



# The ascomycete genus *Niesslia* and associated monocillium-like anamorphs

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## Abstract

The species of *Niesslia* including anamorphs formerly known as *Monocillium* form a distinct group in the Hypocreales and can be delimited by several unique morphological characters. *Niesslia* species inhabit decaying plant substrates, such as leaf litter or bark of diverse plants, especially coniferous hosts. Certain species occur on and may parasitize lichens, fruiting bodies of other fungi and even nematode eggs. Taxonomically, species of *Niesslia* are classified in the Niessliaceae. *Niesslia* species are recognised by their tiny superficial, mostly dark brown, shiny and typically spine covered ascomata. Monocillium-like phialides formed in situ and in culture are usually partly or entirely thick-walled. Phialides with wall thickening only in their basal parts sometimes expand in width to taper again into a conidiiferous neck, while others terminate in a non-sporulating vesicle. Based on the revised generic concept presented here, *Niesslia* accommodates 50 cultured species plus around 40 species known only from herbarium material. Some of the latter species may eventually have to be excluded from *Niesslia* but are maintained in the genus ad interim, until DNA sequences necessary for their accurate reclassification are available. The taxonomic concept based on morphological characters is corroborated by DNA sequences of phylogenetic marker loci such as the large subunit (28S) of the ribosomal RNA gene, internal transcribed spacer regions 1 and 2 including the 5.8S ribosomal RNA gene, and partial sequences of translation elongation factor 1- $\alpha$ ,  $\beta$ -tubulin 2 and  $\gamma$ -actin genes. These DNA barcodes support most of the morphologically delimited species and the generic concept of *Niesslia*.

**Keywords** Hypocreales · Niessliaceae · Species taxonomy

## Introduction

*Niesslia* Auersw. was introduced for a single species, *N. chaetomium* (Corda) Auersw. (Auerswald 1869). It is a species-rich ascomycete genus characterised by small, mostly spine-covered (i.e. spinulose) perithecia that collapse into a disc shape when dry and morphologically little-differentiated anamorphs previously known as *Monocillium* S.B. Saksena. In common with the similar genus *Acremonium* Link, *Niesslia* and *Monocillium* have so far received relatively little taxonomic attention. Because of the little-differentiated morphology, a clear-cut distinction of species is impossible without the support from DNA barcodes and phylogenetic analyses. Here, we present a first revision of a large number of species, while acknowledging that for many we have seen only one to three isolates. This study is therefore just an introduction to this species-rich group whose representatives can be found as saprotrophs almost everywhere.

Gams (1971) recognised the connection of *Niesslia* species with hyphomycetous anamorphs classified in *Monocillium*, a

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genus that he differentiated from the still heterogeneous *Acremonium*; he described four species with teleomorphs and nine with only anamorphic sporulation. This connection was found in a late stage of his revision of cephalosporium-like fungi. The coverage of species in that book was therefore quite incomplete and partly inaccurate.

The year 2013 marked an important change in nomenclature. Dual names are no longer acceptable for pleomorphic fungi, and anamorphic and teleomorphic names are treated at equal rank according to priority (Turland et al. 2018: Art. F.8), unless otherwise agreed by competent committees and fixed in a list of protected names. Teleomorphic names no longer have automatic precedence over anamorphic names as was the previous practice. The name *Niesslia* Auersw. 1869 is older than *Monocillium* S.B. Saksena 1955, and thus in this case, the teleomorph name prevails.

This taxonomic revision is presented in five sections. Section 1 consists of dichotomous keys for identifying holomorphic or anamorphic species based on morphological characters. In section 2, holomorphic species with living culture material are described, while anamorphic species known from living cultures are described in section 3. Accepted *Niesslia* species without viable cultures are listed in section 4 and excluded species or species with an uncertain identity are listed in section 5. Section 5 also includes a set of taxa tentatively included in *Niesslia* but ultimately excluded because of their phylogenetic affinities or unusual patterns of morphological characters. Most species listed in section 4 and 5 are teleomorphically typified and known from herbarium specimens only; many are monotypic. Some of the species listed in sections 4 and 5 were also included in the dichotomous key where ‘to be excluded’ is specified for species of section 5. Besides the recollection and characterisation of these ‘herbarium species’, it will be the task of future studies to re-evaluate the delimitation of each species on the basis of additional material.

### Morphological characters of *Niesslia*

Species of *Niesslia* are easily recognised by scattered, tiny, initially globose, mostly dark brown, shiny and spinulose, ostiolate ascomata, each with a periphysate ostiole. Ascomata tend to collapse into a cup-like shape when dry. The perithecia sit superficially on the substrate; a subiculum below the perithecia is usually absent but in a few species a weft of curled hyaline hyphae occurs around or below the ascomata. The perithecial spines are mostly dark brown and aculeate with a pointed tip; they rarely end in a kind of vesicle or are paler pigmented. No spines were encountered in *N. leucoula* and *N. monocilliata*. The spines are not normally branched, a character that differentiates *Niesslia* from *Valetoniella* Höhn. 1909, the species of which have branched spines. Phylogenetic

relatedness of *Niesslia* and *Valetoniella* cannot be verified currently because no DNA sequence data are available for latter. The ascoma wall is generally opaque in the outermost layer and is composed of an indistinct *textura epidermoidea*. Unfortunately, in many cases, microtome sections were unavailable to determine the wall thickness. Paraphyses are absent, at least at maturity. No colour reactions occur with KOH or iodine reagents. The asci are unitunicate, thin-walled, cylindrical or slightly club-shaped, with a more or less short pedicel, and mostly lack microscopically visible apical differentiation; only in *N. stictarum* and in *N. coloradensis* is a distinct, barrel-shaped ring visible above the ascospores. The ascospores (mostly eight, rarely four) usually show an oblique, distichous arrangement. At maturity and after discharge, the ascospores accumulate at the ostiole, and are hyaline, always two-celled with a median, generally not constricted septum when mature (unless otherwise stated), and mostly smooth- and thin-walled. The two cells of ascospores usually remain firmly connected. Characteristics common to all species are not repeated in the descriptions.

Only few species, *N. exigua* (after mating), *N. aemula*, *N. artocarpi*, *N. exilis*, *N. physacantha* and *Niesslia* sp. (CBS 478.73), produce ascomata in vitro; some of them may be homothallic. Mating experiments in other species have so far not yielded ascomata in vitro.

Perithecia of *Niesslia* are often surrounded by hyaline conidiophores of the monocillium-like anamorph. The latter is similar to *Acremonium* but differs by phialides with thickened walls in the lower part and usually absence of branched conidiophores (see below). For the formation of the fertile structures on agar cultures, the terminology of Gams (1971) is used in our descriptions: **phalacrogenous**—phialides arising from submerged vegetative hyphae; **nematogenous**—phialides arising from single aerial hyphae; **plectonematogenous**—phialides arising from creeping fasciculate aerial hyphae; and **synnematogenous**—phialides arising from more or less erect fascicles of vegetative hyphae.

The monocillium-like phialides consist of up to three parts. They (a) have a thicker wall at least in their lower part, distinctly thicker than the vegetative hyphae—in some species, they are extremely thick-walled—(b) have a widening, thin-walled portion, which may end with a sterile vesicle or becomes elongate; and (c) extend into a narrower conidiiferous distal portion. The conidiogenous cells develop in two steps: First, a thick-walled basal part is formed that ends in a thin-walled vesicular portion; in a later phase, a slender, thin-walled fertile neck grows out beyond the vesicular structure. The second step does not always occur and sterile vesicular ends are often observed. The conidiiferous neck is usually so narrow that the periclinal wall thickening, normally present in phialides, is invisible. In old material, the distal part

disintegrates first, leaving the basal portions with a torn opening. In some species, the phialides can be regularly aculeate, i.e. tapering continuously towards the tip, and the basal part merges into the thin-walled apical part. In a few species, short, highly fertile phialides occur in addition to the long ones, and in extreme cases, particularly *N. curvisetosa* (Gams and Turhan 1996, as *Monocillium curvisetosum*), the long, thick-walled structures may appear as hyaline sterile setae and sporulation is confined to short phialides, which may be thin-walled. In such species intermediate, slender, thick-walled phialides are also commonly seen. In addition to aseptate phialides, septate conidiophores with less differentiated wall thickening are formed in a few species. Such conidiophores may be aggregated in sporodochium-like aggregates. The conidia are usually hyaline, smooth- and thin-walled, and one-celled. They adhere in slimy or almost dry heads. Conidial chains are seen only in *N. catenata* and *N. indica*. Thick-walled conidia are characteristic of a few species; in *N. aurantiaca*, they are slightly pigmented when seen en masse.

In species with aculeate phialides, the morphological distinction of monocillium- from acremonium-like fungi may be difficult. In addition to the wall thickness, a major criterion for recognising monocillium-like anamorphs lies in the chromophilic or even metachromophilic (turning reddish purple) incrustation of the basal part of the conidiogenous cells and subtending hyphae, i.e. this material stains strongly with aniline or cotton blue.

The vegetative hyphae are usually narrow (0.5–2 µm wide) and thin-walled. Hyaline chlamydospores occur in a few species. *Niesslia aterrima*, *N. bulbillosa*, *N. gamsii* and *N. indica* have discrete, darkly pigmented sclerotia; *N. ligustica* has less sharply differentiated dark structures.

In most cultures of *Niesslia*, no distinct odour is noticed, although in a few taxa, it is sweetish. A few species produce characteristic crystals in culture. These may be prismatic or form irregular aggregates; in *N. tenuis*, they are characteristically fan-shaped as seen in fresh isolates but not reappearing in cultures after long preservation.

The characters described above serve to define monocillium-like anamorphs as a group of naturally related taxa, whilst the remaining species in *Acremonium* represent a heterogeneous assembly. Most cannot yet be reclassified because so few teleomorph connections are known and phylogenetic support is based only on a few DNA sequences of barcode markers, despite of some efforts in this direction by Gräfenhan et al. (2011) and Summerbell et al. (2011).

With the combination of ascoma and spine size and pigmentation and ascospore shape, size and ornamentation, most species of *Niesslia* can be distinguished. The distinction of taxa occurring on the same or similar

substrates, having similar anamorphs but differing in ascospore shape and length such as *N. exosporioides*–*N. luzulae*, *N. clarkii*–*N. ilicifolia*, may be less clear, but DNA sequences of phylogenetic marker genes support these taxonomic concepts.

On the whole, a good correlation exists between single species of teleomorphs and anamorphs. *Niesslia luzulae*, *N. tenuis* and some others described by Gams (1971) represent ‘species aggregates’, partly connected with teleomorphs belonging to several species. When no unequivocal teleomorph connection is established, the anamorph epithet is adopted in *Niesslia*. Isolates preserved as *N. exilis* turned out to be particularly heterogeneous.

After the revision by Gams (1971), anamorph-teleomorph connections were established for several additional taxa. Numerous species described in other genera were previously recognised as teleomorphs or anamorphs related to *Niesslia* and are now classified in the genus. No older epithets were discovered to replace those recognised for the species treated by Gams (1971). However, *N. exilis* and *N. pusilla*, both occurring on pine needles and synonymized by Gams (1971), turn out to be distinct. The similar *N. luzulae* also had to be segregated from *N. exosporioides*, and *Monocillium granulatum* was shown to be a synonym of the former. Several *Monocillium* species remain for which no teleomorph are known, while four *Niesslia* species, *N. lampracantha*, *N. petrakii*, *N. striatispora* and *N. sydowii*, are newly described based on herbarium material only and lack well-defined anamorphs. A few species placed in *Niesslia* by other authors and some newly described taxa (*Niesslia albosubiculosa*, *N. minutispora* and *N. waitemataensis*) will have to be excluded from the genus eventually, but for the time being are formally retained in *Niesslia* pending the collection of additional specimens, cultures and observations.

