

## Stray Studies in the Coronophorales (Pyrenomycetes) 4–8

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### Abstract

4. Comparative morphological studies on ascocarps, asci and spores lead to the conclusions (1) that *Coronophorales* is a highly specialized homogeneous group, derived from *Lasiosphaeriaceae*, (2) that *Coronophoraceae* and *Nitschkiaceae* should be united under the latter name, (3) that *Coronophorales* should be given up as a separate order and placed as a "satellite" family close to *Lasiosphaeriaceae*, and (4) that the number of genera grouping round *Nitschkia* should be radically reduced.

5. A full nomenclator embracing 16 generic names is given for *Nitschkia*. Nomenclators, lists of exsiccata, short descriptions and sketches of the geographical distribution are given for the 22 accepted species. One is new (*N. tetraspora* from tropical Africa), one is renamed (*N. gigantospora* for *Calyculosphaeria macrospora* Fitzp., non *N. macrospora* Teng). New combinations are *N. affinis* (basionym *Fracchiaea a. H. & P. Syd.*), *N. brevispina* (*Trichosphaeria b. Munk*), *N. callista* (*Sphaeria c. B. & C.*), *N. chaetomioides* (*Enchnoa ch. Penz. & Sacc.*), *N. leonensis* (*Scortechiniellopsis l. Sivan.*), *N. multiasca* (*Fracchiaea m. Pat. & Gaill.*), *N. similis* (*Trichosphaerella s. Bres.*), *N. uniseriata* (*Tympanopsis u. Fitzp.*), and *N. velutina* (*Bicilliospora v. Petr.*).

6. *Acanthonitschkea* with 4 accepted species is treated in the same manner. *Ac. pulchella* (*Neotrotteria p. Sacc.*) is the only new combination.

7. A lichenicolous fungus parasitic in apothecia of two species of *Stictia* in tropical Africa and South America is described as *Nitschkiopsis stictarum* Nannf. & R. Sant. nov. gen. et sp. Its taxonomical position is doubtful but probably *Lasiosphaeriacean*.

8. The distributions of the 8 European species of *Nitschkia* and *Acanthonitschkea* are treated in detail. A determinative key is given.

### 4. Some Morphological Features and Their Taxonomical Bearing

The "Historical Review" in Nannfeldt (1975) is intended to show how indicia have accumulated that the *Coronophorales* form a phylogenetically homogeneous group

rooting in the true (ascohyemial and unitunicate) Pyrenomycetes. This will be further elucidated in this Chapter.

Let us, however, prefatorily remove some fungi that Fitzpatrick (1923) included in his *Nitschkieae*, and first of all *Thaxteria* Sacc., still generally considered a true member of them, although the text in Ainsworth & Bisby's Dictionary (all editions, 1943–1971)—without giving any source—runs: “Sphaeriales . . . ; or possibly a syn. of *Lasiosphaeria*”. The genus shows in fact several features transitional to *Lasiosphaeriaceae* sensu Lundq. and seems to find its fittest resort there.

The first features of *Thaxteria* to awaken my suspicions were related to the spores. They are large (up to  $30 \times 8 \mu\text{m}$ ) and broadly subcylindrical with the lower end often slightly tapering, geniculate rather than allantoid. The walls of (over)ripe spores show often a few irregularly placed, circular, dark, internally thickened spots, which may tentatively be interpreted as scars of abortive phialides. In addition, the asci have truncate (sometimes even invaginated) tips with a thickened wall and a distinct, though small and low ring taking Cotton Blue as well as Congo Red, but without a refractive globule. Numerous shrivelled, unstainable, long threads between the asci may be dissolving (gelatinized?) paraphyses. The peridial cells possess distinct “Munk pores”, and a pore is often visible in the central septum of mature spores. The ascocarps have certainly no perforated ostiolum.

The material examined includes isotypes (in S) of *Th. leptosporoides* (Wint.) Fitzp. and of the obviously synonymous *Leptospora spermoides* var. *rugulosa* Rick and *Bertia puttemansii* P. Henn. (nov. syn.). According to Hansford (1956: 29) the correct name of this species is *Th. archeri* (Berk.) Hansf. The generic type, *Th. didyma* (Speg.) Sacc. (illustrated by Fitzpatrick 1923 and Müller & Booth 1972), is only very doubtfully distinct.

It should further be observed that *Thaxteria* was completely misunderstood by Booth (1958; together with Dennis 1960 and 1968), who used the name for what was later described as *Chaetosphaerella* Müller & Booth (1972).

Two odd species which Fitzpatrick with some doubts admitted into his group should also be removed, viz. *Nitschkia javanica* P. Henn. & Nym. and *Tympanopsis coelosphaerioides* Penz. & Sacc. The former is a unitunicate Pyrenomycete whose asci possess a conspicuous apical apparatus in the shape of a high refractive ring or rather dome that does not take Iodine or Congo Red and becomes only very slightly stained by Cotton Blue. The large spores become eventually 1-septate and their walls distinctly rough. No “Munk pores” are to be found. This species too is probably related to the *Lasiosphaeriaceae*. The second species (*T. coelosphaerioides*) is a bitunicate fungus, synonymous to *Auerswaldia examinans* (Mont. & Berk.) Sacc. (Höhnel 1909: 1510).

Two (monotypical) genera of later date, described as Coronophoralean, should also be excluded, viz. *Rostr coronophora* Munk (1953; 1957) and *Spinulosphaeria* Sivanesan (1974). The former was unmasked by Munk himself (pers. comm.) as based on a *Gnomonia* (Nannfeldt 1975: 51; comp. Sivanesan 1974: 40). The latter, based on *Neopeckia thaxteri* Pat., seems to have a Lasiosphaeriaceous kinship.

Through the courtesy of Dr. Sivanesan I have had access to a fragment of IMI 46511 (a) (unfortunately devoid of asci) and slides of IMI 165 094. The ascocarps resemble in shape those of *Thaxteria* and lack certainly a functioning ostiolum, although the apical part of the ascocarpic locule possesses thick conspicuous periphyses. The rest of the locule is lined by a continuous palisade of asci at very different stages. No apical apparatus has so far been observed, but richer material is needed. The peridium shows tendencies to being slightly areolate in the same manner as in sundry *Lasiosphaeriae* and *Cercophorae*. The cell walls show a kind of "Munk pores", but these are smaller than usual and the surrounding thickened ring less prominent.

It should also be observed that the inclusion amongst the *Coronophorales* of the type species of *Bertia* (*B. moriformis*) does not mean that other species placed in that genus necessarily are of the same affinity. Only three have been examined, viz. *B. puttemansii* P. Henn. (= *Thaxteria archeri*, see above), *B. italica* Sacc. & Speg. and *B. (Bertiella) macrospora* Sacc. and they were all found to be alien elements, the third even bitunicate. The second was synonymized by Müller & Arx (1962: 818) with *Calyculosphaeria macrospora* Fitzp., but this is a true *Nitschkia* (*N. gigantospora*).

We shall now compare various significant features in the species studied by me. It will then gradually emerge that Fitzpatrick's *Nitschkieae* after some remodelling stands out as a group of *inter se* closely related species, whose "pattern of variation" suggests a multidimensional latticework of crossing lines (comp. Munk 1962), whereas other *Coronophorales* take more isolated positions.

**Mode of growth and ecology.** All *Coronophorales* grow on bark and/or wood, but the principal habitat of one (*N. parasitans*) is stromata of *Nectria cinnabarina* and/or its conidial state *Tubercularia vulgaris* (see e.g. Schweinitz 1832; Tulasne 1865=1931; Petrak 1927: 362; Chesters 1939; Mason 1940; Müller & Arx 1955: 366; Möller 1958). Stromata may at the same time bear well-grown ascocarps of both the *Nectria* and the *Nitschkia*. Sometimes, when the *Nitschkia* is unusually vigorous, it may also form patches of closely crowded ascocarps—like those of the other *Nitschkieae*—on the surrounding bark. This species seems thus to be  $\pm$  parasitic.

Desmazières' statement (1860 n. 780) that his specimens (on *Robinia pseudacacia*) "sont quelquefois mêlés avec le *Nectria coccinea*, et même, mais plus rarement avec le *N. Cinnabarina*" rests on a clear misunderstanding of the former species, for he continues "ces espèces reposent sur le *Tubercularia confluens*, Pers. var. *Acaciae*, Fr. qui leur sert de stroma". His "*N. coccinea*" must thus have been *N. cinnabarina* too.

The remaining species seem to be saprophytic, but it may be doubted if any is a "saprophyte of the first incidence" (sensu Munk), and indications of hypersaprophytism are numerous. Such are e.g. the frequent association of *N. confertula* with old stromata of *Hypoxylon rubiginosum* observed in Britain (Chesters l.c.; Mason l.c.), U.S.A. and South Africa (Miller 1942: 259) as well as in Ghana (IMI).

Similarly, an association of *N. grevillii* with "*Diatrype stigma* and related fungi" is reported from Britain (ll. cc.), and it is true that various Pyrenomycetes (especially *Eutypa* spp. but only rarely *Diatrype*) are often seen together with this *Nitschkia*. An association between *N. broomeiana* and species of *Botryosphaeria* has also been observed. Even if—on external inspection—no other Pyrenomycetes are visible, immersed such (or Coelomycetes) hide very often in the matrix beneath patches with *Coronophorales*. Associated Coelomycetes have now and then been taken as their conidial states, but there are in fact no trustworthy indications of any imperfect states whatsoever within the whole group.

In *Coronophora* s. lat. (i.e. incl. *Cryptosphaerella*; Munk 1957: 289), a genus studied only cursorily by me, the ascocarps develop as a rule in small clusters, often standing in a circle of 5–8, on the inner-bark, lifting the periderm and eventually becoming visible through cracks in it. In *Bertia moriformis*, on the contrary, the ascocarps are scattered to gregarious and grow superficially on hard decorticated wood. In *N. parasitans* as well as in *N. broomeiana* the ascocarps (some tens in number) are mostly crowded in rather compact small cushions. In most other species the ascocarps are gregarious, forming distinct rounded patches of different density and size, superficial from the beginning or at most hidden by lifted but partly still attached flakes of periderm and/or inner-bark. It seems doubtful if any species has a true basal stroma of its own; anyhow a distinction between species with and such without stroma cannot be upheld.

**Subiculum.** The bases of the ascocarps are surrounded by undulating, richly branched, thick-walled, dark hyphae, which may be rather short, scarce and inconspicuous as in e.g. *Bertia moriformis*, *Coronophora* spp. *N. broomeiana*, and *N. parasitans*. In other species such superficial hyphae form large patches, either as a loose network or as a continuous,  $\pm$  dense subiculum, which may be so thick as to bury the ascocarps, e.g. in *N. acanthostroma*, *N. chaetomioides*, and *N. similis*. In several species the amount of subiculum is very variable and dependent on external conditions, e.g. in *Ac. tristis* and *N. collapsa*. In still other species, e.g. *N. cupularis* and *N. grevillii*, it rarely exceeds the state of a loose network. The subiculum seems as a rule to be better developed on periderm than on inner-bark or lignum, but, on the other hand, cavities and hollows on inner-bark and wood as well as gaps between them are often stuffed by subicular hyphae (comp. Petrak 1923: 277–278 for *Ac. tristis*). In *N. callista* the relatively scanty subiculum is nevertheless rather conspicuous as it is clear brown and thus much paler than the ascocarps. Its hyphal walls are unusually pale and thin. In *N. acanthostroma*, as alluded to in the specific epithet, the subicular hyphae are richly adorned with thornlike lateral processes (Fig. 1j; Werdermann 1923; Arx & Müller 1954: 379).

In *Acanthonitschkea* the subiculum is armed by scattered, long (up to 500  $\mu$ m), stiff, thick-walled, non-septate, tapering and pointed, blackish bristles (basally up to

20  $\mu\text{m}$  in diam.) (Fig. 2 j). In *Ac. tristis* they are especially numerous round the bases of the ascocarps and form there distinct "crowns". In the other species they are present also on the very ascocarps (see below).

**Ascocarps.** Unfortunately, very little is known about the ontogeny of the Coronophoralean ascocarps, and practically nothing about those of the *Nitschkieae*. *Bertia moriformis* has been studied in some detail by Luc (1952) and Parguey-Leduc (1966: 19-26), and *Coronophora gregaria* (Lib.) Fuck. by the latter authoress (l.c. pp. 26-30). Scattered notes are contributed by e.g. Petrak (1921: 182-184, *Coronophora*) and Munk (1953: 34-35, 96-100; 1957: 288-295).

It is evident that the development does not follow the "classical" ascohyemial scheme (i.e. the "Xylaria Type" of Luttrell 1951), the interior of primordia and young ascocarps being filled by a hyaline thin-walled tissue (thus corresponding with Luttrell's "Diaporthe Type"). The asci are formed within this tissue, which changes in various ways and successively dissolves. A central "locule" appears, containing the asci and lined by hyaline compressed cells. The asci are often seen to be attached to a basal large-celled placenta-like cushion or to some few smaller lateral ones. Such a basal "coussinet ascogène" was described and depicted in *Bertia* by Luc (l.c.) and Müller & Arx (1962: 817). It has also been observed by me, but Parguey-Leduc (l.c.) could not find it. I have seen similar structures in several other species, and Arx & Müller (1954) show them in *N. acanthostroma* (fig. 116) and *N. similis* (fig. 117), Müller & Arx (1955) in *N. confertula*, Sivanesan (1974: 38, fig. 2 a) in *N. leonensis*.

The basic shape of the mature ascocarp in **Fitzpatrick's Nitschkieae** (well shown in his excellent photographs) is turbinate or kettledrum-like and (especially when dry) collapsed into cup-shape. There is no true (perforated) ostiolum but mostly a distinct apical papilla. The surface is finely to coarsely tuberculate. Enclosed in the upper part is the  $\pm$  flattened locule. *N. broomeiana* (= *Fracchiæa heterogenea*) is extreme by its unusually robust and firm ascocarps, which only rarely collapse.

In some species the ascocarps have a voluminous base, so high that they look stipitate and their heights exceed their widths, but in others it is almost absent, the dry ascocarps looking as sessile apothecia. The first case may be exemplified by *N. calyculus* and *N. parasitans*, the second by *N. collapsa*, *N. pezizoidea* and *N. tetraspora*.

The size of the adult ascocarps varies within rather wide limits, but is rather constant in the individual species. The smallest ascocarps (ca. 0.2-0.25 mm across) are those of *N. parasitans*, the usual size is 0.3-0.5 mm, and in some species (e.g. *N. collapsa* and *N. broomeiana*) they may reach 0.8 mm.

The peridium is a coriaceous (not carbonized) pseudoparenchyma of in the outer parts brown-walled, rather large cells. When there is a stipe-like base, its internal cells are prolonged vertically and arranged in slightly divergent rows. The external

tuberculations are formed by aggregations of  $\pm$  globose cells with walls thicker and darker, especially peripherally. In a few species some peripheral cells run out into pointed, spine-like processes, which in *N. brevispina* have an average length of ca. 10  $\mu\text{m}$  (Munk 1957: 185, fig. 67) and in *N. broomeiana*, where they often are forked and/or provided with secondary "barbs", may reach a length of 25  $\mu\text{m}$  or more. In *Ac. argentinensis*, *Ac. foveolata* and *Ac. pulchella* the ascocarps are armed with a restricted number of easily broken-off bristles agreeing with those of the subiculum (see above).

The basic shape of the ascocarps in **Höhnel's Coronophoreen** (excl. *Coronophorella*) is subglobose or broadly ellipsoid, without ostiolum and apical papilla, shrivelling irregularly on drying and only rarely distinctly tuberculate. The ascocarps are relatively large, in some species (e.g. *Coronophora gregaria*) even very large, reaching almost 2 mm in diameter. The structure of the peridium agrees with that in the *Nitschkieae*. The ascocarpic wall is only slightly thicker basally.

In the two genera later added to the *Coronophorales*, *Bertia (moriformis)* and *Gaillardielliella (pezizoides)* the ascocarps possess well developed basal parts. In the former the ascocarps are subcylindrical, large and high (up to  $0.7 \times 1$  mm) and very coarsely tuberculate (whence the specific epithet). They have no apical papilla and do not collapse on drying. The apex is unrecognizable externally because of the tuberculations, but thin, exactly median sections show a small "plug" with special anatomy simulating an ostiolum (Figs. 1a, b). Due to its minuteness the "plug" was missed by Luc, Munk, and Parguey-Leduc, but it was illustrated and described by Müller & Arx (1962: 816–818).

The ascocarps of *G. pezizoides* are also rather large (up to  $1.1 \times 1.1$  mm) and subcylindrical but collapse cupulately on drying. The extant material (in FH) is now so poor that we have in the main to rely upon the detailed studies by Petrak (1953a) and Müller & Arx (1952: 818–820). The latter authors, who also draw a section, recognized it as Coronophoralean. It approaches *Nitschkia* by the collapsing ascocarps, but deviates markedly by their size and, especially, by the strong circular thickening of the peridium round the "cup".

"Munk pores" (Nannfeldt 1975: 51) have been observed in all members studied by me, thus also in the large-fruited (true) *Coronophora gregaria*, where Munk himself failed to see them, but their obviousness is very variable, depending both upon the species and the stage.

The pores are ca. 1  $\mu\text{m}$  in diam. and surrounded by a ring-shaped thickening of the wall, which makes them look like miniatures of the ring pores of the conifers (Fig. 2e). Their number varies with the species. As a rule the common wall between two cells shows only one pore, but on some occasions a higher number seems out of doubt.

By the way it may be mentioned that Patouillard seems to have been the first to observe these pores. He drew them carefully in a pencil sketch accompanying the type specimen of his

*Gaillardia pezizoides*, where they are both numerous and conspicuous, but his observation did not appear in print.

Towards the locule the peridial cells become flattened and their walls thinner and paler. The cells lining the locule are hyaline-walled and almost compressed. Apart from the  $\pm$  strongly developed base the peridium is of almost uniform thickness, except that, in some species without a "Quellkörper" (see below), the brown layer is distinctly excavated apically, the hyaline tissue intruding into the papilla as a dome or flat cone, e.g. *N. broomeiana* (Figs. 2a, b), *N. collapsa* (Fig. 2h), *N. grevillii* (Figs. 2c, d; further ill. Müller & Arx 1962: 815=1973: 92), and *N. tetraspora*. If Petrak's description and drawing (1952d) of *N. velutina* are correct, the brown layer has (almost) disappeared apically and no papilla is visible in it. The hyaline tissue shows always special structures below the papilla (see below), and due to their firmness the papilla persists or becomes even more prominent after drying.

Much has been written about the mode of spore discharge in the *Coronophorales*, but little is in fact known about what happens in nature. Fuckel (1871: 324) describes his *Coronophora macrosperma* (a true *Coronophora* fide Höhnelt 1918: 137) with "ascis ut massa hyalina expulsis", and Patouillard & Gaillard (1889: 107) remark about their *N. multiasca*:—"Le contenu des périthèces s'échappe sous forme d'une masse blanche". Boudier (1910a: pl. 574) depicts his *Trichosphaeria vagans* (= *N. collapsa*) with slime drops crowning some ascocarps and comments (1910b: 340): "les uns émettent des globules de spores et d'autres sont dépressés circulairement près de l'ostiole après leur sortie". My sole personal observation is that, in a fresh sample of *N. parasitans* (Holm 175a), a few minutes after thorough wetting some mature ascocarps ruptured on one side by an irregular subequatorial slit and opened as by a hinge, thus exposing the slimy spore mass. In the same way behaved also an old, very well developed herbarium sample (Romell 15834, S).

