A = Key to genera based on type of substrate, host and morphology
KEY B = Key to genera based on morphological criteria (*currently unavailable*)
KEY C = Key to taxa based on host association(s) (*currently unavailable*)

If you are familiar with the morphological terms of the non-lichenized inoperculate discomycetes, try KEY B. If the fungal host has been identified, try KEY C, otherwise try the main KEY A.

Various symbols are used to indicate the taxonomic status of the taxa. Taxon names in ***bold italics*** are accepted (by us) names. Taxon names in quotation marks, e.g. **"*Poculum* " *sydowianum***, mean that the taxon has been studied by us, but we are still uncertain about its generic placement. Taxon names in quotation marks plus square brackets, e.g. [**"*Rutstroemia* " *juniperi***], mean that the taxon has NOT been studied by us, but there are reasons to doubt the current generic placement of the taxon. Taxon names in *plain italics* are synonym names; names in bold refer to the accepted, correct name. The word "ined." added after the taxon name indicates that we are prepared to accept this new name, however the name is not yet validly published (according to ICBN, Greuter (1994)).

KEY A
Key to the genera based on the type of substrate (host) and (macro)morphology

1. Apothecia campanulate (verpoid, bell-shaped) . . . . . *Scleromitrula*
(see also *Episclerotium* L. M. Kohn (Leotiaceae), Kohn & Nagasawa, 1984)

1. Apothecia cupulate to discoid (cup- or saucer-shaped) . . . . . 2.

2. (1) Apothecia yellowish-green to greenish brown. . . . . *Lanzia*
(see also *Piceomphale* Svrcek (Leotiaceae), Svrcek, 1957)

2. Apothecia brownish . . . . . 3.

3. (2) On woody substrate. . . . . 4.

3. On other substrates. . . . . 5.

4. (3) Apothecia short-stipitate, errumpent through outer bark, densely aggregated, margin at maturity often splitting, apothecia arising from a stroma embedded in the inner cortex of its hosts, ascospores unicellular. . . . . *Encoelia*

4. Apothecia long-stipitate, one to several arising from an indeterminate stroma, ascospores becoming septate and multicellular at maturity, often with secondary spores produced at the

poles. . . . . *Rutstroemia*

5. (3) On cones of conifers. . . . . 6.

5. On other substrates. . . . . 7.

[6. (5) Apothecia dark olive-green, short-stipitate, cup discoid, many apothecia scattered on intact cones. . . . .*Piceomphale* (excluded from the families)]

6. Apothecia brown, short-stipitate, cupulate to discoid, one to many from cone-scales of *Abies*. . . . ."*Ciboria*" *rufofusca*

7. (5) On stromatized, decaying catkins. . . . .*Ciboria*

7. On other substrates . . . . . 8.

8. (7) On stromatized seeds, fruits and berries . . . . . 9.

8. On other substrates . . . . . 13.

9. (8) On stromatized fruits of *Betula* or *Alnus* . . . . .*Ciboria*

9. On other fruits . . . . . 10.

10. (9) Stroma formed superficially on a variety of fruits and berries, associated with a macroconidial anamorphic state of the *Botrytis* type. . . . . *Botryotinia*

10. Stroma formed within fruits and berries. . . . . 11.

11. (10) Stroma formed within stone and pome-fruits of the family Rosaceae, associated with a macroconidial anamorphic state of the *Monilia* type. . . . . *Monilinia*

11. Stroma formed within fruits of Ericaceae, Empetraceae and Pyrolaceae, *Monilia* anamorph with disjunctors, appearing on foliage 2-4 weeks after apothecial (teleomorphic) state . . . . 12.

12. (11) Stroma formed within fruits of *Vaccinium* hosts, apothecia long stipitate, ascospores di- or trimorphic. . . . . *Franquinia*

12. Stroma on other ericaceous hosts, ascospores usually monomorphic. . . . . *Franquinia*

13. (8) On stromatized leaves. . . . . 14.

13. On other substrates. . . . . 33.

14. (13) On stromatized leaf-nerves. . . . . 15.

14. On stromatized leaf-plate. . . . . 21.

15. (14) On leaves of *Vaccinium* spp. . . . . 16.

15. On leaves of deciduous trees. . . . . 18.

16. (15) Apothecial outer excipulum composed of globose cells (textura globulosa) . . . . . *Ciboria*

16. Apothecial outer excipulum composed of angular to prismatic cells (textura angularis-prismatica) . . . . . 17.

17. (16) Stroma determinate, apothecial outer excipulum without a gelatinous layer . . . . *Valdensinia*

17. Stroma indeterminate, apothecial outer excipulum with a gelatinous layer . . . . . *Poculum*

18. (15) Stroma up to 1mm thick, elongate, to 10 mm broad and 30 mm long, surrounding the midrib of overwintering leaves, ± detached from leaf-plate, well differentiated into a cortex and medulla. Apothecial stipe slender, up to 25 mm long. . . . . *Ciborinia*

18. Stroma not well differentiated. . . . . 19.

19. (18) Apothecia yellowish-green, arising from blackish stromatized leaf-nerves and petioles of *Acer*, *Tilia*, *Fagus* and *Quercus*. . . . . *Lanzia*

19. Apothecia brownish. . . . . 20.

20. (19) On leaves of *Quercus* and *Fagus* spp. . . . . *Poculum*

20. On leaves of other hosts. . . . . *Ciboria*

21. (14) On leaves of deciduous trees. . . . . 22.

21. On leaves of other hosts . . . . 24.

22. (21) Apothecia short-stipitate, margin radially splitting in a stellate manner, hymenium pale yellowish-brown, outside brownish-black, associated with a macroconidial anamorphic state consisting of arthroconidia in chains (form genus *Acarosporium*) borne in pycnidia. . . . . *Pycnopeziza*

22. Apothecia long-stipitate, brown, macroconidial anamorphic state wanting. . . . . 23.

23. (22) Apothecia from stromata without an obvious stromatal rind . . . . .*Ciboria*

23. Apothecia from a discoid or crustlike stroma with a determinate stromatal rind. (see also *Scleromitrula candolleana*) . . . . .*Ciborinia*

24. (21) On hosts of monocots . . . . . 25.

24. On hosts of dicots. . . . . 28.

25. (24) Stroma indeterminate, without a determinate stromatal rind, on poaceous, juncaceous and cyperaceous hosts . . . . . *Poculum*

25. Stroma a determinate sclerotium; pyramidal, globose or loaf-shaped. . . . . 26.

26. (25) With a *Botrytis* macroconidial anamorphic state . . . . . *Botryotinia*

26. Macroconidial anamorphic state wanting. . . . . 27.

27. (26) Stroma a sclerotium, medulla pinkish in immature sclerotia, on cyperaceous and juncaceous hosts . . . . . *Myriosclerotinia*

27. Stroma a sclerotium, medulla of immature sclerotia white . . . . . *Sclerotinia*

28. (24) Ascospores brown . . . . . *Lambertella*

28. Ascospores hyaline. . . . . 29.

29. (28) Associated with a macroconidial anamorphic state . . . . . 30.

29. Macroconidial anamorphic state wanting. . . . . 31.

30. (29) Associated with a *Botrytis* macroconidial anamorphic state borne on free conidiophores. . . . . *Botryotinia*

30. Associated with a macroconidial state of arthroconidia in chains (form genus *Acarosporium*) borne in pycnidia . . . . .*Pycnopeziza*

31. (30) Stroma a determinate sclerotium; discoid, crustlike, pyramidal, globose or loaf-shaped with a well differentiated rind and medulla. . . . . 32.

31. Stroma crustlike, without an obvious stromatal rind . . . . . *Ciboria*

32. (31) Stroma pyramidal, globose or loaf-shaped . . . . . *Sclerotinia*

32. Stroma discoid or crust-like . . . . . *Ciborinia*

33. (13) Stroma tuberoid, globose, loaf-shaped, pyramidal, cylindrical or discoid with a well differentiated rind and medulla . . . . . 34.

33. Stroma indeterminate, with or without an obvious stromatal rind . . . . . 39.

34. (33) Sclerotia cylindric, loaf-shaped, tuberoid, pyramidal or discoid, on flowers, stems or roots of its host. . . . . 35.

34. Sclerotia tuberoid to globose, borne in soils inbetween roots of its hosts; sclerotial medulla without obvious remnants of host tissues, or without gelatinous substance between sclerotial hyphae; macroconidial anamorphic state wanting . . . . . 38.

35. (34) Sclerotia borne within stems of juncaceous and cyperaceous hosts, sclerotia cylindrical to tuberoid (see also *Sclerotinia tetraspora*) . . . . . *Myriosclerotinia*

35. Sclerotia formed on leaves, stems and roots of other plant families; sclerotia wholly or partially embedded in and digesting host tissues; sclerotial medulla with remnants of host tissues, or with

a gelatinous substance inbetween sclerotial hypha . . . . . 36.

36. (35) Macroconidial anamorphic state wanting . . . . . *Sclerotinia* (but see also *Botryotinia* and *Ovulinia*)

36. Macroconidial anamorphic state present . . . . . 36.

37. (36) Sclerotia discoid; on wilting flowers (petals) of *Rhododendron*. Apothecia long-stipitate (up to 15 mm). Macroconidial anamorphic state (if present) of *Ovulitis* type; macroconidia borne on short conidiophores . . . . . *Ovulinia*

37. Sclerotia pyramidal, discoid or flat; on stems, leaves, corms or bulbs. Apothecia short-stipitate (usually less than 8 mm). Macroconidial anamorphic state and apothecial state often co-occuring; macroconidia borne on straight, branched conidiophores (form genus *Botrytis*) . . . . . *Botryotinia*

38. (34) Apothecial outer excipulum with a layer of prismatic, elongate cells (textura prismatica) embedded in a gelatinous matrix. . . . . *Dumontinia*

38. Apothecial outer excipulum with a layer of angular to globose cells, no gelatinous matrix . . . . . *Sclerotinia*.

39. (33) Ascospores brown . . . . . *Lambertella*

39. Ascospores hyaline . . . . . 40.

40. (39) Stroma a blackened, mantling, crust-like indefinite stroma with a well differentiated rind, developed on rhizomes and bulbs of monocot plants . . . . . *Stromatinia*

40. Stroma lacking a well differentiated rind . . . . . 41.

41. (40) Apothecial outer excipulum consisting of globose cells (textura globulosa) . . . . . *Ciboria*

41. Outer excipulum of apothecium consisting of angular to prismatic cells with a ± prominent layer of gelatinized, long celled hyphae . . . . . *Poculum*

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KEY B
Key to the genera based on morphological criteria
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KEY C
Key to the genera based on host association(s)
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Botryotinia (*Botrytis* anamorphs)
Ciboria

Ciborinia
Dumontinia
Encoelia
Franquinia (*Monilia* anamorphs)
Lambertella
Lanzia
Monilinia (*Monilia* anamorphs)
Myriosclerotinia
Ovulinia (*Ovulitis* anamorphs)
Poculum
Pycnopeziza (*Acarosporium* anamorphs)
Rutstroemia
Scleromitrula
Sclerotinia
Stromatinia
Valdensinia

Synonyms and taxa excluded from the families: Gloeotinia , *Piceomphale* , *Scleroglossum* , *Verpatinia*

Botryotinia Whetzel
Type species: *B. convoluta* (Drayton) Whetzel. Apothecia brownish, stipitate, cup-shaped to plane, on loaf-shaped to pyramidal to lenticular black sclerotia. Ascospores ellipsoid, hyaline, unicellular. Macroconidial anamorphic state of the *Botrytis* Micheli: L. form type, arising from the mycelium or sclerotial rind, embedded in host tissue in nature, conidiophores in bundles, straight, distally branched, macroconidia ellipsoid to ovoid to subglobose, produced from swollen ampullae of ultimate branchlets of the conidiophores. On herbaceous debris, withered leaves and decaying bulbs and corms. Apothecia in spring and early summer.
Literature: Drayton (1937), Jørstad (1945), Whetzel (1945), Røed (1949, 1952), Hennebert & Groves (1963), Hennebert (1973), Holst-Jensen & al. (1997b).

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Ciboria Fuckel.
Type species: *Ciboria caucus* (Reb.:Fr.) Fuckel. *Ciboria* is a heterogeneous assemblance of species characterized by ± determinate stromata, an apothecial outer excipulum consisting of globose cells (textura globulosa) NOT embedded in a gelatinous matrix, and hyaline, unicellular ascospores. The genus is probably polyphyletic. The species on catkins of amentiferous trees constitute a monophyletic group. Based on scientific evidence and educated guess we distinguish **five groups** within the genus, the true *Ciboria* (on catkins), the warted-spored *Ciboria* , which are presumably obligate parasites and produce apothecia on fruits of amentiferous trees, the deciduous leaf inhabitants, forming a ± well differentiated stroma on leaves of deciduous trees, the herbaceous plant inhabitants, nutritioning on plant remnants of various kind (for groups three and four, see also *Rutstroemia*), and a fifth group of incommon features, consisting of presumably unrelated taxa classified on the basis of stromatal type.

Literature: Whetzel (1945), Buchwald (1947), Schumacher (1978), Schumacher & al. (1995), Holst-Jensen & al. (1997b).

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Ciborinia Whetzel
Type species: *Ciborinia whetzelii* (Seaver) Seaver. The genus *Ciborinia* is a heterogeneous assemblance of species characterized by an apothecial outer excipulum consisting of globose cells (textura globulosa) NOT embedded in a gelatinous matrix, hyaline, unicellular ascospores, the production of ± discoid sclerotia, and lacking a macroconidial anamorphic state. *Ciborinia* should probably be restricted to a group of leaf parasites on amentiferous trees, including the type species *C. whetzelii* on leaves of *Populus*. A number of taxa are keyed out here on the basis of the traditional generic character of a discoid, differentiated stroma. See also *Botryotinia*, *Ciboria*, *Myriosclerotinia*, *Scleromitrula* (=*Verpatinia*) and *Valdensinia*.
Literature: Whetzel (1945), Buchwald (1947), Batra & Korf (1959), Batra (1960), Holst-Jensen & al. (1997a, 1997b), Schumacher & Holst-Jensen (1997).

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Dumontinia L. M. Kohn
Type species: *Dumontinia tuberosa* (Hedw.:Fr.) L. M. Kohn. Apothecial outer excipulum composed of brick-shaped cells (textura prismatica) and an inner zone of loose hyphae embedded in a gelatinous matrix. Macroconidial anamorphic state wanting. The genus was seggregated from *Sclerotinia* by Kohn (1979), and typified with *Dumontinia tuberosa* as the only species. One additional species (see below) has recently been referred to the genus.
Literature: Kohn (1979), Holst-Jensen & al. (1997b).