## Ecology and distribution

Ascomata of *Niesslia* can easily be collected on decaying plant substrates. A range of substrates seems to be specific for certain groups of species. They include twigs and needles of conifers; other kinds of strongly decayed wood; decaying leaves of *Carex*, *Luzula* and various grasses; leaves of hard-leaved shrubs such as *Ilex* and *Laurus*; fungal fruitbodies, e.g. Xylariaceae and soft polypores; and lichenized fungi, particularly foliose genera. Different species of *Niesslia* are found on each of these substrate groups. Anamorphic fungicolous species are frequently found on wood-inhabiting fungi (Gams 1971). A few anamorphic species, particularly *N. aurantiaca*, *N. indica* and *N. mucida*, are often isolated from soil, and at least the latter two of these species show a cosmopolitan distribution. Microsclerotia of *N. gamsii* were

encountered inside the eggs of the nematode *Heterodera filipjevi*, and interpreted as a trait, certain *Niesslia* species may express in parasitic interactions with nematode eggs (Ashrafi et al. 2017).

### Similar genera

In *Trichosphaerella* E. Bommer, M. Rousseau & Sacc. 1891 (syn. *Bresadolella* Höhn. 1903), the type species, *T. decipiens* E. Bommer, M. Rousseau & Sacc., was studied in culture by Samuels and Barr (1997) and the association with an acremonium-like anamorph was demonstrated. For *T. arecae* (Sydow) E. Müller (Gams 1971) and *T. inaequalis* (Grove) E. Müller (W. Gams, unpubl. observ.), the part spores secede easily and acremonium-like anamorphs have been observed but the latter species did not grow in vitro. *Trichosphaerella ceratophora* (Höhn.) E. Müller, CBS 130.82, also has an acremonium-like anamorph. Early fragmenting ascospores were observed in *Niesslia* species such as *N. echinoides* and *N. schizospora*. The branched perithecial spines more than the fragmenting ascospores exclude *N. schizospora* from *Niesslia* and suggest *Valetoniella*. *Valetoniella* was regarded as a synonym of *Niesslia* by Müller and von Arx (1962) but recognised as distinct by Samuels and Barr (1997) and is characterised by branched perithecial spines and ribbed ascospores. Living culture material was unavailable for any of the species characterised by early fragmenting ascospores. For this reason, the generic affiliation of these species remains uncertain and they may need to be excluded from *Niesslia* although they are retained in *Niesslia* for the time being.

Another genus closely related to *Niesslia* is *Eriosphaeria* Sacc. 1875 and some of the species described in that genus belong to *Niesslia*. The type species, *E. vermicularia* (Nees: Fr.) Sacc., has perithecia borne on a thin, dark crustose stroma. Two of the species that Kirschstein (1939) included in *Niesslia* belong in *Eriosphaeria*, viz. *E. horridula* (Wallr.) Sacc. and *E. vermicularia* (Müller 1953). *Niesslia barbicincta* (Ellis & Everh.) M.E. Barr in Bigelow and Barr (1963) has nearly glabrous, non-collapsing ascomata, surrounded by conidiophores. The anamorph is a species of *Codinaea* Maire 1937 with pallid phialidic tips from which are extruded hyaline, one-celled, lunate conidia, 14–17 × 1.5–2 µm. This species was transferred to *Chaetosphaeria* Tul. & C. Tul. 1863 as *Ch. barbicincta* (Ellis & Everh.) M.E. Barr (Barr 1993) close to *Ch. callimorpha* (Mont.) Sacc. that forms slightly longer and thicker conidia (Fernández and Huhndorf 2005).

A number of *Niesslia* species were discovered that had been described as *Venturia* Sacc. 1882. Based on Barr (1968) and Sivanesan (1977) and with some guesswork, a number of species of this large genus turned out to belong to *Niesslia*. Spegazzini (1887, 1910; see also Farr 1973) described several *Niesslia* species in *Venturia* for which type material is preserved at LPS.

### Higher classification of *Niesslia*

Müller and von Arx (1962) placed *Niesslia* with three species in the broadly conceived Sphaeriaceae alongside *Eriosphaeria*, which was distinguished by the presence of a crustose stroma, although this is sometimes only slightly developed. Müller (1953) characterised the type species, *E. vermicularia* (Nees.) Sacc., by partly immersed perithecia surrounded by a superficial crust. Later, *Niesslia* was included in the Trichosphaeriaceae by Barr (1983) of the Trichosphaeriales, Sordariomycetes (e.g. Eriksson and Hawksworth 1991). Niessliaceae was introduced by Kirschstein (1939) for ‘the smallest, superficially growing pyrenomycetes of the Sphaeriales with a reticulate fruitbody structure’. He included 12 genera, which, according to present concepts, were quite heterogeneous, some having bitunicate asci.

In revising the non-lichenized pyrenomycetous Hymenoascmycetes, Barr (1990) classified the Niessliaceae in the Hypocreales including five genera with superficial, pallid to dark brown, ostiolate, periphysate ascomata with the perithecial surfaces bearing dark, thick-walled, pointed, simple or branched setae or spines. She differentiated the family from the Trichosphaeriaceae characterised by usually non-collapsing perithecia and narrow, apically free paraphyses and classified in the Xylariales. Later, Barr (1993) re-examined species described by J.B. Ellis, transferred and redescribed two of them to *Niesslia* and synonymized a few other names with previously known species.

Several genera are included in the Niessliaceae. *Cryptoniesslia* Scheuer 1993 was added to the family based on a single species, *Cr. setulosa* Scheuer, which is characterised by immersed perithecia. Samuels and Barr (1997) revised the family and recognised nine genera with *Circinoniesslia* Samuels & M.E. Barr 1998 and *Valetoniellopsis* Samuels & M.E. Barr 1998 as additions. They included *Taiwanascus* Sivan. & H.S. Chang 1997, rendering the associated Taiwanascaceae a synonym of Niessliaceae. They left out the core species of *Niesslia* awaiting publication of the material presented here.

*Niesslia* is now recognised in the Niessliaceae, Hypocreales (Barr 1990; Samuels and Barr 1997) on the basis of phylogenetic analyses of sequences of *N. exilis* (Castlebury et al. 2004; Zhang et al. 2006). Recent additions to the family are *Paraniesslia* C.K.M. Tsui, K.D. Hyde & Hodgkiss 2001 and *Hyaloseta* A.W. Ramaley (Ramaley 2001); the latter has hyaline spines on the perithecia and is included in *Niesslia* because of its monocillium-like anamorph. Lumbsch and Huhndorf (2007) listed 16 genera in the family including also *Malmeomyces* Starbäck, *Melchioria* Penz. & Sacc., *Miyakeomyces* Hara, *Myrmaeciella* Lindau, *Pseudonectriella* Petr., *Pseudorhynchia* Höhn., and *Trichosphaerella* E. Bommer, M. Rousseau & Sacc.

## Material and methods

### Collection, isolation and morphological observations

Because of the small size of the ascomata, it is hardly possible to recognise *Niesslia* on material in the field with a hand lens. Therefore, plant material was usually collected in bulk and subsequently sorted under a stereomicroscope. Material of various plants was collected, preferably persistent leaves in a progressed stage of decay. Crushed ascomata or even whole ascomata were streaked out for isolation; cultures were subsequently purified when necessary. Microscopic mounts were observed of squashed perithecia or conidial material in lactic acid, mostly with added aniline blue or Waterman ink. Mass-ascospore or mass-conidial isolates were obtained on malt agar with antibacterial antibiotics (penicillin + streptomycin), and colonies were described after 10 or more days growth on oatmeal (OA), 2% malt (MEA), cornmeal (CMA), potato-carrot (PCA), cherry decoction (CHA), synthetic nutrient-poor (SNA) agar plates or V8-juice agar (formulae following Gams et al. 1998). As with *Acremonium*, the best colonies were obtained if the inoculum on a pointed needle was streaked over a few centimetres on the agar. Where the colony diameter was constant, this dimension is used for growth measurements. Growth rate was measured after 7–14 days at room temperature, 20–25 °C. The figures for growth rate are indicative only; a distinction of slow (less than 10 mm diam in 7 days), medium (10–25 mm diam) and fast-growing species (more than 25 mm diam in 7 days) is usually sufficient for distinguishing taxa.

All microscopic observations were documented with drawings made with the Wild camera lucida on a Wild M20 microscope with Fluotar optics, usually at  $\times 2000$ . Measurements and calculation of length/width ratios were based on these drawings.

When recent collections of previously described species from different locations or substrates from those recorded in its protologue yielded a culture, we hesitated to designate these as epitypes, although our taxonomic interpretations were based on this material.

Listed type material was examined unless specified differently.

### DNA extraction and DNA barcode generation

Total genomic DNA was extracted from living cultures, cells preserved in liquid nitrogen or in lyophils or from dried fungarium specimens using column-based or high-throughput 96-well plate DNA extraction techniques (Ivanova et al. 2006; Stielow et al. 2015). PCR reactions for amplification of the ITS barcode employed

primers ITS5/ITS1/ITS1F and ITS4 and were performed under standard or semi-nested conditions in 12.5- $\mu$ L reactions containing 2.5  $\mu$ L purified DNA, 1.25  $\mu$ L PCR buffer (Takara, Japan, incl. 2.5 mM  $MgCl_2$ ), 1  $\mu$ L dNTPs (1 mM stock; Takara, Japan), 0.6  $\mu$ L *v/v* DMSO (Sigma, Netherlands), forward-reverse primer 0.25  $\mu$ L each (10 mM stock), 0.06  $\mu$ L (5 U) Takara HS Taq polymerase, and 7.19  $\mu$ L MilliQ water (White et al. 1990; Yurkov et al. 2012). PCR conditions for amplifying partial large subunit (28S) of the ribosomal RNA gene (LSU) using primers LR0R and LR5 differed only by their annealing temperature (55 °C instead of 60 °C) and increased cycle extension time (90 s per cycle). Amplification of partial  $\gamma$ -actin (ACT), covering the more variable 5'-end including two small introns, and partial  $\beta$ -tubulin 2 (TUB2), covering the variable 5'-end with up to four small introns, followed the protocol of Aveskamp et al. (2009) and Carbone and Kohn (1999) using the primers Btub2Fd and Btub4Rd, and ACT-512F, ACT-783R, respectively. The partial translation elongation factor 1- $\alpha$  gene (TEF) was amplified following the protocols of Rehner and Buckley (2005). PCR products were directly purified using FastAP thermosensitive alkaline phosphatase and shrimp alkaline phosphatase (Thermo Fisher Scientific). Cycle-sequencing reactions were set up using ABI BigDye Terminator v. 3.1 Cycle Sequencing kit (Thermo Fisher Scientific), with the manufacturers' protocol modified by using a quarter of the recommended volumes, followed by bidirectional sequencing with a 3730xl DNA Analyser (Thermo Fisher Scientific). Sequences were archived, bidirectional reads assembled and manually corrected for sequencing artefacts using BioMICS software v. 8.0 ([www.bio-aware.com](http://www.bio-aware.com)) (Vu et al. 2012). Edited sequences were exported to and aligned with MAFFT v. 7.0 (Kato et al. 2005) and further corrected for indels and SNPs (single nucleotide polymorphisms) by replacing respective positions with ambiguity code letters. Conspecificity and phylogenetic relationships were inferred from individual DNA barcodes using homology searches of the Basic Local Alignment Search Tool for Nucleotides (BLASTn) with default parameters (Johnson et al. 2008) against newly generated (Supplementary Table 1) and other DNA sequences previously deposited with GenBank (Benson et al. 2013). NCBI Genome Workbench v2.12.8 (National Center for Biotechnology Information, Bethesda, MD, USA) was used to build and view uncorrected distance trees of closely related taxa. Generated sequences were deposited at Genbank under numbers MG826913–MG827044 (ITS), MG826718–MG826852 (LSU), MG896220–MG896346 (TUB2), MG896347–MG896466 (TEF) and MG896467–MG896570 (ACT).