The textbook descriptions are taken from Höhnelt's detailed accounts, but these are based on his experiments with herbarium material, placing ascocarps in water and studying them in the microscope. They must thus be taken *cum grano salis*. He found that in *Coronophora annexa* (Nke) Fuck. (1906: 662–663) and *N. chaetomioides* (1910: 1505–1507) mature ascocarps swelled, their peridium burst apically, a hyaline sack protruded and emptied its contents of spores embedded in slime through an apical, gelatinized pore. Afterwards a compact subcylindrical body with transversely elongated cells with strongly gelatinized walls became visible. He interpreted this body as a rest of the contracted sack. He studied later (1918: 136–137) richer material of the former species and found his earlier interpretation to have been erroneous, for the gelatinized body was present also in unopened ascocarps, hanging down from the apex of the locule. These bodies were now considered as "Quellkörper, die im Augenblicke des Aufreissens der Perithezien sich plötzlich stark vergrössern, das Perithezium zum grossen Teil ausfüllen und

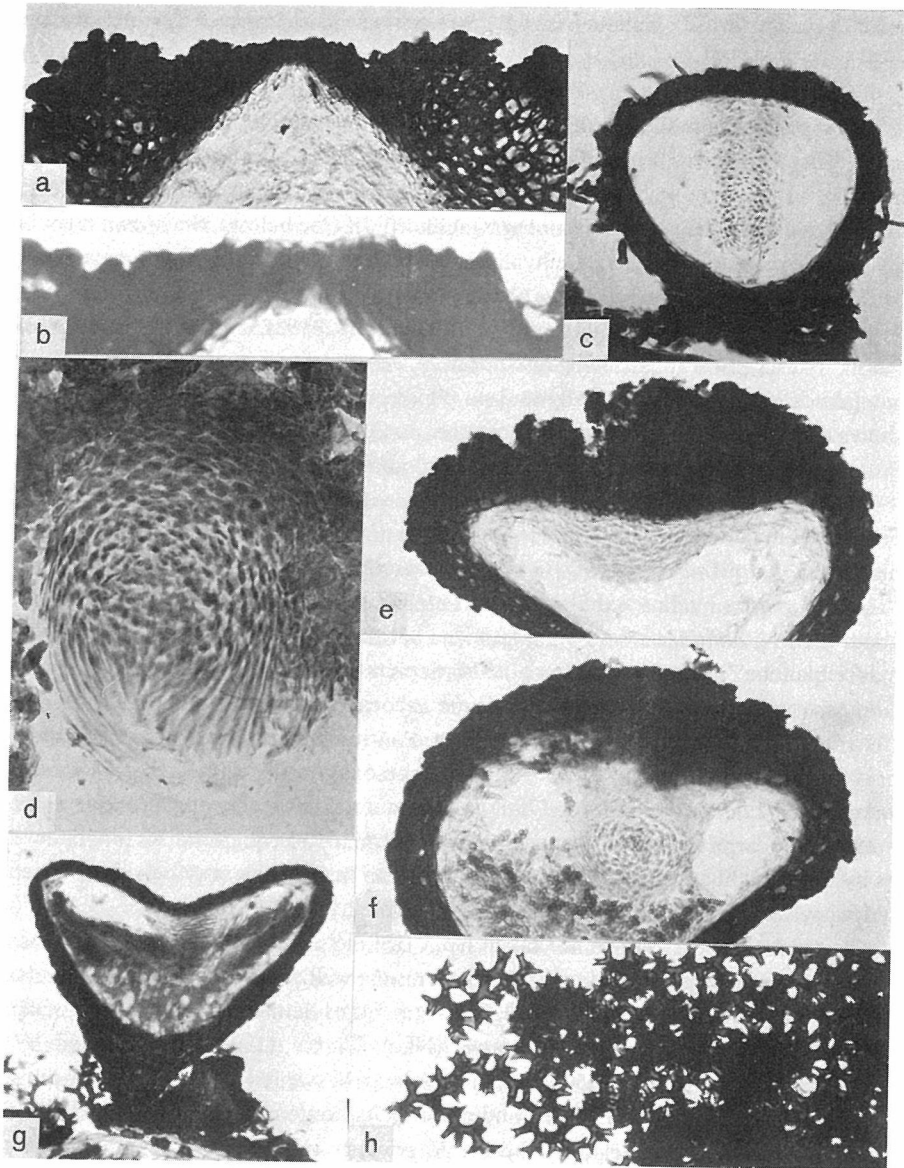


Fig. 1. (a, b) *Bertia moriformis* 3.x.1948 Lundell UPS) median sections of ascocarps showing the ostiolum-like apical structure of the peridium (ca. 200 $\times$ , ca. 450 $\times$ ). — (c) *Nitschkia chaetomioides* (IMI 40291r) median section with "Quellkörper" (ca. 160 $\times$ ). — (d) *N. callista* (Sturgis UPS) top of "Quellkörper" with periphysis-like hyphae (ca. 400 $\times$ ). — (e, f) *N. confertula* (Curtis UPS) eccentric sections, e showing the enlarged base of a "Quellkörper", f showing a curved "Quellkörper" in cross-section (ca. 160 $\times$ ). — (g) *N. acanthostroma* (IMI 53244) median section (ca. 160 $\times$ ). — (h) *N. acanthostroma* (Moller COI) subicular hyphae (ca. 250 $\times$ ).



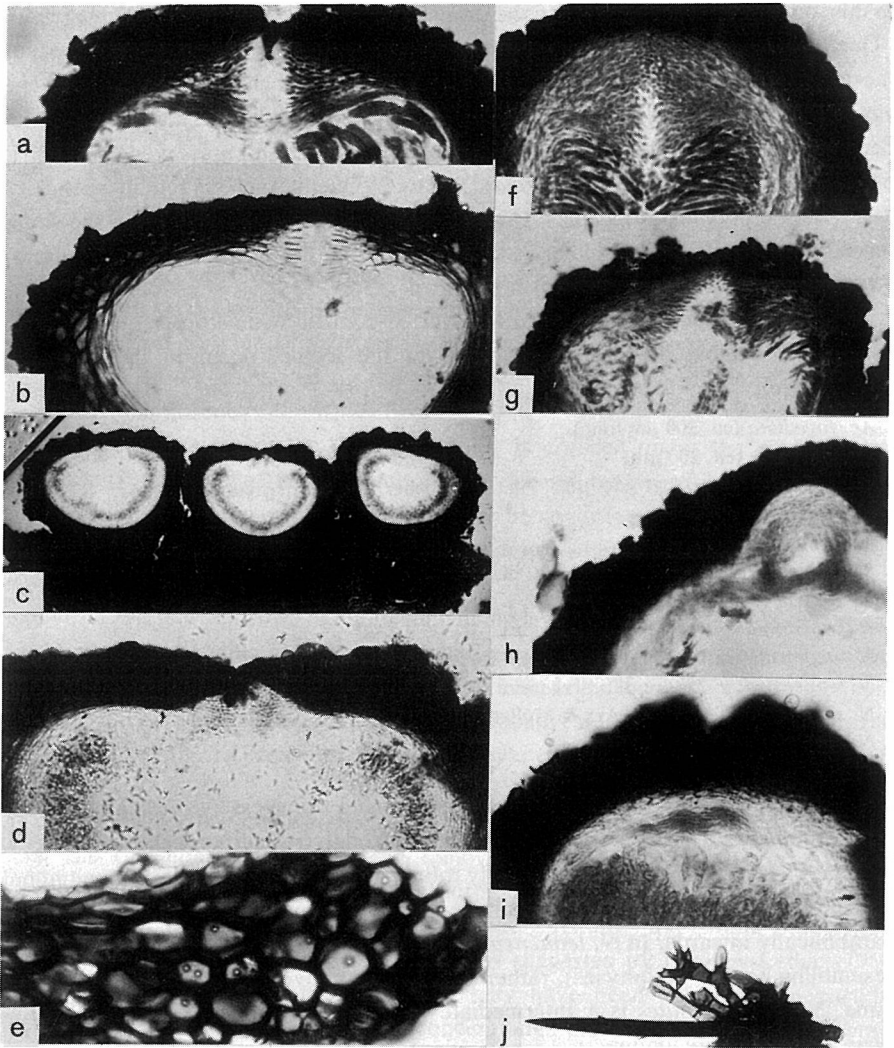


Fig. 2. (a, b) *Nitschkiopsis broomeiana* (1888 Bresadola UPS and IMI 139 074) median sections of ascocarps, an older stage in b (ca. 150 $\times$ ). — (c, d) *N. grevillii* (IMI 68040) median sections (ca. 40 $\times$ , ca. 150 $\times$ ). — (e) *Acanthostromella foveolata* (Malme S) "Munk pores" (ca. 400 $\times$ ). — (f, g) *N. parasitans* (Munk UPS and IMI 9901) median sections, an older stage in g (ca. 250 $\times$ , ca. 150 $\times$ ). — (h) *N. collapsa* (Romell 15823 S) and (i) *N. florida* (Hb. Fitzp. 1896 FH) median sections (ca. 150 $\times$ ). — (j) *Ac. foveolata* (Wright LPS) subicular bristle (ca. 200 $\times$ ).

hierdurch den Nukleus aussleudern". The same structure was independently described and depicted by Werdermann (1923) in *N. acanthostroma*.

When revising *Fracchiaria* Fitzpatrick (1924) took for granted that "Quellkörper" were structures unique (but not obligatory) to Höhnel's "*Coronophoreen*" and alien

to his own *Nitschkieae*, and so he transferred three alleged *Fracchiaeeae* with "Quellkörper" and cupulate ascocarps to Höhnel's group. In the present paper these species are put back into Fitzpatrick's group and included in *Nitschkia*. The year before, when establishing his *Nitschkieae*, Fitzpatrick (1923) had evidently not become observant of this structure, for in one of his own still preserved slides (FH) of *Ac. macrobarbata* (i.e. *Ac. foveolata*) a large "Quellkörper" is readily seen.

It must be presumed that the "Quellkörper" play an important rôle in the spore discharge or at least have played such a rôle during the evolution of the *Coronophorales*, but how they function is not known.

Such  $\pm$  prolonged subcylindrical to inverted-conical "Quellkörper", which may even reach almost down to the bottom of the locule, occur in the following *Nitschkieae*:

*Ac. foveolata* (ca. 300  $\mu\text{m}$  long)

*Ac. pulchella* (ca. 200  $\mu\text{m}$ )

*N. acanthostroma* (ca. 250  $\mu\text{m}$ ; Fig. 1g, further ill. Werdermann 1923, Arx & Müller 1954: 379 (inaccurate))

*N. affinis* (rather short?)

"*Fracchiaea australis*" (ca. 200  $\mu\text{m}$ ; ill. Fitzpatrick 1924)

*N. callista* (rather short?; Fig. 1d)

*N. chaetomioides* (ca. 300  $\mu\text{m}$ ; Fig. 1c)

*N. confertula* (rather short; Figs. 1e, f, further ill. Müller & Arx 1955 (inaccurate))

*N. leonensis* (ca. 250  $\mu\text{m}$ ; ill. Sivanesan 1974)

*N. similis* (ca. 200  $\mu\text{m}$ ; ill. Arx & Müller 1954)

*N. uniseriata* (ca. 120  $\mu\text{m}$ ).

The "Quellkörper" consist of concentrically and transversely orientated, firmly conglutinated cells with very thick, hyaline, strongly refractive walls and narrow lumina (Figs. 1c, d, f). The parabolically rounded apex shows a fringe of longitudinal hyphae. In *N. callista* these hyphae have thick walls and narrow lumina and curve parabolically inwards. In *N. leonensis* they are thin-walled with larger lumina (thus resembling normal periphyses), rather straight and convergent as to circumscribe a cone. *N. chaetomioides* is  $\pm$  intermediate with curved and rather thick-walled hyphae but still ample lumina.

In other *Nitschkieae* the "Quellkörper" is replaced by a low perforated "cushion". Höhnel (1918: 138) found that in *Fracchiaea heterogenea* (= *N. broomeiana*) the hyaline layer of the peridium thickens apically (from ca. 20  $\mu\text{m}$  to ca. 70  $\mu\text{m}$ ), "ist hier rundlich durchbrochen und löst sich hier in einen Kranz von Periphysen auf. Diese innere hyaline Schicht hat daher ein typisches Ostiolum". Such "cushions", which may be interpreted as either incipient or reduced "Quellkörper", have so far been observed in:

*Gaillardella pezizoides* (ill. Müller & Arx 1962)

*N. brevispina*

*N. broomeiana* (Figs. 2a, b)

*N. collapsa* (Fig. 2h)

*N. cupularis* s. orig.

*N. floridana* (Fig. 2i)

*N. grevillii* (Figs. 2c, d, further ill. Müller & Arx 1962, 1973)

*N. parasitans* (Figs. 2f, g)

*N. velutina* (ill. Petrak 1952d).

The "cushions" of *N. parasitans* (Figs. 2f, g) with its peerlessly small ascocarps are of special interest, for their hyphae are unusually periphysis-like and leave a relatively large, upwards tapering, empty canal reaching the brown, outer peridial layer, which shows no sign of an opening, not even of an excavation.

With regard to Höhnel's "Coronophoreen" it may suffice here to note that *Cryptosphaerella* is marked by the presence of "Quellkörper" and *Coronophora* s.str. by their absence.

When an ascocarp of the *Coronophorales* is crushed under the cover-slip the locule surrounded by a hyaline membrane may sometimes protrude as a closed sack. I have not been able to establish, whether this behavior is peculiar to certain species only and/or to certain stages. Nor do we know, whether this behavior has any counterpart in nature or is a mere artifact (comp. Höhnel's observations cited above). Cells and cell-rows of the hyaline lining layer loosen often in squash-mounts and represent certainly the paraphyses and pseudoparaphyses of various previous descriptions. The readiness with which the lining layer loosens from the peridium strongly favours a supposition that, ontogenetically, this layer is part of the locule, i.e. of the (perithecial) centrum sensu Wehmeyer (1926) et Luttrell (1951), not of the peridium.

In my opinion, the above comparative studies of the ascocarps show convincingly that the *Coronophorales* (after the removal of *Thaxteria*, *Rostricornophora*, *Spinulosphaeria* and some odd species) form a most natural unit. The close agreement in structure and texture and such striking features as "Munk pores" and "Quellkörper" make a double origin such as suggested by Parguey-Leduc (1966) most improbable, to say the least. She may have been influenced in part by Chadefaud's (1960: 588-589) confused conception of the *Coronophorales* as embracing also such fungi as *Calosphaeria princeps* Tul. and *Enchnoa infernalis* (Kze ex Fr.) Sacc.

With regard to the shape and structure of the ascocarps Fitzpatrick's *Nitschkieae* form a very homogeneous group, to which also *Fracchiaea* belongs and *Gaillardielli* shows close affinity. Höhnel's *Coronophoreen* (i.e. *Coronophora* s.lat.) form a second very homogeneous, smaller group, whereas *Bertia* alone stands out as a third group, but the differences are not profound enough to motivate different families.

**Asci.** As already mentioned, the ontogeny of the asci is not sufficiently known. Most asci of a locule are in about the same stage, and young asci are relatively rarely seen, suggesting that the early stages pass rather rapidly.

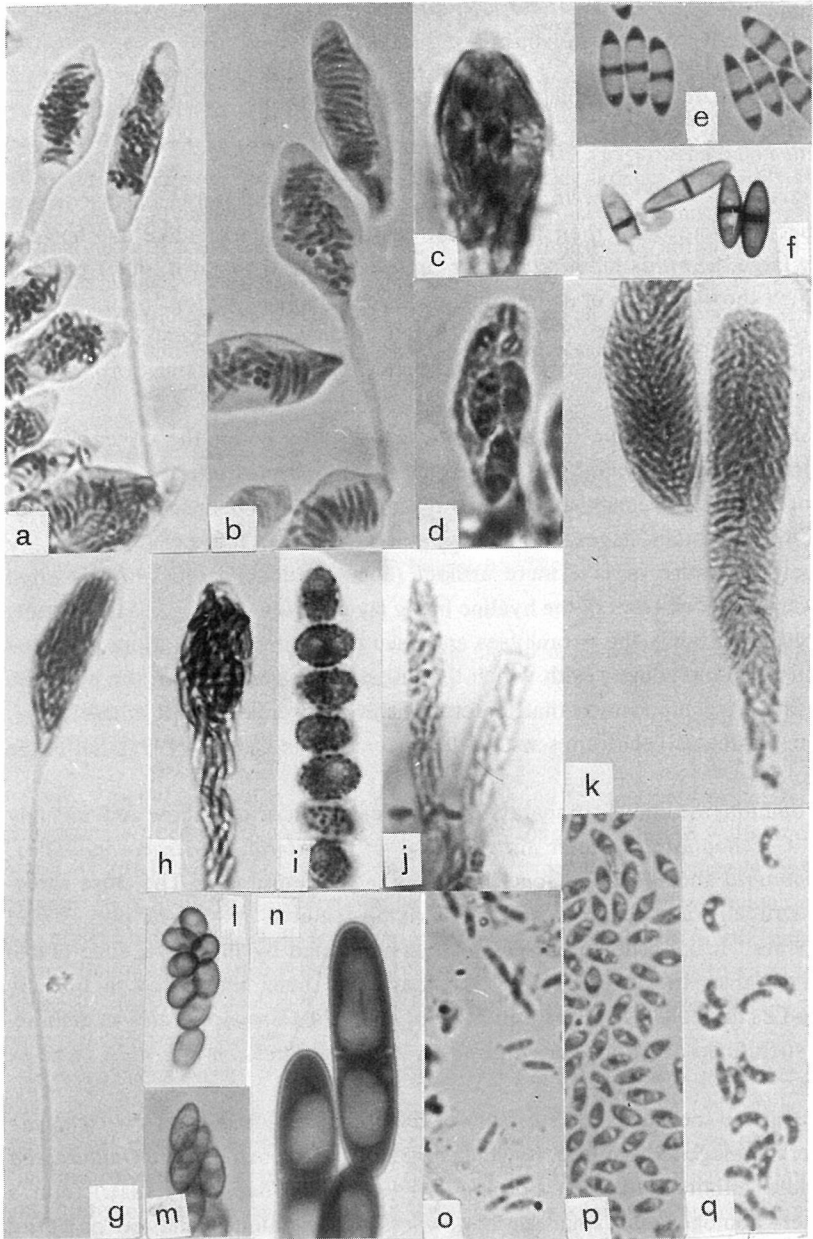


Fig. 3. (a, b) *Coronophora annexa* (Krieg., F. sax. 968) asci (ca. 725 $\times$ , ca. 900 $\times$ ). — (c–f) *Nitschkia collapsa* (c, d: 28.iii.1908 Lind C; c in Lactic Blue, d in glycerine with Congo Red) asci, the apical cylinder clearly seen in d (ca. 1600 $\times$ ); (e, f: Romell 15823 S) spores (ca. 900 $\times$ ). — (g) *C. gregaria* (Petr., Myc. gen. 1567) ascus (ca. 725 $\times$ ). — (h) *N. callista* (Rel. Farl. 706), (i) *N. uniseriata* (typus), and (j) *N. affinis* (typus) asci (ca. 900 $\times$ ). — (k) *N. broomeiana* (Rav., F. carol. 4: 57) asci (ca. 725 $\times$ ). — (l, m) *N. confertula* (Curtis UPS and IMI 144 570) asci (ca. 725 $\times$ ). — (n) *N. gigantospora* (typus), (o) *N. calyculus* (typus), (p) *Acanthonitschkea foveolata* (Malme S), and (q) *Ac. argentinensis* (IMI 38113a) spores (ca. 900 $\times$ ).

Generally speaking, the asci are stipitate, rather thin-walled and obviously unilocular. As a rule the wall deliquesces rather early. The apical apparatus has lost its gun-function and is abortive.

In *Coronophora* the shape of the ascus (Figs. 3a, b, g) is most characteristic (comp. e.g. Parguey-Leduc 1966: 26-30) and repeatedly illustrated. The wall of the mature ascus is relatively firm and slightly thickened in the apical part, which is cylindrical to conical and obtusely rounded. Downwards, often delimited by a slight constriction of the lumen (a "bourrelet sous-apical"), follows the main body of the ascus as a bulging sack, downwards  $\pm$  abruptly constricted into a very long, almost filiform stipe. In a subadult stage the "bourrelet" is much stronger, and so the subapical chamber of the spore-stuffed lumen looks like a stalked head "crowning" the body of the ascus as depicted by the author of the genus (Fuckel 1870 tab. vi, fig. 16) and commemorated in the generic name.