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Encoelia (Fr.) P. Karst.
Type species: *Encoelia furfuracea*. (Roth: Pers.) P. Karst. Apothecia short-stipitate (subsessile), clustered or not, errumpent through the outer bark, arising from a delineate stroma inbetween inner bark cells of the host. Apothecial outer excipulum of small-sized, globose cells, outermost layer becoming loose with age, giving rise to a scurfy (granular) outer surface of the apothecium. Ascospores ellipsoid to fusiform, hyaline, unicellular.
Literature: Torkelsen & Eckblad (1977), Holst-Jensen & al. (1997b).

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Franquinia Holst-Jensen & T. Schumach. ined.
Type species: *Franquinia oxycocci*. (Woronin) Holst-Jensen & T. Schumach ined. The genus is seggregated from *Monilinia* based on a combination of ecological (life history), morphological, land molecular, phylogenetic evidence. The members of *Franquinia* are characterized by the production of an apothecial state obligately alternating with a *Monilia* anamorphic state composed of ovoid cells in chains intercalated by disjunctors.

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Lambertella Höhnel

Type species: *Lambertella corni-maris* Höhnel. Apothecia arising from stromatized host tissues, stromata sometimes being delimited by blackened lines on the surface of the substrate. Outer excipulum composed of prismatic cells, more rarely by isodiametric, angular cells. Asci 8- or 4-spored. Ascospores (mostly) unicellular, spore walls becoming brown within ascus or soon after spore discharge. Macroconidial anamorphic state wanting.

The genus is heterogeneous, and some taxa currently classified as *Lambertella* should probably be referred to the Helotiaceae, e.g. "*Lambertella* "*langei* , the presumably related "*Hymenoscyphus*" *kermesinus* (Fr.) Arendholz, and yet another possibly unnamed taxon. We have not yet had the opportunity to examine the type species*Lambertella corni-maris* Höhnel and to develop a sound concept of *Lambertella*. At this point, only a couple of brown-spored stromatic taxa with some affinity to a broad concept of *Lambertella* have been keyed out.
Literature: Whetzel (1943), Dumont (1971), Korf & Zhuang (1985), Schumacher & Holøs (1989), Holst-Jensen & al. (1997b).

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Lanzia Sacc.
Type species: *Lanzia flavo-rufa* (Sacc.) Sacc. *Lanzia* is a segregate genus of *Rutstroemia*. Apothecia stipitate-cupulate, brown to greenish brown, arising from stromatized patches of host tissues, no obvious stromatal rind. Apothecial outer excipulum composed of thin-walled, prismatic cells (textura prismatica) NOT embedded in a gelatinous matrix. Ascospores hyaline, uni- to tricellular. Macroconidial anamorphic state wanting. On herbaceous debris or wood. Apothecia in early summer and autumn.
Literature: Dumont (1972), Korf (1973).

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Monilinia Honey
Type species: *Monilinia fructicola*. (Winter) Honey. The genus *Monilinia* was segregated from *Sclerotinia* by Honey (1928), who further subdivided the genus into two (informal) sections, i.e. the Junctoriae (lacking intercalating disjunctors of the macroconidial chains) and the Disjunctoriae (having intercalating disjunctors of the macroconidial chains) (Honey, 1936). Batra (1991) included ca. 30 species in the genus (worldwide). In a molecular phylogenetic study including 18 species traditionally referred to *Monilinia* , Holst-Jensen et al. (1997a) demonstrated that the genus was polyphyletic, and that the Junctoriae constituted an evolutionary lineage distinct from the Disjunctoriae. Based on morphological and phylogenetic evidence the Disjunctoriae group of species are referred to the new genus *Franquinia*. , retaining *Monilinia* for a restricted subset of species comprising the Junctoriae (true *Monilinia*) which infect fleshy fruits of the family Rosaceae and only rarely produce apothecia.

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Myriosclerotinia N. F. Buchw.
Type species: *Myriosclerotinia scirpicola* (Rehm) N. F. Buchw. Apothecia cup-shaped to plane to funnel-shaped, brownish, stipitate, arising from a distinct sclerotium with a well-differentiated rind and medulla, medulla at first pinkish, becoming white when mature, developing within (or on) stems (culms) of cyperaceous and juncaceous hosts. Apothecial outer excipulum composed of

globose cells (textura globulosa). Ascospores hyaline, unicellular, ellipsoid to allantoid. Macroconidial anamorphic state wanting. Microconidial anamorphic state produced in sporodochia (form genus *Myrioconium* Sydow.) in locules within host tissues of the culms, or wanting. Apothecia produced in spring and early summer. Some authors treat the species as members of *Sclerotinia*.
Literature: Whetzel (1946), Buchwald (1947), Jørstad (1964), Schumacher & Kohn (1985), Vaage (1996), Holst-Jensen & al. (1997b).

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Ovulinia Weiss
Monotypic genus.
Literature: Weiss (1940), Whetzel (1945), Dennis (1956), Gjærum (1970b), Holst-Jensen & al. (1997b).

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Piceomphale Svrcek
This monotypic genus has recently been excluded from the Sclerotiniaceae and Rutstroemiaceae by Holst-Jensen & al. (1997b). The genus is included in the key for convenience.
Literature: Svrcek (1957), Dixon (1974), Holst-Jensen & al. (1997b).

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Poculum Velen.
Type species: *Poculum ruborum* Velen. The genus was adopted by Dumont (1972) to accommodate a group of species previously referred to *Rutstroemia* P. Karst. ss. White (1941), characterized by having a distinct layer of highly gelatinized, long-celled hyphae of the outer excipulum. As presently circumscribed, the genus is probably polyphyletic. We have not studied the generic type *Poculum ruborum* , growing on stems of *Rubus*. Two groups of species have been included here.
Literature: Velenovsky (1934), White (1941), Holst-Jensen & al. (1997b).

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Pycnopeziza White & Whetzel
Type species: *Pycnopeziza sympodialis* (Bubak & Vleugel) White & Whetzel. Apothecia arising from a definite stroma with a differentiated rind and medulla, apothecia solitary or gregarious, short-stipitate to substipitate, brown to dark brownish black, cleistocarpous from beginning, then discoid to flat, finally margin rupturing irregularly, giving a stellate margin; or opening by a pore, becoming saucer-shaped with a circular, entire margin. Macroconidial anamorphic state (*Acarosporium* Bubak & Vleugel) produced in superficial, solitary, black pycnidia less than 1 mm diam., globose or flattened-globose, attached by a broad basal portion, opening by irregular splits from the apex toward the base, expanding widely to expose the conidial mass. Apothecia and pycnidial anamorph are frequently observed side by side on the substrate.
Literature: White & Whetzel (1938), Schumacher (1990), Holst-Jensen & al. (1997b).

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Rutstroemia P. Karst.
Type genus of the family Rutstroemiaceae. Type species: *Rutstroemia firma*. (Pers.: Fr.) P. Karst. Apothecia cup-shaped, brownish, stipitate, arising from stromatized patches of host tissues. Outer excipulum of angular to prismatic cells, with a ± prominent layer of gelatinized, long-celled hyphae. Ascospores ellipsoid, hyaline, (uni-) bi- multi-cellular, frequently budding (producing microconidia) while still within ascus. Macroconidial anamorphic state wanting. On wood. Most species fruit in summer and autumn. (= *Kriegeria* Rabh.). See also *Ciboria* , *Lanzia* and *Poculum*.
Literature: White (1941), Buchwald (1947), Dennis (1956), Holm & Holm (1976, 1977), Holst-Jensen & al. (1997b).

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Scleromitrula S. Imai
Type species: *Scleromitrula shiraiana* (Henn.) S. Imai. Apothecia stipitate-capitate, exceptionally stipitate-cupulate, the capitate forms with a pendent margin forming a collar around stipe apex interrupting the continuity between the hymenium and stipe. Outer excipulum of head (cup) of globose to angular to brick-shaped cells in chains perpendicular to stipe axis, medullary excipulum of textura intricata, subhymenium distinct, of densely packed hyphae. Stroma determinate, of the lenticular to pyramidal type, developing on surface of infected host fruits, leaves or stems; stroma black outside, white to greyish inside, with a well-developed dorsi-ventral rind composed of thick-walled, melanized, globose to prismatic cells, stromatal cortex and medulla not much differentiated, of compact textura oblita with heavily gelatinized walls enveloping partly digested and undigested host tissues. Ascus inoperculate, with a thickened apex, pore channel wall J+ or J- after pretreatment in 2% KOH. Ascospores hyaline, ellipsoidal to allantoid, unicellular, eguttulate or with one or two minute polar guttules. Macroconidial anamorphic state wanting. The genera *Scleroglossum* Hara and *Verpatinia* Whetzel & Drayton are recent synonyms.
Literature: Imai (1941), Whetzel (1945), Groves & Elliott (1961), Kohn & Nagasawa (1984), Holst-Jensen & al. (1997b), Schumacher & Holst-Jensen (1997).

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Sclerotinia Fuckel
Type genus of the family Sclerotiniaceae.Type species: *Sclerotinia sclerotiorum* (Lib.) de Bary. Apothecia cup-shaped to funnel-shaped to plane, brownish, stipitate, arising from distinct, free, tuberoid sclerotia with a carbonaceous rind (black) and medulla (white) without remnants of host tissue. Apothecial outer excipulum of globose to hexagonal cells. Ascospores hyaline, ellipsoid, unicellular, multiguttulate. Macroconidial anamorphic state wanting. Terricolous or among herb debris of a number of vascular plants; apothecia in spring, summer or autumn.
Literature: Whetzel (1945), Kohn (1979), Holst-Jensen & Schumacher (1994), Graf & Schumacher (1995), Vaage (1996), Holst-Jensen & al. (1997b).

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Stromatinia Boud.
Type species: *Stromatinia rapulum* (Bull.) Boud. Apothecia stipitate-cupulate, brownish, arising from a mantling stroma covering the affected "root" organs of the host. Ascospores hyaline, ellipsoid, unicellular. Macroconidial anamorphic state wanting. On rhizomes, corms and bulbs of its monocot hosts. Apothecia in spring or early summer.
Literature: Whetzel (1945), Jørstad (1945), Drayton & Groves (1952), Schumacher (1984), Holst-Jensen & al. (1997b).

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Valdensinia Peyronel
Monotypic genus. Indeterminate crust-like stromata on leaf nerves and petioles. Macroconidial anamorphic state = form genus *Valdensia* Peyronel (syn. *Saliastrum* Kujala).
Literature: Peyronel (1923, 1953), Kujala (1946), Gjærum (1970a, 1993), Holst-Jensen & al. (1997b).

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List of species:

The list is currently being compiled. It will soon be available.

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Acknowledgements:

We are indebted to the following people who contributed by collecting and sending us material of stromatic inoperculate discomycetes from the Nordic countries: Marianne Berdal, Lennart Holm, Sverre Bjørn Holøs, Kolbjørn Mohn Jenssen, Edvin W. Johansen, Mia Knutsen, Linda M. Kohn, Roy Kristiansen, Sara Landvik, Per Marstad, Björn Nordén, Truls E. J. Oftedal, Sigmund Sivertsen, Nina Sletvold, Trude Vrålstad, Marianne Vaage.

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Botryotinia Whetzel
Type species: *B. convoluta* (Drayton) Whetzel. Apothecia brownish, stipitate, cup-shaped to plane, on loaf-shaped to pyramidal to lenticular black sclerotia. Ascospores ellipsoid, hyaline, unicellular. Macroconidial anamorphic state of the *Botrytis* Micheli: L. form type, arising from the mycelium or sclerotial rind, embedded in host tissue in nature, conidiophores in bundles, straight, distally branched, macroconidia ellipsoid to ovoid to subglobose, produced from swollen ampullae of ultimate branchlets of the conidiophores. On herbaceous debris, withered leaves and decaying bulbs and corms. Apothecia in spring and early summer.
Literature: Drayton (1937), Jørstad (1945), Whetzel (1945), Røed (1949, 1952), Hennebert & Groves (1963), Hennebert (1973), Holst-Jensen & al. (1997b), Holst-Jensen & al. (1998).

A typical conidiophore of the *Botrytis* type, on decaying remnants of *Filipendula ulmaria* a typical host of the type species of *Botryotinia* (*B. fuckeliana*). The entire width of the conidiophore and conidia is approximately 3 mm. (Photo: © Arne Holst-Jensen)

1. On leaves of monocot plants . . . . . 2.

1. On leaves of dicot plants . . . . . 3.

2 (1). On leaves of *Allium porrum*. Sclerotia plano-convex, deeply furrowed, variable in size, from 2-5 to 18 mm broad, up to 8 mm thick. Apothecia cupulate to plane, light brown, disc 3-12 mm diam., stipe 8-26 x 1-1.5 mm, apothecia one to four from a sclerotium; in outer leaf sheets of bulb neck of the host. Asci 165-245 x 10.5-14 um. Ascospores ellipsoid, biguttulate, 12-24 x 6.5-10 um. Macroconidial anamorphic state (*Botrytis porri* N. F. Buchw.) on withered, rotten leaves of the host, macroconidia ovoid, 7-19 x 5-11 um . . . . . ***Botryotinia porri*** (van Beyma) Whetzel

2. On leaves of *Iris pseudacorus.* Sclerotia lenticular to loaf-shaped, convoluted, 1-10 x 0.5-3 mm. Apothecia shallow cupulate to plane, pale brown to cinnamon, disc 2.5-4.5 mm diam., stipe 2-8 x 0.5-1.0 mm. Asci 150-190 x 9-13 um. Ascospores ellipsoid, eguttulate, 11.5-18 x

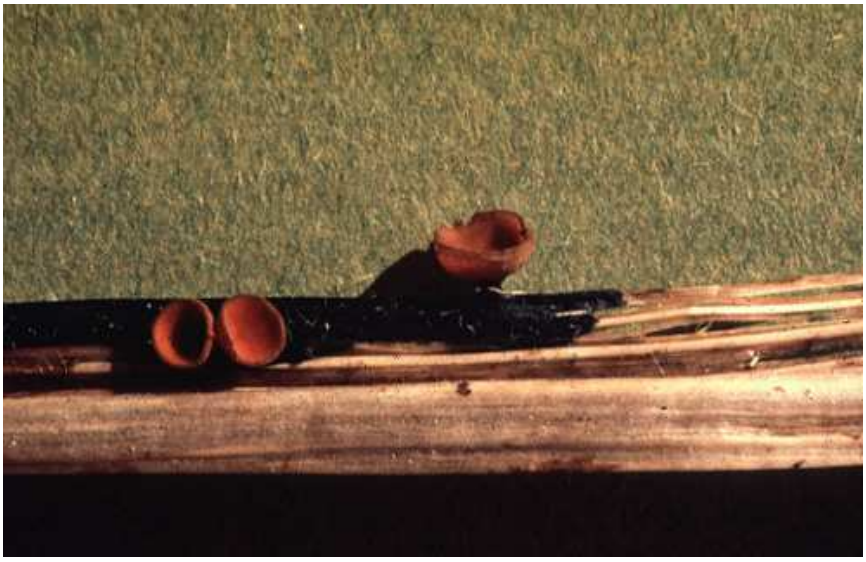
5.0-8.5 um. Apothecia in early summer. Macroconidial anamorphic state (*Botrytis convoluta* Whetzel & Drayton) erect, fasciculate, ca. 1-1.5 mm tall, pinkish, on decaying leaves of its host, macroconidia light brown, ovate to slightly pyriform, 7-18 x 5-13 um . . . . . ***Botryotinia convoluta*** (Drayton) Whetzel

Apothecia and conidiophores of *Botryotinia convoluta* on decaying remnants of *Iris pseudacorus*, Norway, Telemark, Bamble, Stokkevatn, June 29th 1996. (© Photo: Arne Holst-Jensen).