Key to the *Niesslia* species based on teleomorph characters

- 1a.** Perithecia lacking spines.....2  
**1b.** Perithecia with spines.....4
- 2a.** Perithecia not sitting on a white subiculum; ascospores  $10\text{--}13 \times 3.0\text{--}3.5 \mu\text{m}$ .....  
*N. waitemataensis* (to be excluded)  
**2b.** Perithecia sitting on a white subiculum.....3
- 3a.** Ascospores ellipsoidal, slightly curved,  $9\text{--}13 \times 3.0\text{--}3.5 \mu\text{m}$ ; perithecia covered with woolly white hyphae in the lower part.....*N. albosubiculosa* (to be excluded)  
**3b.** Ascospores fusiform with pointed ends, straight,  $9.5\text{--}12.5 \times 2.0\text{--}2.5 \mu\text{m}$ .....*N. leucoula*  
**3c.** Ascospores fusiform-ellipsoidal, somewhat curved and slightly verrucose,  $11\text{--}15 \times 2.2\text{--}4 \mu\text{m}$ .....  
*N. monociliata*
- 4a.** Asci at least sometimes 4-spored.....5  
**4b.** Asci 8-spored.....6
- 5a.** Asci always 4-spored; ascospores  $12\text{--}15.5 \times 3.8\text{--}5 \mu\text{m}$ , finely warted.....*N. aemula*  
**5b.** Asci mostly 8-spored; when 4-spored, ascospores  $15\text{--}17 \times 4.5\text{--}5.5 \mu\text{m}$ ; lichenicolous.....*N. robusta*
- 6a.** Ascospores ornamented, surrounded by a sheath, becoming gelatinous at maturity.....7  
**6b.** Ascospores smooth-walled.....14
- 7a.** Ascospores ellipsoidal-fusiform, striate,  $16\text{--}21 \times 5\text{--}7 \mu\text{m}$ .....*N. striatispora*  
**7b.** Ascospores not striate.....8
- 8a.** Ascospores with a gelatinous sheath.....9  
**8b.** Ascospores finely warted, without sheath.....11
- 9a.** Perithecia sitting on a white subiculum; ascospores  $9.6\text{--}13 \times 2.0\text{--}3.0 \mu\text{m}$ .....*N. vaginata*  
**9b.** Perithecia not sitting on a subiculum.....10
- 10a.** Ascospores narrowly ellipsoidal, with gelatinous sheath,  $13.5\text{--}21.5 \times 4\text{--}5.5 \mu\text{m}$ .....*N. kapitiana*  
**10b.** Ascospores ellipsoidal, appearing double-walled, smooth-walled, becoming gelatinous at maturity, wall  $0.5 \mu\text{m}$  thick,  $7.0\text{--}8.5(10.5) \times 2.0\text{--}2.7(3.0)$ .....*N. exigua*
- 11a.** Ascospores 1-celled, globose,  $3\text{--}4 \mu\text{m}$  diam, warted; lichenicolous.....*N. globispora* (to be excluded)  
**11b.** Ascospores ellipsoidal to fusiform, curved,  $19\text{--}20 \times 2.5\text{--}2.7 \mu\text{m}$ ; spines pale brown, septate,  $300\text{--}320 \mu\text{m}$  long.....*N. petrakii*  
**11c.** Spines shorter.....12
- 12a.** Ascospores coarsely verrucose,  $17\text{--}20 \times 5\text{--}6.5 \mu\text{m}$ .....*N. philippinensis*  
**12b.** Ascospores finely verrucose, dotted, or punctated.....13
- 13a.** Ascospores long-ellipsoidal, rather coarse-walled and finely dotted,  $10.5\text{--}11.5 \times 2.5\text{--}3.0 \mu\text{m}$ ; perithecia with few, rather pale spines.....*N. cladii*  
**13b.** Ascospores cylindrical-fusiform,  $12\text{--}19 \times 2.0\text{--}2.5 \mu\text{m}$ ; spines  $60\text{--}120 \mu\text{m}$  long.....*N. sukauensis*  
**13c.** Ascospores oblong-ellipsoidal,  $15.5\text{--}17.5 \times 3\text{--}4 \mu\text{m}$ ; spines  $90\text{--}200 \mu\text{m}$  long.....*N. sabalicola*  
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.....*N. cladii*
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- 44d.** Growing on leathery dicot leaves, Malaysia.....  
.....*N. sukauensis*
- 44e.** Growing on on decaying leaves of *Freycinetia banksii*, New Zealand.....*N. kapitiana*

## Taxonomy

*Niesslia* Auersw., apud Gonnermann & Rabenh., Mycol. Europae 5/6: 30. 1869. Type: *Chaetomium pusillum* Fr.: Fr. ≡ *Niesslia pusilla* (Fr.: Fr.) G. Winter; originally designated as *Niesslia chaetomium* (Corda) Auersw., but Corda's name *Sphaeria chaetomium* was an obligate synonym of the original *Chaetomium pusillum*.

Mycobank MB 3506.

= *Monocillium* S.B. Saksena, Indian Phytopathol. 8: 9. 1955; emend. W. Gams (1971) (anamorphic genus). Type: *Monocillium indicum* S.B. Saksena, now regarded as *Niesslia indica* (S.B. Saksena) W. Gams & Stielow.

= *Lohwagiella* Petrak, Sydowia 23: 280. 1970 ('1969'). Type: *Lohwagiella pulchriseta* (Peck) Petr., now *Niesslia pulchriseta* (Peck) M.E. Barr.

= *Nitschkiopsis* Nannf. & R. Sant. apud Nannfeldt, Svensk bot. Tidskr. 69: 322. 1975. Type: *Nitschkiopsis stictarum* Nannf. & R. Sant., now *Niesslia stictarum* (Nannf. & R. Sant.) R. Sant. & Tretiach.

= *Hyaloseta* A.W. Ramaley, Mycotaxon 79: 269. 2001. Type: *Hyaloseta nolinae* A.W. Ramaley, now *Niesslia nolinae* (A.W. Ramaley) W. Gams.

= *Collarina* Giraldo, Gene & Guarro, Persoonia 33: 271. 2014 (anamorphic genus). Type: *Collarina aurantiaca* Giraldo, Gene & Guarro, now *Niesslia aurantiaca* (Giraldo, Gene & Guarro) Giraldo & Schroers.

Misapplied name: *Torulomyces* Delitsch sensu Hashmi et al., Can. J. Bot. 50: 1463. 1972, pro parte (anamorphic genus).

**Description:** Perithecia developing superficially on decaying plant debris (or on a hyphal subiculum), from which they are easily detached; dark brown, globose when fresh, usually collapsing cup-shaped when dry; ostiolum hardly protruding; wall brittle, often shiny blackish brown, consisting of several layers of flattened cells; upper part of the perithecium usually beset with several to numerous stiff, mostly dark brown spines consisting of one or several cells; perithecial spines mostly aculeate, sometimes ending with a vesicle. Paraphyses absent (at least at maturity). Asci very thin-walled, cylindrical or clavate, often apically tapering and narrowly truncate, with an undifferentiated apex or containing an inconspicuous ring. Ascospores hyaline, ellipsoidal, cylindrical or somewhat fusiform, two-celled at maturity; both cells usually remaining firmly connected. Anamorph acremonium-like. Phialides simple, orthotropic, wall thickened in the lower part or throughout; where the wall distally becomes thinner, the diameter often expands; phialides tapering in the uppermost part again into a thin-walled conidiiferous neck, often without a distinct collarette; the vesicle often remains sterile without forming a fertile neck. Conidia formed in chains or, more commonly, in ± slimy heads. Characteristic crystals are often present in cultures, prismatic with indented ends, fasciculate with ragged ends or fan-shaped.

**Comments:** Petrak (1970) described *Lohwagiella* for *Sphaeria pulchriseta* Peck, thinking that the minute ascomata lacked ostioles. Small periphysate ostioles are present in the type, leaving no convincing argument to separate the genus. Santesson in Nannfeldt (1975b) erected *Nitschkiopsis* Nannf. & R. Sant., which he thought to be significantly distinct not only because of its lichenicolous habit (necrotizing apothecia of *Sticta* species in Africa and South America) but also a thickened apical ring in the asci. The genus was synonymized with *Niesslia* by Tretiach (2002).

The synonymy with *Torulomyces* Delitsch postulated by Hashmi et al. (1972) was not recognised by most subsequent authors, because in that genus, the conidial chains adhere firmly by well-differentiated connectives. The conidia are dry and hydrophobic. Ando et al. (1998) correctly delimited these genera. A teleomorph connection was established for *Torulomyces* with *Eupenicillium* (Goch. & Zlattner, in Stolk and Samson 1983). Recent studies by Houbraeken and Samson (2011) and Visagie et al. (2016) confirm this affinity, and *Torulomyces* is regarded just as a simplified *Penicillium*, with most species transferred to that genus. Since 1972, one species, *Torulomyces macrosporus*, was described that belongs to *Niesslia* and is transferred to *Niesslia* below.

Crous et al. (2014) introduced the monotypic genus *Collarina* based on *C. aurantiaca* and compared it with genera of the Clavicipitaceae (including *Chamaeleomyces* Sigler, *Pochonia* Bat. & O.M. Fonseca, and *Nomuraea* Maubl.) after purporting relatedness of *Collarina* to the Clavicipitaceae based on 18S rDNA sequences. While acknowledging morphological similarities of the new species with *Monocillium*, the new genus was described because *C. aurantiaca* grows slowly in culture and forms collarettes and somewhat pigmented conidial masses. The isolate studied by Crous et al. (2014) originated from river sediments and is morphologically similar to a group of *Niesslia* strains mainly encountered from soil environments. ITS sequence data also confirm identity of these strains. Accordingly, *Collarina* is considered a synonym of *Niesslia*.

Whitton et al. (2012) added several species to *Niesslia* and classified one that lacked ascomatal spines in *Melanopsamma* Niessl 1876. The status of most species described by these authors requires revision because their types seem to be lost (K.D. Hyde, pers. comm.).

*Niesslia exilis* and *N. chaetomium* present two different species, but *N. pusilla* should be used instead of the latter because the epithet *chaetomium* was a homonym and invalid when published.

*Niesslia pusilla* (Fr.: Fr.) G. Winter, Rabenh. Kryptogamen-Flora 1(2): 198. 1887 [as '(Speg. & Roumeg.) Winter']; [redundant combination also made by Schroeter, Kryptogamen-Flora Schles. 2, Pilze 2: 294. Nov. 1894].

Mycobank MB 827559.

≡ *Chaetomium pusillum* Fr.: Fr., Syst. mycol. 3: 255. 1829 (and Strauss apud Sturm, Deutschl. Fl., Pilze 3: 34. 1853).

≡ *Sphaeria chaetomium* Corda, Icon. Fung. 2: 29. 1838 [non *Sphaeria pusilla* Pers. 1801].

≡ *Venturia chaetomium* (Corda) Ces. & De Not., Schema di Classif. Sferiacei, in Comment. Soc. Crittog. Ital. 1(4): 225. 1863.

≡ *Niesslia chaetomium* (Corda) Auersw. apud Gonnermann & Rabenh., Mycol. Europae 5/6: 30. 1869.

≡ *Venturia pusilla* (Fr.: Fr.) Speg. & Roumeg., Rev. Mycol. Toulouse 2(1): 23. 1880.

Further possible synonyms, not verified here:

= *Venturia conoplea* Cooke, Grevillea 8: 87. 1879 [fide Saccardo, Syll. Fung. 1: 591. 1882].