In the *Nitschkieae* the asci are more varied. Those of *N. collapsa* are pictured with an apical wall-thickening and a cylindrical apical apparatus by Boudier (1910a pl. 574) and Lind (1913 tab. iii, fig. 31). Chenantais (1918: 71-72, fig. 5b) depicts two young asci and describes them as follows: "A l'état jeune, ils sont surmontés d'un cylindre hyalin pourvu au centre d'une dépression en entonnoir fermée par un anneau réfringent qui se présente en coupe optique sous l'apparence de deux guttules, analogues à celles des *Diaporthe*, *Melanconis*, *Laestadia* etc.". Fitzpatrick (1923) notes an apical wall-thickening in the same species as well as in *N. cupularis* and *N. grevillii*. Arx & Müller (1964: 815=1973: 92) describe and depict it in the last-mentioned species.

These structures are only faintly seen in lactophenol (and in Lactic Blue) but well shown in water, which certainly was the medium used by the early authors. Although the structures themselves do not take Congo Red, this stain makes them stand out more clearly. Janus Green as a stain has also sometimes proved to be useful as well as glycerine as a medium. In *N. collapsa* the apical thickening is just discernible in Lactic Blue (Fig. 3c), but an ascus in the right stage shows in glycerine and Congo Red an apical perforated cylinder, up to 2  $\mu$ m high and about as broad (Fig. 3d). In *N. cupularis* a distinct wall-thickening is seen with Congo Red. The apex is often truncate and may even show a deep hemispherical invagination.

It seems likely that, at least during some (short) stage, the ascus wall of most (all?) species is thickened apically and has a "bourrelet sous-apical". Thus e.g., in *N. floridana* the tip may show a slight thickening and be truncate and even shallowly concave. In *N. brevispina*, *N. tetraspora*, *Ac. foveolata*, and *Ac. tristis* asci have been seen with the tips constricted into short, truncate cylinders with slightly thickened wall, and in the first also an apical apparatus in the shape of a low, perforated cylinder taking Janus Green. In *N. parasitans* a distinct wall-thickening has been observed and, occasionally, also an abortive ring has glimpsed as two indistinct points (comp. Chadeaud 1960: 587 fig. 444: 2 as *N. cupularis*).

The shape of the (mature) ascus is as a rule  $\pm$  clavate to fusiform with the spores disorderly in several rows. In a few species they are  $\pm$  cylindrical, thus in *N. affinis* (Fig. 3j), where they are rather truncate, and in *N. uniseriata* (Fig. 3i), where the eight spores are uniseriate and often transversely orientated. Tendencies to transverse spore orientation are pronounced in both *Coronophora* and the *Nitschkieae*, thus in *Coronophora annexa* (Figs. 3a, b) with its polysporous asci and allantoid spores, and in an early stage in *Ac. foveolata*, when the eight spores are also uniseriate.

**Number of spores.** True polyspory (sensu Martens 1937) is common within the *Coronophorales*, and the number of spores per ascus is then often about 32.

All species of *Coronophora* s.lat. are polysporous. To judge from the literature (e.g. Höhnelt 1906, 1907; Munk 1957) the number of spores should normally be about 32, but one (anonymous) species illustrated by Munk (l.c. fig. 111 c) seems to possess only about 16 spores, and *C. annexa* as illustrated by Miller (1949: 100 fig. 31) shows much more than 32. My own observations on the latter species (Krieger, F. sax. 968) indicate that the number often approaches 64, but that some asci have only about 32. About 64 seems to be the normal number in *C. gregaria* (several collections).

In *Bertia moriformis* the asci are 8-sporous, and so they are in the majority of the *Nitschkieae*, but six species have about 32 spores per ascus, viz. *Ac. pulchella*, *N. affinis*, *N. callista*, *N. leonensis*, *N. multiasca*, and *N. similis*. Deviations from even multiples are not rare and in some species rather the rule. Thus in *N. affinis* and *N. leonensis* numbers about 25 seem to be the most common, but in the latter species I have observed numbers up to about 32 and down to about 16.

*N. broomeiana* offers an extreme case not only by the high number of spores (>200) per ascus but also by their extraordinary and most characteristic arrangement, excellently described by Fitzpatrick (1924: 108): "in several longitudinal rows, each spore lying obliquely with its lower end towards the ascus wall and its upper end towards the interior". I know of only one similar arrangement, and that was kindly pointed out to me by Dr. N. Lundqvist, viz. the oblique orientation of the spores in the young ascus of *Podospora setosa* (Wint.) Niessl (comp. Lundqvist 1972 pl. 28 fig. d).

My new African *Nitschkia* deviates in the opposite direction. Though 8 spores are formed in the ascus, only four of them reach maturity (hence the epithet *tetraspora*), become fusiform and get a coloured wall. The remaining four (as a rule the basal ones) remain as acicular to narrowly fusiform, very thin-walled bodies with homogeneous plasma and sometimes a spurious septum. They are best seen just after the deliquescence of the ascus wall, as they deliquesce later soon themselves.

**Spore size, shape, septation and wall.** The spores are mostly relatively small, sub-allantoid to boomerang-shaped, until late or permanently continuous with thin,

smooth, long or permanently hyaline walls, without germ pores or germ slits, without gelatinous sheaths, and at least in some stages, with distinct drops or droplets,  $\pm$  constant in number.

Strikingly divergent are the spores of *Bertia moriformis*. They have the usual appearance but are of another magnitude ( $30-50 \times 5-6 \mu\text{m}$ ), become normally 1-3-septate but may occasionally get up to 7 septa (Hawley 1923: 223). About as large are the spores of *N. gigantospora* (Fig. 3 n) and *N. macrospora*.

Suballantoid, permanently hyaline and sometimes eventually 1-septate spores (as a rule  $8-12 \times 1-2 \mu\text{m}$ ) characterize almost all species with polysporous asci (both in *Coronophora* and in the *Nitschkieae*) but also some with 8-sporous, e.g. *N. parasitans*. The allantoid spores of *Ac. argentinensis* (Fig. 3 q) are extreme both in their minuteness (ca.  $5-8 \times 2 \mu\text{m}$ ) and in their curvature (often semicircular or horseshoe-like). In some species the subcylindrical spores are only slightly curved to almost straight, e.g. in *N. calyculus* (Fig. 3 o), *N. grevillii* and *N. cupularis*.

A peculiarity, on which two monotypical genera have been based, is the apical appendiculation of the spores in *N. velutina* (*Biciliospora*; not seen by me) and *N. similis* (*Scortechiniella*). The spores of the latter show also another, hitherto unnoticed peculiarity, unique within the *Coronophorales*, viz. a spiral twisting (up to  $90^\circ$ ).

In *N. confertula* (Figs. 3 l, m) the spores are  $\pm$  reniform, inequilaterally ellipsoid or ovoid, get early coloured (smoky-grey) walls but remain unseptated. In *N. collapsa* (Figs. 3 e, f) and *N. tetraspora* (Figs. 4 b, c) the spores are straight, become early fusiform and distinctly 1-septated, and get early coloured walls.

Only one species (*N. uniseriata*) has an ornamented wall and is so an analogon to *Lasiosphaeria punctata* Munk (1957: 114-115) in that genus. At a certain stage, when still within the ascus, the spores of *N. uniseriata* possess distinct cyanophilous warts on the hyaline wall (Fig. 3 i), but in fully mature spores with coloured wall the warts have been reduced to a barely visible roughness.

**Taxonomic conclusions.** The above comparative studies on asci and spores reveal a surprisingly wide variation, but this does in no way weaken the conclusion of the homogeneity of the *Coronophorales*, won by the morphological studies on the ascocarps.

The peculiar ascus shape, the polyspory, and the spore shape can be added to the characteristics of *Coronophora*. *Bertia* keeps its isolated position. But the variable features within the *Nitschkieae* do not show any correlation *inter se* nor with features in the ascocarp morphology and disclose no evolutionary trends. On the other hand, they demonstrate convincingly the futility of genera in this group, based exclusively on such characters, and this invites to a complete merging of all the *Nitschkieae* into one genus. However, four species stand out by the addition of a peculiar morphological structure, viz. the long, stiff, dark bristles on the subiculum

and, in three of them, also on the ascocarps. These bristles are exactly alike in all species, and their monophyletical origin can hardly be questioned. Even if the species are not homogeneous as to "Quellkörper" and spore number I find it motivated and preferable to treat them as a separate genus (*Acanthonitschkea*) distinct from the bristle-less *Nitschkia*.

My conclusion is thus that all Coronophoralean fungi so far known should be treated as one family (*Nitschkiaceae*) with *Coronophora*, *Bertia*, *Gaillardiella*, *Nitschkia* and *Acanthonitschkea* as the genera.

The establishing of the correct name for the combined family offers its problem. To those who accept "Familie der Coronophoreen" (Höhnelt 1907) as a valid name, *Coronophoraceae* by priority becomes the correct name. But to those who—like myself—consider the Latin ending as a *sine qua non*, *Coronophoraceae* and *Nitschkiaceae* are of the same age (Nannfeldt 1932), and so we have to follow Miller (1949: 121) in using *Nitschkiaceae*, for as far as I am aware he was the first to combine the two families.

In this family, and especially in the "*Nitschkieae*", evolution and speciation have worked with "Quellkörper", ascus structures and spore shape, whereas ascocarp shape and peridium structure have remained fairly constant. The family affords thus a striking contrast to another aberrant, most characteristic and homogeneous group of true Pyrenomycetes recently studied by me, viz. *Boliniaceae* with *Camarops* as the sole genus (Nannfeldt 1972). In that family asci and spores are practically identical in all species, whereas perithecial shape and stromatal size and shape show enormous differences, the stromatal shape varying from almost valsoid to xylarioid, but the variation in stromatal structure is still kept within narrow limits.

It remains to discuss the taxonomic position of the *Coronophorales* (= *Nitschkiaceae*). To-day considerably more is known about the evolutionary trends within the Ascomycetes than it was well 40 years ago. One of the salient features of the *Coronophorales*, the cleistocarp, is now known to have evolved repeatedly and is not *eo ipso* a sign of high taxonomic rank (comp. e.g. Cain 1972: 3–5; Müller & Arx 1973: 96). The abortive apical ascus apparatus is also an obviously polyphyletic phenomenon and in our case a natural consequence of the cleistocarp. The recognition of the "*Diaporthe* Type Centrum" (Luttrell) makes it possible to connect the Coronophoralean locule with more "normal" ascohymenial types.

The features of our group are thus no longer so strange as originally thought, and its place among the true (ascohymenial and unitunicate) Pyrenomycetes seems firmly established. Here it should be understood that, in my opinion, there are no convincing facts in favour of the hypothesis by Chadefaud and his school that unitunicate asci have evolved polyphyletically from bitunicate. Recent investigations on the fine structure of the ascus walls make such repeated transitions even more unlikely (comp. e.g. Griffith 1973).



Next question is then, in what direction the affinities of our group might be sought. Carroll & Munk (1964: 96-97) suggested "that the natural affinities of the *Coronophorales* are very close to the genus *Lasiosphaeria*", the crucial species being their new *L. noonae-daniae*. Its ascocarps are ostiolate, and its spores germinate by phialides, but otherwise it exhibits a number of Coronophoralean features: tuberculate peridium, radiating vertical cell-rows in the bases of the ascocarps, "Munk pores" (also in *L. tuberculosa* Carroll & Munk), stipitate asci without any apical apparatus. An additional indicium is the cyanophilous network of longitudinal, anastomosing cytoplasmic ribs on the inside of the wall in emptied asci. A possible connection in about the same direction (with *Bombardiella* and *Bombardia*) was surmised already by Theissen (1917).

With Carroll & Munk's suggestion as the working hypothesis we shall now continue the comparison between the two groups. As the Coronophoralean asci as a rule deliquesce early, cyanophilous ribs have not been sought for. "Munk pores" have been found in all *Coronophorales* and also in *Thaxteria* and *Spinulosphaeria* (? comp. above), two genera above transferred to *Lasiosphaeriaceae*. Diverging vertical cell rows in the basal peridium occur in all *Coronophorales* with "stipitate" ascocarps, and the same trend has been found by Parguey-Leduc (1967: 373) in another ally ("*L. ovina*" = *Bombardia* (?) sp. fide Lundqvist 1972: 77). It occurs also in *Thaxteria* and *Spinulosphaeria*. The peridium structure is very uniform in our group, highly diverse in *Lasiosphaeria*, including such of Coronophoralean type. The "Quellkörper" are unique to our group but the "apical cushions" of the locules of some species resemble closely the periphysate "inner" ostiola in *Lasiosphaeria* (comp. Parguey-Leduc 1973: 75 fig. 4D), and so do the fringed tips of the "Quellkörper". The simplification of the ascus structures in our group is well on the line with similar trends within *Lasiosphaeria* and allies. The spore germination by phialides is a peculiarity within the *Lasiosphaeriaceae*, where the spores as a rule are large and 8 per ascus but extremely varied as to shape, septation and colour. A few *Coronophorales* have large spores, but the majority medium-sized to small. True polyspory (combined with allantoid spores) is widespread in our group. Hypersaprophytism is common in both groups.

My final conclusion is thus that there are no longer sufficient reasons for keeping our group as an order of its own but that it still deserves the rank of an independent family (*Nitschkiaceae*), which should be regarded as a highly specialized "satellite" group derived from *Lasiosphaeriaceae* sensu Lundqv. It will presumably—like that family—be found to have its place in a remodelled order *Sordariales* (comp. Lundqvist 1972: 55-56).

### 5. The Species of *Nitschkia*

The considerations in the preceding Chapter result in a wholesale reduction of the number of accepted genera and in the following long nomenclator for *Nitschkia*,

embracing no less than 16 generic names based on its well 20 species. (In the nomenclators for the individual species appear a total of 20 additional generic names that *Nitschkia* have been described under or combined with and as synonyms 20 specific and infraspecific epithets!)

Somebody may consider it a mere waste of paper to publish these nomenclators in such detail, but the bitter words on the polypores by my late friend M. A. Donk are of general applicability: "During these activities I encountered a complaint dating from as long as 150 years ago that revealed that a failing common to many a modern author is of long standing: 'The practice of accurately examining the synonyms, instead of copying them from other authors, has been too long neglected' (Purton, App. Midl. Fl. 335. 1821). The failing has culminated in a number of errors and puzzles in references in some of the much used European publications that is really stupendous" (Donk 1974: 5-6).

**Nitschkia** Otth in Fuck., Symb. mycol. p. 165 (1870; nom. nud.); ex Karst., Mycol. fenn. 2: 13 (1873). — Lectotypus: *N. fuckelii* Nke=*N. cupularis* sensu Karst., i.e. *N. parasitans*.

[*Cyathisphaera* Dum., Comment. bot. p. 87 (1822) p.p. (vide Nannfeldt 1975: 60-61).]

*Coelosphaeria* Sacc., Atti Soc. Ven.-Trent. Sci. Nat. 2(2): 163 (xii.1873) — Nom. nov. pro *Nitschkia*, diatomearum generis *Nitschia* Hassall causa; nom. nud. et superfl. (cp. Nannfeldt l.c.).

*Fracchiaea* Sacc., ibid. (xii.1873). — Typus: *Fr. heterogenea* Sacc., i.e. *N. broomeiana*.

*Echusia* Hazsl., Verh. zool.-bot. Ges. Wien 23: 367 (xii.1873). — Typus: *E. Vitis* "(Schulzer)" Hazsl. [non *Gibbera Vitis* Schulzer], i.e. *N. broomeiana*. — Syn. fide Höhnel 1920: 130-131.

*Scortechinia* Sacc. in Sacc. & Berl., Atti R. Ist. Venet. Sci. Lett. Art. 6(3:4): 713 (1885). — Typus: *Sphaeria acanthostroma* Mont.

*Tympanopsis* Starb., Bih. K. Sv. Vet.-Akad. Handl. 19(3:2): 24(1894). — Typus: *Sphaeria euomphala* Berk. & Curt., i.e. *N. confertula*.

*Winterella* Berl., Icon. fung. 1(3): 94 (1892) [non *Winterella* O. Kze (1891) nec *Winterella* Sacc. (1899)]. — Typus: *Winteria tuberculifera* ("tuberculigera") Ell. & Ev., i.e. *N. grevillii*.

*Winterina* Sacc., emend. Sacc. & Syd. in Sacc., Syll. fung. 14: 589 (1899) [non sensu orig., Syll. fung. 9: 909 (1891)]. — Lectotypus: *Winteria tuberculifera* Ell. & Ev., i.e. *N. grevillii*.

*Coronophorella* Höhn., Sitz.ber. Akad. Wiss. Wien, Math.-nat. Kl. 118(1): 1507 (1909). — Typus: *Enchnoa chaetomioides* Penz. & Sacc.

*Teratonema* H. & P. Syd., Ann. Mycol. 15(3-4): 180 (1917). — Typus: *Asterula corniculariiformis* P. Henn., i.e. *N. acanthostroma*.

? *Schizocapnodium* Fairm., Proc. Rochester Acad. Sci. 6(3): 93 (1921). — Typus: *Sch. sarcinellum* Fairm. (comp. below p. 318).

*Calyculosphaeria* Fitzp., Mycologia 15(2): 45 (1923). — Nov. nom. pro *Winterella* Berl.

*Biciliospora* Petr., Sydowia 6(5-6): 429 (1952). — Typus: *B. velutina* Petr. — Syn. ex descr.

*Scortechiniella* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1): 382 (1954). — Typus: *Trichosphaerella similis* Bres.

*Scortechiniellopsis* Sivanesan, Trans. Brit. Mycol. Soc. 62(1): 36 (1974). — Typus: *Sc. leonensis* Sivanesan.

An alphabetical list of the 22 accepted species follows, with nomenclators, published exsiccata (if any) and sketches of their distributions as well as short notes on their diagnostic features. Most of them are readily known by some unique feature or by a combination of two conspicuous features. Thus *N. acanthostroma* by the "spiny" subiculum branches, and *N. callista* by the bright (brown) colour of the subiculum; *N. parasitans* by the small ascocarps (<0.3 mm across); *N. uniseriata* by the uniseriate, rough spores; *N. confertula* by the reniform, unseptated, early coloured spores; *N. broomeiana* by the large asci with numerous (>200), regularly arranged spores; *N. velutina* and *N. similis* by the appendiculated spores, 8 and ca. 32 per ascus respectively; *N. tetraspora* and *N. collapsa* by the fusiform, distinctly 1-septated and eventually coloured spores, long and narrow and only 4 per ascus reaching maturity in the former, shorter and thicker in the latter; *N. macrospora* and *N. gigantospora* by the very large spores, 24-45×6-6.5 μm and 36-45×12-14 μm respectively.

(1) *Nitschkia acanthostroma* (Mont.) Nannf., Sv. Bot. Tidskr. 69(1): 58 (1975).

*Sphaeria acanthostroma* Mont., Ann. Sci. Nat. Bot. 4(3): 126 (1855); Syll. crypt. p. 226 (1856). — *Trichosphaeria acanthostroma* Sacc., Syll. fung. 1: 454 (1882). — *Scortechinia acanthostroma* Sacc. & Berl., Atti R. Ist. Venet. Sci. Lett. Art. 6(3:4): 714 (1885). — *Bysosphaeria (Trichosphaeria) acanthostroma* Cke, Grevillea 15(=n. 76): 122 (1887). — *Tympanopsis acanthostroma* Müll. & Arx, Phytopath. Zeitschr. 24(4): 365 (1955). — Typus: French Guiana, Leprieur 1163 (PC).