3 (1). On host plants of the family Ranunculaceae . . . . . 4.

3. On host plants of other dicot families . . . . . 6.

4 (3). On *Aconitum septentrionale.* Sclerotia elongate, 0.5-25 mm long, 0.3-0.8 mm broad, ca. 1-3 mm thick, on stems and leaf petioles of the host. Apothecia produced in high summer, one to five from a sclerotium, cup-shaped to plane, medium brown to dark brown, short-stipitate, disc 3-8 mm diam., stipe 2-10 x 0.5-1.5 mm. Macroconidial anamorphic state from sclerotia in high summer. Conidiophores erect, fasciculate, whitish, ca. 1-2 mm tall, macroconidia ovoid, 8-15 x 6-9 um. . . . . ***Botryotinia aconitincola*** (Rehm) T. Schumacher & Holst-Jensen ined.



Apothecia of *Botryotinia aconitincola* arising from a sclerotium on *Aconitum septentrionale*. Norway, Sør-Trøndelag, Oppdal, Vårstigen. (© Photo: Trond Schumacher).

4. On *Caltha* or *Ranunculus* . . . . . 5.

5 (4). On withered petioles and leaf nerves of *Caltha palustris*. Sclerotia pyramidal, elongate, striate, 3-18 x 2-10 x 0.5-2.0 mm. Apothecia produced in late spring and summer, one to four from a sclerotium, shallowly cupulate to plane, light brown, disc 1-4 mm diam., stipe 2-20 x 0.5-1.5 mm. Asci 110-170 x 8-11 um. Ascospores eguttulate, 11.0-16.5 x 5.0-8.8 um. Macroconidial anamorphic state (*Botrytis calthae* Hennebert & Elliott: Hennebert) consisting of erect, fasciculate conidiophores, about 1-2 mm tall, macroconidia light brown, ovoid, 8-16.5 x 6-9 um, on withered leaves and stems of the host . . . . . ***Botryotinia calthae*** Hennebert & Elliott

Apothecia and conidiophores of *Botryotinia calthae* on decaying remnants of *Caltha palustris*, Norway, Bamble, Telemark, near Rørholtveien, 2 km SE of Rørholt, May 30th 1996. (© Photo: Arne Holst-Jensen)

5. On deeply decayed leaves of *Ranunculus ficaria*. Sclerotia slender, striate, 3-12 x 3-10 x 0.5-1.5 mm. Apothecia one to three from a sclerotium, funnel-shaped to plane or slightly recurved, pale brown, disc 2-5 mm diam., stipe 1-25 x 0.3-1 mm. Asci 125-175 x 7-11 um. Ascospores 10.5-17.5 x 4.5-7.5 um. Macroconidial anamorphic state (*Botrytis ficariarum* Hennebert) on withered leaves, conidiophores in groups of two to three, 0.3-2 mm high, macroconidia ovoid to pyriform, 8.8-18 x 4.5-9.5 um. Apothecia in spring and early summer . . . . . ***Botryotinia ficariarum*** Hennebert

6 (5). On leaves of *Pelargonium* (in greenhouse). Sclerotia hemispherical to pyramidal, 2-7 mm broad, 1.5-2 mm thick. Apothecia one to four from the sclerotium, shallow cupulate to plane, light brown, disc 1-4 mm diam., stipe 5-15 x 0.5-1.5 mm. Asci 120-160 x 7-10 um. Ascospores narrowly ellipsoid to allantoid, 14-19 x 6-8 um. Apothecia in early spring. Macroconidial anamorphic state (*Botrytis pelargonii* Røed) on withered leaves, macroconidia ovoid, 8.5-16 x 5-11.5 um . . . . . ***Botryotinia pelargonii*** Røed

6. On herbaceous debris of various dicot plants, commonly on members of the family Rosaceae. Sclerotia lenticular, 2-7 mm in length and width, 1-3 mm thick. Apothecia one to several from the sclerotium, shallow cupulate to plane, pale brown, disc 1.5-7 mm diam., stipe 3-15 x 0.5-1 mm. Asci 100-150 x 7-12 um. Ascospores 8-12 x 4-6 um. Macroconidial anamorphic state (*Botrytis cinerea* Pers.) on withered leaves, conidiophores erect, 1-2 mm tall, macroconidia ovoid, 8-15 x 6-10 um. Apothecia in spring and early summer . . . . . ***Botryotinia fuckeliana*** (de Bary) Whetzel

Ciboria Fuckel.
Type species: *Ciboria caucus* (Reb.:Fr.) Fuckel. *Ciboria* is a heterogeneous assemblance of species characterized by ± determinate stromata, an apothecial outer excipulum consisting of globose cells (textura globulosa) NOT embedded in a gelatinous matrix, and hyaline, unicellular ascospores. The genus is probably polyphyletic. The species on catkins of amentiferous trees constitute a monophyletic group. Based on scientific evidence and educated guess we distinguish **five groups** within the genus, the true *Ciboria* (on catkins), the warted-spored *Ciboria* , which are presumably obligate parasites and produce apothecia on fruits of amentiferous trees, the deciduous leaf inhabitants, forming a ± well differentiated stroma on leaves of deciduous trees, the herbaceous plant inhabitants, nutritioning on plant remnants of various kind (for groups three and four, see also *Rutstroemia*), and a fifth group of incommon features, consisting of presumably unrelated taxa classified on the basis of stromatal type.

Literature: Whetzel (1945), Buchwald (1947), Schumacher (1978), Schumacher & al. (1995), Holst-Jensen & al. (1997b).

1. Apothecia on catkins of amentiferous trees and shrubs . . . . 2.

1. Apothecia on fruits, inflorescences or leaves . . . . 6.

2 (1). Asci 4-spored. Apothecia ochraceous brown to pale brown, disc 1-4 mm diam., stipe 5-25 x 0.2-0.4 mm. Asci clavate, 60-105 x 5.8-7.5 um. Ascospores (7.5)10 - 12 (14.5) x 4-5.5 um. On male catkins of *Myrica gale*, *Salix* spp. and *Populus* spp., occasionally on leaves of *Acer* spp., *Salix* spp. and *Rubus chamaemorus*. Apothecia in spring and early summer . . . . . ***Ciboria acerina*** Whetzel & N. F. Buchw.

Apothecia of *Ciboria acerina* on male catkin of *Myrica gale*. Norway, Oslo, Sognsvann, May 13th. 1996. (© Photo: Arne Holst-Jensen).

2. Asci 8-spored . . . . . 3.

3 (2). Apothecia pale brown, disc 3-11 mm diam., stipe 5-35 x 0.3-1 mm. Asci 130-170 x 7-11 um. Ascospores subfusoid, 9.0-15.5 x 6-8 um. On male catkins of *Corylus avellana*. Apothecia in early spring . . . . . ***Ciboria coryli*** (Schellenb.) N. F. Buchw.

3. Ascospores < 11 um long . . . . . 4.

4 (3). Apothecia on male catkins of *Betula*, pale to medium brown, disc 3-10 mm diam., stipe 5-30 x 0.3-1 mm. Asci cylindric-clavate, 75-145 x 6-10 um. Ascospores ellipsoid, 5.5-9.5 x 3-5.5 um. Apothecia in spring . . . . . ***Ciboria betulicola*** Groves & Elliott

Apothecia of *Ciboria betulicola* on male catkins of *Betula pubescens*. Norway, Hedmark, Snødøldalen, June 13th. 1996. (© Photo: Arne Holst-Jensen).

4. Apothecia on other hosts . . . . . 5.

5 (4). Apothecia on catkins of *Populus*, *Salix* and *Corylus*, pale brown to medium brown, disc 4-15 mm diam., stipe 5-25 x 0.3-1.7 mm. Asci cylindric-clavate, 95-145 x 6-9 um. Ascospores ellipsoid, 7.5-11.0 x 4.5-6 um. Apothecia in spring . . . . . ***Ciboria caucus*** (Rebent.: Fr.) Fuckel

Apothecium of *Ciboria caucus* on FEMALE catkin of *Salix lapponum*. Note the presence of *Pezizella amenti* on the decaying catkin. Norway, Oppland, Near the river Mya, 2 km W of Muen, June 13th. 1996. (© Photo: Arne Holst-Jensen).

5. Apothecia on catkins of *Alnus*, ochraceous brown to pale brown, disc 4-12 mm diam., stipe flexuous, 10-35 x 0.3-1.0 mm. Asci cylindric-clavate, 95-145 x 6-9 um. Ascospores 7.5-10.5 x 4.2-6 um. Apothecia in spring . . . . . ***Ciboria amentaceae*** (Balbis) Fuckel

Apothecia of *Ciboria amentaceae* on decaying male catkins of *Alnus* sp. Norway, Vestfold, Brunlanes, Helgeroa, April 1994. (© Photo: Arne Holst-Jensen).

6 (1). Apothecia on decaying cone scales of *Abies*, dark brown to medium brown, disc 3-15 mm diam., stipe 2-7 x 0.7-1.5 mm. Asci 65-90 x 5.5-6.5 um. Ascospores 5.5-7.5 x 2.8-3.5 um. Apothecia in spring and early summer . . . . . ***"Ciboria " rufofusca*** (Weberb.) Sacc.

Apothecia of *"Ciboria" rufofusca* on cone scales of *Abies alba*. Norway, Østfold, Jeløya, Alby gård. (© Photo: Roy Kristiansen).

6. Apothecia on fruits, bulbils, acorns or leaves . . . . . 7.

7 (6). Apothecia on stromatized fruits or female floral organs . . . . . 8.

7. Apothecia on leaves . . . . . 12.

8 (7). Apothecia on stromatized patches of fruits (carpels) of *Alnus* or *Betula* ; very slow growing on PDA (potato dextrose agar), mass ascospore isolates reaching a diameter of 10-20 mm after 6-12 months . . . . . 9.

8. Apothecia on fruits or floral organs of other hosts. . . . . 10.

9 (8). On fruits (carpels) of *Alnus*, pale brown, disc 1.5-3 mm diam., stipe 1-10 x 0.5-1 mm. Asci 100-125 x 5.5-7.5 um. Ascospores narrowly ellipsoid to subfusoid, multiguttulate, minutely verrucose, 12-18 x 3-4.5 um. Apothecia in early spring . . . . . ***"Ciboria " lentiformis*** (Velen.) T. Schumach. ined. (= *Ciboria alni* (O. Rostr.) N. F. Buchw. nom. illeg. = *Ciboria seminicola* (Kienh. & Cash) Hechler & Steindl)

9. On fruits (carpels) of *Betula*, pale brown, disc 1.5-3 mm diam., stipe 4-14 x 0.5-1 mm. Asci 110-160 x 6-8 um. Ascospores narrowly ellipsoid, biguttulate, minutely verrucose, 9.5-15 x 4-5.5 um. Apothecia in late spring . . . . . ***"Ciboria " betulae*** (Woronin) White

10 (8). Apothecia on female inflorescenses of *Alnus*, yellowish to olivaceous brown, disc 1-3 mm diam., stipe 2-25 x 0.7-1.5 mm. Asci 110-140 x 7-10 um. Ascospores ellipsoid, 7.8-10.6 x 4.2-5.5 um. Apothecia in autumn . . . . . ***"Ciboria " viridifusca*** (Fuckel) Höhn (= "*Ciboria* " *amenticola* (P. Karst.) Boud.)

10. Apothecia on bulbils of *Polygonum viviparum* or acorns of *Quercus*. . . . . 11.

11 (10). Apothecia on stromatized bulbils of *Polygonum viviparum*, pale to medium brown, disc 0.5-2.5 mm diam., stipe 1-12 x 0.3-0.6 mm. Asci 150-180 x 10-12 um. Ascospores biguttulate, 13-17 x 5.5-7 um. Apothecia in summer and autumn. . . . . ***"Ciboria " polygonivivipari*** Eckbl.

11. Apothecia on stromatized acorns of *Quercus*, medium to purplish brown, disc 3-15 mm diam., stipe 3-30 x 0.8-2 mm. Ascospores 6-11 x 4-6 um. Apothecia in autumn . . . . . ***"Ciboria " batschiana*** (Zopf) N. F. Buchw.

12 (7). Apothecia on leaves of deciduous trees . . . . . 13.

12. Apothecia on plant remnants of *Rubus chamaemorus* . . . . . 14.

13 (12). On leaves of *Alnus*, more exceptionally *Betula* and *Populus*, dark to medium pale brown, disc 0.5-3 mm diam., stipe 0.5-7 x 0.3-0.6 mm. Asci 65-95 x 6-8 um. Ascospores 6.5-10 x 4.2-5.3 um. Apothecia in spring and early summer from stromatized patches on decaying

leaves . . . . . ***"Ciboria " conformata*** (P. Karst.) Svrcek

13. On leaves of *Salix* spp. Several collections from Northern Europe fall into this category. The taxonomy of this group is under investigation in our lab.