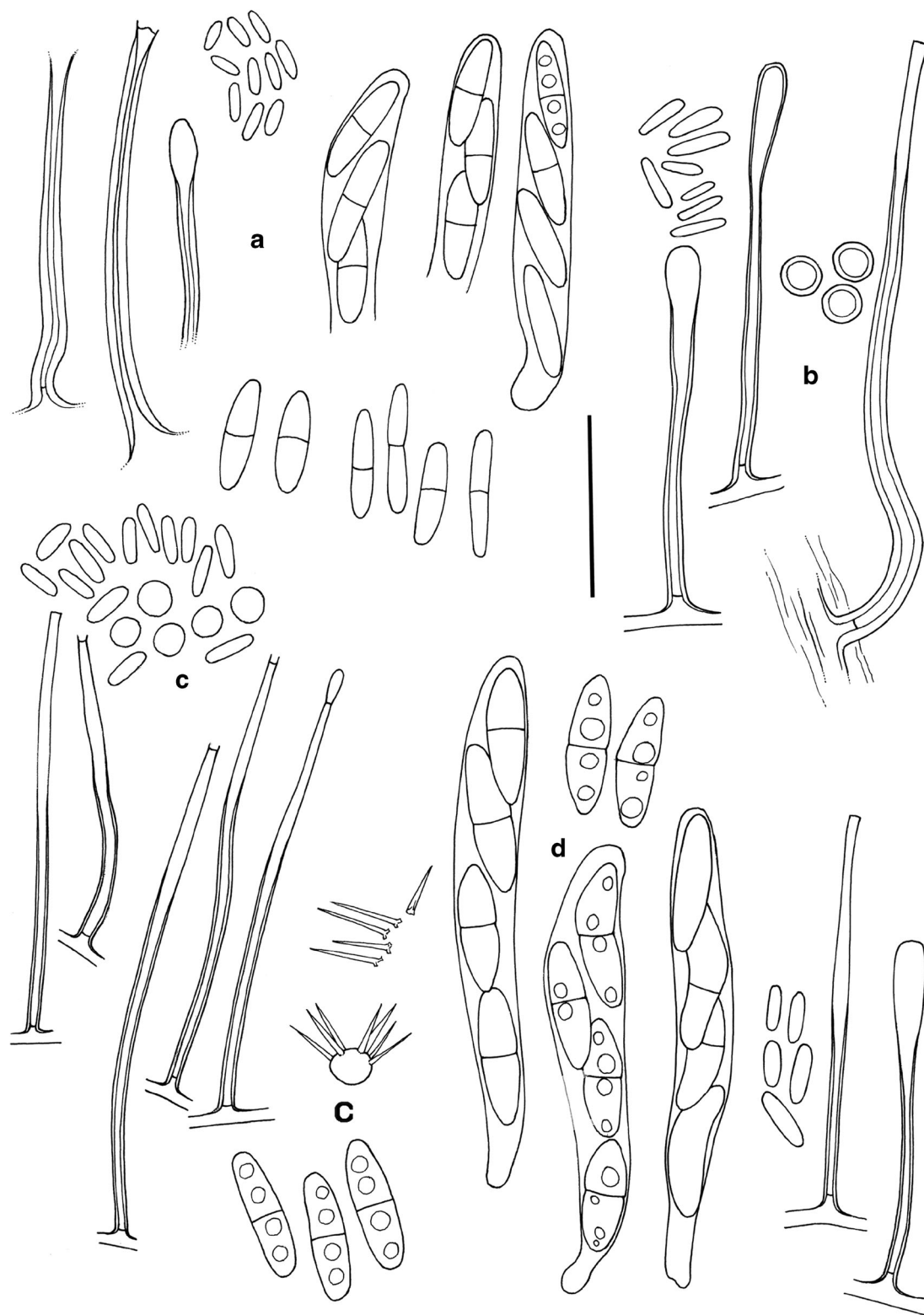
= *Venturia sequoiae* Plowr., Grevillea 7: 74. 1878.

≡ *Acanthostigma sequoiae* (Plowr.) Sacc., Syll. Fung. 2: 208. 1883 [herb. NY, fide Barr 1968].

**Lectotype for *Chaetomium pusillum*, here designated:** Sweden, Scleromyc. suec. 272, E. Fries, on *Pinus* needles (UPS:BOT:F-006408, MBT 383306); isotype in K.

**Description:** Perithecia scattered on dead conifer needles, dark brown, glossy, globose, collapsing cup-like when dry, 100–150 µm diam. Spines numerous, dark brown but not quite opaque, non-septate, (20–)30–45 µm long, tapering from 4 µm at the base towards the pointed apex. Asci cylindrical with slightly truncate apex, 8-spored, 35–40 × 5 µm. Ascospores obliquely uni- or biserial in the ascus, ellipsoidal-fusiform, gradually tapering towards the rounded ends, very slightly curved, two-celled, smooth- and thin-walled, 8.5–12 × 1.2–2.5 µm, l/w 3.8–5, in type of *N. pusilla* 10–12 × 1.5 µm.

**Herbarium specimens examined:** *Sphaeria chaetomium*, on *Pinus laricio* in the winter, in Desmazières, Pl. crypog. Ed. I, Sér. 1, 1836–1851 (K) [ascospores less fusiform, 9–11.5 × 1.5–2.0 µm]. – *Sphaeria chaetomium*, on needle of *Pinus laricio*, Desmazières, Pl. crypt. Ed. II, Sér. I, 1825–1851 (K). – *Venturia pusilla* (Fr.) Speg. & Roum., leg. Roumeguère (BR). – *Sphaeria chaetomium*, UK, Herb. Berkeley, leg. C.E. Broome 25 Jan. 1850. – *Venturia chaetomium*, France, Pyrénées centrales, Environs de Cierp, on leaves of *Carex pendula*, automne 1880, C. Roumeguère, Fungi Gall. exs. 1620 [no perithecia seen] (BR 5020096923200). – *Niesslia pusilla*, Germany, Triglitz in der Prignitz, Prov. Brandenburg, on needle litter of *Pinus sylvestris*, O. Jaap, Fungi sel. Exs. 187 and in Rehm Ascomyceten 1762, Apr. 1906 (L, K). – As *Niesslia exilis*, Venezuela, in foliis *Podocarpi*, in Sydow, Fungi exot. 806, 19 Jan. 1928, H. Sydow (K) [ascospores 11.5–12.5 × 1.7–2.0 µm (deviating?)]. – *Niesslia pusilla*, UK, Islet Gometse, on fallen needle of *Juniperus communis*, R.W.G. Dennis, 8 Aug. 1968 [no ascospores seen] (K). – UK, Scotland, Iona (off Isle of Mull), on *Juniperus communis*, M. C. Clark, 28 May 1974 (CBS H-64 and 166). Some other specimens preserved under these names were different fungi.



**Fig. 1** *Niesslia aemula*. **a** Monocillium-like conidiophores, conidia, asci and ascospores (lectotype in BR). **b** Monocillium-like conidiophores and cylindrical conidia (MEA, 13 days) and globose conidia and conidiophore (MEA, 8 weeks) (CBS 556.75). **c** Monocillium-like conidiophores and cylindrical and globose conidia (MEA, 9 days), perithecium (not

drawn to scale), perithecial spines, and ascospores (OA, 4 weeks) (CBS 261.70). **d** Asci, ascospores, monocillium-like conidiophores and conidia (OA, 17 days) (CBS 261.70). Scale bar, 20  $\mu\text{m}$ ; for perithecial spines in **c**, 200  $\mu\text{m}$

**Comments:** The authorship of *Venturia pusilla* has been confused. Spegazzini and Roumeguère (Roumeguère 1880) cited Fries as author in brackets, and we therefore conclude that they did not intend to describe the taxon as new. Thus, the author citation for the combination *Niesslia pusilla* by Winter (1887) is here corrected according to Art. 41.8 (Turland et al. 2018).

Another description of this species was given by Gutsevich (1964).

A list of teleomorphic synonyms was compiled by Gams (1971) for *N. exilis* and later (unpublished) after a morphological comparison of herbarium specimens. Subsequent observations cast doubt on the interpretation of differences in ascospore shapes and dimensions, raising questions about these synonyms and the precise delimitation of the species. *Niesslia exilis* may have regularly elongate, ellipsoidal ascospores, and those of *N. pusilla* could be more fusiform and shorter. However, it seems that the ascospores in fresh material are wider (2–2.5 µm) than in old herbarium specimens (1.2–1.5 µm). The other synonymies may or may not be correct. Other isolates preserved as *N. exilis* turned out to be not conspecific and are not yet reclassified. Epitypification, best on the basis of a specimen from pine needles collected in Sweden, remains to be settled. Strain CBS 493.73 (Germany, from twig of *Abies alba*, leg. K. Freyer, München, isol. H.A. van der Aa 3521, conidia cylindrical, with rounded ends, 3.5–4.7 × 1–1.2 µm, l/w 3.4–4, monocillium-type phialides 25–45 µm long) may represent conidial *N. pusilla* but without epitypification it should not serve as a reference strain for this species.

### Pleomorphic species

*Niesslia aemula* Sydow, Ann. Mycol. 38: 462. 1940.  
Fig. 1a–d

Mycobank MB 288797

**Lectotype for *Niesslia aemula*, designated here:** Germany, Löffelpfuhl near Quermathen near Groß-Behnitz, Kr. Westhavelland, ‘in culmis vetustis adhuc stantibus’ *Typha latifolia*, 6 Oct. 1936, leg. H. Sydow. Mycoth. german. No. 3301 (BR 5020096921183, MBT 383235); isotypes in L, S.

**Description:** Perithecia of the type material scattered on culms of *Typha latifolia*, dark brown, glossy, globose, collapsing cup-like when dry, 125–185 µm diam; in vitro up to 250 µm diam. Spines numerous, dark brown, 50–85 µm long, tapering from 2 to 2.5 µm at the base towards the pointed apex. Asci cylindrical-clavate, with a very short pedicel, 4-spored, 50–58 × 7–8.5 µm. Ascospores ellipsoidal, two-celled, 4-guttulate, finely warted, chromophilic, in the type 11.5–14 × 3.0–3.5 µm, l/w 3.3–4.3, in culture 12.5–17 × 4–5 µm. Colonies moderately slow-growing, reaching 28 mm diam in 10 days at 20 °C on MEA, floccose, whitish to pale pink. Vegetative hyphae commonly 0.7–1.5(–2.0) µm wide, hyaline, thin-walled. Crystals absent. Sporulation abundant, plectonematogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting

of a thick-walled (0.3–1.0 µm), 1.5–2.5 µm wide basal portion, sometimes extending into an elongate, 2.5–4 µm wide vesicular expansion that may remain sterile, usually producing a thin-walled, 1 µm wide conidiiferous tip, total length up to 70 µm. Conidia one-celled, smooth-walled, either cylindrical, not apiculate at the base, 4.5–7.5 × 1.2–2.0 µm, l/w 2.5–3.5 (–5), or more rarely globose, rather thick-walled, 3–4.5 µm diam. Chlamydo-spores absent.

**Herbarium specimens examined:** Possibly conspecific: Canada, Saskatoon, isolated from wood of *Picea glauca*, D.E. Wells, Dec. 1952, Herb. DAOM 35416. – New Zealand, Auckland Province, Piha, Waitakere Range, on *Rhopalostylis sapida*, J. M. Dingley, 31 Jul. 1963 (DAOM 96192, = PDD 21307, CBS H-15160).

**Living cultures:** Netherlands, East Flevoland Polder, from agricultural soil, A. Nederbrecht, Sep. 1969 (CBS 261.70). – Netherlands, Schokland, Northeast Polder, from burnt soil (after pasteurisation at 80 °C), isol. B. van der Pol-Luyten (CBS 556.75).

**Comments:** *Niesslia aemula* is unique based on its 4-spored asci and large ascospores. The strain CBS 556.75 survived a treatment of 80 °C for 20 min (B. van der Pol-Luyten, pers. comm.). Assumingly the globose, thick-walled conidia were heat resistant. The isolates CBS 359.70 (*Niesslia* cf. *ligustica*), 390.70 (*N. cf. ilicifolia*), 827.73 (*Niesslia* sp.), and 885.73 (*Niesslia* sp.), were previously identified as *N. aemula*, although no teleomorph was observed. Molecular data, however, show that they are not conspecific; they did not produce the second type of conidia. The specimen DAOM 35416 has longer conidia, 6.1–7.9 × 0.8–1.3 µm, l/w 5.8–7.9, with rounded ends (Gams 1971: 157, Abb. 104c). Its identity with the present anamorph cannot be ascertained without a living culture. The strain CBS 261.70 formed numerous ascomata after incubation under near-UV after 3 weeks on OA, up to 250 µm diam, with brown-black spines 50–85 µm long; possibly homothallic.