*Sphaeria culcitella* Berk. & Rav. in Rav., F. carol. 4: 53 (1855; nom. nud.); in Berk. & Curt., Proc. Amer. Acad. Arts Sci. (Boston) 4: 128 (1860). — *Scortechinia culcitella* Speng., Anal. Soc. Cie. Argentina 26: 29 (1888). — Lectotypus: Rav., F. carol. 4: 53.

[*Sphaeria aculeata* Berk. & Br. ex Cke, Grev. 15(=n. 76): 122 (1887; nom. nud., ut syn. *Bysosph. acanthostr.*.)]

*Asterula corniculariiformis* P. Henn., Hedwigia 36(4): 218 (1897). — *Teratonema corniculariiforme* H. & P. Syd., Ann. Mycol. 15(3-4): 180 (1917). — Typus: Brazil, S<sup>ta</sup> Catarina, Möller 228 (S!).

*Orbicula Richenii* Rick, Ann. Mycol. 2(3): 245 (1904). — Typus: Rick, F. austro-amer. 1.

EXS.: Ell. & Ev., N. Amer. F. 2: 2356 (*Trichosph. ac.*) PAD!, UPS! — Rav., F. carol. 4: 53 (*Sph. culc.*) UPS!. — Rick, F. austro-amer. 1 (*Orb. Rich.*) PAD!, S!.

[Non: Theiss., Dec. f. bras. 90 (*Trichosph. ac.*)=*Chaetosphaerella sp.*]

Subiculum forming large and dense blackish patches, the hyphal terminations characteristically spiny. Ascocarps often almost buried, 0.25-0.4 mm across. Asci 8-sporous. Spores ellipsoid to ovoid, 6-8×3-4 μm, hyaline (or eventually with pale-smoky walls?).

DISTRIBUTION: Widespread in subtropical and tropical regions; known from south-eastern North America (U.S.A.: Florida, Louisiana, South Carolina), Central and South America (Nicaragua, French Guiana, Bolivia, Brazil, Paraguay), Africa (Sao Tomé, Sierra Leone, Uganda, Zaire), Asia (Ceylon, Java, The Philippines) and Australia (Queensland).

**(2) *Nitschkia affinis* (H. & P. Syd.) Nannf. nov. comb.**

*Fracchiaea affinis* H. & P. Syd., Ann. Mus. Congo Bot. 5: 16 (1909). — Typus: Zaire, Vanderyst (S!).

Ascocarps 0.5–0.7 mm. Asci ca. 32-sporous. Spores subcylindrical to narrowly ellipsoid, straight to slightly curved,  $5.5\text{--}7 \times 1\text{--}1.5 \mu\text{m}$ , hyaline, with 2 drops.

DISTRIBUTION: Tropical Africa (Zaire). Only the type collection.

**(3) *Nitschkia brevispina* (Munk) Nannf. nov. comb.**

*Trichosphaeria brevispina* Munk, Dansk Bot. Ark. 17(1): 185 (1957). — Typus: Denmark, Müller, Munk & Nannfeldt (C irreperetus 1973).

Similar to *N. grevillii*. Ascocarps 0.3–0.4 mm; part of the peridial cells prolonged into pointed spines (up to  $20 \mu\text{m}$  long). Asci 8-sporous. Spores subcylindrical to narrowly ellipsoid, slightly curved,  $(7\text{--})10\text{--}16 \times 3\text{--}4 \mu\text{m}$ , hyaline, with 2 large drops, sometimes almost filling the lumen, eventually with a (pseudo?)septum.

DISTRIBUTION: Europe (Sweden, Denmark, Finland, England). Evidently very rare.

**(4) *Nitschkia broomeiana* (Berk.) Nannf., Sv. Bot. Tidskr. 69(1): 60 (1975).**

*Sphaeria (Caesptosae) broomeiana* Berk., Hooker's Journ. Bot. 6: 231 (1854). — *Coronophora broomeiana* Sacc., Syll. fung. 1: 106 (1882). — *Fracchiaea broomeiana* Petch, Ann. R. Bot. Gard. Peradeniya 6(4): 333 (1917). — Typus: Ceylon, Thwaites (K fide Petch).

? *Sphaeria rasa* Berk. in Hook., Fl. N. Zeal. 2: 205 (1855). — *Fracchiaea rasa* Sacc., Syll. fung. 1: 95 (1882). — Typus: New Zealand, Colenso (holotypus: K fide Fitzp.; isotypus: PAD! inutilis 1974).

[*Sphaeria subcongregata* Berk. & Curt. in Rav., F. carol. 4: 57 (1855; nom. nud.); ex Cke, Grevillea 15(=n. 75): 83 (1887; nom. nud., ut syn. *Fr. subconnatae*). —] *Fracchiaea subcongregata* Ell. & Ev., N. Amer. Pyrenom. p. 244 (1892). — Typus: Rav., F. carol. 4: 57.

*Fracchiaea heterogenea* Sacc., Atti Soc. Ven.-Trent. Sci. Nat. 2(2): 163 (1873). — Coll. orig.: "in agro Tarvisino et Patavino, vere, frequens".

*Echusias Vitis* "(Schulzer)" Hazsl., Verh. zool.-bot. Ges. Wien 23: 367 (1873) [non *Gibbera Vitis* Schulzer (1870)]. — *Fracchiaea Vitis* Höhn., Ann. Mycol. 17(2–6): 131 (1920). — Typus: Czechoslovakia, Schulzer v. Müggenburg (n.v.). — Syn. fide Höhnel l.c.

[*Sphaeria brevibarbata* Berk. & Curt. in sched. —] *Cucurbitaria brevibarbata* Berk. & Curt. ex Berk., Grevillea 4(=n. 30): 47 (1875). — *Fracchiaea(?) brevibarbata* Sacc., Syll. fung. 1: 94 (1882). — Coll. orig.: USA, South Carolina, Ravenel 1558 & 1803 (K fide Fitzp.).

*Sphaeria subconnata* Berk. & Curt. ex Berk., Grevillea 4(=n. 32): 141 (1876; nom. illegit.; non *Sph. subconnata* Schw., 1832). — *Coelosphaeria subconnata* Sacc., Syll. fung. 1: 93 (1882). — *Fracchiaea subconnata* Cke, Grevillea 15(=n. 75): 83 (1887); Berl., Icon. fung. 3: 24 (1900). — *Nitschkia subconnata* O. Kze, Rev. gen. pl. 3(2): 501 (1898; "Nitschkea"). — Typus: USA, South Carolina, Ravenel (Curtis 2737 K fide Fitzp.).

*Gibbera moricarpa* Cke, Grevillea 7(=n. 42): 51 (1878). — *Fracchiaea moricarpa* Sacc., Syll. fung. 1: 94 (1882). — Coll. orig.: USA, Georgia, Ravenel 2471 & 2540 (K, NY fide Fitzp.).

*Fracchiaea cucurbitarioides* Speg., Anal. Soc. Cie. Argentina 10(1): 16 (1880). — Typus: Argentina, Spegazzini (LPS fide Fitzp.).

[*Sphaeria subconvexa* Berk. & Rav. ex Cke, Grevillea 15(=n. 75): 83 (1887; nom. nud., ut syn. *Fr. moric.*).]

*Fracchiæa americana* Berl., F. moricolæ 5: 1 (1888; n.v.). — Typus: USA, New Jersey, Ellis 137 (isotypus: NY fide Fitzp.).

*Fracchiæa glomerata* Pat., Journ. de Bot. 3(10): 168 (1889). — Typus: Venezuela, Gaillard 285 (holotypus: PC fide Fitzp.; isotypi duo: S!).

[*Sphaeria pauridia* Berk. & Curt. in sched. —] *Nitschkia pauridia* Cke, Grevillea 20(=n. 96): 107 (1892). — *Fracchiæa pauridia* Berl., Icon. fung. 3: 25 (1900). — Typus: USA, South Carolina, Curtis 1413 (isotypus: FH fide Fitzp.).

*Fracchiæa eucalyptina* Berl., Icon. fung. 3: 27 (1900). — Typus: Spag., Dec. myc. arg. 41.

? *Fracchiæa depressa* Petch, Ann. R. Bot. Gard. Peradeniya 6(3): 221 (1917). — Typus: Ceylon, PDA 2922 (n.v.). — Syn. dub. fide Nannfeldt 1975: 62.

EXS.: Cav., F. longob. 119 (*Fr. het.*) BPI, FH, NY fide Fitzp.; S!, W! — Ell., N. Amer. F. 692 (*Gibb. moric.*) CUP, NY fide Fitzp.; UPS! — Rav., F. amer. 343 (*G. moric.*) BPI, CUP, FH, NY fide Fitzp.; F. carol. 4: 57 (*Sph. subcongr.*) BPI, CUP, FH, K, NY fide Fitzp.; UPS! — ? Roumeg., F. gall. 5568 (*Fr. het.*) UPS! inutilis. — Sacc., Myc. ven. 88 (*Fr. het.*) FH fide Fitzp.; S!, W! — Spag., Dec. myc. arg 41 (*Fr. het.*) BPI, FH, NY fide Fitzp.; IMI!, PAD!, W!.

[Non: Cav., F. longob. 234 (*Fr. het.*), q.e. *Ditopella ditopa* (Fr.) Schroet.]

Ascocarps large (0.35–0.65 mm), only rarely collapsing into cupshape, mostly in small pulvinate groups. Peridium with pointed spines (up to 25  $\mu\text{m}$  long), sometimes forked and often with secondary “barbs”. Asci large (up to 125 $\times$ 25  $\mu\text{m}$ ). Spores >200 per ascus, characteristically arranged, subcylindrical, slightly curved, 8–11 $\times$ 1.5–2  $\mu\text{m}$ , hyaline, with one droplet in each end, eventually with a faint septum.

DISTRIBUTION: Widespread in most warmer countries. Known from Europe (France, Italy, Czechoslovakia, Yugoslavia. Records from more northern areas are erroneous, see Chapt. 8), North America (south-eastern USA, seen by me from Florida, Georgia, New Jersey, South Carolina, Virginia, recorded also from Louisiana and Ohio, Fitzpatrick 1924: 106–107, and from North Carolina, Mycologia 33(5): 572, 1941), Central and South America (Nicaragua, Venezuela, Brazil, Argentina), Africa (Sierra Leone, Ghana, Gambia, Southern Rhodesia, cp. Hopkins 1938, 1939 and Doidge 1950: 194), Asia (seen by me from India, Pakistan, Japan, and Ceylon; China fide Teng 1934: 368), Australia (South Australia, IMI!) and New Zealand (North Island).

(5) *Nitschkia callista* (Berk. & Curt.) Nannf. nov. comb.

[*Sphaeria callista* Berk. & Curt. in Rav., F. carol. 5: 67 (1860; nom. nud. —] *Cucurbitaria callista* Berk. & Curt. ex Berk., Grevillea 4(=n. 30): 47 (1875). — *Fracchiæa callista* Sacc., Syll. fung. 1: 94 (1882). — Typus: USA, South Carolina, Curtis 342 (K).

EXS.: Ell. & Ev., N. Amer. F. 1188 (*Cucurb. c.*) UPS!, W!; 2512 (*Fracch. c.*) PAD!, UPS! — Rav., F. carol. 5: 67 (*Sph. c.*) UPS! — Rel. Farl. 26 (*Fr. c.*) S!, UPS!; 706 (*Fr. c.*) S!, UPS!, W!

Ascocarps deeply cupulate, 0.25–0.4 mm, densely gregarious, surrounded by a rather sparse, distinctly brown (not blackish) subiculum. Asci ca. 32-sporous. Spores suballantoid, slightly curved, 7–9×1.5  $\mu\text{m}$ , hyaline with one drop in each end.

DISTRIBUTION: Seems confined to North America; seen by me only from the East: Canada (Ontario) and USA (Alabama, Connecticut, Maryland, Pennsylvania, South Carolina, Virginia) but recorded also from the West (USA: Oregon, Zeller 1927: 130). — A record from Sweden is erroneous (see Chapt. 8). Judged from the description and illustration, a record (Teng 1936: 506) from China (Hunan) is not convincing. It may be an undescribed species.

(6) *Nitschkia calyculus* (Mont.) O. Kze, Rev. gen. pl. 3(2): 501 (1898; “*Nitschkea*”); Berl., Icon. fung. 3: 22 (1900).

*Sphaeria* (*Caespitosa*) *calyculus* Mont., Ann. Sci. Nat. Bot. 2(14): 322 (1840); Syll. crypt. p. 226 (1856). — *Byssosphaeria* (*Caelosphaeria*) *calyculus* Cke, Grevillea 15(=n. 76): 122 (1887). — *Coelosphaeria* (?) *calyculus* Sacc., Syll. fung. 9: 444 (1891). — *Winterina calyculus* Höhn. Ann. Mycol. 16(1–2): 105 (1918). — *Calyculosphaeria calyculus* Fitzp., Mycologia 15(2): 51 (1923). — Typus: French Guiana, Leprieur 372 (PC!).

Similar to *N. grevillii*. Ascocarps 0.35–0.5 mm. Asci 8-sporous. Spores ellipsoid to subcylindrical, almost straight, only 5–7×1.5–2  $\mu\text{m}$ , the smallest amongst the 8-sporous species, hyaline, with one droplet in each end.

DISTRIBUTION: North America (USA: Florida, Petrak 1952c: 400, as *Cal. trist.*; W!), Tropical South America (French Guiana) and Tropical Africa (Ghana, IMI!; Hughes 1953: 11 as *Cal. trist.*).

(7) *Nitschkia chaetomioides* (Penz. & Sacc.) Nannf. nov. comb.

*Enchnoa chaetomioides* Penz. & Sacc., Malpighia 11(4): 390 (1897); Icon. fung. javan. p. 4 (1904). — *Coronophorella chaetomioides* Höhn., Sitz. ber. Akad. Wiss. Wien, Math.-nat. Kl. 118(1): 1507 (1909). — *Scortechinia chaetomioides* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1): 381 (1954). — *Tympanopsis chaetomioides* Arx & Müll., Phytopath. Zeitschr. 24(4): 365 (1955). — Typus: Java, Penzig 260bis (holotypus: PAD!; isotypus: W!).

Similar to *N. acanthostroma* but the dichotomously branched endings of the subicular hyphae not spiny. Ascocarps 0.3–0.4 mm. Asci 8-sporous. Spores suballantoid to subreniform, 6–8×2–3  $\mu\text{m}$ , hyaline, with one large drop in each end.

DISTRIBUTION: According to Arx & Müller (1954: 381) “Indischer Archipel, Afrika, Südamerika”, often mistaken for *N. acanthostroma* and probably not rare in the Tropics. Seen by me only from Africa (Ghana, Sierra Leone, IMI!) and Asia (Java).

(8) *Nitschkia collapsa* (Rom.) Chen., Bull. Soc. Mycol. Fr. 34(1–2): 73 (1918; “*Nitschkea*”).

*Bertia collapsa* Rom., Bot. Not. 1889(1):24 (1889). — *Herpotrichia collapsa* Rehm, Hedwigia 42, Beibl. 4: (176) (1903). — *Calyculosphaeria collapsa* Fitzp., Mycologia 15(2):52 (1923). — Typus: Rom., F. exs. scand. 70.

*Sphaeria tristis* Tode var. *sporidiis majoribus* Berk. & Br., Ann. Mag. Nat. Hist. 4(7):435 (1871). — Coll. orig.: Hainault Forest ii.1859 & Batheaston 22.iii.1869 (vide Chapt. 8).

*Trichosphaeria vagans* Boud., Icon. mycol. 4:339 (1910). — Typus: France, Boudier (PC).

EXS.: Rom., F. exs. scand. 70 (*B. coll.*) FH fide Fitzp.; S!, UPS! — Roumeg., F. gall. 3524 (*Coel. cup.*) COI!, UPS!

[Non: Weese, Eumyc. sel. 418 (*Calyc. coll.*) = *Ac. tristis.*]

Similar to *N. grevillii* but ascocarps larger, 0.45–0.75 mm. Asci 8-sporous, with a distinct apical wall-thickening and a subapical cylinder. Spores fusiform, straight, 12–18×3.5–7 μm, initially with 4 large drops and hyaline wall, eventually with a strong median septum and smoky-grey wall.

DISTRIBUTION: Seen by me from Europe (Sweden, Denmark, England, Belgium, France) and Australia (S. Australia). Recorded also from New Zealand (North Island, Fitzpatrick 1923: 53). — The Australian specimen (G. Beaton 39, IMI 116 884!) deviates by slightly longer spores (16–23×6–6.5 μm) but is otherwise typical.

(9) *Nitschkia confertula* (Schw.) Nannf., Sv. Bot. Tidskr. 69(1): 59 (1975).

*Sphaeria conferta* Schw., Schr. Nat. Ges. Leipzig 1:45 (1822); Fr., Syst. myc. 2:444 (1823) [non *Sph. conferta* Fr., l.c. p. 435, q.e. *Pyrenobotrys conferta* (Fr.) Theiss. & H. Syd.; vide Nannfeldt 1975: 59]. — *Byssosphaeria* (*Amphisphaeria*) *conferta* Cke, Grevillea 15(=n. 75):81 (1887; non sensu Cke). — *Amphisphaeria conferta* Sacc., Syll. fung. 9:747 (1891; non sensu Sacc.). — Typus: USA, North Carolina, Schweinitz (holotypus: PH; isotypi: BPI, FH fide Fitzpatrick 1923: 55–57 et Shear 1939: 324; UPS!).

*Sphaeria confertula* Schw., Trans. Amer. Phil. Soc. 2(4):211 (1832). — *Trematosphaeria confertula* Ell., Proc. Acad. Nat. Sci. Philadelphia 1895:25 (1895; non sensu Ell., q.e. *Chaetosphaerella fusca*). — Nom. nov. pro *Sphaeria conferta* Schw. (non Fr.).

*Sphaeria euomphala* Berk. & Curt. in Rav., F. carol. 4:54 (1855: nom. nud.); ex Berk., Grevillea 4(=n. 32):141 (1876). — *Botryosphaeria euomphala* Sacc., Syll. fung. 1:462 (1882). — *Byssosphaeria* (*Eu-Rosellinia*) *euomphala* Cke, Grevillea 15(=n. 76):122 (1887). — *Nitschkia euomphala* Ell. & Ev., N. Amer. Pyrenom. p. 246 (1892). — *Tyimpanopsis euomphala* Starb., Bih. K. Sv. Vet.-Akad. Handl. 19(3:2):24 (1894). — *Scortechinia euomphala* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1):380 (1954). — Coll. orig.: Rav., F. carol. 4:54.

[*Sphaeria introflexa* Berk. & Rav. in sched. — *Fracchiarea introflexa* Cke, Grevillea 15(=n. 75):84 (1887; nom. nud.). — Coll. orig.: Ravenel 1307, FH fide Fitzp.]

[*Sphaeria craterella* Berk. & Rav. ex Cke, Grevillea 15(=n. 76):122 (1887; nom. nud., ut syn. *Byssosphaeriae euomphalae*). — Coll. orig.: Ravenel 1307; FH fide Fitzp.]

*Coelosphaeria beccariana* Berl. & Pegl., N. Giorn. Bot. Ital. 24 (3): 110 (1892). — *Nitschkia beccariana* O. Kze, Rev. gen. pl. 3(2):501 (1898: "*Nitschkea*") — Typus: Italy, Beccari (isotypus: PAD! ut *Coel. pisana*, comp. Nannfeldt 1975: 62).

EXS.: Rav., F. carol. 4:54 (*Sph. euomph.*) FH, MO, NY, PH fide Fitzp.; UPS!

Similar to *N. grevillii*. Ascocarps 0.3–0.5 mm. Asci 8-sporous. Spores ovoid to ellipsoidal to subreniform, mostly inequilateral,  $7\text{--}11 \times 3.5\text{--}5 \mu\text{m}$ , with 2 large, often confluent drops; wall early smoky-grey. — Mostly associated with *Hypoxylon rubiginosum* (Pers. ex Fr.) Fr. s. lat.