14 (12). Apothecia reddish brown to pale brown, disc 4-7 mm diam., stipe rather thick, 10-38 x 0.7-2.1 mm. Asci 80-120 x 5.5-7 um. Ascospores biguttulate, 9-13.5 x 5-6 um. Apothecia from stromatized patches on leaves and stems in spring and early summer . . . . . ***"Ciboria " latipes*** Holst-Jensen & T. Schumach.

14. Apothecia medium brown to dark brown, disc 0.5-3 mm diam., cupulate to plane, short-stipitate, stipe slender 1-15 x 0.2-0.8 mm. Asci 90-120 x 9-11.5 um. Ascospores ellipsoid, biguttulate, unicellular, 11.5-15.5 x 5-6 um. Apothecia from stromatized leaf veines and petioles of host in early summer . . . . . ***"Rutstroemia " chamaemori*** L. Holm & K. Holm

Ciborinia Whetzel
Type species: *Ciborinia whetzelii* (Seaver) Seaver. The genus *Ciborinia* is a heterogeneous assemblance of species characterized by an apothecial outer excipulum consisting of globose cells (textura globulosa) NOT embedded in a gelatinous matrix, hyaline, unicellular ascospores, the production of ± discoid sclerotia, and lacking a macroconidial anamorphic state. *Ciborinia* should probably be restricted to a group of leaf parasites on amentiferous trees, including the type species *C. whetzelii* on leaves of *Populus*. A number of taxa are keyed out here on the basis of the traditional generic character of a discoid, differentiated stroma. See also *Botryotinia*, *Ciboria*, *Myriosclerotinia*, *Scleromitrula* (=*Verpatinia*) and *Valdensinia*.
Literature: Whetzel (1945), Buchwald (1947), Batra & Korf (1959), Batra (1960), Holst-Jensen & al. (1997a, 1997b), Schumacher & Holst-Jensen (1997).

1. On leaves of deciduous trees . . . . . 2.

1. On other tissues, e.g. leaves of herbs, grasses, fruits etc. . . . . 3.

2 (1). Stroma up to 1 mm thick, elongate, to 10 mm broad and 30 mm long, surrounding the midrib of overwintering leaves, ± detached from leaf plate,sclerotial rind black, inner medulla white, on leaves of *Salix phylicifolia*. Apothecia dark to medium pale brown, disc 2-5 mm diam., stipe slender, up to 25 x 1 mm. Asci 120-140 x 8-10 um. Ascopores uniseriate, ellipsoid, hyaline, 5 x 9-13 um . . . . . ***Ciborinia*** aff. ***foliicola*** (E. K. Cash & R. W. Davids.) Whetzel

Apothecium of *Ciborinia* aff. *foliicola* on stromatized leaf nerve of *Salix phylicifolia*, Norway, Hedmark, Snødøldalen, June 13th 1996. (© Photo: Arne Holst-Jensen)

2. Apothecia from petioles and leaf nerves of *Quercus* and *Castanea* . . . . . see *Scleromitrula candolleana*

There are at least four additional species from Northern Europe on leaves of various deciduous trees and shrubs, most frequently on *Betula* and *Salix* . The taxonomy of this group is under investigation in our lab.

3 (1). On monocot hosts . . . . . 4.

3. A number of small-sized species with brownish or black discoid to crustlike sclerotia are found on decaying leaves of *Vaccinium* spp. in spring. The group is currently under investigation in our lab.

Apothecia of a possibly undescribed species with morphological affinity to *Ciborinia*. The long-stipitate gracile apothecia arise from discoid pale brownish stromata on decaying *Vaccinium uliginosum* leaf. The taxon is easy to cultivate on artificial media, and molecular data support a distinction from the true *Ciborinia* spp. Norway, Akershus, Eidsvoll, Frilsetåsen, June 15th 1996. (© Photo: Arne Holst-Jensen)

4 (3). Apothecia from shell-like sclerotia on stems and leaf sheats of *Eriophorum* and *Carex* . . . . . See *Myriosclerotinia ciborium*

4. Apothecia from ± free-lying flat sclerotia associated with liliaceous hosts, note the North American species "*Ciborinia* " *allii* L. M. Kohn, "*Ciborinia* " *erythronii* (Whetzel) Whetzel and "*Ciborinia* " *gracilis* (Clements) Whetzel. None of these are at present known from the Nordic countries.

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Dumontinia L. M. Kohn
Type species: *Dumontinia tuberosa* (Hedw.:Fr.) L. M. Kohn. Apothecial outer excipulum composed of brick-shaped cells (textura prismatica) and an inner zone of loose hyphae embedded in a gelatinous matrix. Macroconidial anamorphic state wanting. The genus was seggregated from *Sclerotinia* by Kohn (1979), and typified with *Dumontinia tuberosa* as the only species. One additional species (see below) has recently been referred to the genus.
Literature: Kohn (1979), Holst-Jensen & al. (1997b), Holst-Jensen & al. (1998).

1. Sclerotia and apothecia in soil inbetween rhizomes of *Anemone* . Sclerotia tuberoid, 15-40 mm long, by 5-25 mm broad and thick. Apothecia cup-shaped to plane, long-stipitate, medium brown to dark brown, disc 10 - 30 mm diam., stipe 40 - 100 x 1.5-3 mm, without rhizoidal tufts at base. Asci cylindric-clavate, 140-175 x 8-10 um. Ascospores ellipsoid, hyaline, biguttulate, 12-17 x 6-9 um. Apothecia in early spring . . . . . ***Dumontinia tuberosa*** (Hedw.: Fr.) L. M. Kohn

Apothecia of *Dumontinia tuberosa* on sclerotia among rhizomes of *Anemone nemorosa*. Norway, Vestfold, May 1997. (© Photo: Arne Holst-Jensen)

1. Sclerotia and apothecia in soil inbetween roots of *Filipendula ulmaria*, sclerotia up to 10 mm in diam, apothecia ligh brown to medium brown, disc 4 - 10 mm diam., stipe 20 - 40 mm long, sometimes with rhizoidal tufts at base. Asci 110-160 x 10-12 um. Ascospores ellipsoid, hyaline, uniguttulate, 10-12 x 5-7 um. Apothecia in late spring . . . . . ***Dumontinia ulmariae*** (Svrcek) Holst-Jensen (= *Sclerotinia ulmariae* Svrcek)

Apothecia of *Dumontinia ulmariae* arising from sclerotia among rhizomes of *Filipendula ulmaria*. Norway, Buskerud, May 1996. (© Photo: Arne Holst-Jensen)

Encoelia (Fr.) P. Karst.
Type species: *Encoelia furfuracea*. (Roth: Pers.) P. Karst. Apothecia short-stipitate (subsessile), clustered or not, errumpent through the outer bark, arising from a delineate stroma inbetween inner bark cells of the host. Apothecial outer excipulum of small-sized, globose cells, outermost layer becoming loose with age, giving rise to a scurfy (granular) outer surface of the apothecium. Ascospores ellipsoid to fusiform, hyaline, unicellular.
Literature: Torkelsen & Eckblad (1977), Holst-Jensen & al. (1997b).

1. On *Alnus* and *Corylus*. Apothecia singly or in clusters, medium brown, disc -15 mm diam., exterior furfuraceous, covered with a cinnamon-brown meal. Asci up to 90 x7 um, ascuspore J+. Ascospores biseriate, cylindrical with rounded ends, slightly curved, 6-11 x 2-2.5 um . . . . . ***Encoelia furfuracea*** (Roth: Pers.) P. Karst.

1. On *Populus*. . . . . 2.

2 (1). Apothecia in clusters of 4-10, medium brown to dark brown (blackish when dry), exterior greyish, disc 3-10 mm diam. Asci up to 105 x 7.2 um, ascuspore J- . Ascospores biseriate, cylindrical, slightly curved, 12-15 x 3.5-4 um. . . . . ***Encoelia fascicularis*** (Alb. & Schw.: Pers.) P. Karst.

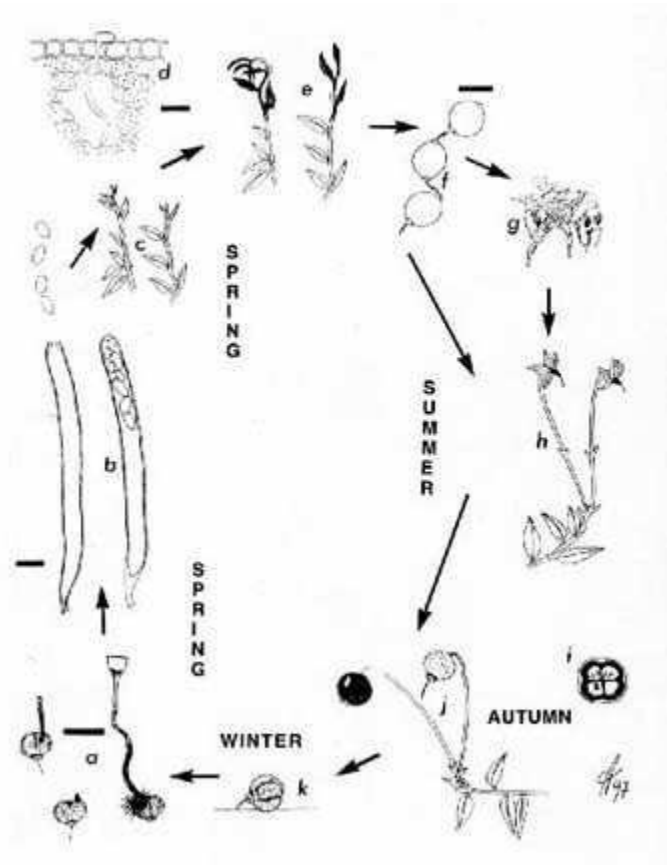
Apothecia of *Encoelia fascicularis* breaking up through the bark of a branch of *Populus tremula*. (Photo: © Arne Holst-Jensen)

2. Apothecia solitary, gregarious, dark brown to black, disc 3-5 mm diam. Asci up to 90 x 4.5-6 um, ascuspore faintly J+. Ascospores biseriate, cylindrical, slightly curved, 10.5-14 x 2.4-3 um . . . . . ***Encoelia pruinosa*** (Ellis & Ev.) Torkelsen & Eckbl.

The genus
Franquinia
Holst-Jensen & T. Schumach. ined.

The genus was named after the late Belgian cartoonist André Franquin (1924 - 1997) who introduced the creative mycologist Count of Champignac in 1951 (Spirou 2: Il y a un sorcier à Champignac, Editions Dupuis, Belgium).

Type species: *Franquinia oxycocci*. (Woronin) Holst-Jensen & T. Schumach ined. The genus is seggregated from *Monilinia* based on a combination of ecological (life history), morphological, land molecular, phylogenetic evidence. The members of *Franquinia* are characterized by the obligate alternation between two successive states. In the spring long-stipitate, brownish apothecia, are produced on stromatized fruits of Rosaceae, Ericaceae, Empetraceae or Pyrolaceae. The ascospores successively infect the unfolding foliage producing a disseminative mitosporic state (*Monilia*) **with** each spore being separated from the adjacent spores by small needle-like appendages (disjunctors, Woronin 1888). The mass of conidia is releasing aromatic odours thought to attract insects. Some species even reflect ultraviolet light, and are thought to exploit the hosts insect pollinators as vectors. The typical life-cycle of *Franquinia* species is shown below:



Life cycle of *Franquinia oxycocci* . (***a***) The life cycle starts in early spring when mummified fruits on the ground give rise to apothecia. (***b***) Ascospores constitute the primary inoculum. (***c***) Young shoots of the host plants are infected. (***d***) Section through leaf surface showing penetration hyphae develop from the ascospores. (***e***) By the time the host flowers, the infected foliage is modified, excreting sugar, releasing a strong aromatic odour, and in some species also reflecting ultraviolet light. (***f***) Macroconidia (mitotic spores) with disjunctors produced on the foliage function as the secondary inoculum. (***g***) Insect pollinators are thought to be important vectors, transferring conidia to the host flowers. (***h***) Host fruits are infected through the stigma and style, by macroconidia. The fungal infection is then arrested. (***i***) A (fully) developed fruit becomes stromatized by fungal hyphae; transverse section through a stromatized fruit. (***j***) Stromatized fruits are often still attached to the host plant during late summer and autumn. (***k***) Stromatized fruits overwinter on the ground where next spring they

give rise to the primary infection (***a,b***). Scale bar: ***a*** = 1 cm, ***b, d, f*** = 20 um. Modified from Woronin (1888) and Honey (1936).

Literature: Woronin (1888, 1895, 1900), Woronin & Nawaschin (1896), Honey (1928, 1936), Grosse (1912), Whetzel (1945), Gjærum (1969), Pyykkö & Hämet-Ahti (1980), Batra (1991), Holst-Jensen (1992), Holst-Jensen & al. (1997a, 1997b).

1. On Rosaceae. Apothecia on fruits, or macroconidial anamorphic state on leaves . . . . . 2.

1. On Ericaceae, Empetraceae or Pyrolaceae. Apothecia on fruits, or macroconidial anamorphic state on leaves . . . . . 4.

2 (1). On *Prunus padus*. Apothecia cup-shaped, pale to ochraceous brown, 2-5 mm diam., stipe 4-12 x 0.5-1.5 mm. Asci 130-160 x 8-10 um. Ascospores 8.5-14.5 x 5-9.5 um. Macroconidial anamorphic state a thin, whitish covering on the young leaf-nerves of the host in late spring - early summer, macroconidia broadly ovoid, 7.5-15 x 6-11 um, with disjunctors 2-5 um long. . . . . ***Franquinia padi*** (Woronin) Holst-Jensen & T. Schumach. ined.

Apothecia of *Franquinia padi* on stromatized fruits of *Prunus padus*, Norway, Telemark, Bamble, Rørholtveien, 2 km SE of Rørholt, May 5th. 1996. (© Photo: Arne Holst-Jensen).

2. On fruits or leaves of *Sorbus* or *Crataegus* . . . . . 3.

3 (2). On *Sorbus aucuparia*. Apothecia cup-shaped, pale brown, disc 3-10 mm diam., stipe 10-30 x 1-2 mm. Asci 100-160 x 6.5-8 um. Ascospores 8-13 x 4-6 um. Macroconidial anamorphic state a thin, whitish covering on young leaf-nerves of the host in late spring - early summer, macroconidia broadly ovoid, 7-12.5 x 5-9.5 um, with disjunctors 1.5-3 um long. . . . . ***Franquinia aucupariae*** (Ludw.) Holst-Jensen & T. Schumach. ined.