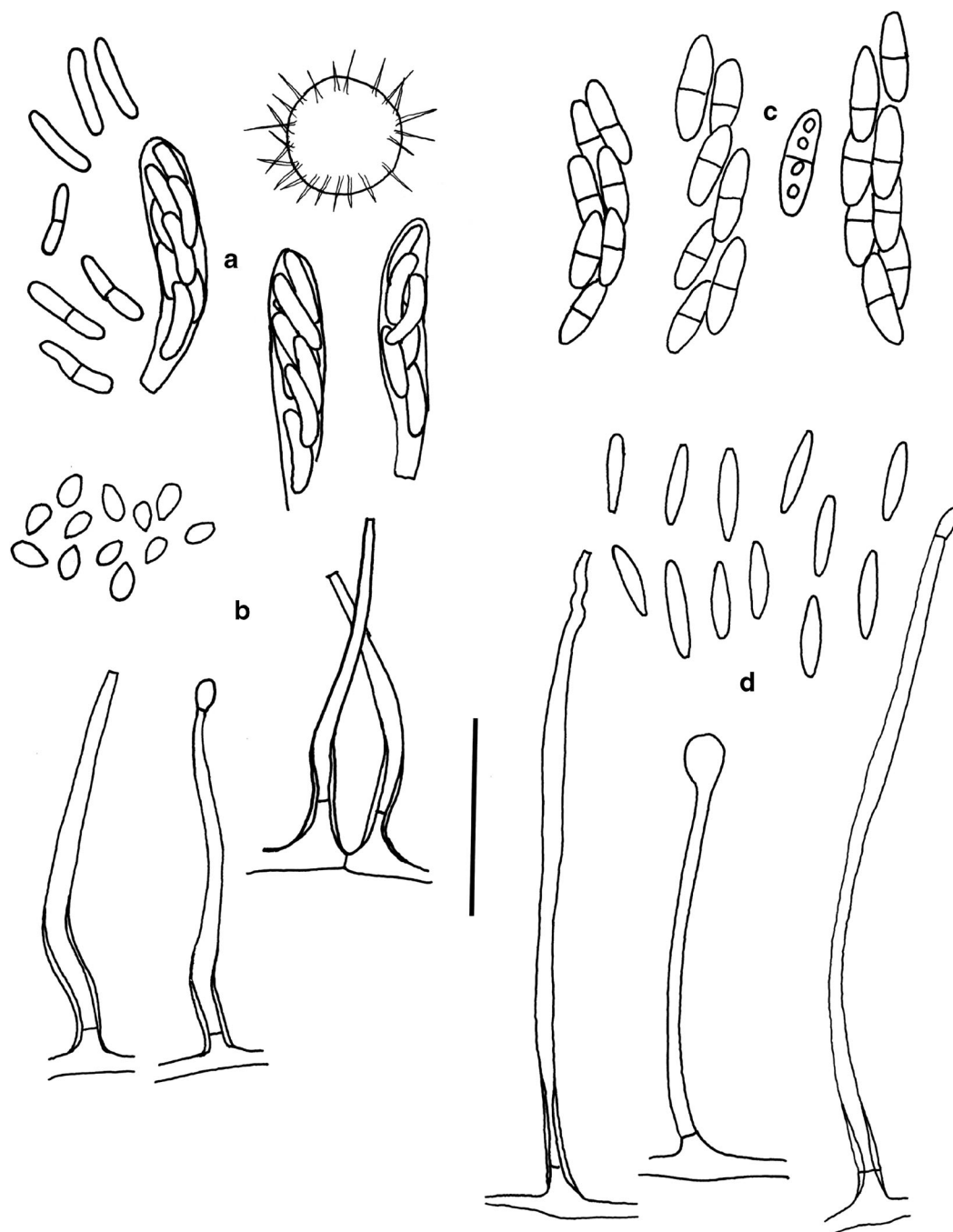
*Niesslia allantoides* W. Gams, spec. nov. Fig. 2a, b.

Mycobank MB 827217.

**Holotype:** France, Ariège, isolated from *Hypoxylon rubiginosum*, F. Candoussau No. 6240, 15 Feb. 1996, isolated by W. Gams (CBS 914.96, alive, metabolically inactive deposit).

**Etymology:** Greek *allantoeidēs* indicating the shape of the ascospores.

**Description:** Perithecia scattered, black, glossy, globose, with inconspicuous ostiole, collapsing cup-like when dry, about 115 µm diam. Spines numerous, dark brown, 30–50 µm long. Asci cylindrical-clavate, with slightly truncate apex, 8-spored, 25–30 × 5 µm, with short pedicel. Ascospores ellipsoidal-allantoid, becoming two-celled rather late, septum hardly visible, smooth- and thin-walled, 8.5–9.5 × 1.5–1.8 µm, l/w 4.2–6.3. Colonies slow-growing, reaching 11 mm diam in 10 days at 20 °C on OA, finely powdery, orange, reverse similarly



**Fig. 2** *Niesslia allantoidea*. **a** Perithecium, asci and ascospores from natural substrate (CBS 914.96). **b** Conidia and monocillium-like conidiophores (PCA, 14 days) (CBS 914.96) *Niesslia ammophila*. **c** Single mature ascospore and groups of ascospores from asci from natural

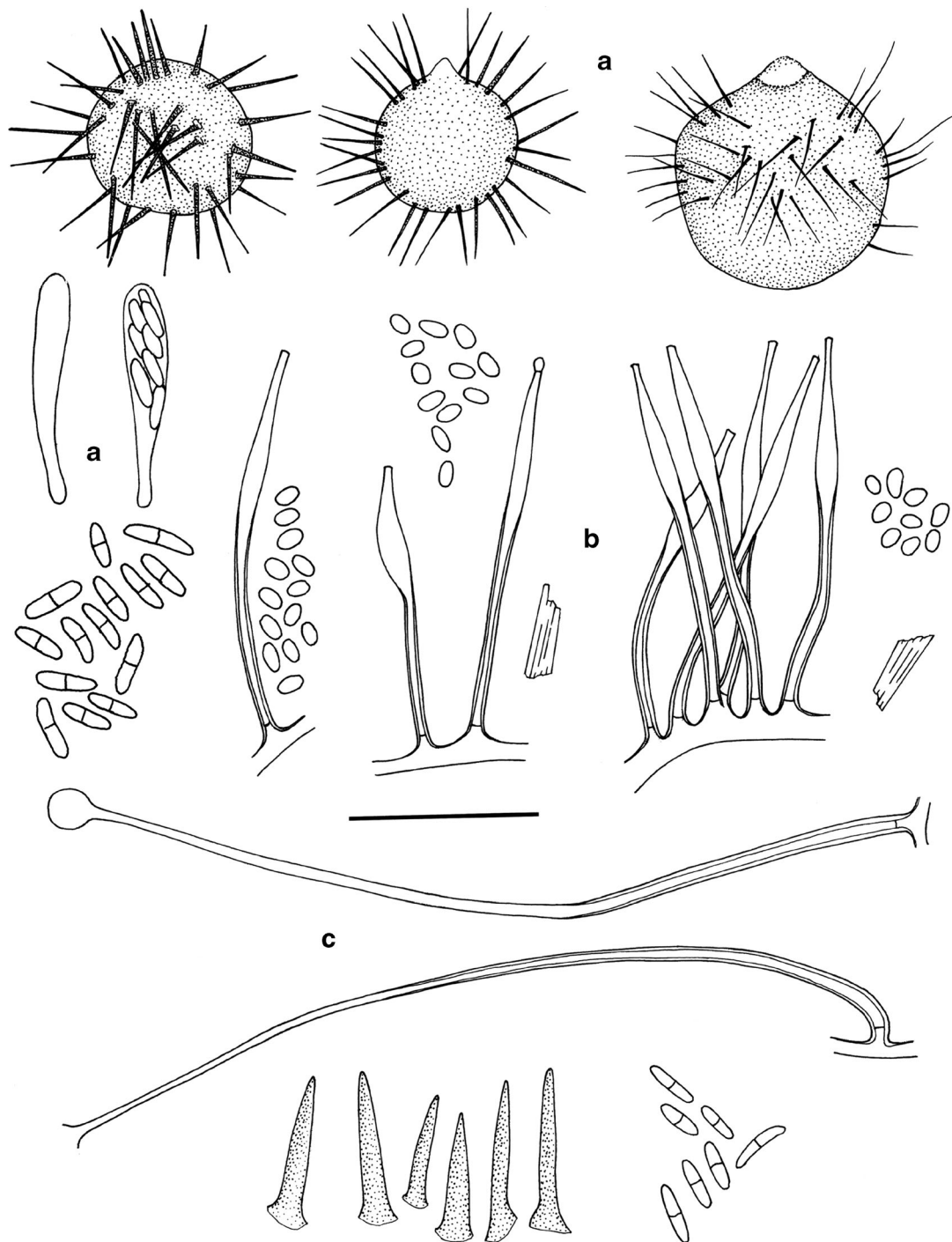
substrate (CBS 138112). **d** Monocillium-like conidiophores and conidia (PCA, 17 days) (CBS 138112). Scale bar, 20  $\mu\text{m}$ ; for perithecium in **a**, 200  $\mu\text{m}$

coloured. Vegetative hyphae 0.5–1.2  $\mu\text{m}$  wide, metachromophilic basal hyphae up to 5  $\mu\text{m}$  wide, hyaline, thin-walled, no crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides aculeate, in thick-walled, up to 0.5  $\mu\text{m}$ , lower part 2–3  $\mu\text{m}$  wide, gradually tapering to thin-walled, 1  $\mu\text{m}$  wide tip, total length 27–55  $\mu\text{m}$ . Conidia short-

ellipsoidal, tapering to apiculate base, one-celled, smooth-walled, 3–4  $\times$  1.5–2.5  $\mu\text{m}$ , l/w 1.6–3.2. Chlamydospores absent.

**Living culture:** Isolated from same source as holotype (CBS 839.96).

**Comments:** This collection was initially identified as *N. pulchriseta*, but the type of that species, growing on naked



**Fig. 3** *Niesslia artocarpi*. **a** Perithecia with spines, asci and ascospores (CMA, 37–42 days) (CBS 582.73). **b** Monocillium-like conidiophores, conidia and crystals (CMA, 37 days; OA, 20 days; CMA, 90 days) (CBS

582.73). *Niesslia* ?*artocarpi*. **c** Monocillium-like conidiophores, perithecial spines and ascospores (PDD 32484). Scale bar, 20  $\mu\text{m}$ ; for perithecia in a, 200  $\mu\text{m}$ ; for perithecial spines in c, 50  $\mu\text{m}$

poplar wood, had somewhat shorter ascospores that lacked the allantoid shape seen in the present material.

*Niesslia ammophilae* W. Gams & Aplin, spec. nov. Fig. 2c, d MycoBank MB 827218

**Holotype:** UK, on dead leaves of *Ammophila arenaria*, leg. Nick Aplin, March 2014 (CBS H-21838); ex-type cultures CBS 138112, 139548.