DISTRIBUTION: Europe (Great Britain, Italy), North America (seen by me from USA: Georgia, Maryland, New York, North Carolina, South Carolina) and Africa: (Ghana, IMI!; South Africa fide Miller 1942: 259 et Doidge 1950: 146). Recorded also from Central America (Arx & Müller 1954: 380) and Asia (China: Chekiang and Yunnan, Teng 1934: 370).

(10) *Nitschkia cupularis* (Fr. ex Fr.) Karst., Mycol. fenn. 2: 81 (1873) [non sensu Karst., q.e. *N. parasitans*].

*Sphaeria cupularis* Fr. [Sv. Vet.-Acad. Handl. 37: 112 (1817)] ex Fr., Syst. myc. 2: 416 (1823) [vix Pers., vide Nannfeldt 1975: 53; nec *Sphaeria (Poronia) cupularis* Fr. 1830]. — *Cucurbitaria cupularis* S. F. Gray, Nat. Arr. Brit. Pl. 1: 519 (1821); Cke, Handb. Brit. F. p. 842 (1871). — *Cyathisphaera cupularis* Dumort., Comment. bot. p. 87 (1822). — *Hypoxylon cupulare* Kickx, Fl. crypt. Louvain p. 114 (1835; n.v.). — *Coelosphaeria cupularis* Karst., Medd. Soc. F. Fl. Fenn. 5: 42 (1879). — *Tympanis cupularis* Wallr., Fl. crypt. Germ. 2: 428 (1833; non sensu Wallr.). — Typus (sel. Fitzp. 1923, comp. Nannfeldt 1975: 55): Fr., Scl. Suec. (ed. 1) 231 (hololectotypus: FH; isolectotypus: UPS!).

*Melanopsamma numerosa* Fautr. in Roumeg., Rev. Myc. 13(=n. 50): 76 (=Roumeg., F. exs. 5629) (1891). — Typus: France, Fautrey iv: 159 (isotypi duo: UPS!; Roumeg., F. exs. 5629).

*Herpotrichia rehmana* P. Henn. & Kirschst. in P. Henn., Verh. Bot. Ver. Brandenb. 40: xxviii (1898). — Typus: Germany, Kirschstein (isotypi duo: S!).

EXS.: Fr., Scler. Suec. (ed. 1) 231 (*Sph. cup.*) FH fide Fitzp.; UPS! — Plowr., Sph. brit. 1: 63 (*Sph. trist.*) FH fide Fitzp.; S! — Rehm, Ascom. 1743 (*N. trist.*) BPI, FH fide Fitzp.; S!, W! — Roumeg., F. gall. 1551 (*Chaetosph. trist.*) C! inutilis, UPS!; F. exs. 5629 (*Mel. num.*) UPS!

[Non: Cke, F. brit. 2: 561 (*Cucurb. cup.*)=N. par. — Desm., Pl. crypt. 2: 780 (*Sph. cup.*)=N. par. — Fr., Scl. Suec. (ed. 2) 231 (*Sph. cup.*)=N. par. — Fuck., F. rhen. 968 (*Cuc. cup.*)=Hb. Barb.-Boiss. 591 (*Coel. cup.*)=N. par. — Holl & Schm., Deutschl. Schw. 6 (*Sph. cup.*)=*Cuc. (laburni?)* + *Camarosporium* (comp. Nannfeldt 1975: 54). — Karst., F. fenn. 861 (*Sph. cup.*)=N. par. — Kochm., Myc. pol 326 (*N. cup.*)=N. par. — Moug. & Nestl., St. crypt. vog.-rhen. 771 (*Sph. cup.*)=N. par. — Petr., Fl. boh.-mor. 2: 1: 1634 (*N. cup.*)=N. par.; Myc. gen. 177 (*N. cup.*)=N. par. — Plowr., Sph. brit. 1: 57 (*Cuc. cup.*)=N. par. — Rehm, Ascom. 983 (*N. cup.*)=N. par. — Roumeg., F. gall. 3524 (*Coel. cup.*)=N. coll. — Syd., Myc. march. 1915 (*N. cup.*)=N. par.; 2430 (*N. cup.*)=N. par. — Vize, Micro-f. brit. 161 (*Cuc. cup.*)=N. par. — Westend., Herb. crypt. 528 (*Hyp. cup.*)=N. grev.]

Similar to *N. grevillii*. Ascocarps 0.3–0.45 mm. Asci 8-sporous. Spores sub-cylindrical, slightly curved to almost straight,  $10\text{--}18 \times 2\text{--}2.5 \mu\text{m}$ , hyaline, with 4 large drops.

DISTRIBUTION: Due to the bad confusion about this name only records substantiated by specimens seen by Fitzpatrick or me can be taken into account. The



known area becomes thus restricted to Europe (Sweden, Great Britain, France, Germany, Austria).

(11) *Nitschkia floridana* Fitzp., Mycologia 15(1): 31 (1923).

Typus: USA, Florida, Thaxter (FH!).

Similar to *N. grevillii*, but ascocarps more coarsely rough, 0.35–0.6 mm. Asci 8-sporous. Spores subballantoid, 15–20×3–4.5  $\mu\text{m}$ , hyaline with 2–4 drops, of which the two central may be very large, eventually with a distinct septum.

DISTRIBUTION: North America (USA: Florida) and South America (Brazil: Rio Grande del Sul 1904 Rick 7 as *Bertia submoriformis*, S!). Reported also from Asia (China: Yunnan, Teng 1934: 368). — The type of *Sph. submoriformis* Plowright (1876: 74) from California has not been seen by me. Should it turn out to be conspecific with the present species, it would afford the correct epithet for it and widen its known distribution considerably.

(12) *Nitschkia gigantospora* Nannf. nov. nom.

*Calyculosphaeria macrospora* Fitzp., Mycologia 15(2): 53 (1923) [non *Nitschkia macrospora* Teng, 1934]. — Typus: USA, Florida, Thaxter (FH!).

Subiculum scanty. Ascocarps 0.5–0.6 mm. Asci 8-sporous. Spores cylindrical with rounded ends, straight, extremely large (36–45×12–14  $\mu\text{m}$ ), hyaline, with 2 very large drops, at maturity often less conspicuous, eventually relatively thick-walled and with a distinct septum.

DISTRIBUTION: North America (USA: Florida). Only the type collection.

(13) *Nitschkia grevillii* (Rehm in Starb.) Nannf., Sv. Bot. Tidskr. 69(1): 53 (1975).

*Melanopsamma Grevillii* Rehm in Starb., Bih. K. Sv. Vet.-Akad. Handl. 16(3: 3): 5 (1890). — Typus: Sweden, Grevillius (S!).

"*Nitschkia tristis* (Pers.) Fuck.", Symb. mycol. p. 165 (1870), sensu Fuck., Wint. et auctt. plur. [non sensu orig., q.e. *Acanthonitschkea tristis*]. — *Calyculosphaeria tristis* ("Fuck.") Fitzp., Mycologia 15(2): 48 (1923). — Typus: Rbh., F. eur. 632 (comp. Nannfeldt 1975: 57).

*Winteria tuberculifera* Ell. & Ev., Proc. Acad. Nat. Sci. Philadelphia 1890: 240 (1890). — *Winterella tuberculifera* Berl., Icon. fung. 1: 94 (1892; "*tuberculigera*"). — *Winterina tuberculifera* Sacc., Syll. fung. 14: 589 (1899). — Typus: Canada, Dearness 1553 (holotypus: NY; isotypus: FH fide Fitzp.). — Syn. fide Fitzp.

*Wallrothiella fraxinicola* Feltg., Rec. Mém. Trav. Soc. Bot. Luxembourg 16: 286 (1905). — Typus: Luxembourg, Noppeney (LUX, comp. Nannfeldt 1975: 62–63). — Syn. fide Höhnelt 1906: 1215.

*Nitschkia winteriana* Sacc., Atti Mem. R. Accad. Sci. Lett. Art. Padova 33: 159 (1917; n.v.). — Typus: France, Flageolet (PAD!).

EXS.: Fuck., F. rhen. 947 p.p. (*Sph. tristis*) S! (una cum *Chaetosphaerella phaeostr.*) [FH *Chaet. phaeostr.* solum fide Fitzp.] = Hb. Barb.-Boiss. 590 p.p. (*Coel. tristis*) FH fide Fitzp.; S!,

UPS! p.p. (una cum *Chaet. phaeostr.* et *Ac. trist.*), W! — Rbh., F. eur. 632 (*Sph. trist.*). CUP, FH, NY fide Fitzp.; S!, UPS!, W! — Vize, Micro-f. brit. 391 FH fide Fitzp. — Westend., Herb. crypt. 528 (*Hypox. cup.*) COI!, LD!<sup>1</sup>

Subiculum scanty to profusely developed but never hiding the ascocarps. These medium-sized (0.3–0.5 mm), gregarious to scattered. Asci 8-sporous. Spores subcylindrical to subfusoid, mostly straight,  $6\text{--}9 \times 1.5\text{--}2.5 \mu\text{m}$ , hyaline, with 2(–4) large drops, eventually with a (pseudo?)septum.

**DISTRIBUTION:** This seems to be one of the least rare and most widespread temperate species of the genus, being known with certainty from Europe (Sweden, Denmark, Norway, England, Belgium, Luxembourg, France, Germany, Switzerland), North America (Canada: Ontario and USA: Florida, Michigan, New York), and South America (Trinidad, Fitzpatrick 1923: 51). It is also recorded from Poland (Schroeter 1894: 313) and Italy (Traverso 1907: 359) as *N. tristis* and from Asia (China: Chekiang and Yunnan, Teng 1934: 369) as *Cal. tristis*. — The record of *Cal. tristis* from Africa (Ghana) by Hughes (1953: 11) refers to *N. calyculus* (q.v.)

**(14) *Nitschkia leonensis* (Sivan.) Nannf. nov. comb.**

*Scortechiniellopsis leonensis* Sivan., Trans. Brit. Mycol. Soc. 62(1): 37 (1974). — Typus: Sierra Leone, Deighton M 6233 (IMI!).

Similar to *N. acanthostroma* but the repeatedly dichotomously branched subicular hyphae with pale, acuminate (not spiny) endings. Ascocarps 0.3–0.4 mm. Asci ca. 32-sporous. Spores broadly allantoid to subreniform,  $5\text{--}7 \times 2\text{--}3 \mu\text{m}$ , hyaline, with 2 large, often confluent drops, sometimes with a (pseudo?)septum.

**DISTRIBUTION:** Tropical Africa (Sierra Leone). Only the type locality (3 finds, all on *Cynometra leonensis*).

**(15) *Nitschkia macrospora* Teng, Sinensia 4(12): 368 (1934).**

Typus: Yunnan, Tsiang 301 (n.v.).

No subiculum. Ascocarps “seated on a pseudoparenchymatous stroma”, 0.35–0.55 mm, coarsely roughened, collapsing. Asci 8-sporous. Spores allantoid, occasionally straight, very large ( $26\text{--}45 \times 6\text{--}6.5 \mu\text{m}$ ), hyaline, guttulate, eventually with a pseudoseptum. (Compiled from the diagnosis.)

**DISTRIBUTION:** Asia (China: Yunnan). Only the type collection.

**(16) *Nitschkia multiasca* (Pat. & Gaill.) Nannf. nov. comb.**

*Fracchiaea(?) multiasca* Pat. & Gaill., Bull. Soc. Mycol. Fr. 4(3): 106 (1889). — Typus: Venezuela, Gaillard 1: 24 p.p. (n.v.; comp. Fitzpatrick 1924: 109).

<sup>1</sup> It seems to have remained unobserved that there exist two variants (editions?) of this exsiccatum. The bound copy in LD has on the printed label a more detailed locality than has the loose copy in COI.

Ascomycetes 0.25 mm, collapsing into cupshape, surrounded by brown hyphae. Asci ca. 32-sporous. Spores ovoid, straight, 5-6×3 μm, hyaline, with 2 droplets. (Compiled from the diagnosis.)

DISTRIBUTION: Tropical South America (Venezuela). Only the type collection.

(17) *Nitschkia parasitans* (Schw.) Nannf., Sv. Bot. Tidskr. 69(1): 52 (1975).

*Sphaeria parasitans* Schw., Trans. Amer. Phil. Soc. 2(4):206 (1832). — Typus: USA: Pennsylvania, Schweinitz (holotypus: PH inutilis fide Ell. & Ev. 1892: 794; isotypus: UPS!).

*Nectria (Gibbera) Hippocastani* Otth, Mitth. naturf. Ges. Bern 1868: 57 (1869; nom. confus. vide Nannfeldt 1975: 63). — *Calonectria (Chiariaea) Hippocastani* Sacc., Hedwigia 35, Beibl. p. xxxiii (1896). — Typus: Switzerland, Otth (n.v.). — Syn. fide Höhnelt 1920.

*Nitschkia Fuckelii* Nke in Fuck., Symb. Mycol. p. 165 (1870; non rite publ.). — *Coelosphaeria Fuckelii* Sacc., Atti Soc. Ven. Trent. Sci. Nat. 2: 163 (1873; non rite publ.). — Typus: Fuck., F. rhen. 968 (“*Cucurbitaria cupularis*”).

*Coelosphaeria anceps* Sacc. & Malbr., Atti R. Ist. Veneto Sci. Lett. Art. 6(1:2); 1273 (1883). — *Nitschkia anceps* Lindau in Engl. & Prantl, Nat. Pfl.-Fam. 1(1): 409 (1897); Berl., Icon. fung. 3: 23 (1900). — Typus: France, Malbranche 512 (PAD!).

*Winteria tuberculifera* E. & E. var. *caespitosa* E. & E., N. Amer. Pyrenom. p. 212 (1892). — Typus: North America (NY), — Syn. fide Fitzp.

*Nitschkia moravica* Niessl in Paul, Verh. Naturf. Ver. Brünn 47: 138 (1909). — Typus: Czechoslovakia, Paul (n.v.). — Syn. ex descr.

EXS.: Berk., Brit. f. 174 (*Sph. acervata*) FH, MO fide Fitzp.; UPS! — Cke, F. brit. 2: 561 (*Cucurb. cup.*) IMI!, UPS! — Desm., Pl. crypt. 2: 780 (*Sph. cup.*) UPS!, W! — Fr., Scl. Suec. (ed. 2) 231 (*Sph. cup.*) UPS! — Fuck., F. rhen. 968 (*Cuc. cup.*) FH fide Fitzp.; S!; =Hb. Barb.-Boiss. 591 (*Coel. cup.*) FH fide Fitzp.; S!, UPS!, W! — Karst., F. fenn. 861 (*Sph. cup.*) FH fide Fitzp.; UPS! — Kochm., Myc. pol. 326 (*N. cup.*) UPS! — Moug. & Nestl., St. crypt. vog.-rhen. 771 (*Sph. cup.*) NY fide Fitzp.; S!, UPS!, W!; 1455 (*Sph. cucurb.*) UPS! — Petr., Fl. boh.-mor. 2: 1: 1634 (*N. cup.*) C!, S!; Myc. gen. 177 (*N. cup.*) IMI!, S!, UPS!, W! — Plowr., Sph. brit. 1: 57 (*Cuc. cup.*) S! — Rehm, Ascom. 983 (*N. cup.*; =Syd., Myc. march. 1915) H! S!, W! — Roumeg., F. gall. 1488 (*N. fuck.*) CUP, FH fide Fitzp.; COI!, UPS! — Sacc., Myc. ven. 1449 (*Coel. fuck.*) UPS!, W! — Syd., Myc. march. 1915 (*N. cup.*; =Rehm, Ascom. 983) FH, NY fide Fitzp.; S!, UPS!, 2430 (*N. cup.*) FH, NY fide Fitzp.; S!, UPS!; 4131 (*N. trist.*) FH, NY fide Fitzp.; B!, S!, UPS! — Thüm., Myc. univ. 1947 (*N. fuck.*) BPI, FH, NY fide Fitzp.; B!, COI!, UPS!, W! — Vize, Micro-f. brit. 161 (*Cuc. cup.*) IMI!

Ascomycetes small (0.2–0.3 mm), mostly caespitose on stromata of *Nectria cinabarina*. Asci 8-sporous. Spores suballantoid to boomerang-shaped, 9–16×2–3 μm, hyaline, with one droplet (rarely 2) in each end, eventually with a faint (pseudo?)septum.

DISTRIBUTION: Known with certainty from Europe (Sweden, Denmark, The Faeroes, Finland, Norway, England, Belgium, France, Germany, Switzerland, Austria, Poland, Czechoslovakia, Italy, S.S.S.R.) and North America (USA: Pennsylvania). Recorded also from USA: Montana (Ellis & Everhart 1892: 245) and from Asia (India, several finds; Mundkur & Ahmad 1946: 5). This species, rather con-

spicuous in spite of the minuteness of its ascocarps, appears evidently more frequently in certain years (springs) and may then be fairly copious in its localities.

(18) *Nitschkia pezizoidea* (Pat. & Gaill.) O. Kze, Rev. gen. pl. 3(2):501 (1898; "*Nitschkea pezizodea*").

*Coelosphaeria pezizoidea* Pat. & Gaill., Bull. Soc. Mycol. Fr. 4(3):106 (1889; "*Caelosphaeria*"). — *Winterina* (?) *pezizoidea* Höhn., Ann. Mycol 16(1-2):105 (1918). — Typus: Venezuela, Gaillard 266 (PC).

Similar to *N. grevillii*. Ascocarps 0.35–0.45 mm, collapsing into deeply cupulate, apical papilla unusually prominent. Asci 8-sporous. Spores fusiform to ovoid, straight, 7–11×2–3  $\mu\text{m}$ , hyaline, eventually with a distinct septum. (Compiled from Fitzpatrick 1923:52.)

DISTRIBUTION: South America (Venezuela). Only the type collection.

(19) *Nitschkia similis* (Bres.) Nannf. nov. comb.

*Trichosphaerella similis* Bres., Bull. Jard. Bot. Bruxelles 4(1):7 (1914). — *Scortechiniella similis* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1):383 (1953). — Typus: Zaïre, Vanderyst (S!).

Similar to *N. acanthostroma* but the dichotomously branched endings of the subicular hyphae not spiny. Ascocarps 0.3–0.5 mm. Asci ca. 32-sporous. Spores reniform to suballantoid, often also spirally twisted (up to 90°), hyaline, with a filiform, ca. 5  $\mu\text{m}$  long curved appendix at each end, 6–9×3  $\mu\text{m}$ , and with 2 large drops, almost filling the lumen, and eventually with a distinct (pseudo?)septum.

DISTRIBUTION: Tropical Africa (Zaïre). Only the type collection.

(20) *Nitschkia tetraspora* Nannf. nov. spec.

*N. collapsa* similis et certe affinis. Differt praecipue sporis angustioribus et longioribus (15–22×2.5–3  $\mu\text{m}$ ), initio octonis inasco sed normaliter quaternis tantum maturescentibus. Ascocarpia (sicca) cupulato-collapsa (0.4–0.5×0.25–0.3 mm), papilla apicali parva inconspicua. Sporae anguste fusiformes, rectae vel interdum leviter curvatae, 1-septatae, pariete denique fuscescente.

Typus: Kenya, Nannfeldt 22058 (holotypus: UPS; isotypus: S).

Subiculum absent or scanty. Ascocarps scattered to densely gregarious, seated on periderm or on inner-bark beneath loosening parts of the periderm, turbinate and (when dry) collapsed to cupshape, 0.4–0.5×0.25–0.3 mm, the apical papilla very small. Asci 25–30×8–11  $\mu$  (p. sp.), early deliquescent, initially 8-spored, but as a rule only (the upper) 4 spores reach maturity. Spores fusiform, straight or sometimes slightly curved, 15–22×2.5–3  $\mu\text{m}$ , with initially 4–6 drops, later confluent to 2 and at a certain stage almost filling the lumen, successively getting a median septum and constriction; wall smooth, eventually smoky-grey. Abortive spores acicular to narrowly fusiform (ca. 16×1–1.5  $\mu\text{m}$ ), hyaline, 1-septate.