Apothecia of *Franquinia aucupariae* on stromatized fruits of *Sorbus aucuparia*, Norway, Buskerud, Jevnaker, Svenodalen, May 28th. 1996. (© Photo: Arne Holst-Jensen).

3. On *Crataegus monogyna*. Apothecia cupulate, one to four from a stromatized fruit, disc 3-10 mm diam., pale brown to medium brown, stipe 10-30 x 1-2 mm. Asci 140-170 x 8-10 um. Ascospores ellipsoid, 12-16 x 4.5-7.5 um. Macroconidial anamorphic state a whitish covering on leaves of its host, macroconidia subglobose, 10.5-21 x 9-20 um, separated by prominent needle-like disjunctors up to 5-6 um, 2.5-3.5 um long. Apothecia in spring and early summer . . . . . ***"Monilinia "johnsonii*** (Ell. & Ev.) Honey. This taxon fits into *Franquinia* morphologically and ecologically, but currently available molecular data does not support the inclusion of this species in *Franquinia*. We have therefore refrained from reclassifying this taxon.

4 (1). On *Empetrum*, apothecia brown to dark reddish-brown, disc 1-4 mm diam., stipe 5-15 x 0.3-0.8 mm. Asci 100-135 x 8-12 um, 4-spored. Ascospores 13-18 x 5-6 um. Macroconidial anamorphic state not observed (possibly overlooked) . . . . . ***Franquinia empetri*** (Lagerh.) Holst-Jensen & T. Schumach. ined.

4. On Ericaceae or Pyrolaceae . . . . . 5.

5 (4). On *Pyrola* or *Moneses*. Apothecia brownish, disc 3-7 mm diam., stipe 10-30 x 1-1.5 mm. Asci 130-145 x 8-10 um. Ascospores 8-11 x 5-6 um. Macroconidial anamorphic state observed in axenic culture, but not in nature. Apothecia reported only once (from the Baltics; Grosse, 1912). Probably overlooked in the Nordic countries (Pyykkö & Hämet-Ahti, 1980). . . . . ***Franquinia pirolae*** (Grosse) Holst-Jensen & T. Schumach. ined.

5. On Ericaceae . . . . . 6.

6 (5). On Ericaceae that produces capsular fruits. . . . . 7.

6. On Ericaceae that produces berries (*Vaccinium* sensu lato) . . . . . 8.

7 (6). On *Cassiope tetragona.* Apothecia brown, disc 2-4 mm diam., stipe 8-12 x 0.5-1 mm. Ascospores 10-12 x 5-6.5 um. Macroconidial anamorphic state not observed. Stromatized fruits are frequently observed in Northern Scandinavia, however, apothecia are only known from the original collection from East-Greenland (Rostrup, 1894). . . . . ***Franquinia cassiopes*** (Rostr.) Holst-Jensen & T. Schumach. ined.

7. Apothecia on fruits of *Ledum palustre*, and macroconidia on *Vaccinium uliginosum*. Apothecia brown, disc 2-5 mm diam., stipe 10-40 x 1-1.5 mm. Asci 160-205 x 12-14 um. Ascospores 12-14 x 6.5-8 um. Macroconidial anamorphic state a thin, greyish covering on leaves and leaf-nerves of *Vaccinium uliginosum*, macroconidia limoniform, 17.5-22 x 11-18 um, with disjunctors 2.5-4 um long. Possibly overlooked. . . . . ***Franquinia ledi*** (Nawaschin) Holst-Jensen & T. Schumach. ined. *Vaccinium uliginosum* is also the host of *Franquinia megalospora*.

8 (6). On thick-leaved species of *Vaccinium* 9

8. On thin-leaved species of *Vaccinium* . . . . . 10.

9 (8). On *Vaccinium oxycocci* (*Oxycoccus quadripetalus*) and *V. microcarpus* (*O. mircrocarpus*). Apothecia dark reddish-brown, cupulate, disc 3-12 mm diam., stipe 10-70 x 0.5-1.5 mm, arising from greyish-pink hollow-sphaeroid stromatized fruits which frequently remain attached to the host. Asci 150-190 x 8-12 um. Ascospores dimorphic, 4 larger spores 9.5-14.5 x 5.5-8.5 um, 4 smaller spores 6-10 x 4-5 um. Macroconidial anamorphic state a thin, greyish-white covering on young shoots in early summer, macroconidia ovoid-citriform, 14.5-25 x 9.5-15 um, with disjunctors 3-6 um long. . . . . ***Franquinia oxycocci*** (Woronin) Holst-Jensen & T. Schumach. ined.

The photograph shows a mature apothecium arising from a stromatized Cranberry (*Oxycoccus quadripetalus* Br.-Bl.) deeply embedded in *Sphagnum* moss. Note the healthy red berry to the left, behind the cup, and the grey shriweled stromatized berry to the right. (© Photo: Arne Holst-Jensen).

The photograph shows the mitosporic (macroconidial) state (grey-white covering) along the nerves of young leaf-shoots of Cranberry. (Photo: © A. Holst-Jensen).

Description of the species:

Apothecia usually one to three from a hollow-sphaeroid stroma, dark reddish-brown, cupulate, cup (disc) 3-12 mm diam., stipe 10-70 x 0.5-1.5 mm, arising from greyish-pink stromatized fruits which frequently remain attached to the host. Conspicuous rhizoid-like tufts present at the base of the stipe, probably functioning as anchor for the apothecium. Asci cylindrical 150-190 x 8-12 um, strongly J+ in Melzer´s reagent. Ascospores uniseriate, dimorphic, 4 large spores ellipsoid, 9.5-14.5 x 5.5-8.5 um, 4 small spores 6-10 x 4-5 um. Paraphyses filiforme, 2-3 um wide, slightly enlarged at the tip, septate and branched near base. Apothecial ectal excipulum bi-zonate with an inner zone of a textura angularis, cells 15-30 x 10-15 um, and an outer zone of textura intricata, cells approx. 5 um. Mitosporic state a greyish white covering on young shoots in early summer, mitospores ovoid-citriform, 14.5-25 x 9.5-15 um, with disjunctors 3-6 um long. The species is common in the Nordic countries.

9. On *Vaccinium vitis-idaea*. Apothecia nut-brown to dark chocolate brown, discoid to cupulate, disc 3-20 mm diam., stipe 10-50 x 0.5-2 mm, arising from greyish or blackish hollow-sphaeroid, stromatized fruits on the ground. Asci 150-200 x 10-14 um. Ascospores inconspicuously dimorphic, 4 larger spores 14-18 x 5.6-9 um, 4 smaller spores 12-16 x 5-8 um. Macroconidial anamorphic state a thin, whitish covering on young shoots in early summer, macroconidia citriform, 22-42 x 13.5-25 um, with disjunctors 3-8 um long. . . . . ***Franquinia urnula*** (Weinm.) Holst-Jensen & T. Schumach. ined.

Apothecia of *Franquinia urnula*, arising from a stromatized berry that has been uncovered from the leaf-litter under a budding host (*Vaccinium vitis-idaea*) plant. Norway, Telemark, Kragerø, Kurdøla, May 25th. 1996. (© Photo: Arne Holst-Jensen).

A mitosporic infection on young leaves and shoots, of*Vaccinium vitis-idaea* (cowberry), Norway, Telemark, Kragerø, Kurdøla, June 30th., 1996. (© Photo: Arne Holst-Jensen).

Healthy unripe (green) and infected (brown) fruits of cowberry, Norway, Akershus, Eidsvoll, Feiring, September 1997. (© Photo: Arne Holst-Jensen).

Description of the species:

Apothecia usually singly from a hollow-sphaeroid stroma, dark chocolate brown, discoid to cupulate, cup (disc) 3-20 mm diam., stipe 10-50 x 0.5-2 mm, arising from blackish grey stromatized fruits burried in litter below the host plant. Conspicuous rhizoid-like tufts present at the base of the stipe, probably anchoring the stipe. Asci cylindrical 150-200 x 10-14 um, strongly J+ in Melzer´s reagent. Ascospores uniseriate, dimorphic, 4 large spores ellipsoid, 14-18 x 5.6-9 um, 4 smaller spores ca. 1-2 um shorter. Paraphyses filiforme, 2-3 um wide, slightly enlarged at the tip, septate and unbranched. Apothecial ectal excipulum of a textura globulosa or prismatica. Mitosporic state a whitish covering on the young shoots in early summer, mitospores citriform, 22-42 x 13.5-25 um, with disjunctors 3-8 um long. The species is common in the Nordic countries.

10 (8). On *Vaccinium myrtillus*. Apothecia dark brown, deeply cupulate, disc 3-10 mm diam., stipe 15-50 x 0.5-2 mm. Asci 140-180 x 9-12 um. Ascospores dimorphic, 4 larger spores 15-20.5 x 6-8 um, 4 smaller spores 10-13 x 4-5 um. Macroconidial anamorphic state a greyish white covering on young shoots in early summer, macroconidia ovoid-citriform, 19-30 x 13.5-21 um, with disjunctors 3-4 um long. . . . . ***Franquinia baccarum*** (Schroet.) Holst-Jensen & T. Schumach. ined.

Apothecium of *Franquinia baccarum* on stomatized fruit of *Vaccinium myrtillus*, Norway, Oslo, Sognsvann, May 12th. 1996. (© Photo: Arne Holst-Jensen).

The photograph shows healthy ripe (blue) and infected (grey) fruits of blueberry (*Vaccinium myrtillus* L.), Norway, Akershus, Eidsvoll, Feiring, September 1997. (© Photo: Arne Holst-Jensen).

Description of the species:

Apothecia usually one to three from a hollow-sphaeroid stroma, dark reddish-brown, cupulate, cup (disc) 3-10 mm diam., stipe 15-50 x 0.5-2 mm, arising from greyish-pink stromatized fruits burried in litter below the host plant. Conspicuous rhizoid-like tufts at the base of the stipe wanting. Asci cylindrical 140-180 x 9-12 um, strongly J+ in Melzer´s reagent. Ascospores uniseriate, dimorphic, 4 large spores ellipsoid, 15-20.5 x 6-8 um, 4 smaller spores 10-13 x 4-5 um. Paraphyses filiforme, 2-3 um wide, slightly enlarged at the tip, septate and unbranched. Apothecial ectal excipulum bi-zonate with an inner zone of a textura

angularis, cells 16-20 um, and an outer zone of textura intricata, cells approx. 6-7 um. Mitosporic state a greyish white covering on the concave side of young shoots and leaves in early summer, mitospores ovoid-citriform, 19-30 x 13.5-21 um, with disjunctors 3-4 um long. The species is common in the Nordic countries.

10. On *Vaccinium uliginosum*. Apothecia dark brown to reddish brown, deeply cupulate, disc 4-8 mm diam., with a prominent sterile margin, stipe 20-100 x 0.5-2 mm. Asci 220-300 x 13-22 um. Ascospores slightly dimorphic (or sometimes trimorphic), 4 larger spores 17-32 x 9.5-17.5 um, 4 smaller spores ca. 1-2 um shorter. Macroconidial anamorphic state a whitish-grey covering along midnerves of young leaves of *Vaccinium uliginosum* in early summer, macroconidia broadly ovoid-citriform, 19-27 x 17-23 um, with disjunctors 1-3.5 um long. . . . . ***Franquinia megalospora*** (Woronin) Holst-Jensen & T. Schumach. ined. *Franquinia ledi* is a similar taxon also having a macroconidial anamorphic state on leaves of *Vaccinium uliginosum* .

Apothecium of *Franquinia megalospora* arising from a stromatized fruit of *Vaccinium uliginosum* deeply burried in *Sphagnum* moss and leaf litter under a budding host plant. Norway, Telemark, Kragerø, Kurdøla, May 25th. 1996. (Photo: © Arne Holst-Jensen).

Leaves (middle and right) and flowers (left) of *Vaccinium uliginosum* infected by the mitosporic (macroconidial) state of *Franquinia megalospora*. Note the brownish patches along the leaf-nerves visible from above (middle), and the grey-white covering along the midnerve of leaves visible from underneath the leaves (right). Norway, Oslo, Sognsvann, June 16th.1996. (Photo: © Arne Holst-Jensen).

Description of the species:

Apothecia usually singly from a solid stromatized fruit of *Vaccinum uliginosum*, dark brown to reddish brown, deeply cupulate, disc 4-8 mm diam., with a prominent sterile margin, stipe 20-100 x 0.5-2 mm. Without rhizoid-like tufts at the base of the stipe. Asci cylindrical 220-300 x 13-22 um, strongly J+ in Melzer´s reagent. Ascospores broadly ellipsoid, slightly dimorphic (or sometimes trimorphic), 4 larger spores 17-32 x 9.5-17.5 um, 4 smaller spores ca. 1-2 um shorter. Paraphyses filiforme, 2-3 um wide, swollen at the tip, septate and profusely branched. Apothecial ectal excipulum of a textura intricata or angularis. Macroconidial anamorphic state a whitish-grey covering along midnerves of young leaves of *Vaccinium uliginosum* in early summer, macroconidia broadly ovoid-citriform, 19-27 x 17-23 um, with disjunctors 1-3.5 um long. The species is common in the Nordic countries and in eastern North America.

Lambertella Höhnel
Type species: *Lambertella corni-maris* Höhnel. Apothecia arising from stromatized host tissues, stromata sometimes being delimited by blackened lines on the surface of the substrate. Outer excipulum composed of prismatic cells, more rarely by isodiametric, angular cells. Asci 8- or 4-spored. Ascospores (mostly) unicellular, spore walls becoming brown within ascus or soon after spore discharge. Macroconidial anamorphic state wanting.

The genus is heterogeneous, and some taxa currently classified as *Lambertella* should probably be referred to the Helotiaceae, e.g. "*Lambertella* "*langei* , the presumably related "*Hymenoscyphus*" *kermesinus* (Fr.) Arendholz, and another possibly unnamed taxon which is shown at the bottom of this page. We have not yet had the opportunity to examine the type species*Lambertella corni-maris* Höhnel and to develop a sound concept of *Lambertella*. At this point, only a couple of brown-spored stromatic taxa with some affinity to a broad concept of *Lambertella* have been keyed out.
Literature: Whetzel (1943), Dumont (1971), Korf & Zhuang (1985), Schumacher & Holøs (1989), Holst-Jensen & al. (1997b).