**Etymology:** In reference to its occurrence on *Ammophila arenaria* (Poaceae).

**Description:** Perithecia black, collapsing cup-like when dry, 120–150(–160)  $\mu\text{m}$  diam. Spines dark brown, 70–90(–100)  $\mu\text{m}$  long, base 4–5  $\mu\text{m}$  wide. Ascospores biseriate oblique or straight in ascus, ellipsoidal with tapering ends, straight, 4-guttulate, 8–11  $\times$  2.5–3  $\mu\text{m}$ . Colonies on PCA reaching 14 mm diam in 10 days. Hyphae 0.8–1.5  $\mu\text{m}$  wide. Sporulation phalacrogenous. Phialides almost aculeate, basal portion moderately thick-walled, 1.5–2  $\mu\text{m}$  wide, indistinctly widening in upper, thin-walled part to 1.5–2.0  $\mu\text{m}$ , sometimes ending in a 4  $\mu\text{m}$  diam sterile vesicle, thin-walled apex sometimes undulate, about 1.0  $\mu\text{m}$  wide, overall length 50–80  $\mu\text{m}$ . Conidia long ellipsoidal, almost fusiform with rounded ends, 7.7–10  $\times$  1.8–2.0  $\mu\text{m}$ , l/w 4–6.5.

**Comments:** The holotype contains a dense layer of perithecia. The species was at first mistaken for *N. exosporioides* but differs from that species by shorter, broader, more fusiform ascospores. The almost fusiform conidia are a conspicuous character.

*Niesslia artocarpi* W. Gams, spec. nov. Fig. 3a–c  
Mycobank MB 827219

**Holotype:** Sri Lanka, Hikkaduwa, isolated from decaying leaf of *Artocarpus integrifolia*, 27 Jan. 1973 (CBS 582.73, alive, metabolically inactive deposit).

**Etymology:** In reference to its occurrence on *Artocarpus integrifolia* (Moraceae).

**Description:** Perithecia formed in vitro on CMA after 5–6 weeks, dark brown, glossy, globose with slightly bulging ostiolate neck, collapsing cup-like when dry, up to 190(–230)  $\mu\text{m}$  diam. Spines numerous, dark brown, 50–75  $\mu\text{m}$  long, ca. 5  $\mu\text{m}$  wide at base. Asci clavate, 8-spored, with short pedicel, 25  $\times$  3.5–4.5  $\mu\text{m}$ . Ascospores obliquely biseriate in asci, ellipsoidal, straight or slightly curved, two-celled, smooth- and thin-walled, 6–7.5  $\times$  1.5–1.8  $\mu\text{m}$ , l/w 3.3–4.2. Colonies slow-growing, reaching 8 mm diam in 20 days at 20 °C on MEA, but 10 mm in 9 days on OA, finely powdery, orange, reverse similarly coloured. Vegetative hyphae 0.7–1.5(–2.0)  $\mu\text{m}$  wide, hyaline, thin-walled; some broader hyphae (2–3  $\mu\text{m}$ ) metachromophilic. Prismatic crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting of a thick-walled, up to 0.5  $\mu\text{m}$ , 1.2–1.5  $\mu\text{m}$  wide basal portion, extending into an elongate, slightly widened part up to 1.5–2  $\mu\text{m}$  diam, and a long thin-walled, 0.7–1  $\mu\text{m}$  wide conidiiferous tip, total length 20–35(–52)  $\mu\text{m}$ , sometimes ending in a sterile vesicle. Conidia short-ellipsoidal, symmetrically rounded or ovoid and tapering towards base, one-celled, smooth-walled, (1.7–)2.2–3.0  $\times$  (1.0–)1.3–1.5  $\mu\text{m}$ , l/w 1.6–2.1; phialide tips and conidia chromophilic. Chlamydospores absent, but chlamydospore-like swellings present.

**Herbarium specimens examined:** Possibly conspecific, New Zealand, Little Barrier Isl., Summit Track, on *Agathis australis*, leg. W.B. & S. Kendrick, det. G.J. Samuels as *N. ilicifolia* (PDD 32484, G.J.S. 74-22).

**Comments:** The species has ellipsoidal ascospores unlike the similar *N. ilicifolia*, which has ascospores that are longer and slightly fusiform, 9–14(–17)  $\times$  1.3–2.0(–2.5)  $\mu\text{m}$ .

*Niesslia barbula* (Berk. & Broome) Kirschst., Ann. Mycol. 37: 91. 1939. Fig. 4a–d

Mycobank MB 827290.

$\equiv$  *Sphaeria barbula* Berk. & Broome, Ann. Mag. Nat. Hist. Ser. 3, 3: 369 (No. 870). 1859.

$\equiv$  *Venturia barbula* (Berk. & Broome) Cooke, Handb. Brit. Fungi p. 924. 1871.

$\equiv$  *Trichosphaeria barbula* (Berk. & Broome) G. Winter, Rabenh. Kryptogamen-Flora I, 2: 206. 1887.

$=$  *Venturia barbula* var. *foliicola* Ellis, North Amer. Pyrenomyc.: 141. 1892 (fide Barr (1993), a syn. of *N. lanea*).

$=$  *Venturia lanea* Dearness, Mycologia 18: 246. 1926.

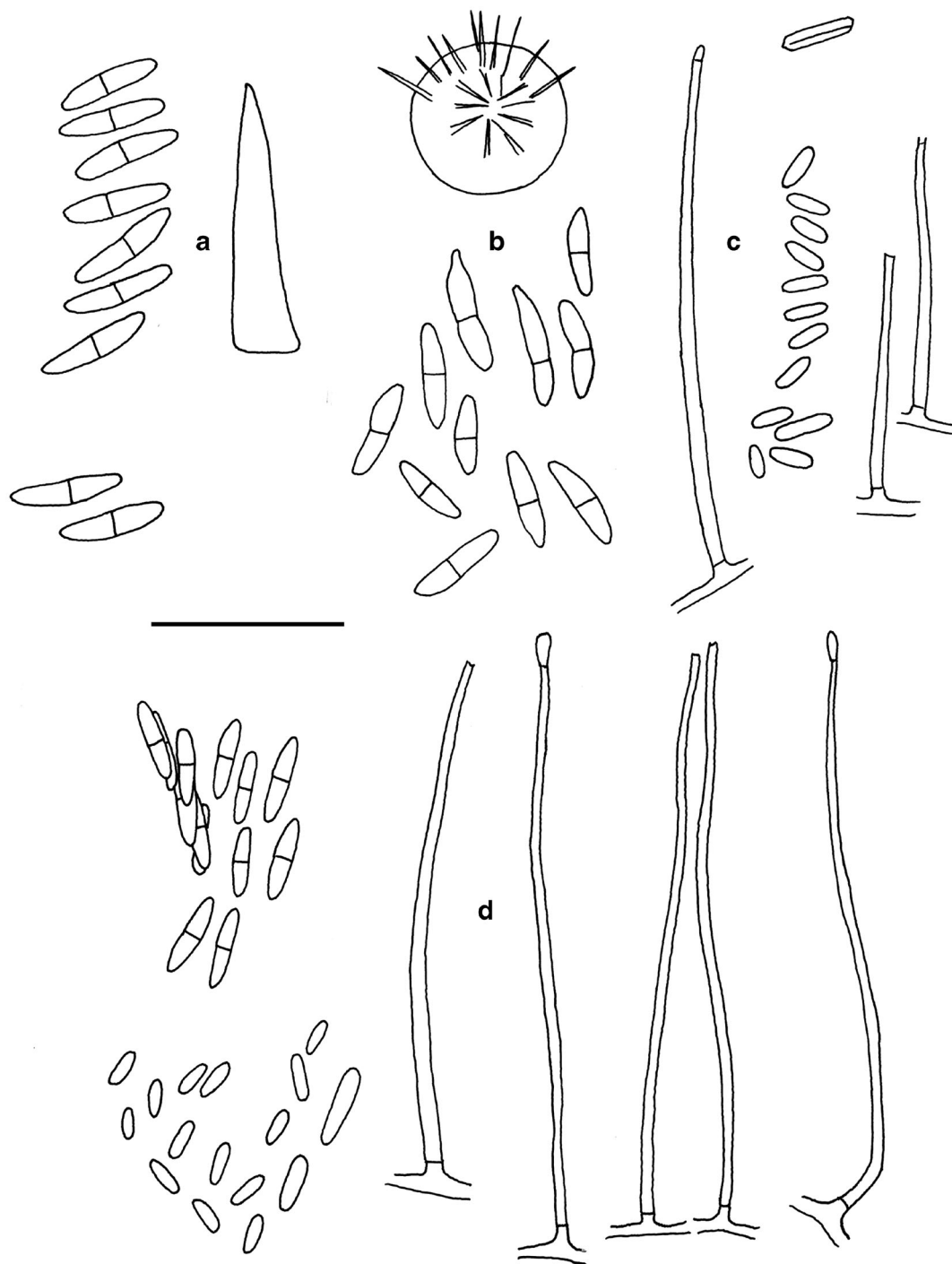
$\equiv$  *Niesslia lanea* (Dearness) M.E. Barr, Mycotaxon 46: 52. 1993.

**Lectotype for *Sphaeria barbula*, designated here:** UK, England, Wraxall, Somerset, on bark of pine-tree, C.E. Broome, March 1845 (J. Curran 215) (K 251640; MBT 383543).

**Description:** Perithecia described by Ellis and Everhart (1892) as globose and collapsing. Spines 25–35  $\times$  4  $\mu\text{m}$ . Asci cylindrical, 60  $\times$  6  $\mu\text{m}$  [in Barr (1993), 35–50  $\times$  6–8  $\mu\text{m}$ ]. Ascospores 8–10  $\times$  4.5  $\mu\text{m}$  and 8–10  $\times$  3–4  $\mu\text{m}$  for var. *barbula* [in Barr (1993) as (7.5–)9–13.5  $\times$  2–3.5  $\mu\text{m}$  for *N. lanea*]. **Observations by WG:** Perithecia in type material about 270  $\mu\text{m}$  diam, in other material 150–180  $\mu\text{m}$  diam, spines brown, 30–60  $\mu\text{m}$  long, at base about 6  $\mu\text{m}$  wide. Ascospores slightly fusiform with rounded ends and slightly curved, thin-walled, 11–12  $\times$  2.0–2.5  $\mu\text{m}$ , l/w 4.6–5.8. Colonies of CBS 560.74 on MEA reaching 24 mm diam in 3 weeks, pink, raised, with plectonematous sporulation; some moniliform hyphae present; crystals prismatic, scanty. Hyphae supporting phialides metachromophilic. Phialides aculeate, up to 60(–70)  $\mu\text{m}$  long, moderately thick-walled in lower part. Conidia cylindrical, 4–6.5  $\times$  (1–)1.5  $\mu\text{m}$ , l/w 3–5.

**Herbarium specimens examined:** As *Venturia barbula* Berk. & Broome var. *foliicola* Ellis, USA, Newfield N.J., North American Fungi No. 792, on dead needles in fallen tree tops of *Pinus rigida*, J.B. Ellis, Jan. 1880, 3 parts NY No. 914432, 914433, 914434; K [perithecia often aggregated in a kind of nest; ascospores scanty, seen only in 914,433: almost fusiform, 11.5–14.5  $\times$  2.0  $\mu\text{m}$ , biseriate, almost spirally twisted in ascus; this material matches the above-mentioned lectotype perfectly; it was identified by Barr as *N. lanea*]. – USA, Washington, Upper White River, on *Chamaecyparis nootkatensis*, J.M. Grant, Sep.