DISTRIBUTION: Tropical Africa (Ghana, Kenya, Sierra Leone).

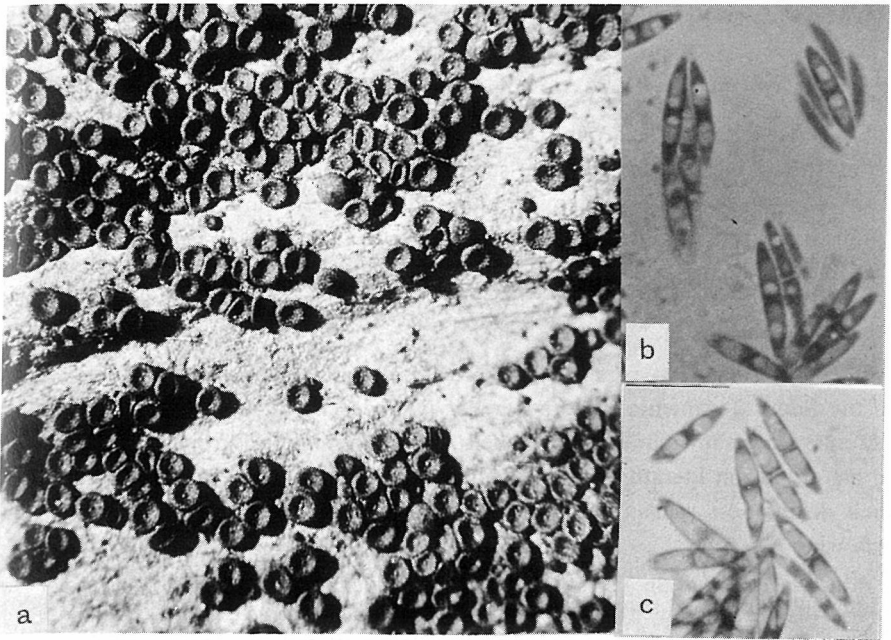


Fig. 4. *Nitschkia tetraspora* (holotypus). (a) Substrate with dry ascocarps (ca. 8 $\times$ ; phot. K. Holm). — (b, c) Spores in the stage they become free; in the upper right corner of b four abortive spores are seen surrounding a normal (ca. 900 $\times$ ).

**Africa:** Kenya: Coast Prov., Kwale Distr., Jadini Forest 26.ii.1972 J. A. Nannfeldt 22058. (Type.)

Ghana: Amanase 7.vi.1949 S. J. Hughes 1172 (IMI 38190a!); Asuansi (*Cola nitida*) 9.vi.1949 S. J. Hughes 1183 (IMI 44569!); Bunsu (*Hevea bras.*) 17.vi.1949 S. J. Hughes 1331 (IMI 38076c!).

Sierra Leone: Puabu ("Kpuabu"; Gaura) (*Theobroma cacao*) 29.ix.1960 A. B. Katta M. 6605 (IMI 84483!).

(21) *Nitschkia uniseriata* (Fitzp.) Nannf. nov. comb.

*Tympanopsis uniseriata* Fitzp., Mycologia 15(2): 58 (1923). — Typus: USA: Florida, Thaxter (FH!).

Subiculum dense. Ascocarps 0.25–0.35 mm, cupulate, gregarious to scattered. Asci 8-sporous, cylindrical (p. sp. 60–70 $\times$ 8–10  $\mu$ m). Spores uniseriate, often transversely orientated, broadly ellipsoid to ovoid, slightly inaequilateral, 7–9 $\times$ 4.5–5.5  $\mu$ m with 2 large often confluent drops, wall before maturity hyaline with distinct cyanophilous warts, eventually minutely echinulate, smoky- to yellowish-brown.

DISTRIBUTION: North America (USA: Florida). Only the two finds listed by Fitzpatrick.

**(22) *Nitschkia velutina* (Petr.) Nannf. nov. comb.**

*Biciliospora velutina* Petr., Sydowia 6(5-6): 429 (1952). — Typus: Puerto Rico, Earle 284 (n.v.).

Similar to *N. acanthostroma*. Subicular hyphae dichotomously branched, their terminations short, often conical or subglobose (not spiny). Ascocarps 0.5–0.6 mm. Asci 8-sporous. Spores narrowly ellipsoid to subcylindrical, mostly straight, 19–30×4.5–7  $\mu\text{m}$ , hyaline, with numerous droplets and at each end with a filiform (ca. 10  $\mu\text{m}$  long) appendix, curved backwards. (Compiled from the diagnosis.)

DISTRIBUTION: Tropical America (Puerto Rico). Only the type collection.

The above list is not exhaustive. There hide certainly in all warmer countries and in the South Temperate Zone a number of undescribed species as well as such described in the most unexpected genera. Also several (non-European) fungi known to me only from literature may be valid species, although their true affinities and their distinctness remain doubtful until their types have been examined, e.g. the following:

*Fracchiæa australis* Speg. in sched., illustrated by Fitzpatrick (1924: pl. 10 fig. 5) and due to its "Quellkörper" regarded by him (l.c. p. 108) as a *Cryptosphaerella*.

*Coelosphaeria corticata* Ell. & Ev. from USA (Missouri), regarded by Fitzpatrick (1923: 38) after studying type material as a *Coronophorella* (asci 8-sporous, spores "moderately curved, 10–14×3  $\mu$ ").

*Tympanopsis coelosphaerioides* Penz. & Sacc. var. *minor* Teng (1932). The main species is the bitunicate *Auerswaldia examinans* (Mont. & Berk.) Sacc. (cp. Chapt. 4), but according to Teng's description and illustration (1934: 370) his variety seems to be widely different and perhaps a true *Nitschkia*, marked by deeply cupulate ascocarps (0.28–0.45 mm), 8-sporous asci, mostly uniseriate, ellipsoid to inaequilateral spores, 11–15×4.5–6.5  $\mu\text{m}$ , usually uniguttate, with eventually smoky-yellow wall.

*Nitschkia hainanensis* Teng & Ou in Ou (1936). The description and illustration of this species from China (Hainan) indicate a *Nitschkia*, close to *N. floridana* but probably distinct, the main differences being the minute roughness of the ascocarps and the larger spores (18–32×4–5  $\mu\text{m}$ ).

*Schizocapnodium sarcinellum* Fairm. (1921). The very unsatisfactory type specimen (from USA: New York) was studied by Petrak (1952a: 265). From his description and drawings Müller & Arx (1962: 819) suggested that it might be congeneric with *Gaillardietta pezizoidea* (cp. Chapt. 4 above). If it is Coronophoralean at all, it is in my eyes rather a species of *Nitschkia*, as there is no sign of the ringshaped thickening of the peridium, characteristic of *Gaillardietta*. The "double-spores" are clearly an artifact due to beginning decay and the very dark spore wall may have the same cause. An exacter disposition may perhaps be possible when the mycoflora of the type area has become better known.

## 6. The Species of *Acanthonitschkea*

The changed delimitation of *Acanthonitschkea*, as motivated in Chapt. 4, with the presence (at least on the subiculum) of strong, dark, unseptate bristles as the leading

character results in the following nomenclator and in the subsequent alphabetical list of the accepted four species with their nomenclators, exsiccata, diagnostic features and distributions, all in the same manner as for the *Nitschkiae* in the preceding chapter.

**Acanthonitschkea** Speg., Anal. Mus. Nac. Bueno Aires 3(10): 116 (1908). — Typus: *Ac. argentinensis* Speg.

*Eucanthe* Theiss., Ann. Mycol. 15(3-4): 272 (1917). — Typus: *Meliolopsis usambarensis* Rehm, i.e. *Ac. foveolata*.

*Neotrotteria* Sacc., Bull. Orto Bot. R. Univ. Napoli 6: 45 (1918). — Typus: *N. pulchella* Sacc.

*Petelotia* Pat., Bull. Soc. Mycol. France 40(1): 35 (1921). — Typus: *P. tonkinensis* Pat., i.e. *Ac. pulchella*.

*Sydowinula* Petr., Ann. Mycol. 21(3-4): 277 (1923). — Typus: *S. moravica* Petr., i.e. *Ac. tristis*.

? *Fitzpatrickia* Cif., Mycologia 20(1): 29 (1928). — Typus: *F. massae* Cif. (prob.=*Ac. foveolata*). — Syn. dub. ex descr. (comp. Nannfeldt 1975: 60).

The species are all well marked and readily known from each other. Three  $\pm$  tropical species have bristles also on the ascocarps, one (*Ac. pulchella*) has polysporous (ca. 32-sporous) asci, and the others 8-sporous (*Ac. argentinensis* with suballantoid, strongly curved spores and *Ac. foveolata* with  $\pm$  ellipsoidal and  $\pm$  straight spores). The fourth, so far exclusively European species (*Ac. tristis*) has no bristles on the very ascocarps but a "crown" of such round their bases.

Only one additional species has been described under any of the relevant generic names, viz. *Ac. coloradensis* Cash & Davidson (1940), but as shown in Chapt. 3 (Nannfeldt 1975: 62) this is decidedly misplaced and rather of Diaporthalean affinity.

(1) **Acanthonitschkea argentinensis** Speg., Anal. Mus. Nac. Buenos Aires 3(10): 116 (1908).

Typus: Argentina, Spegazzini 2107 (LPS!).

Ascocarps 0.2–0.3 mm, with bristles 100–200  $\mu$ m long. Asci 8-sporous. Spores suballantoid, strongly curved, often almost semicircular or horseshoe-shaped, 5–8 $\times$ 2  $\mu$ m, hyaline, 4-guttate.

DISTRIBUTION: America (Puerto Rico fide Fitzpatrick 1923: 63, Argentina) and Africa (Ghana, IMI!; Hughes 1953: 4).

(2) **Acanthonitschkea foveolata** (Berk. & Curt. ex Berk.) Nannf., Sv. Bot. Tidskr. 69(1): 60 (1975).

*Sphaeria* (*Byssisedae*) *foveolata* Berk. & Curt. ex Berk., J. Linn. Soc. 10: 387 (1868). — *Rosellinia foveolata* Sacc., Syll. fung. 1: 271 (1882). — Coll. orig.: Cuba, Wright 489 & 548 (spec. auth.: LPS 5810!).

*Sphaeria* (*Byssisedae*) *hystricula* Berk. & Br., J. Linn. Soc. 14: 125 (1873). — *Rosellinia hystricula* Sacc., Syll. fung. 1: 274 (1882). — *Chaetosphaeria hystricula* Cke, Grevillea 15(=n. 76): 124 (1887). — *Fracchiaea hystricula* Petch, Ann. R. Bot. Gard. Peradeniya 5(4): 290 (1912; non sensu Petch, q.e. *Ac. pulchella*). — Typus: Ceylon, Thwaites 171 p.p.=1074<sup>1</sup> (isotypus: UPS!).

[“*Trichosphaeria acanthostroma* (Mont.) Sacc.” sensu Speg., Anal. Soc. Cie. Argentina 26: 28 (1888). — Cp. Nannfeldt 1975: 58.]

*Meliolopsis usambarensis* Rehm in P. Henn., Deutsch Ost-Afrika 5C: 31 (1895). — *Euacanthus usambarensis* Theiss., Ann. Mycol. 15(3–4): 272 (1917). — *Scortechinia usambarensis* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1): 381 (1954). — *Tympanopsis usambarensis* Müll. & Arx, Phytopath. Zeitschr. 24(4): 365 (1955). — Typus: Burundi, Holst (S!).

*Acanthonitschkea macrobarbata* Fitzp., Mycologia 15(2): 63 (1925). — Typus: Trinidad, Thaxter (FH!).

? *Fitzpatrickia Massae* Cif., Mycologia 20(1): 30 (1928). — *Scortechinia Massae* Arx & Müll., Beitr. Krypt.-fl. Schweiz 11(1): 381 (1954). — *Tympanopsis Massae* Müll. & Arx, Phytopath. Zeitschr. 24(4): 366 (1955). — Typus: loc., temp. et matr. ignot., leg. C. Massa (School of Viticulture and Enology, Alba, Italy; n.v.). — Cp. Nannfeldt 1975: 60.

Ascocarps 0.25–0.5 mm with bristles 200–300  $\mu$ m long. Asci 8-sporous. Spores ovoid or ellipsoid to subfusiform, inequilateral, almost straight, 5–8 $\times$ 2–3  $\mu$ m, hyaline (eventually with brownish wall?), with 2 drops, as a rule confluent to one eccentrically placed.

DISTRIBUTION: Known from the Americas (USA: South Carolina fide Berkeley 1868: 387, Cuba, Trinidad, Brazil, Paraguay), tropical Africa (Burundi), and tropical Asia (Ceylon).

### (3) *Acanthonitschkea pulchella* (Sacc.) Nannf. nov. comb.

*Neotrotteria pulchella* Sacc., Bull. Orto Bot. R. Univ. Napoli 6: 45 (1918). — Typus: Singapore, Baker 5277 (n.v.); comp. Petrak 1962: 353).

[“*Fracchiaea hystricula* (Berk. & Br.) Petch” sensu Petch, Ann. R. Bot. Gard. Peradeniya 5(4): 229 (1912); non s. orig., q.e. *Ac. foveolata*.]

*Petelotia tonkinensis* Pat., Bull. Soc. Mycol. France 40(1): 35 (1921). — Typus: North Vietnam, Petelot 570 (holotypus: FH!).

Ascocarps 0.3–0.5 mm with bristles 100–250  $\mu$ m long. Asci ca. 32-sporous. Spores subballantoid, 6–12 $\times$ 1.5–2(–2.5)  $\mu$ m, hyaline, with 2(–3) droplets.

DISTRIBUTION: Tropical Africa (Ghana, IMI!; Hughes 1953: 18 as *Fr. hystr.*) and tropical Asia (Ceylon, North Vietnam, Malaya). A sample (IMI 104 902) from North Borneo may also belong here, but its stage is too advanced for certain determination.—The matrix is in most cases *Hevea brasiliensis*.

<sup>1</sup> Expressions such as “nos. 1074, 171 in part” frequently used by Berkeley & Broome in connection with Thwaites’ Ceylon fungi do not indicate two different collections but mean that part of a mixed collection (in this case 171) was given a number (1074) of its own (Petch 1912: 266).



**(4) *Acanthonitschkea tristis* (Pers. ex Fr.) Nannf., Sv. Bot. Tidskr. 69(1): 57 (1975).**

*Sphaeria tristis* Pers. [Icon. descr. fung. 2:49 (1800)] ex Fr., Syst. myc. 2:444 (1823) [non *Sphaeria tristis* Tode 1791, q.e. *Chaetosphaerella phaeostroma* fide Fuck.]. — *Nitschkia tristis* Fuck., Symb. mycol. p. 165 (1870; non rite publ. et non sensu Fuck., q.e. *N. grevillii*). — *Coelosphaeria tristis* Karst., Medd. Soc. F. Fl. Fenn. 5:42 (1879; non sensu Karst.); Sacc. in Roumeg. & Sacc., Rev. myc. 3(=n. 11):42 (1881; non sensu Sacc., q.e. *N. cupularis* s. orig.). — *Byssonectria (Caelosphaeria) tristis* Cke, Grevillea 15(=n. 76):122 (1887; sensu Sacc.). — *Winterina tristis* Höhn., Ann. Mycol. 16(1-2):105 (1918; non sensu Höhn.). — Lectotypus (sel. Nannfeldt 1975:57); Hb. Persoon L. 910, 269-833!

*Coelosphaeria media* Sacc., Michelia 2:592 (1882). — *Nitschkia media* O. Kze, Rev. gen. pl. 3(2):501 (1898; "Nitschkea"). — *Loranthomyces (?) media* Höhn., Ann. Mycol. 16(1-2):105 (1918). — Typus: Switzerland, Morthier 4 (PAD!). — Vide Nannfeldt 1975:61.

*Sydowinula moravica* Petr., Ann. Mycol. 21(3-4):277 (1923). — Typus: Moravia, 18.vi.1922, Petrak (n.v.). — Syn. ex descr. (comp. Nannfeldt 1975:63).

EXS.: Cke, F. brit. I:269 (*Sph. tr.*) UPS! — Fr., Scl. Suec. 386 (*Sph. tr.*) UPS! — Fuck., F. rhen. 947 p.p. (*Sph. tr.*) W! (copy with number and name in handwriting)=Hb. Barb.-Boiss. 590 p.p. (*Coel. tr.*) UPS! (una cum *N. grev.* et *Chaet. phaeostr.*). — Weese, Eumyc. sel. 448 (*Calyc. coll.*) UPS!

[Non: Plowr., Sph. brit. I:63 (*Sph. tr.*)=*N. cup.* s. orig. — Rbh., F. eur. 632 (*Sph. tr.*)=*N. grev.* — Rehm, Ascom. 1743 (*N. tr.*)=*N. cup.* s. orig. — Roumeg., F. gall. 1485 (*Sph. tr.*)=?; 1551 (*Chaetosph. tr.*)=*N. cup.* s. orig.]

Bristles 150-200  $\mu\text{m}$  long, only on subiculum but most thickset round the bases of the ascocarps, which are 0.3-0.35 mm. Asci 8-sporous. Spores subcylindrical to narrowly ovoid, slightly curved, 6-9 $\times$ 1.5-2  $\mu\text{m}$ , hyaline, (2-)4-guttulate, eventually with an obscure (pseudo?)septum.

DISTRIBUTION: Due to the confusion about this species, only specimens actually studied by me (plus of course Petrak's record of his new species) can be taken into account, which gives an area restricted to Europe (Sweden, Norway, England, France, Germany, Switzerland, Czechoslovakia).

**7. *Nitschkiopsis stictarum* nov. gen. et sp.  
(with a contribution by R. Santesson)**

The observant reader may have missed any allusion in the preceding chapters to the new African lichenicolous species. The reason is that the sharper delimitation of "Coronophorales", i.e. *Nitschkiaceae*, leaves it outside. It mimics a diminutive *Acanthonitschkea*, but shows a number of alien features, e.g. the paler conical papilla of the ascocarps, the structure of the peridium (well shown in Fig. 5d) with relatively thin cell walls without "Munk pores", the indumentum of hyaline hairs and dark, broad-based spines, the palisade of relatively long asci lining the major part of the locule. Our fungus affords a new example that lichenicolous fungi as a rule have no really close relatives among fungi inhabiting vascular plants, but it may,

like the *Nitschkiaceae*, have Lasiosphaeriaceous ancestors and so it is still justified to treat it in this paper.

Prof. Santesson has contributed the following descriptions and comments: —

“Sometimes very small but characteristic ascocarps of a fungus appear on the discs of dead, black apothecia of certain species of *Sticta*. At first, this fungus was taken for a new species of *Acanthonitschkea*. The cupulately collapsing ascocarps armed with rigid, sharp-pointed spines, the clavate asci tapering to a thin stalk, the absence of paraphyses, and the small fusiform to ellipsoidal, hyaline spores seemed to indicate a relationship to this otherwise corticolous genus. This suggestion could not be upheld. The fungus was found to take a rather isolated position and has to be placed in a new genus.

**Nitschkiopsis** Nannf. & R. Sant. **nov. gen.**

Perithecia sicca cupulato-collapsa, papilla apicali distincta. Peridium membranaceum, fuscescens. Asci 8-spori, clavati, stipitati, annulo apicali incrassato. Sporae fusiformes vel ellipsoideae, 1-septatae, hyalinae.—Lichenicola.

Typus: *N. stictarum* Nannf. & R. Sant.

**N. stictarum** Nannf. & R. Sant. **nov. sp.**

Perithecia madefacta ± globosa, 0.09–0.12 mm diam., fusco-nigricantes, pilis hyalinis et spinis fuscis ornata. Sporae 6–7 × 1.5–2 μm.—In apotheciis *Stictarum*.

Typus: Kenya, Santesson 22144 f (holotypus: UPS; isotypus: S).

The vegetative dark mycelium immersed in the ± dead tissues of the host.