1. Apothecia arising 1-4 from stromatized patches on leaves of *Andromeda polifolia*, disc 0.5-2.5 mm diam., applanate to slightly convex, dark yellowish brown to vinaceous brown. Stipe 1-22 x 0.3-0.8 mm. Asci 130-180 x 11.5-15.5 um. Ascospores unicellular, ellipsoid, brownish when mature (at or soon after discharge), 14.5-21 x 5.6-8 um. Apothecia in spring to early summer . . . . . ***"Lambertella " langei*** T. Schumach. & Holøs

Apothecia of *"Lambertella" langei* on leaves of three different hosts: *Andromeda polifolia* (left), *Vaccinium uliginosum* (middle), and *Oxycoccus quadripetalus* (right). Norway, Telemark, Kragerø, Kurdøla, May 25th., 1996. (Photo: © Arne Holst-Jensen).

1. Apothecia arising one to many from plant debris of possibly *Matteucia struthiopteris* , disc 0.5-4 mm diam., applanate to slightly convex, greyish to olivaceous brown, without hairs. Stipe 5-25 x 0.3-1 mm. Asci 80-120 x 8-12 um, J+. Ascospores unicellular, fusiform to elongate-ellipsoid, brownish when mature, 10.5-14.5 x 3.5-4.5 um, (uni-), bi-, (multi-) guttulate. Apothecia in autumn . . . . . ***Lambertella*** sp.

The photograph shows apothecia of a *Lambertella* among plant debris. (Photo: © Roy Kristiansen).

A possibly unnamed species with affinity to *"Lambertella" langei* and *"Hymenoscyphus" kermesinus* is found on leaves of *Myrica gale* (Myricaceae). Based on unpublished DNA sequence data a suspected relationship to *"Lambertella" langei* is supported.

An unnamed fungus with affinity to *"Lambertella" langei* and *"Hymenoscyphus" kermesinus*, growing on decaying leaves of *Myrica gale*. Norway, Telemark, Kragerø, Kurdøla, June 30th, 1996. (Photo: © Arne Holst-Jensen).

Lanzia Sacc.
Type species: *Lanzia flavo-rufa* (Sacc.) Sacc. *Lanzia* is a segregate genus of *Rutstroemia*. Apothecia stipitate-cupulate, brown to greenish brown, arising from stromatized patches of host tissues, no obvious stromatal rind. Apothecial outer excipulum composed of thin-walled, prismatic cells (textura prismatica) NOT embedded in a gelatinous matrix. Ascospores hyaline, uni- to tricellular. Macroconidial anamorphic state wanting. On herbaceous debris or wood. Apothecia in early summer and autumn.
Literature: Dumont (1972), Korf (1973).

1. Apothecia solitary, on petioles of fallen leaves of *Acer*, *Tilia*, *Fagus* and *Quercus*; disc 1-3 mm diam., pale greenish-yellow brown, stipe 5-15 x 0.5-1 mm. Asci 120-150 x 10-12 um. Ascospores unicellular, 12-16 x 5-7 um, with two internal, polar droplets. Apothecia in high summer and autumn . . . . . ***Lanzia luteovirescens*** (Roberge) Dumont & R. P. Korf (= *Rutstroemia luteovirescens* (Roberge) White)

Apothecia of *Lanzia luteovirescens* on stromatized leaf petioles of *Acer platanoides*. Norway, Telemark, Kragerø, Kurdøla, October 20th. 1996. (© Photo: Arne Holst-Jensen).

Monilinia Honey emend Holst-Jensen & T. Schumach.
Type species: *Monilinia fructicola*. (Winter) Honey. The genus *Monilinia* was segregated from *Sclerotinia* by Honey (1928), who further subdivided the genus into two (informal) sections, i.e. the Junctoriae (lacking intercalating disjunctors of the macroconidial chains) and the Disjunctoriae (having intercalating disjunctors of the macroconidial chains) (Honey, 1936). Batra (1991) included ca. 30 species in the genus (worldwide). In a molecular phylogenetic study including 18 species traditionally referred to *Monilinia* , Holst-Jensen et al. (1997a) demonstrated that the genus was polyphyletic, and that the Junctoriae constituted an evolutionary lineage distinct from the Disjunctoriae. Based on morphological and phylogenetic evidence the Disjunctoriae group of species are referred to the new genus *Franquinia*. *Monilinia* is restricted to the species on fleshy, edible fruits of domesticated rosaceous plants, e.g. peaches, plums, apples, pears, cherries. Macroconidial anamorphic state **without** disjunctors intercalating the chains of spores (the Junctoriae = true *Monilinia*). Apothecia are very rare, except in *M. fructicola*.
Literature: Woronin (1888, 1895, 1900), Woronin & Nawaschin (1896), Honey (1928, 1936), Grosse (1912), Whetzel (1945), Gjærum (1969), Pyykkö & Hämet-Ahti (1980), Batra (1991), Holst-Jensen (1992), Holst-Jensen & al. (1997a, 1997b).

1. Macroconidial anamorphic state produced in persistent, pale yellowish pustules, 2-5 mm broad, usually in concentric rings on the fruits, or as greyish-white covering on wilted, brown shoots of branchelets in summer, macroconidia ellipsoid, 12-34 x 9-12 um. Apothecia yellowish-brown, very rare, disc 3-10 mm diam., stipe 5-15 x 1-2 mm. Asci 120-180 x 9-12 um. Ascospores ellipsoid, sligthly tapering at the ends, 9-12.5 x 5-7 um. Macroconidial anamorphic state =*Monilia fructigena* (Pers.: Fr.) Pers. . . . . ***Monilinia fructigena*** Honey

1. Macroconidial anamorphic state produced in soft, greyish pustules, 1-2 mm broad, irregular in distribution (not in concentric circles), common on infloresences and usually on young, immature fruits which becomes putrid and necrotic 2

2 (1). Macroconidial state (=*Monilia cinerea* Bonorden) of broadly ovoid macroconidia, 8-23 x 7-16 um. Apothecia yellowish brown, very rare (not observed in the Nordic countries), disc 3-8 mm diam., stipe 10-30 x 1-2 mm. Asci 120-190 x 7.5-12 um. Ascospores ellipsoid to broadly ovoid, 7-19 x 4.5-8.5 um. In axenic culture (PDA, 20 C), mycelium lobate, giving rise to ± well defined stroma (figure) . . . . . ***Monilinia laxa*** (Woronin) Honey

Cherry tree attacked by *Monilinia laxa*. Norway, Oslo, Blindern, July 1996. (© Photo: Arne Holst-Jensen).

Macroconidial infection (greyish powder) by *Monilinia laxa* causing wilt on inflorescence of sweet cherry (*Prunus cerasus*). Norway, Oslo, Blindern, July 1996. (© Photo: Arne Holst-Jensen).

2. Macroconidial state (=*Monilia fructicola* L. R. Batra) of ellongate-ellipsoid to limoniform macroconidia, 10-25 x 8-20 um. Apothecia uncommon, disc up to 20 mm diam., stipe 10-40 x

1-2 mm. Asci 125-170 x 8-11 um. Ascospores ellipsoid to ovoid, slightly tapering at the ends, 8-11 x 5-7 um. In axenic culture (PDA, 20 C), mycelium a thin cottony mat rapidly covering the petri dish, giving rise to scattered applanate, crust-like stromata arranged in ± concentrical circles (figure) . . . . . ***Monilinia fructicola*** (Winter) Honey. The species is widely distributed in N-America, S-America, South-Africa, and Austral-Asia. It is not reported from Europe.

Myriosclerotinia N. F. Buchw.
Type species: *Myriosclerotinia scirpicola* (Rehm) N. F. Buchw. Apothecia cup-shaped to plane to funnel-shaped, brownish, stipitate, arising from a distinct sclerotium with a well-differentiated rind and medulla, medulla at first pinkish, becoming white when mature, developing within (or on) stems (culms) of cyperaceous and juncaceous hosts. Apothecial outer excipulum composed of globose cells (textura globulosa). Ascospores hyaline, unicellular, ellipsoid to allantoid. Macroconidial anamorphic state wanting. Microconidial anamorphic state produced in sporodochia (form genus *Myrioconium* Sydow.) in locules within host tissues of the culms, or wanting. Apothecia produced in spring and early summer. Some authors treat the species as members of *Sclerotinia*.
Literature: Whetzel (1946), Buchwald (1947), Jørstad (1964), Schumacher & Kohn (1985), Vaage (1996), Holst-Jensen & al. (1997b), Holst-Jensen & al. (1998).

1. On juncaceous hosts. Ascospores allantoid to narrowly ellipsoid . . . . . 2.

1. On cyperaceous hosts. Ascospores ellipsoid . . . . . 4.

2 (1). On *Luzula pilosa*. Sclerotia long, cylindrical, 5-30 x 0.5-1.5 mm. Apothecia one to several from each sclerotium, disc 2-6 mm diam., cupulate to applanate, stipe 7-25 x 0.4-1 mm. Asci 80-125 x 7-10 um, 2- 4 -6 spored. Ascospores ellipsoid to allantoid, 14.5-18.5 x 5-7 um. Apothecia in spring. Microconidial anamorphic state not observed in nature . . . . . ***Myriosclerotinia luzulae*** T. Schumach. & L. M. Kohn

Apothecia of *Myriosclerotinia luzulae* arising from sclerotia in decying culms of *Luzula pilosa*, Norway, Østfold. (© Photo: Roy Kristiansen).

2. On *Juncus* spp . . . . . 3.

3 (2). Sclerotium cylindrical, 4-20 x 0.5-3 mm. Apothecia one to several from a sclerotium, disc 2-12 mm diam., stipe 3-16 x 0.5-1.5 mm. Asci 60-95 x 4-5.5 um. Ascospores narrowly allantoid with rounded ends, 7.5-15 x 1-2.5 um. Microconidial anamorphic state in sporodochial locules, 0.5-1 x 0.5 mm, irregularly scattered along the upper host culm. Apothecia in spring . . . . . ***Myriosclerotinia curreyana*** (Berk.) N. F. Buchw.

3. Sclerotium cylindrical 6-25 x 0.5-2 mm. Apothecia one to several from each sclerotium,

disc 3-7 mm diam., stipe 4-20 x 0.5-1 mm. Asci 65-85 x 5-6 um. Ascospores narrowly ellipsoid with slightly pointed ends, 7-11 x 2-4 um. Microconidial anamorphic state in sporodochial locules, ca. 1 x 0.5 mm, irregularly scattered along the upper host culm. Apothecia in summer, most abundantly on *Juncus filiformis* . . . . . ***Myriosclerotinia juncifida*** (Nyl.) Palmer

4 (1). On *Carex* spp . . . . . 5.

4. On *Eriophorum*, *Eleocharis* or *Scirpus* . . . . . 8.

5 (4). Sclerotia long and slender, curved, with pointed ends, developing inbetween leaf sheats of young shoots, 30-200 x 4-12 mm. Apothecia cup-shaped, arising 2 - 16 from a sclerotium, disc 10-30 mm diam., stipe 30-100 x 1.5-2.5 mm. Asci 190-235 x 9-13.5 um. Ascospores ellipsoid, 11-16.5 x 7-10 um. Microconidial anamorphic state in sporodochial locules, 2-4 x 0.5-1.5 mm, distributed with regular intervals along the host culm. Apothecia in spring and early summer, on stems of *Carex rostrata* and *C. aquatilis* . . . . . ***Myriosclerotinia caricisampullaceae*** (Nyberg) N. F. Buchw.

5. Sclerotia cylindrical to fusoid, or shell-like to tuberoid, less than 30 mm long . . . . . 6.

6 (5). Sclerotia shell-like, becoming tuberoid, developing superficially in leaf sheats of *Carex* spp. and *Eriophorum* spp. (see description below) . . . . . ***Myriosclerotinia ciborium*** (Vahl:Fr.) Holst-Jensen, Vaage & T. Schumach. ined.

6. Sclerotia tuberoid to cylindrical, developing within culms of *Carex* hosts . . . . . 7.

7 (6). Ascospores navicular, flattened to incurved on one side. Sclerotium cylindrical, 5-18 x 1-3 mm. Apothecia cup-shaped, solitary or two to three from a sclerotium, disc 3-7 mm diam., light brown to medium brown, stipe 2-25 x 0.5-1.5 mm. Asci 130-165 x 7-10 um. Ascospores 10.5-14 x 5.5-7 um. Microconidial anamorphic state in sporodochial locules in groups of 3-6, distributed at regular intervals along the host culm, each group dull black, elongate, 1-3 mm long. Apothecia in early summer on *Carex* spp., particularly frequent on *C. chordorrhiza* . . . . . ***Myriosclerotinia duriaeana*** (C. Tul. & Tul.) N. F. Buchw.

7. Ascospores ellipsoid, with slightly pointed ends. Sclerotium tuberoid to cylindrical, 3-15 x 2-5 mm. Apothecia cup-shaped, solitary or two to three from a sclerotium, cup (disc) 3-9 mm diam., medium brown, stipe 5-20 x 0.5-1.5 mm. Asci 160-220 x 7.5-10 um. Ascospores 13-17 x 5.5-7.5. Microconidial anamorphic state in sporodochial locules in groups, 1-5 x 0.2-0.5 mm, irregularly scattered on stems of its host. Apothecia in early summer . . . . . ***Myriosclerotinia sulcatula*** T. Schumach. & L. M. Kohn (= *M. sulcata* (Whetzel) N. F. Buchw. nom. illeg.)

8 (4). Sclerotia shell-like, becoming tuberoid, 10-25 x 4-10 mm, developing superficially in leaf sheats of *Eriophorum* and *Carex*. Apothecia one to several from each sclerotium, disc deeply cupulate to turbinate, 5-15 mm diam., medium to dark brown, stipe 5-40 x 1.5-2 mm. Asci 140-190 x 7.5-12 um. Ascospores ellipsoid, flat to concave on one side, bi-tri-guttulate, 9.5-18 x 4.5-7.5 um. Microconidial anamorphic state not observed in nature. Apothecia in summer . . . . . ***Myriosclerotinia ciborium*** (Vahl: Fr.) Holst-Jensen, Vaage & T. Schumach. ined. (= *Ciborinia ciborium* (Vahl:Fr.) T. Schumach. & L. M. Kohn = *Sclerotinia vahliana* Rostr. = *Myriosclerotinia vahliana* (Rostr.) N. F. Buchw. = *S. arctica* Elliott)

8. Sclerotia tuberoid, cylindrical or fusoid, developing within culms of *Eriophorum*, *Scirpus* or *Eleocharis* . . . . . 9.