**Fig. 4** *Niesslia barbula*. **a** Ascospores and perithecial spine from lectotype (Currey 215; group of 2 ascospores, North American Fungi No. 792). **b** Perithecium with spines and ascospores from natural substrate (CBS 560.74). **c** Conidiophores, conidia and a rare crystal

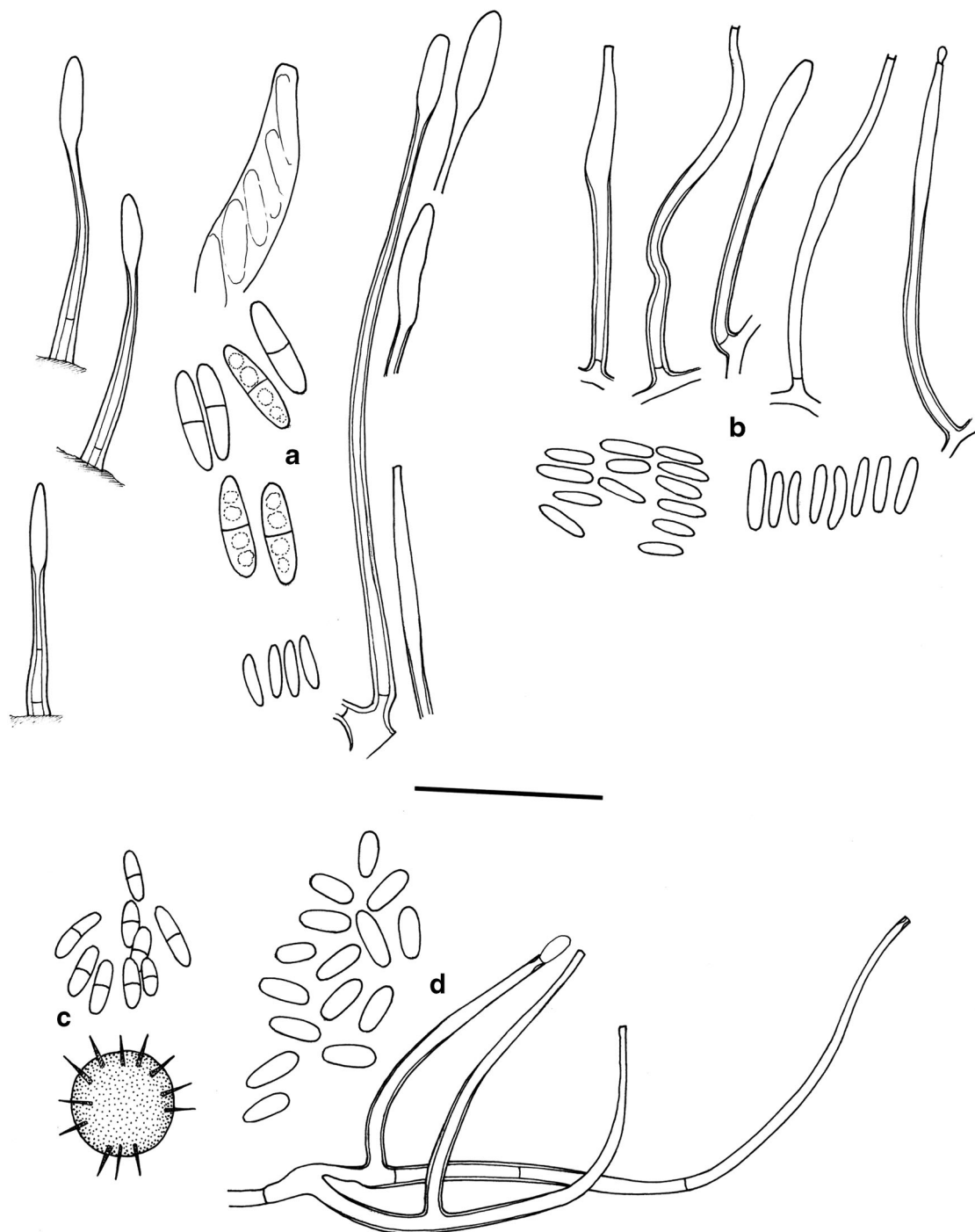
(MEA, 25 days; PCA, 10 days) (CBS 560.74). *Niesslia* aff. *barbula*. **d** In culture formed ascospores (OA), conidiophores and conidia (SNA, 14 days) (CBS 692.94). Scale bar, 20  $\mu$ m; for perithecium in b, 200  $\mu$ m

1924, No. 6018 in DAOM (holotype of *V. lanea*, not seen). – In NY several secondary collections identified as *V. lanea* by M.E. Barr, among which were also

examined here: *Venturia barbula* var. *foliicola*, USA, NJ, Newfield on withered pine leaves hanging on the branches of an old tree, J.B. Ellis, Jan. 1881, NY No.

914429 [no mature ascospores seen]. – Canada, Bay of Islands, Newfoundland, on dead fir tree, leg. Rev. A.C. Waghorne, autumn 1898 [as *Niesslia vermicularia*, redet M.E. Barr as *N. lanea*] (NY 02963643).

**Living cultures:** UK, Hay Wood, Warwickshire, from decayed needle of *Pinus* sp., attached to a small branch cut off and lying on the ground, M.C. Clark, 21 Aug. 1974, isol. W. Gams from ascospores (CBS 560.74, also CBS H-65)



**Fig. 5** *Niesslia cladii*. **a** Monocillium-like conidiophores, partial ascus, ascospores and conidia from natural substrate (CBS 652.79). **b** Conidiophores and conidia (OA, 14–25 days) (CBS 652.79). *Niesslia cladoniicola*. **c** Perithecialium and ascospores from natural substrate (IMI

179266). **d** Monocillium-like conidiophores and conidia (CMA, 6 weeks) (CBS 960.73). Scale bar, 20  $\mu\text{m}$ ; for left three monocillium-like phialides in a, 40  $\mu\text{m}$ ; for perithecialium in c, 200  $\mu\text{m}$

[ascospores  $9.5\text{--}12 \times 2.0\text{--}2.5 \mu\text{m}$ ; anamorph corresponding to *Monocillium tenue*]. – *Niesslia* aff. *barbula*, Spain, Canary Islands, La Gomera, Garajonay, from litter of *Myrica faya*, W. Gams, 1994 (CBS 692.94) [perithecia formed on litter of *Myrica faya* and, after several months, on OA, rather pale brown, glossy, globose, collapsing cup-like when dry,  $90\text{--}125 \mu\text{m}$  diam; spines numerous, dark brown,  $(20\text{--})38\text{--}44 \mu\text{m}$  long; asci clavate, 8-spored; ascospores obliquely 2–3-seriate in ascus, ellipsoidal-fusiform with hardly rounded ends, straight, two-celled (but septum hardly visible), smooth- and thin-walled,  $7.5\text{--}9.5 \times 1.5\text{--}2.0 \mu\text{m}$ , l/w 3.0–5.7; colonies slow-growing, reaching 21 mm diam in 14 days at 20 °C on OA, finely powdery, orange, reverse similarly coloured; vegetative hyphae normally  $0.5\text{--}1.2 \mu\text{m}$ , but later commonly  $1.5\text{--}2 \mu\text{m}$  wide, hyaline, thin-walled, cyanophilic and partly metachromophilic; crystals absent; sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent; phialides regularly aculeate, moderately thick-walled in lower part, from  $1.3\text{--}1.5 \mu\text{m}$  at the base tapering to almost  $1 \mu\text{m}$ , occasionally widening again to about  $1.5 \mu\text{m}$ , total length  $40\text{--}60 \mu\text{m}$ ; conidia cylindrical, symmetrically rounded, one-celled, smooth-walled,  $(3.5\text{--})4.0\text{--}5.5(8.5) \times 1.0\text{--}1.5(2.0) \mu\text{m}$ , l/w 2–3(–4); chlamydospores absent].

**Comments:** This is a third species described growing on coniferous substrates, often synonymized with *N. pusilla*. Its regular, almost fusiform, slightly broader and slightly curved ascospores are distinctive. Winter (1887) described the ascospores as  $6\text{--}8 \times 4.5 \mu\text{m}$ , having a gelatinous sheath, obviously a different fungus. The variety *foliicola* was obviously distinguished from the type variety by its growth on conifer needles rather than on bark. We cannot explain why Barr (1993) overlooked the older name *barbula* for this species. The fungus identified by Rehm (herbarium 1874) as *N. barbula* should be compared to *N. coloradensis*. *Niesslia barbula* also resembles *N. ilicifolia*, with which it had previously been synonymized, but that species has distinctly curved ascospores.

DNA sequences assign *N. barbula* strain CBS 560.74 and *Niesslia* aff. *barbula* CBS 692.94 into the *N. tenuis* species clade (not shown). Also, the anamorph of both of these strains corresponds to that of *N. tenuis*. It is thus possible that strains identified here as *N. tenuis* or *N.* (aff.) *barbula* are conspecific. The shape and size heterogeneity of ascospores encountered in CBS 560.74 and CBS 692.94 suggests that more living pleomorphic gatherings need to be considered for the obviously necessary epitypification of *N. barbula* and to validate the synonymy of *N. barbula* and *N. tenuis*. *Niesslia tenuis* is frequently encountered on the fruiting bodies of other fungi, however, not exclusively (Gams 1971), while *Niesslia* aff. *barbula* occurs on dead plant material.

*Niesslia cladii* W. Gams & Stielow, spec. nov. Fig. 5a, b  
Mycobank MB 827220.

**Holotype:** Netherlands, Noord-Holland, Callantssoog, Zwanenwater, on dead leaves of *Cladium mariscus*, leg. W. Gams, 25 Aug. 1979 (CBS H-1249); ex-type strain, CBS 652.79.

**Etymology:** In reference to its occurrence on *Cladium mariscus* (Cyperaceae).

**Description:** Perithecia  $120\text{--}140 \mu\text{m}$  diam, with few, pale spines. Ascospores long-ellipsoidal, coarse-walled and finely dotted,  $10.5\text{--}11.5 \times 2.5\text{--}3.0 \mu\text{m}$ , l/w 3.4–4.4. Monocillium-like conidiophores on natural substrate  $75\text{--}100 \mu\text{m}$  long, wall about  $0.5 \mu\text{m}$  thick in a long, cylindrical basal portion, gradually widening to a terminal, elongate, thin-walled, sterile vesicle,  $10\text{--}20 \mu\text{m}$  long. Colonies on OA reaching 8 mm diam in 14 days, salmon-pink with whitish floccose overgrowth. Sporulation phalacrogenous – nematogenous, phialides  $35\text{--}50 \mu\text{m}$  long, wall thickened in a long basal portion, aculeate or sometimes slightly widening and again becoming narrow towards the conidiiferous tip. Conidia almost cylindrical, straight,  $5\text{--}7 \times 1.0\text{--}1.5 \mu\text{m}$ , l/w 4–6.