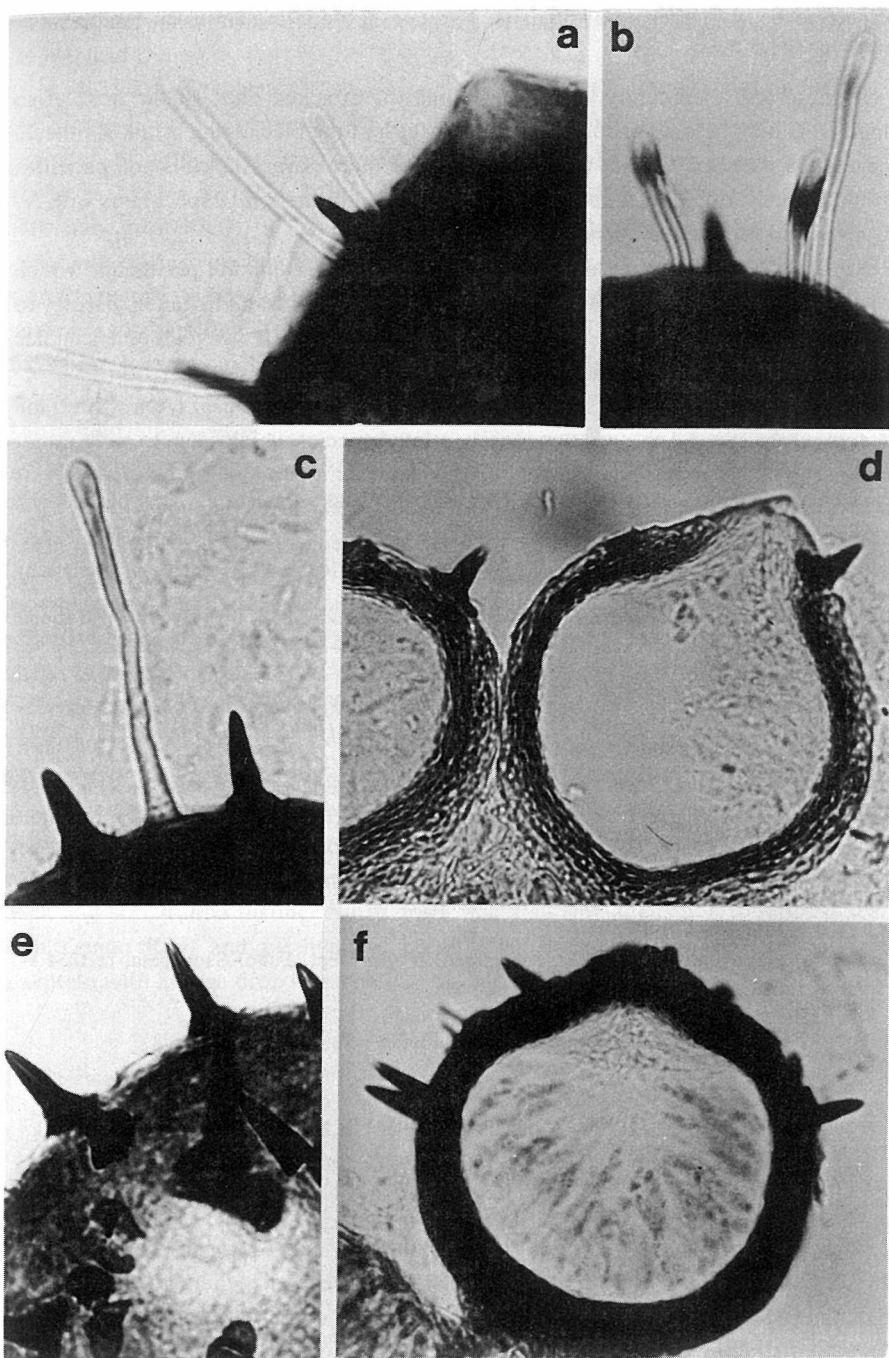
Perithecia at first immersed in the necrotic hymenia of the host but later superficial, scattered or sparsely gregarious, when moist almost spheric with a slightly protruding conical papilla, which is somewhat paler than the rest of the perithecium, when dry collapsed into cup-shape without any visible papilla. The upper part of the perithecium furnished with spines and hairs. Spines 1-celled, thick-walled, dark brown to almost black, 12–20 μm long, ± conical with pointed apex and up to 3–5 μm broad, basally rather abruptly enlarged to 6–12 μm. Hairs 2–5-celled, thin-walled, hyaline, subcylindrical, 55–85 μm long and mostly 3.5–4 μm broad, apically rounded and the apical as well as the basal part slightly enlarged, ca. 5 μm and 5–6 μm respectively. The dark spines usually 10–25 per perithecium, the hyaline hairs much fewer, usually 3–6 only. Hyaline hairs rarely with dark brown zones and a flattened broad base, thus in some respects transitional to dark spines.

Peridium membranaceous, pseudoparenchymous, in thin sections rather pale brown, 10–15 μm thick, the paler papilla ca. 25–30 μm in diam.

Asci 8-sporous, 30–40 × 5–6 μm, clavate, rather long-stalked, non-amyloid; apical ring distinct, thickened. No paraphyses visible. Below the papilla a cushion (ca. 15–20 μm) of periphysis-like hyphae.

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*Fig. 5. Nitschkiopsis stictarum* (holotypus). (a–c) Hairs and spines on the surface of the ascocarps. (a, c) Hyaline hairs with rounded tips and slightly thickened bases. (e) Dark-brown spines with pointed tips and broad flattened bases. (b) Transitional types with dark parts on the hyaline hairs and broad flattened bases (ca. 700×). — (d, f) Median sections of ascocarps, (d) showing the prominent ostiolar part (seen also in a), f showing the arrangement of the asci and the periphysis-like hyphae (ca. 500×).



Spores obliquely uniseriate or biseriate, 1-septate, fusiform to ellipsoidal, hyaline, thin-walled,  $6-7 \times 1.5-2 \mu\text{m}$ .

*N. stictarum* is evidently a parasite killing the attacked parts of the host. Also other fungi may be responsible for the necroses and the blackening of the apothecia and thallus parts as it is not rare to find two or more parasymbionts and parasites simultaneously attacking a lichen thallus. However, in the *Sticta* specimens with *N. stictarum* no other fungus could be identified.

Our fungus is very easily overlooked on account of its minute perithecia, which are as dark as the substrate. When collecting specimens of *Sticta* lichenologists try to avoid the partly dead specimens in which the fungus grows. However, some samples of the new fungus were found in lichen herbaria.

The hosts of *N. stictarum* so far known, viz. *Sticta ambavillaria* (Ach.) Bory and *St. tomentosa* (Sw.) Ach., are two closely related species which seem to have rather similar ecological requirements. On the East African mountains the parasite seems to be common in wet forests and bushlands from 2 500 to 3 500 m s.m.

**DISTRIBUTION:** Most probably widely distributed in tropical regions. At present known from East Africa and South America.

**Africa** (all finds on *St. ambavillaria*): *Kenya*: Central Prov.: Mt. Kenya, W. slope, National Park Road (Naro Moru Track), bamboo zone, alt. 2 700–3 100 m, on *Arundinaria alpina*, 23.i.1970 R. Santesson 22144 f (Type). SW. slope, upper part of bamboo zone, 6.ii.1922 R. E. & Th. C. E. Fries 4024 b (UPS). E. slope, Urumandi, alt. 3 100 m 1959 M. J. Coe (UPS). — Mt. Aberdare, along Wandera's Track, alt. 3 300 m, on *Stoebe kilimandarica*, 15.vii.1971 I. & O. Hedberg 5024 1 (UPS).

*Tanzania*: Arusha Prov.: Mt. Meru, E. slope, road to the crater, alt. 1 900 m, on a big tree in the montane forest, 7.i.1971 R. Santesson 23073 b (UPS). E. slope, ca. 2 km N. of Kitoto Camp, alt. 2 450 m, on *Stoebe kilimandscharica* and *Hypericum lanceolatum* in dense Ericaceous bushland, 7.i.1971 R. Santesson 22960, 22969 (UPS). — Kilimanjaro Prov.: Mt. Kilimanjaro, W. slope, E. of Lemosho Glades, Ericaceous zone, alt. 2 800–2 900 m, on various shrubs, 14.i.1970 R. Santesson 21297 a (UPS).

**South America** (both finds on *St. tomentosa*): *Peru*: Dept. Puno: Sachapata, ix.1854 W. Lechler (parasitic on *Plantae peruv.* 3124; UPS).

*Brazil*: Estado Paraná: Rio Negro 9.x.1908 P. Dusén (S)."

## 8. The "Nitschkia Group" in Europe

My studies in the Scandinavian herbaria and in some others have revealed 6 species of this group to occur in the Nordic countries and two more in West and South Europe, one of which (*N. confertula*) should be sought for in south-western Scandinavia. The floristic literature is insufficient to recognize them, and—as shown in Chapt. 2—their nomenclature has been badly confused. Fitzpatrick's well-founded distinction between the two species that had both passed as *N. cupularis* has astonishingly been neglected by all subsequent European writers.

*Acanthonitschkea tristis*, which escaped his notion, has been missed also by Arx & Müller and Dennis.

*N. dissipata* Kirschst. is *Dermea padi* (A. & S. ex Fr.) Fr. (Nannfeldt 1975: 62). As Munk (in litt.) has pointed out to me, his *Trichosphaeria brevispina* is in fact a member of this group (cp. above) but his *Rostrocoronophora geranii* Munk (1953: 96; 1953 b: 87; 1957: 282) is a *Gnomonia*. Gola (1930: 192) listed, as present in Hb. Saccardo (PAD), a Swedish specimen of an additional species, viz. of the otherwise exclusively North American *Fracchiaea callista* (= *N. callista*). On inspection the record turned out to be based on a tentative determination by Saccardo of a sample sent by Romell (a duplicate of Hb. Romell 16154, S!). Berlese (1900: 26) based on the same gathering his *Fr. romelliana*, which Fitzpatrick (1924: 109) considered to be a *Cryptosphaerella* and which also in my opinion belongs to *Coronophora* s.lat.

Due to the similitude between the different species and the discussions in Chapt. 4 of the diagnostic features, no descriptions are given here, only a determinative key. This is followed by detailed accounts of the European distributions so far known of the species (for their total distributions see Chapt. 5 and 6). The lists are based on the specimens revised by me and on reliable literary records. They do not pretend to be exhaustive except for the Nordic countries. Erroneous records have been rectified as far as possible.

Here, it should be remembered that there exists one not too rare, widely different Pyrenomycete with ascocarps collapsing into cup-shape and thus easily mistaken for a *Nitschkia*, viz. *Sphaeria pomiformis* Pers. ex. Fr., later transferred to genera such as *Melanopsamma* and *Chaetosphaeria*. It is easily known by the ostiolate ascocarps (0.25–0.3 mm across), often with some hyaline "setae" (in fact effete conidiophores) up to 250  $\mu\text{m}$  long, by subcylindrical—clavate asci with a relatively thick and stiff wall, a distinct apical dome and a subapical cushion (both best seen with Congo Red) and by hyaline, broadly ellipsoidal spores (12–18 $\times$ 5–8  $\mu\text{m}$ ), 1-septate with a large drop in each cell.

*Key to the European species of the "Nitschkia Group".*

1. Subiculum with dark stiff bristles, up to 200  $\mu\text{m}$  long (*Acanthonitschkea*).  
Spores 6–9 $\times$ 1.5–2  $\mu\text{m}$ . *Ac. tristis*
1. No bristles *(Nitschkia)*
2. Asci large (up to 120 $\times$ 25  $\mu\text{m}$ ) with >200 spores, arranged in longitudinal rows.  
Sp. 8–11 $\times$ 1.5–2  $\mu\text{m}$ , suballantoid. Ascocarps 0.3–0.65 mm across, only rarely collapsing into cup-shape. *N. broomeiana*
2. Asci much smaller, 8-sporous.
3. Ascocarps small (0.2–0.3 mm), caespitose (to gregarious). Sp. 9–13(–16) $\times$  2–3(–3.5)  $\mu\text{m}$ , suballantoid. *N. parasitans*
3. Ascocarps larger (0.3–0.75 mm), gregarious to scattered.
4. Part of the peridial cells prolonged into pointed spines (up to 20  $\mu\text{m}$  long).  
Sp. 7–14 $\times$ 3–4  $\mu\text{m}$ , subcylindrical to narrowly ellipsoidal. *N. brevispina*

4. External peridial cells rounded or at most mamillate.
5. Average spore length <math>< 10 \mu\text{m}</math>.
6. Sp. 6-9(-11)  $\times$  1.5-2.5  $\mu\text{m}$ , subcylindrical to subfusoid, straight, hyaline, eventually 1-septate. *N. grevillii*
6. Sp. (6-)7-10(-11)  $\times$  3.5-5  $\mu\text{m}$ , ovoid to ellipsoidal to subreniform not septate, wall early smoky-grey. *N. confertula*
5. Average spore length > 10  $\mu\text{m}$ .
7. Sp. 10-18  $\times$  2-2.5  $\mu\text{m}$ , subcylindrical, hyaline. *N. cupularis*
7. Sp. 12-18  $\times$  3.5-7  $\mu\text{m}$ , fusiform, eventually with a very distinct median septum and smoky-grey wall. *N. collapsa*

(1) *Acanthonitschkea tristis* (Pers. ex Fr.) Nannf.

**Sweden:** *Skåne*: Lund (lignum) E. Fries (Scl. Suec. 386). — *Småland*: Kärda, Källunda, Beech Forest (*Fagus* periderm) 21.vii.1944 S. Lundell (UPS). — *Värmland*: Varnum, Niklasdamm (*Ulmus* inner-bark) vii.1892 H. Hamberg (S). — *Uppland*: Lohärad, Erken, Bibacken (*Sorb. auc. perid.*, inner-bark and lignum) 19.v.1918 L. Romell 15562 (S, UPS). Solna, Haga (*Ulmus* inner-bark) 3.ii.1891 H. Hamberg (S); (*Sorb. auc. perid.*) 15.vi.1901 L. Romell 16201 (S, UPS). Stockholm between Skuggan and Värtan (*Ulmus* inner-bark) 5.v.1888 L. Romell 15835 (S, UPS). Uppsala (Bondkyrka) Kvarnbo lund (*Corylus av. perid.*) 23.v.1926 & 2.iv.1928 N. Hylander & J.A.N. 4383 (UPS; Weese, Eumyc. sel. exs. 448); *Prun. spin. perid.*) 24.iv.1928 J.A.N. 4382 (UPS); Vårdsåtra Nature Park (*Aln. glut. lignum*) 9.iv.1928 S. Lundell & J.A.N. 4381 (UPS); (*Ulmus* inner-bark) 27.iii.1929 S. Lundell & J.A.N. 2025 (UPS). Årentuna, Storvreta Forest, ca. 4 km SE of the village (*Cor. av. perid.*) 24.iv.1967 N. Lundqvist 5268 (UPS). — *Västmanland*: Sala, at the Silver Mine (*Cor. av. perid.*) 15.viii.1949 R. Morander 1451 (UPS). — *Gästrikland*: Gävle, Lövudden (*Ulmus* fallen decorticated branch) 23.iv.1962 J.A.N. 17118 (UPS).

**Norway:** *Akershus*: Ö. Bærum at the R. Lysakerelva, above Jar (bark and lignum) 7.vi.1962 I. Jörstad & J.A.N. 17145b (O, UPS).

[**Denmark:** No material is left relating to the records of *N. tristis* from Jylland (Larsen 1952: 13). They may refer to *N. grevillii*.]

**Great Britain:** *Gloucestershire*: Saintsbury (*Acer*) 26.iv.1936 E. W. Mason 1352 & C. G. C. Chesters (IMI 15228, 15230). — *Lincolnshire*: nr. Brigg (*Ac.*) 7.iv.1962 G. Morgan-Jones (IMI 127 063). — *Somerset*: Batheaston (*perid.*) iv.1866 C. E. Broome (Cke, F. brit. I:269). — *Yorkshire*: Carperby (*Ulmus?*) 10.x.1936 W. G. Bramley (IMI 13490). Howdale (*Ac. pseudopl. una cum N. cup. et soc. Eutypa sp.*) 3.iii.1957 W. G. Bramley (IMI 68769a); Pickering, Howdale (*Ac. pseudopl.*) 22.xi.1956 W. G. Bramley (IMI 75384); Pickering, Clunhall Wood (*Ilex*) 6.i.1957 W. G. Bramley (IMI 68154c).

**France:** *Dép<sup>t</sup>. Côte-d'Or*: (*Juglans r. lignum*) F. Fautrey IV: 143 (UPS).

**Germany:** sine loco exactiore (probably *Niedersachsen*: nr. Göttingen) (*Fagus?* bark) C. H. Persoon (lectotypus *Sph. tristis*).

**Switzerland:** sine loco exactiore (*Ulmus* bark) Morthier 4 (typus *Coel. med.*). Jura Mts. (*Cor. av. perid. and lignum*) Morthier (Hb. Barb.-Boiss. 590 p.p.; Fuck., F. rhen. 947 p.p.).

**Czechoslovakia:** *Moravia*: Hranice (=Mähr.-Weisskirchen) Podhorn (*Ulmus* fallen decorticated branches) 18.vi.1922 F. Petrak (typus *Syd. mor.*). "Schlesien pr. Gabel" (*Fagus* *perid. and inner-bark*) viii.1911 G. v. Niessl. (S).

(2) *Nitschkia brevispina* (Munk) Nannf.

**Sweden:** *Uppland*: Dalby, "Ormberget" (nr. Gråna) (*Ulmus*) 7.iii.1975 Kerstin Holm & J.A.N. 23901 (UPS).

**Denmark:** *Sjælland:* Hvalsø (*Fagus* bark, soc. *Quaternaria quaternata* (vetusta), *Nectria sanguinea* (vetusta) & *Calosphaeria parasitica*) 14.ix.1952 E. Müller, A. Munk & J.A.N. (typus). — *Ermelünden* (*Ulmus*) 12.xii.1963 A. Munk (C).

**Finland:** *Nyland:* Borgå (*Sambucus*) ii.1925 W. Nyberg (H).

**Great Britain:** *Staffordshire:* Oscott College, nr. Birmingham (*Ac. ps.pl.*) 3.iv.1930 W. B. Groves, E. W. Mason & P. G. M. Rhodes 4481 p.p. (S).

### (3) *Nitschkia broomeiana* (Berk.) Nannf.

[**Denmark:** The record from Odense (*Salix*) E. Rostrup (Lind 1913: 195 as *Fracch. heterog.*) sounds very improbable from a phytogeographical point of view. Munk (in sched. 1945) could not find this fungus on the sample (C), nor could I. The very rotten wood is also a most unlikely matrix. The record should be cancelled.]

[**Belgium:** The record from Groenendael (*Rosa*) by Bommer & Rousseau (1890: 244 as *Fr. het.*) is equally improbable, and the morphological discrepancies noted by them indicate that their determination is erroneous.]

**France:** *Dép<sup>t</sup> Vaucluse:* Orange (*Paliurus acul.*) J. H. Fabre (fide 1878: 68).

[Three other reputed finds (*Dép<sup>t</sup> Haute-Saône:* Rigny (*Salix*) J. Flageolet 37 (PAD); *Dép<sup>t</sup> Rhône:* Lyon (Roumeg., F. gall. 5568) and *Dép<sup>t</sup> Seine-Inférieure:* Rouen F. Fautrey (UPS) are not substantiated by the specimens. Fautrey's fungus is *N. cupul.* s. orig.]

[**Germany:** Reported by Kirschstein (1911: 289) from Brandenburg (Rathenow) on *Robinia pseudacacia*. The find was originally published (Kirschstein 1906: 51) as *Bertiella polyspora* nov. gen. et sp. on *Quercus*. His renaming is definitely erroneous, as seen already from his illustration. The type specimen (B) shows it to be a unitunicate Pyrenomycete, widely different from the *Coronophorales* but unknown to me.]