9 (8). Sclerotia cylindrical, elongate, 3-30 (-50) x 0.5-2.5 mm, developing within the stems, or exceptionally in the leaf sheats of *Eriophorum* spp., *Scirpus cespitosus* or *Eleocharis uniglumis*. Apothecia solitary or two to four from a sclerotium, cup-shaped to plane, disc 2-9 mm diam., light brown to medium brown, stipe 3-30 x 0.5-1.3 mm. Asci 70-140 x 5-10 um. Ascospores narrowly ellipsoid, slightly inequilateral, 8-15 x 3-5.5 um. Microconidial anamorphic state not observed in nature. Apothecia in spring and early summer . . . . . ***Myriosclerotinia dennisii*** (Svrcek) Schwegler (= *M. gregoriana* (Palmer) Palmer)

Apothecia of *Myriosclerotinia dennisii* arising from sclerotia in decying culms of *Eriophorum* sp., Norway. (© Photo: Roy Kristiansen).

9. Sclerotia tuberoid to fusoid, from 5-20 x 3-10 mm (tuberoid: in *Scirpus lacustris*, incl. ssp. *tabernaemontani*, *S. sylvaticus*) to 5-22 x 1-3 mm (fusoid: in *S. maritimus*, *Eleocharis palustris*). Apothecia one to several from each sclerotium, cup-shaped to plane, disc 3-15 mm diam., light brown to medium brown, stipe 3-22 x 0.5-2 mm. Asci 110-150 x 5.5-9 um. Ascospores elliposid, with slightly pointed ends, 9-16 x 4.5-7 um. Microconidial anamorphic state in ovoid to elongate sporodochial locules, 0.5-5 mm broad, distributed at irregular intervals along the host culm. Apothecia in spring and early summer . . . . . ***Myriosclerotinia scirpicola*** (Rehm) N. F. Buchw. (= *Sclerotinia eleocharidis* Henders.)

Apothecia of *Myriosclerotinia scirpicola* arising from sclerotia inside culms of *Scirpus lacustris* floating on the water, Norway, Telemark, Bamble, N end of Stokkevatn. Note the black spordochia containing microconidia of the *Myrioconium* type. (© Photo: Arne Holst-Jensen).

Ovulinia Weiss
Monotypic genus.
Literature: Weiss (1940), Whetzel (1945), Dennis (1956), Gjærum (1970b), Holst-Jensen & al. (1997b).

1. Sclerotium ovoid to discoid, 1-4 x 1-2 mm, formed within the petals of *Rhododendron* and *Azalea* spp. Apothecia cup-shaped to funnel-shaped, brownish, stipitate, arising one or two-three from a distinct sclerotium, disc 2-5 mm diam., medium brown, stipe 5-12 x 0.5-1.5 mm. Asci 130-160 x 9-14 um. Ascospores ellipsoid, unicellular, hyaline, 10-18 x 8-11 um. Macroconidial anamorphic state formed within flowers in high summer, of short conidiophores (form genus *Ovulitis* N. F. Buchw.: N. F. Buchw.), giving rise to broadly ellipsoid to obovoid macroconidia with empty disjunctors present, 40-60 x 20-35 um. . . . . ***Ovulinia azaleae*** Weiss

Piceomphale Svrcek
This monotypic genus has recently been excluded from the Sclerotiniaceae and Rutstroemiaceae by Holst-Jensen & al. (1997b). The genus is included in the key for convenience.
Literature: Svrcek (1957), Dixon (1974), Holst-Jensen & al. (1997b).

1. Apothecia shallowly cupulate to discoid, dark greenish black, cartilaginous in texture, hymenium often wrinkeled, short-stipitate, from blackish patches on cone scales of *Picea*. Disc 2.5-11 mm diam., stipe 0.5-3 (5) mm long. Outer excipulum with an outermost layer of globose cells, inner layer of prismatic cells. Asci 65-85 x 6-7.5 um. Ascospores hyaline, unicellular, 6-9.5 x 3-5 um. Macroconidial mitosporic state wanting. Apothecia in early spring . . . . . ***Piceomphale bulgarioides*** (Rabenh.) Svrcek (= *Rutstroemia bulgarioides* (Rabenh.) P. Karst.)

Poculum Velen.
Type species: *Poculum ruborum* Velen. The genus was adopted by Dumont (1972) to accommodate a group of species previously referred to *Rutstroemia* P. Karst. ss. White (1941), characterized by having a distinct layer of highly gelatinized, long-celled hyphae of the outer excipulum. As presently circumscribed, the genus is probably polyphyletic. We have not studied the generic type *Poculum ruborum* , growing on stems of *Rubus*. Two groups of species have been included here.
Literature: Velenovsky (1934), White (1941), Holst-Jensen & al. (1997b).

1. On leaves of deciduous trees 2

1. On leaves and stems of monocot plants 3

2 (1). On decaying leaves of *Quercus* spp. Apothecia short-stipitate, solitary or two to three from stromatized areas of petiole and leaf nerves of its hosts, disc 1-3 mm diam., cupulate to plane, reddish brown, stipe 0.5-10 x 0.5-1 mm. Asci 110-130 x 9-11 um. Ascospores ellipsoid, loaf-shaped, unicellular, 11.5-13.5 x 5-6.5 um. Apothecia in autumn . . . . . ***Poculum sydowianum*** (Rehm) Dumont (= *Rutstroemia sydowiana* (Rehm) White = *Ciboria sydowiana* (Rehm) Rehm)

Apothecia of *Poculum sydowianum* on leaf petioles of *Quercus petrea*. Norway, Telemark, Kragerø, Kurdøla, October 1996. (© Photo: Arne Holst-Jensen)

2. On decaying leaves of *Fagus* or *Quercus*. Apothecia long-stipitate, solitary or several from stromatized areas of petiole and leaf nerves of its hosts, disc 1-4 mm diam., medium brown, stipe 2-20 x 0.5-1 mm. Asci 95-120 x 9-12 um. Ascospores ellipsoid, loaf-shaped, uni- to tetra-cellular, 14-17 x 4.5-6 um. Apothecia in early summer . . . . . ***Poculum petiolorum*** (Roberge) Dumont & Korf (= *Rutstroemia petiolorum* (Roberge) White)

Apothecia of *Poculum petiolorum* on leaf petioles of *Phagus sylvatica*. Denmark, Sjælland, Sorø, October 16th. 1989. (© Photo: Sverre Bjørn Holøs)

3 (1). On decaying leaves of *Carex* spp., *Eriophorum* spp., and *Juncus* spp. Apothecia cupulate to plane, short-stipitate, arising from stromatized areas of host tissues demarcated by a black line, disc 0.5-2 mm diam., yellowish-brown, stipe 0.3-4 x 0.2-0.5 mm. Asci 145-160 x 8-10 um. Ascospores ellipsoid, biguttulate, unicellular, 13-15 x 5-6 um. Apothecia in spring and early summer . . . . . ***Poculum henningsianum*** (Plöttn.) T. Schumach. & L. M. Kohn (= *Rutstroemia henningsiana* (Plöttn.) Dennis)

3. On dead stalks and leaves of grasses. Apothecia flat, arising from stromatized areas of host tissues demarcated by a black line, disc 1-4 mm diam., pale ochraceous, stipe 0.5-4 x 0.3-0.8 mm. Asci 115-130 x 8-10 um. Ascospores ellipsoid, biguttulate, unicellular, 12-15 x 5-7 um. Apothecia in spring and early summer . . . . . [**"*Rutstroemia* " *calopus*** (Fr.) Rehm.]

NOTE: The cause of dollar spot on turff grass, "*Sclerotinia* " *homoeocarpa* Bennett is probably a closely related taxon.

Apothecia of a taxon on decaying leaves of *Iris pseudacorus*, not yet investigated properly. Morphologically with affinity to *Poculum*. Norway, Telemark, Bamble, Stokkevatn, June 30th 1996. (© Photo: Arne Holst-Jensen)

Pycnopeziza White & Whetzel
Type species: *Pycnopeziza sympodialis* (Bubak & Vleugel) White & Whetzel. Apothecia arising from a definite stroma with a differentiated rind and medulla, apothecia solitary or gregarious, short-stipitate to substipitate, brown to dark brownish black, cleistocarpous from beginning, then discoid to flat, finally margin rupturing irregularly, giving a stellate margin; or opening by a pore, becoming saucer-shaped with a circular, entire margin. Macroconidial anamorphic state (*Acarosporium* Bubak & Vleugel) produced in superficial, solitary, black pycnidia less than 1 mm diam., globose or flattened-globose, attached by a broad basal portion, opening by irregular splits from the apex toward the base, expanding widely to expose the conidial mass. Apothecia and pycnidial anamorph are frequently observed side by side on the substrate.
Literature: White & Whetzel (1938), Schumacher (1990), Holst-Jensen & al. (1997b).

1. Apothecia opening at maturity by irregular fissures, becoming expanded and flat, disc 2-6 mm diam., margin split in a stellate manner, with a dark brown to blackish outer excipulum of heavily melanized globose cells, gradually passing into the stromatal rind of the underlying stroma, outside minutely scabrous, stipe 0.3-2 x 0.3-0.7 mm. Asci 70-90 x 6.5-8 um. Ascospores narrowly ellipsoid, hyaline, unicellular, 7-9.5 x 3-4 um. Macroconidial anamorphic state borne in pycnidia, (*Acarosporium sympodiale* Bubak & Vleugel), solitary and superficially on substrate, macroconidia needle-shaped, two-celled, 15-22 x 2.6-3 um, the upper cell with two lateral whip-like appendages up to 30 um long. On decaying leaves of deciduous trees and ericaceous plants, plant remnants etc., frequently on leaves of *Betula* . . . . . ***Pycnopeziza sympodialis*** (Bubak & Vleugel) White & Whetzel

Apothecia (pale brown, stellate) and pycnidia (black spherical, with a longitudinal slit) of *Pycnopeziza sympodialis* on leaves of *Betula pubescens*. Norway, Oppland, Hedmark, Hirkjølen, June 13th. 1996. (© Photo: Arne Holst-Jensen).

1. Apothecia opening by a pore, finally becoming saucer-shaped with a circular, entire margin, disc 1-4 mm diam., stipe 1-3 x 0.5 mm. Outside yellowish brown, minutely furfuraceous. Asci 75-85 x 6.5-7.5 um. Ascospores narrowly ellipsoid, hyaline, unicellular, 7-9 x 3-4 um. Macroconidial anamorphic state (*Acarosporium quisquiliaris* White & Whetzel: Sutton) producing needle-shaped, two-celled macroconidia, 15-22 x 2.5-3 um, lacking appendages. On leaves of *Quercus* and *Alnus*. . . . . ***Pycnopeziza pachyderma*** (Rehm) Whetzel & White (= *Pycnopeziza quisquiliaris* (Ellis & Everh.) White & Whetzel)

Pycnidia of *Pycnopeziza pachyderma* on leaves of *Quercus petrea* (black, spherical, opening with a ± longitudinal slit exposing the yellow-buff inner mass of macroconidia). Norway, Telemark, Kragerø, Kurdøla, May 25th., 1996. (© Photo: Arne Holst-Jensen).

Rutstroemia P. Karst.
Type genus of the family Rutstroemiaceae. Type species: *Rutstroemia firma*. (Pers.: Fr.) P. Karst. Apothecia cup-shaped, brownish, stipitate, arising from stromatized patches of host tissues. Outer excipulum of angular to prismatic cells, with a ± prominent layer of gelatinized, long-celled hyphae. Ascospores ellipsoid, hyaline, (uni-) bi- multi-cellular, frequently budding (producing microconidia) while still within ascus. Macroconidial anamorphic state wanting. On wood. Most species fruit in summer and autumn. (= *Kriegeria* Rabh.). See also *Ciboria* , *Lanzia* and *Poculum*. Literature: White (1941), Buchwald (1947), Dennis (1956), Holm & Holm (1976, 1977), Holst-Jensen & al. (1997b).

1. Apothecia on coniferous wood . . . . . 2.

1. Apothecia on other woody plants . . . . . 3.

2. Apothecia on branchlets and needles of *Juniperus communis*. Apothecia cupulate to plane, short-stipitate, disc 0.5-2 mm diam., reddish brown, stipe 1-3 x 0.5-1 mm. Asci 110-130 x 8-10 um. Ascospores ellipsoid, uni- to tetra-cellular, 12-18 x 5-6 um. Apothecia in autumn . . . . ["***Rutstroemia " juniperi*** Holm & Holm]

2. Apothecia on dead branches of *Abies alba*, still attached or detached from the tree. Apothecia cup-shaped, dark olivaceous brown to blackish, cartilaginous, short-stipitate, cup (disc) 2-6 mm diam., stipe 1-4 x 0.5-1 mm. Asci 130-160 x 10-13 um. Ascospores ellipsoid to allantoid, biguttulate, uni-bicellular, 12-19 x 4.5-6.5 um. Apothecia in early spring . . . . . ["***Rutstroemia "elatina*** (Alb. & Schw.: Fr.) Rehm] (= *Ciboria kriegeriana* Rehm = *Kriegeria elatina* (Alb. & Schw.) Wint. = *Kriegeria olivacea* Rabh.)

3. Apothecia on branchlets of *Rosa*. Apothecia cupulate, short-stipitate, medium brown to dark brown, arising from stromatized tissues, disc 2-4 mm diam., stipe 1-3 x 0.4-1 mm. Asci 110-130 x 7-8 um. Ascospores ellipsoid, two-celled, 12-15 x 3-4 um. Apothecia in spring . . . . ["***Rutstroemia "rhenana*** (Kirschst.) Dennis]

3. Apothecia on branchlets of other woody plants . . . . . 4.

4. Apothecia medium brown to dark brown, shallowly cup-shaped, soon becoming plane, arising from stromatized patches on decaying twigs and branchlets of deciduous trees (frequently *Quercus*) on the ground, disc 4-12 mm diam., stipe 6-25 x 0.5-1.5 mm. Asci 125-160 x 9-12 um. Ascospores narrowly ellipsoid, becoming multiseptate with age, 12-19 x 3.5-6.5 um. Apothecia in summer and autumn . . . . . ***Rutstroemia firma*** (Pers.: Fr.) P. Karst. (= *Poculum firmum* (Pers.: Fr.) Dumont)

Apothecia of *Rutstroemia firma* on decaying twigs of *Quercus petraea*, Norway, Telemark, Kragerø, Kurdøla, October 20th. 1996. (© Photo: Arne Holst-Jensen).