**Italy:** "Lombardia, Veneto, Trentina, Sicilia (*Acer camp., Aesculus, Alnus, Buxus, Cercis, Eriobotrya, Lonicera, Rhamnus, Rubus* etc.)" fide Traverso (1907: 361 as *Fr. het.*). Several specimens seen by me in PAD, S, UPS and W, e.g. Cav., F. longob. 119, and Sacc., Myc. ven. 88.

**Czechoslovakia:** *Slovakia:* Prešov (=Eperjes) (*Vitis vinif.*) vii.1869 St. Schulzer v. Mügenburg (1870: 641-642, Hazslinszky 1873: 367; fide Höhnelt 1920: 130).

**Yugoslavia:** *Bosna i Hercegovina:* Jajce (=Jaize) (*Salix*) 1903 Fr.v.Höhnelt (fide 1918: 139).

### (4) *Nitschkia collapsa* (Rom.) Chen.

**Sweden:** *Närke:* St. Mellösa, Tjuren Isl. (*Sorb. auc.* inner-bark) 27.vii.1945 R. Morander 247 (UPS). — *Uppland:* Norrsunda, Rosersberg (*S. auc.* inner-bark) 7.iv.1890 & v.1890 J. W. Hamner (S, UPS); (*S. auc.?* inner-bark and lignum) 7.iv.1890 L. Romell 15563 (S; Romell 1892: 176). Spånga (*S. auc.* perid.) 3.vi.1892 H. Hamberg Hb. Romell 15564 (S; Romell 1892: 177). Stockholm, "ad Holmiam" (*S. auc.* perid. and inner-bark) 2.vi.1892 H. Hesselman ("sine subic." UPS; "cum subic." S). Uppsala, Slottsbacken (*Sorbus sp.?* perid. and inner-bark) 10.v.1962 N. Lundqvist 3514 (UPS). Uppsala (Bondkyrka) Vårdsåtra (*S. auc.* perid., inner-bark and lignum) 12.iv.1885 L. Romell 15121, 15823 p.p. (S; F. exs. scand. 70 "ad Upsaliam", typus; Romell 1889: 24); (*S. auc.* perid.) 31.v.1885 L. Romell 15823 p.p. (S).

**Denmark:** *Sjælland:* Øverød (*Fagus* bark and "terra nuda") 28.iii.1908 J. Lind (C, S; 1913: 190 as *Herpotr. coll.*)

[Munk (1953: 100; 1957: 295) drew evidently his description of "*Calyc. coll.*" from another of Lind's collections, viz. that from Ruderhegn, which is in fact *N. grevillii* and matches Munk's description. He reported *N. collapsa* also from Fyn (Skårup) collected by E. Rostrup (as *Lasiosphaeria spermoides*) on *Robinia pseudacacia*, but I have not seen this collection.]

**Great Britain:** Evidently not common but widespread, being seen by me (mainly in IMI) from Bedfordshire, Devonshire, Nottinghamshire, Somerset, Yorkshire and the Channel Islands (Guernsey) on *Acer*, *Crataegus*, *Fraxinus*, *Prunus spinosa*.—As shown by authentic material from Batheaston (W) "*Sphaeria tristis* var. *sporidiis majoribus*" (Berkeley & Broome 1871: 425) is this species.—Fitzpatrick (1923: 53) saw in NY a specimen collected by Plowright in 1873 and labelled *Sph. tristis*.—The published record of *Bertia collapsa* from Guernsey (on *Ribes grossularia* and *R. rubrum*, leg. Marquand) seems to be correct according to the data given by Booth (1957: 25; cp. Masee 1898: 24; Hawley 1923: 227).

**Belgium:** *Prov. Oost-Vlaanderen:* Dendermonde (= Termonde) (*Ulmus* bark) D. Westendorp (Roumeg., F. gall. exs. 3524).

**France:** sine loco exactiore (*Berberis*, *Crataegus*, *Sorbus*) J. E. Chenantais (fide 1918: 71–73).—*Dép<sup>t</sup> Seine:* "prope Parisios" C. H. Persoon ("*Sph. tristis*", L 910, 269–1008). Montmorency (*Crataegus* and soil) E. Boudier (typus *Trichosph. vag.*).

#### (5) *Nitschkia confertula* (Schw.) Nannf.

**Great Britain:** "On bark &c" (Dennis 1960: 212; 1968: 334 as *Tymp. euomph.*).—Evidently widespread in England and Wales, seen by me (mainly in IMI) from Cardiganshire, Devonshire, Glamorgan, Gloucestershire, Monmouthshire, Pembrokeshire, Somerset, Surrey and Yorkshire (14 localities in all; on *Fraxinus* associated with *Hypoxylon rubiginosum*) and just reaching Scotland (Wigtownshire: Mull of Galloway, Logon Woods viii. 1936 C. G. C. Chesters, IMI 13391).

**Italy:** *Toscana:* "Selva pisana" O. Beccari (typus *Coel. becc.*).

#### (6) *Nitschkia cupularis* (Fr. ex Fr.) Karst. s. orig.

**Sweden:** sine loco exactiore E. Fries (Scl. Suec. (ed. 1) 231; typus).

**Great Britain:** *Glamorgan:* Southerndown (*Frax.*?, bark) 31.x.1944 S. J. Hughes 9 (IMI 132 617). — *Norfolk:* King's Lynn (*Acer camp.*) 13.iii. Ch. E. Plowright (S). Wheatfen Broad (*Salix*) v.1946 (IMI 5528). — *Yorkshire:* Burton, Constable, The Moors (*Ulmus*) 22.i.1949 J. Webster (IMI 34004; S). Howdale (*Frax.*) 12.iv.1947 Mr. Rimmington (IMI 14106); (*Acer pseudopl.*; una cum *Ac. trist.*) 3.ii.1957 W. G. Bramley 68 (IMI 68769b). Thornton (*Crataegus*) x.1945 (IMI 1672).

**Belgium:** *Prov. Liège:* Malmédy (*Frax. ornus*, bark) M. A. Libert (Roumeg., F. gall. 1551).

**France:** *Dép<sup>t</sup> Côte-d'Or:* Noidan (*Carp.*, lignum) 1890 F. Fautrey (typus *Melan. num.*) — *Dép<sup>t</sup> Seine-Inférieure:* Rouen (*Castanea*) 9.iii.1890 F. Fautrey 30 (UPS).

**Germany:** *Brandenburg:* Westhavelland: Gross-Behnitz (*Rhamnus cath.* perid. and inner-bark) 6.iv.1898 W. Kirschstein (Typus *Herp. rehm.*); Park Gross-Behnitz (*Frax. exc.*) 12.iv.1901 W. Kirschstein (B); Klein-Behnitz, Hasellake (*Ulmus*) x.1905, xii.1909, xi.1910 & 23.xi.1913; (*Rosa can.*); (*Coryl. av.*) 9.iv.1917; (*Prunus spin.*) 6.ii.1916 W. Kirschstein (B). Ost-Prignitz: Trignitz i.d. Prignitz (*Crat. ox.*, soc. *Diatr. stigma*) 25.iii.1910 O. Jaap 787 (S).

**Austria:** *Nieder-Österreich:* Wienerwald, Rekawinkel (*Quercus*) vi.1907 Fr. v. Höhnel (Rehm, Ascom. 1743).

#### (7) *Nitschkia grevillii* (Rehm) Nannf.

**Sweden:** *Uppland:* Uppsala (Bondkyrka) Kvarnbo (*Coryl. av.*? inner-bark) 19.ix.1965 N. Lundqvist 4746 (UPS). — *Jämtland:* Åre, between Åre and Sää (*Prunus pad.* inner-bark) 1887 A. Y. Grevillius (typus).

**Denmark:** *Sjælland:* Ruderhegn (*Fagus* bark) 16.iv.1909 J. Lind (1913: 190 as *Herp. coll.*; C,



UPS). Rude Skov (*Samb. nigr. lignum*) 17.ix.1963 A. Munk (C). Dyrehaven (*Fagus?* lignum) 20.iii.1965 A. Munk (C).

[Larsen's records (1952: 13) of *N. tristis* from Jylland may refer to this species, but no material is left.]

**Norway:** sine loco exactiore M. N. Blytt (O). — Oslo: Ullevold N. Moe (O). — Nordland: Saltdalen (*Prunus pad.* inner-bark) iii.1824 S. Chr. Sommerfelt (1826: 212 as *Sph. trist.*; Rostrup 1904a: 16 as *Coel. trist.*; O).

**Great Britain:** Dennis' statement about *Calyc. tristis*: "On wood normally on that bearing members of the Diatrypaceae. Not common" (1960: 212; 1968: 333) refers p.max.p. to the present species. Numerous finds in England. Seen by me (mainly in IMI) from Devon, Durham, Essex, Gloucestershire, Hampshire, Hertfordshire, Norfolk, Oxfordshire, Somerset, Suffolk, Surrey, Wiltshire and Yorkshire; on *Acer pseudopl.*, *Aesculus?*, *Carpinus*, *Fagus*, *Ilex*, *Populus* and *Ulmus*.

**Belgium:** Prov. Liège: Courtrai (*Populus* inner-bark) D. Westendorp (Herb. crypt. 528).

**Luxembourg:** Kockelscheuer (*Frax.* bark and lignum) vi.1901 V. Noppeney (typus *Wallr. frax.*).

**France:** sine locis exactioribus (*Cydonia* and *Prun. spin.*) J. E. Chenantais (fide 1918: 64-72 as *N. trist.*). — *Dépt Haute-Saône:* Rigny (*Salix* bark) 19.vi. J. Flageolet (typus *N. wint.*) — *Dépt Loire-Inférieur:* Nantes "Chêne-Vert" (*Populus fast.*, soc. *Eutypa lata*) J. E. Chenantais (fide l.c.).

**Germany:** sine loco exactiore (probably *Niedersachsen*: nr. Göttingen) (*Populus trem.*? bark) C. H. Persoon (L 910, 270-594) as *Sph. cup.*; cp. Nannfeldt 1975: 53). — *Westfalen:* Bonn (*Aesc. hipp.*) Hb. Sehlmeier (B).

**Switzerland:** Jura Mts. (*Corylus av.*) Morthier (Fuck., F. rhen 947=Herb. Barb.-Boiss. 590).

[**Poland:** Schroeter's record (1894: 313) of *N. tristis* from Falkenberg (=Niemodfin) belongs probably here.]

[**Italy:** Traverso's records (1907: 359) of *N. tristis* refer probably—at least in part—to *N. grevillii*, but no specimens have been seen by me.]

### (8) *Nitschkia parasitans* (Schw.) Nannf.

**Sweden:** *Skåne:* Lund E. Fries (Sci. Suec. (ed. 2) 231 (UPS); cp. Nannfeldt 1975: 54). — *Uppland:* Dalby, "Ormberget" (nr. Gräna) (*Ulmus*) 23.ii.1974 Kerstin & L. Holm 175a (UPS). Soina, Ålkistan (*Acer*) L. Romell 15668 (S); Ulriksdal (*Prun. pad.*) 25.ii.1912 & 9.iii.1912 T. Vestergren (S). Stockholm (*Sorb. auc.*) 1.vi.1884 L. Romell 15327 (S, UPS); Eriksberg (*Tilia*) 9.iv.1887 L. Romell 15834 (S). Uppsala 1885 L. Romell 15833 (S); (*Crataeg.*) 5.viii.1884 L. Romell 16053 (S, UPS). — *Jämtland:* Åre (*Ribes rubr.*) 2.vii.1930 A. G. Eliasson (S, UPS). — *Västertotten:* Umeå (*Prun. pad.*) v.1909 J. Vleugel 113 (1911: 332 as *N. cup.*; C, S).

**Finland:** *Nylandia:* Borgå (*Caragana, Crat., Sambucus*) i.-ii.1925, v. 1926 & iv.1927 W. Nyberg (H, UPS). Elimä, Mustila (*Prun. pad.*) 18.vi.1908 & 15.vi.1909 C. G. Tigerstedt (C, H, UPS). — *Regio aboënsis:* Åbo (*Populus*) 9.iv.1861 P. A. Karsten 1067 (H); (*Ulmus*) 6.v.1861 P. A. Karsten 1068 (H; F. fenn. 861). — *Tavastia australis:* Tammela, Mustiala (*Acer, Crat., Prun. pad. Ribes rubr., Rubus id., Syringa vulg., Tilia*) several dates 1866, 1869, 1872 & 1891 P. A. Karsten 1069-1078, 1080-1082 (H, UPS); (*Syr. vulg.*) 15.v.1887 Onni Karsten, Hb. Karsten 1079 (H).

**Norway:** sine locis exactioribus (*Ribes rubr.*, *Jugl. cin.*, *Acer plat.*) (C, O). — Oslo: M. N. Blytt (O); Bryn (*Ribes rubr.*) v.1849 N. Moe (O); Tveita (*Aesculus*) 1840 M. N. Blytt (O); Töien (*Acer plat.*, *Aesc.*, *Caragana arb.*, *Jugl. cin.*, *J. reg.*, *Rhamnus fr.*) 1840 & 1849 N. Moe (Rostrup 1904a: 16 as *Coel. acervata* and *C. cup.*; C, O). — *Oppland:* Ringebu (*Prun. cer.*, *P. pad.*, *Ribes*) S. Chr. Sommerfelt (O).

**Denmark:** *Sjælland:* Boserup Skov (*Ulmus*) 1.xii.1964 A. Munk (UPS). — *Lolland:* Stensgård ("Corylus" = *Fagus*?) viii.1863 E. Rostrup (Lind 1913: 195 as *N. cup.*; C). — *Jylland:* Hornslet (*Fagus*) 26.xii.1908 Ø. Winge (C). Århus, "Haveselskabets Have" (*Acer pseudopl.*) 2.i.1909 Ø. Winge (C); Risskov (*Ac. camp.*) 30.xii.1908 Ø. Winge (C); Marselisborg (*Prun. spin.*) 9.i.1909 Ø. Winge (C).

**The Faeroes:** Strømø: Sandgårde (*Ribes r.*) 2.ix.1938 F. H. Möller (1958: 90–91 as *N. cup.*).

**[Iceland:** *Coel. cup.* was listed from one locality by Rostrup (1904b: 299) but omitted by Larsen (1932) as he had found only a *Mollisia* on the relevant specimen (in C). My own re-examination gave the same result.]

**Great Britain:** Dennis' statement about *N. cupularis* "On dead branches of *Acer*, *Aesculus*, *Prunus* etc. Not common." (1960: 211; 1968: 333) refers p.max.p. to the present species. Numerous finds in England. Seen by me (mainly in IMI) from Derbyshire, Essex, Gloucestershire, Hertfordshire, Middlesex, Norfolk, Northamptonshire, Staffordshire, Surrey and Yorkshire, on *Acer pseudopl.*, *Aesculus*, *Fagus*, *Malus*, *Tilia*, and *Ulmus*.

**Belgium:** *Prov. Liège:* Malmédy (*Acer ps.pl.*) M. A. Libert (Roumeg., F. gall. 1488; Thüm., Myc. univ. 1947).

**France:** sine loco exactiore (*Aesc.*) L. Dufour 611 (Hb. Fries UPS). — Probably *Dépt Bas-Rhin:* nr. Strasbourg and/or *Dépt Vosges:* nr. Bruyères-en-Vosges (*Alnus*, *Carp.*, *Jugl.* & *Robinia pseudac.*) (Moug. & Nestl., St. crypt. vog.-rhen. 771 & 1455). — *Dépt Seine-et-Oise:* common at Paris and Versailles (*Acer ps.pl.*, *Aesc. h.*, *Juglans r.*, *Populus nigra*, *Ribes rubr.*, *Sorbus hybr.*, *Ulmus* etc.) Tulasne (1865: 82; 1931: 77; as *Sph. cup.*). — *Dépt Seine-Inférieure:* Rouen (*Tilia*) A. Malbranche 512 (typus *Coel. anc.*). — *Dépt Vienne:* Saint-Romain-sur-Vienne (*Rob. ps.*) S. DeLacroix (Desm., Pl. crypt. II: 780).

**Germany:** sine loco exactiore G. Kunze (Hb. Fries UPS; "Sph. cupularis" det. Kze). — "Germania" (probably *Nedersachsen:* nr. Göttingen) (*Crat.*) C. H. Persoon (L 910, 270–591 as *Sph. cup.* cp. Nannfeldt 1975: 53). — *Westfalen:* Bonn (*Aesc. h.*) Hb. Sehlmeier (B). — *Hessen:* Östrich (*Acer*, *Prun. mahaleb*, *Carp.*) L. Fuckel (F. rhen. 968; Hb. Barb.-Boiss. 591). — *Bayern:* Oberbayern: Grosshesselohe (*Acer ps.pl.*) iv.1892 J. N. Schnabl (S). — *Brandenburg:* Berlin Botanic Garden (*Ulmus carp. f. suberosa*) iv.–vi.1888 P. Sydow (Myc. march. 1915; Rehm, Ascom. 983). Steglitz (*Tilia*) xi.1894 P. Sydow (Myc. march. 2340). Charlottenburg Schlossgarten (*Aesc. h.*) viii.1894 P. Sydow (Myc. march. 4131). — *Sachsen:* Leipzig (*Rhamnus*) vi.1874 G. Winter (S).

**Switzerland:** *Ct. Bern:* Bern (*Aesc. h.*) autumn G. Otth (typus *Nectriae hipp.*). — *Ct. Ticino* (fide Traverso 1907: 359 as *N. cup.*).

**Austria:** *Niederösterreich:* Pfaffenberg nr. Deutsch-Altenburg (*Crat. ox.*) xi.1940 F. Petrak (Myc. gen. 177). Sonntagberg (*Aesc. h.*) x.1914 P. Strasser (1915: 95; W). — *Oberösterreich:* Vöcklabruck (*Pr. spin.*) vii.1948 and Wels (*Ulmus*) vii.1968 K. W. Kuchar 1974: 176 as *N. cup.*

**Poland:** Warszawa, Mokotów (*Ulmus*) 17.x.1962 J. Kochman (Myc. pol. 326). — Schroeter's record (1894: 313 as *N. cupularis*) from Wrocław (=Breslau) belongs certainly here.

**Czechoslovakia:** *Moravia:* Hranice (=Mähr.-Weisskirchen) Podhorn (*Ulmus*) 9.x.1922 F. Petrak (Fl. boh.-mor. II: 1: 1634). Mähr.-Schönberg (*Aesc. h.*) 1.iv.1878 J. Paul (typus *N. morav.*). Sternberg (*Ulmus*?) iii.1926 J. Piskoř (fide Petrak 1927: 362 as *N. cup.*).

**Italy:** Traverso's paragraph about *N. cupularis*: "Piemonte, Veneto, Canton Ticino, Trentino, Lazio, Napoletano, Sicilia (*Acer*, *Carpinus*, *Corylus*, *Fraxinus*, *Gleditschia*, *Mespilus*, *Prunus*, *Syringa*, *Tilia*, *Ulmus* etc.)" (1907: 359) refers—at least p.max.p.—to the present species. Several specimens seen by me, e.g. Sacc., Myc. ven. 1449.

**Soviet Union** (European part): "Prov. Nowgorod: Bologue" (*Ulmus mont.*)  $\frac{14}{26}$  vii.1897 W. Tranzschel (S).

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#### Additional Note

Sivanesan (Trans. Brit. Mycol. Soc. 64(3): 441-445, 1975) has recently transferred *Lasiosphaeria noonae-daniae* (discussed in Chapt. 4) to his new, two-species genus *Lasiosphaeriella*, which he placed in *Lasiosphaeriaceae* sensu Lundq. and characterized by ostiolate ascocarps, asci without any apical apparatus, and spores surrounded by a mucilaginous sheath and germinating by phialides. The type species is *L. dennisii* Sivan. from Uganda. Both species have tuberculate ascocarps and "Munk pores". In both the cells of the basal part of the peridium tend to lie in radiating rows.