4. Apothecia olivaceous brown to orange brown, cupulate to plane, arising from stromatized patches on twigs of *Betula* and *Alnus* on the ground, disc 2-10 mm diam., stipe 2-14 x 1-2 mm. Asci 110-150 x 9-12 um. Ascospores narrowly ellipsoid, uni-bi to tricellular, 15-20 x 5-6.5 um. Apothecia in summer and autumn . . . . . ***Rutstroemia bolaris*** (Batsch : Fr.) Rehm (= *Ciboria bolaris* (Fr.) Fuckel)

Apothecia of *Rutstroemia bolaris* on decaying branch of *Betula pubescens*, Norway, Sør-Trøndelag, Oppdal, Vårstigen, August 22nd, 1996. (Photo: © Arne Holst-Jensen)

In the early summer, 1996, a taxon with affinity to the genus was collected on decaying twigs of *Myrica gale*. A picture of the apothecia is shown below:

Apothecia of an undetermined species with affinity to *Rutstroemia*, arising from decaying twigs of *Myrica gale*. Norway, Telemark, Kragerø, Kurdøla, June 30th. 1996. (© Photo: Arne Holst-Jensen).

Scleromitrula S. Imai
Type species: *Scleromitrula shiraiana* (Henn.) S. Imai. Apothecia stipitate-capitate, exceptionally stipitate-cupulate, the capitate forms with a pendent margin forming a collar around stipe apex interrupting the continuity between the hymenium and stipe. Outer excipulum of head (cup) of globose to angular to brick-shaped cells in chains perpendicular to stipe axis, medullary excipulum of textura intricata, subhymenium distinct, of densely packed hyphae. Stroma determinate, of the lenticular to pyramidal type, developing on surface of infected host fruits, leaves or stems; stroma black outside, white to greyish inside, with a well-developed dorsi-ventral rind composed of thick-walled, melanized, globose to prismatic cells, stromatal cortex and medulla not much differentiated, of compact textura oblita with heavily gelatinized walls enveloping partly digested and undigested host tissues. Ascus inoperculate, with a thickened apex, pore channel wall J+ or J- after pretreatment in 2% KOH. Ascospores hyaline, ellipsoidal to allantoid, unicellular, eguttulate or with one or two minute polar guttules. Macroconidial anamorphic state wanting. The genera *Scleroglossum* Hara and *Verpatinia* Whetzel & Drayton are recent synonyms.
Literature: Imai (1941), Whetzel (1945), Groves & Elliott (1961), Kohn & Nagasawa (1984), Holst-Jensen & al. (1997b), Schumacher & Holst-Jensen (1997).

1. Apothecia stipitate-capitate, cap with longitudinal ridges and furrows, arising from lenticular to pyramidal stromata on its host . . . . . 2.

1. Apothecia stipitate-cupulate to applanate to slightly decurved, arising from small, lenticular stromata on petioles and leaf nerves of *Quercus* species and *Castanea sativa* . . . . . ***Scleromitrula candolleana*** (Lév.) T. Schumach. & Holst-Jensen (= *Ciborinia candolleana* (Lév.) Whetzel)

Apothecia of *Scleromitrula candolleana* from stromata produced on (but detached from) decaying leaves of *Quercus*. Norway, Telemark, Bamble, Stokkevatn, June 29th. 1996. (Photo: © Arne Holst-Jensen)

2 (1). Cap minute, 2-5 mm high, 0.8-2 mm broad. Asci 35-55 um long. On leaves and stems of its host . . . . . 3.

2. Cap large, 3-16 mm high, 2-7 mm broad. Asci 65-90 um long. On fruits of *Morus albus* . . .

. . ***Scleromitrula shiraiana*** (Henn.) S. Imai. The species is not recorded from the Nordic countries.

3 (2). Ascospores exceeding 7 mm in length . . . . . 4.

3. Ascospores 5-7 x 1.5-2.5 um. Cap 1-3 mm high, 0.8-1.5 mm broad, stipe 10-30 x 0.2-0.4 mm On leaves of *Filipendula* and *Calystegia* . . . . . ***Scleromitrula spiraeicola*** (Dennis) T. Schumach. & Holst-Jensen (= *Verpatinia spiraeicola* Dennis)

Apothecia of *Scleromitrula spiraeicola* on stromata produced on (but detached from) decaying tissues of *Filipendula ulmaria*. Note the extremely long (approx. 25 mm and slender (approx. 0.2 mm) stipe, and the minute, conical-cupulate receptacle. Norway, Telemark, Bamble, near Rønholt school, June 29th. 1996. (Photo: © Arne Holst-Jensen)

[3. Ascospores 5.5-7 x 2 um. Host unknown . . . . . ***Scleromitrula morchelloides*** (Mains) T. Schumach. & Holst-Jensen (= *Verpatinia morchelloides* (Mains) A. Redhead). The species is not recorded from the Nordic countries.]

4 (3). Cap 2-5 mm high, 1-2 mm broad, stipe 10-40 x 0.3-0.7 mm. Ascospores 6.0-9.4 x 2.0-3.0 um. On leaves of *Rubus chamaemorus* . . . . . ***Scleromitrula rubicola*** T. Schumach. & Holst-Jensen

Apothecium of *Sclerotinitrula rubicola* arising from a stroma produced on (but detached from) decaying leaves of *Rubus chamaemorus*. This apothecium is immature, and the size of the receptacle is therefore smaller than on mature apothecia. Norway, Akershus, Eidsvoll, Frilsetåsen, June 17th. 1996. (Photo: © Arne Holst-Jensen)

4. Cap 2-3 mm high, 1-2 mm broad, stipe 10-30 x 0.2-0.6 mm. Ascospores 6.3-9.8 x 1.5-2.6 um. On leaves of *Caltha palustris* and *Iris pseudacorus*. . . . . ***Scleromitrula calthicola*** (Whetzel) T. Schumach. & Holst-Jensen (= *Verpatinia calthicola* Whetzel)

Apothecia of *Scleromitrula calthicola* on decaying leaves of *Iris pseudacorus*. Norway, Telemark, Bamble, Stokkevatn, June 29th. 1996. (Photo: © Arne Holst-Jensen)

Sclerotinia Fuckel
Type genus of the family Sclerotiniaceae.Type species: *Sclerotinia sclerotiorum* (Lib.) de Bary. Apothecia cup-shaped to funnel-shaped to plane, brownish, stipitate, arising from distinct, free, tuberoid sclerotia with a carbonaceous rind (black) and medulla (white) without remnants of host tissue. Apothecial outer excipulum of globose to hexagonal cells. Ascospores hyaline, ellipsoid, unicellular, multiguttulate. Macroconidial anamorphic state wanting. Terricolous or among herb debris of a number of vascular plants; apothecia in spring, summer or autumn.
Literature: Whetzel (1945), Kohn (1979), Holst-Jensen & Schumacher (1994), Graf & Schumacher (1995), Vaage (1996), Holst-Jensen & al. (1997b), Holst-Jensen & al. (1998).

1. Sclerotia lenticular to tuberoid, 2-8 x 1-4 mm, developing in leaf sheets and on culm remnants of grasses. Apothecia cup-shaped to plane, arising solitary or in groups from a sclerotium, disc 2-7 mm diam., stipe 2-17 x 1.1.5 mm. Asci 175-240 x 9-13.5 um. Ascospores ellipsoid, with pointed ends, thick-walled, 14-21 x 6-9 um. Apothecia produced in autumn. On a variety of host genera, most frequently on *Poa* spp. and *Festuca* spp. . . . . ***Sclerotinia borealis*** Bub. & Vleug. (= *Myriosclerotinia borealis* (Bub. & Vleug.) L. M. Kohn)

1. Sclerotia tuberoid, developing in herb debris or among roots of herbaceous plants . . . . . 2.

2 (1). Asci 4-spored . . . . . 3.

2. Asci 8-spored . . . . . 4.

3 (2). Sclerotia developing in last year stems of *Rubus chamaemorus* , embedded in moss carpets in bogs, cylindrical, 2-12 x 2-5 mm. Apothecia shallowly cup-shaped to plane, medium to pale brown, disc 2-6 mm diam., stipe 5-30 x 0.6-1.5 mm. Asci 80-105 x 12-14 um. Ascospores ellipsoid, slightly inequilateral, with minute internal polar guttules when fresh, 10-15 x 5.6-8.0 um, occasionally megaspores to 18-22 x 8-11 um are observed. Apothecia in early summer . . . . . ***Sclerotinia tetraspora*** Holst-Jensen & T. Schumach.

Apothecia of *Sclerotinia tetraspora* arising from a sclerotium developed inside the culm of a *Rubus chamaemorus* plant, embedded in *Sphagnum* moss. Norway, Akershus, Eidsvoll, Frilsetåsen, June 17th. 1996. (Photo: © Arne Holst-Jensen)

Axenic culture of *Sclerotinia tetraspora* grown on PDA (potato dextrose agar) for 12 weeks at 20 C in darkness. (© Photo: Arne Holst-Jensen)

3. Sclerotia developing on the leaf base of *Ranunculus glacialis*, tuberoid, cylindrical, 2.5-15 x 2-8 mm. Apothecia cup- to disc-shaped, brownish orange, brick red to henna brown, up to four from each sclerotium, cup (disc) 2-10 mm diam., stipe 1-15 x 0.5-1.5 mm. Asci 130-150 x 7-12 um. Ascospores ellipsoid, slightly inequilateral, uni- (bi-) nucleate, 22-27 x 8-10 um. Apothecia in summer. . . . . ***Sclerotinia glacialis*** F. Graf & T. Schumach. The species is known only from Grisons, Switzerland.

4 (2). Ascospores dimorphic in size, 4 larger spores 12-18 x 7-10 um, 4 smaller spores 9-13 x 6-7 um. Apothecia solitary or two to three from a sclerotium, 5-20 x 2-8 mm, disc 2-10 mm diam., cup-shaped to plane to recurved with a central depression, stipe 10-40 x 0.5-2 mm. Asci 150-240 x 9-14 um. Frequently on leguminous hosts, occassionally on non-leguminous hosts. Causing clover rot in fields. Apothecia in summer and autumn . . . . . ***Sclerotinia trifoliorum*** J. Erikss.

4. Ascospores monomorphic . . . . . 5.

5 (4). Sclerotia tuberoid, very variable in shape and size, 4-25 x 2-10 mm x 5-15. Ascospores uniform in size, 9-13.5 x 4-6 um, binucleate. Apothecia solitary or several from each sclerotium, disc 2-10 mm diam., when mature plane or recurved with a central depression, stipe 4-30 x 0.5-2 mm. Apothecial outer (ectal) excipulum composed of slightly elongated prosenchymateous cells turning out perpendicular to the apothecial surface. Asci 110-150 x 6-10 um. On a wide range of host plants (> 350 species among 60 plant families). Apothecia in spring or high summer . . . . . ***Sclerotinia sclerotiorum*** (Lib.) de Bary (= *S. ficariae* Rehm)

Apothecia of *Sclerotinia sclerotiorum* among rhizomes of *Ranunculus ficaria*. (Photo: © Arne Holst-Jensen)

5. Sclerotia tuberoid or irregularly shaped, 0.5-2 mm diam. Ascospores uniform in size, 8-17 x 5-7 um, tetranucleate. Apothecia one from each sclerotium, disc 2-9 mm diam., applanate or recurved with a central depression when mature, stipe 1-4 x 1-2 mm. Asci 125-180 x 7-11 um. Apothecia in high summer. . . . . ***Sclerotinia minor*** Jagger. The species is not known from the Nordic countries.

Stromatinia Boud.
Type species: *Stromatinia rapulum* (Bull.) Boud. Apothecia stipitate-cupulate, brownish, arising from a mantling stroma covering the affected "root" organs of the host. Ascospores hyaline, ellipsoid, unicellular. Macroconidial anamorphic state wanting. On rhizomes, corms and bulbs of its monocot hosts. Apothecia in spring or early summer.
Literature: Whetzel (1945), Jørstad (1945), Drayton & Groves (1952), Schumacher (1984), Holst-Jensen & al. (1997b).

The sclerotial states of *Stromatinia gladioli* (Drayton) Whetzel (= *Sclerotium gladioli* Massee) and *Stromatinia narcissi* Drayton & Groves (= *Sclerotium ambiguum* Duby var. *narcissi* Sacc.) on scales of *Gladiolus* and *Narcissus* bulbs respectively, are observed in the Nordic countries.

1. Apothecia several from rotten, blackened, stromatized rhizomes of *Polygonatum odoratum* and *P. multiflorum*, disc 5-20 mm diam., medium to dark brown, stipe 10-60 x 1-3 mm. Asci 120-170 x 8-11 um. Ascospores ellipsoid, subfusoid, with two polar internal guttules, 11-16.5 x 5-8 um . . . . . ***Stromatinia rapulum*** (Bull.: Fr.) Boud. (= *Sclerotinia richteriana* P. Henn. & Staritz = *S. smilacinae* Durand)

Apothecia of *Stromatinia rapulum* on stromatized rhizomes of *Polygonatum odoratum*, Norway, Østfold. (© Photo: Roy Kristiansen).

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Valdensinia Peyronel

Monotypic genus.

Stroma indeterminate, crust-like, on petioles and leaf nerves of *Vaccinium myrtillus* and *V. vitis-idaea*. Apothecia cup-shaped to plane, pale brown, stipitate, disc 2-5 mm diam., stipe 4-15 x 0.5-1.5 mm. Asci 80-110 x 7-10 um. Ascospores ellipsoid, unicellular, bi- to multiguttulate, 10-13.5 x 4.5-5.5 um. Apothecia in spring and early summer. Macroconidial anamorphic state (= form genus *Valdensia* Peyronel, i.e.*V. myrtilli* (All.) Petrak, syn. *Saliastrum* Kujala) as brownish, withered spots on leaves of *V. myrtillus* and a variety of host plants, producing conspicuous four-armed "star-like" diaspores ca. 0.5 mm diam. . . . .
Valdensinia heterodoxa Peyronel

Apothecium of *Valdensinia heterodoxa* on stromatized leaf nerve of *Vaccinium myrtillus*. Norway, Oslo, Sognsvann, May 25th., 1996. (Photo © Arne Holst-Jensen)

Valdensia heterodoxa infections on leaves of *Vaccinium myrtillus*. Norway, Oslo, Sognsvann, June 16th, 1996. (Photo © Arne Holst-Jensen)