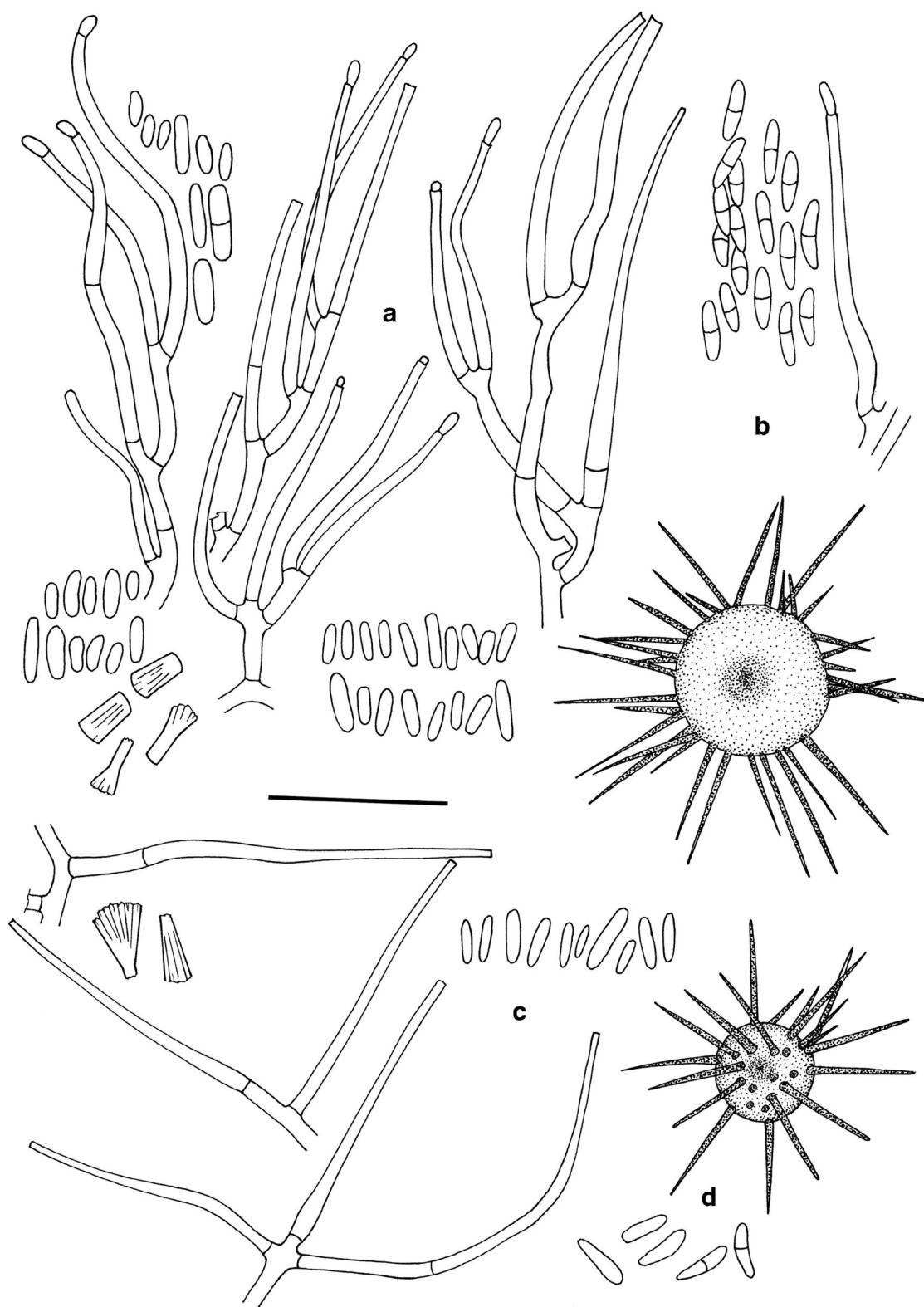
**Comments:** This material was previously identified as *N. antarctica* but differs from that species not only in its origin, but also its slightly narrower ascospores and the absence of vesiculate spines. It differs from the type of *N. exosporioides* by broader ellipsoidal ascospores.

*Niesslia cladonicola* D. Hawksw. & W. Gams, Kew Bull. 30: 194. 1975. Fig. 5c, d

Mycobank MB 318653.

**Holotype:** UK, British Isles, Wales, Glamorgan, Merthyr Mawr, sand dunes, on old podetia of *Cladonia rangiformis*, leg. M. C. Clark, 15 Sep. 1973, isol. W. Gams (Herb. IMI 179266); isotype CBS H-7428; ex-isotype strain, CBS 960.73.

**Description:** Perithecia scattered on lichen thallus, dark brown, glossy, globose, collapsing cup-like when dry,  $100\text{--}150 \mu\text{m}$  diam. Spines numerous, dark brown, about  $25\text{--}45 \mu\text{m}$  long, tapering from  $4$  to  $4.5 \mu\text{m}$  at base towards pointed apex. Ascoma wall  $10\text{--}15(20) \mu\text{m}$  thick. Asci cylindrical with slightly truncate apex, 8-spored,  $25\text{--}30 \times 3.5\text{--}4.0 \mu\text{m}$ . Ascospores elongate ellipsoidal, two-celled, smooth- and thin-walled,  $4.5\text{--}7 \times 1.5\text{--}2.0 \mu\text{m}$ , l/w 2.9–4.3. Colonies slow-growing, reaching 5 mm diam in 20 days at 20 °C on OA; on MEA finely granular, pale pink, margin yellowish; reverse similarly coloured. Vegetative hyphae  $0.8\text{--}1.8 \mu\text{m}$  wide, hyaline, thick-walled. No crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides aculeate,  $25\text{--}40 \mu\text{m}$  long, consisting of a thick-walled (up to  $0.5 \mu\text{m}$ ),  $2 \mu\text{m}$  wide often chromophilic basal portion, sometimes extending into a sterile vesicular expansion,  $2.5\text{--}4 \mu\text{m}$  diam, or normally ending in a



**Fig. 6** *Niesslia clarkii*. **a** Branched, almost sporodochial conidiophores, conidia and crystals (MEA, 12 days) (CBS 170.74). **b** Ascospores, conidiophore and perithecium with spines from natural substrate (IMI 182244). **c** Conidiophores, conidia and crystals (MEA, 15 days, CBS

236.74). **d** Perithecium with spines and ascospores from natural substrate (CBS H-15141). Scale bar, 20  $\mu\text{m}$ ; for perithecium in b, d, 200  $\mu\text{m}$

thin-walled, 1  $\mu\text{m}$  wide conidiiferous tip. Conidia ellipsoidal-cylindrical, not apiculate at base, mostly one-celled, some two-celled, smooth- and rather thick-walled,  $4.5\text{--}6.5 \times 1.8\text{--}2.5 \mu\text{m}$ , l/w 2.5–3.2. Chlamydospores absent.

Description of anamorph also in Hawksworth (1979).

**Herbarium specimens examined:** As *N. peltigericola*, Canada, British Columbia, Wells Grey Prov. Park, 50 km N of Clearwater, forest at SE end of Clearwater Lake, alt. 700 m, P. Diederich & D. Ertz, 23 Jul 2008 (Herb. P. Diederich 17665), on *Peltigera* on the ground [ascospores with rather firm walls,  $6.5\text{--}8 \times 2.0\text{--}2.5 \mu\text{m}$ , too small for *N. peltigericola*, possibly representing this species]. – As *Niesslia* sp., Papua New Guinea, Madang Prov., Huon Peninsula, Finisterre range, Yupna valley, Teptep village, trail in NNW and deep valley in N direction, alt. 2500 m, on *Peltigera* sp., P. Diederich et al., 30 Jul 1992 (Herb. P. Diederich 10988) [perithecia 150–220  $\mu\text{m}$  diam, few spines, 12–25  $\mu\text{m}$ , ascospores rather firm-walled,  $7.5\text{--}8.5 \times 2.5\text{--}3.0 \mu\text{m}$ ].

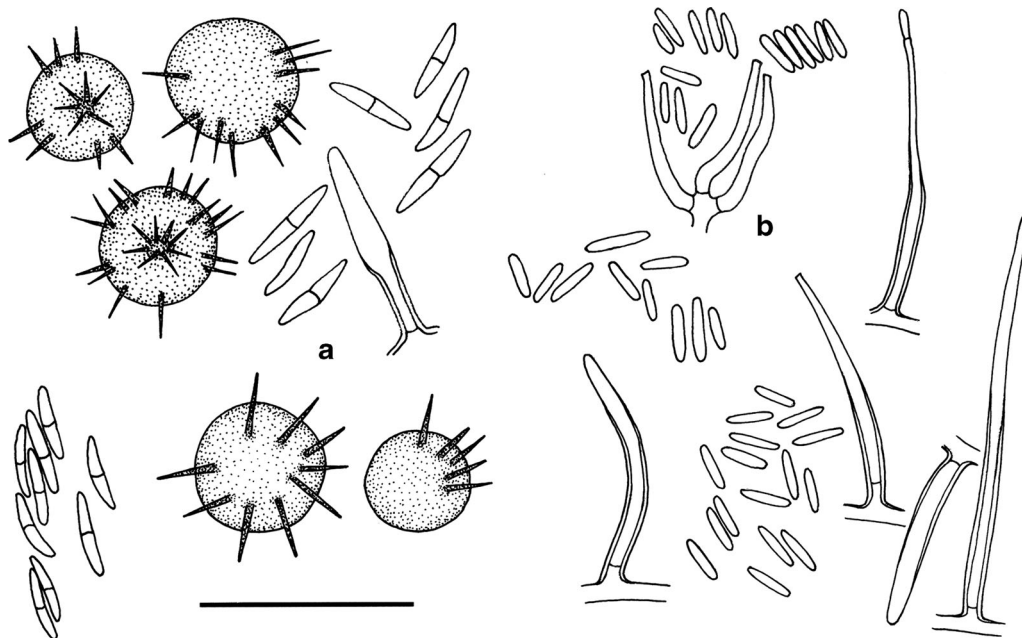
**Comments:** Hawksworth (1975) mentions that *Echinothecium reticulatum*, listed as lichenicolous by Keissler (1930), may be related. For another collection of *N. cladoniicola* on *Cladonia furcata* in Chile, Etayo and Sancho (2008) indicate somewhat larger ascospores,  $8\text{--}10.5 \times 1.5\text{--}2.2 \mu\text{m}$ . Among the lichenicolous species of *Niesslia*, *N. cladoniicola* has rather small ascospores.

*Niesslia clarkii* W. Gams, spec. nov. Fig. 6a–d  
Mycobank MB 827221.

**Holotype:** UK, England, S. Devon, Slapton Ley Nature Reserve, on fallen *Ilex* leaves, leg. M.C. Clark, Feb. 1974, isol. W. Gams (IMI 182244); **isotype** CBS H-15142; ex-type strain, CBS 170.74.

**Etymology:** The species honours the memory of the keen mycologist Mel. C. Clark, Birmingham, who contributed a considerable number of valuable collections to this study and also collected this species.

**Description:** Perithecia scattered on decaying leaves of *Ilex aquifolium*, dark brown, glossy, globose, collapsing cup-like when dry, 110–175  $\mu\text{m}$  diam. Spines numerous, dark brown, partly paler, repeatedly septate, 100–175  $\mu\text{m}$  long, tapering from 5.5–6.5  $\mu\text{m}$  at base towards pointed apex. Asci cylindrical with slightly truncate apex and somewhat extended pedicel, 8-spored, 35–40  $\mu\text{m}$  long. Ascospores biserial in ascus, fusiform with rounded ends, straight or sometimes slightly bent, two-celled, smooth- and thin-walled,  $6\text{--}8 \times 1.5\text{--}2.0 \mu\text{m}$ , l/w 4–5. Colonies slow-growing, reaching 12 mm diam in 12 days at 20 °C on MEA, 20 mm on OA, finely powdery, orange, reverse similarly coloured. Vegetative hyphae 0.7–1.2(–2.0)  $\mu\text{m}$  wide, hyaline, thin-walled, cyanophilic. Prismatic or partly fan-shaped crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Basal hyphae strongly metachromophilic. Conidiophores of 2 kinds: a) Phialides regularly aculeate, consisting of a thick-walled (up to 0.5  $\mu\text{m}$ ), 1.5–2.5  $\mu\text{m}$  wide basal portion, and a 1  $\mu\text{m}$  wide conidiiferous tip, total length 33–45  $\mu\text{m}$ . b) Repeatedly branched and



**Fig. 7** *Niesslia elymi*. **a** Perithecia with spines, ascospores and monocillium-like conidiophore from natural substrate (IMI 196892). **b** Sporodochial conidiophore, monocillium-like conidiophores and conidia (MEA, 16–20 days) CBS 607.75). Scale bar, 20  $\mu\text{m}$ ; for perithecia in **a**, 200  $\mu\text{m}$

septate conidiophores also present, with thin-walled phialides 20–33  $\mu\text{m}$  long, in almost sporodochial aggregations. Conidia cylindrical, symmetrically rounded or tapering at base, one-celled, smooth-walled, (3.5–)4–6.5  $\times$  1.0–2.0  $\mu\text{m}$ , l/w 3–5. Chlamydo-spores absent.

**Herbarium specimens examined:** All on leaf litter of *Ilex aquifolium*. As *N. ilicifolia*, UK, Epping Forest, leg. M.C. Cooke. – UK, Warwickshire, Tamworth-in-Arden, M.C. Clark, 12 Apr. 1974 (CBS H-15141). – As *N. ilicifolia*, Belgium, Beaufays, prov. Liège, leg. V. Mouton (BR).

**Living cultures:** UK, Earlswood, Warwickshire, M.C. Clark, 23 Apr. 1974, isol. W. Gams (CBS 477.74, CBS H-15139). – Netherlands, Gooilust near Hilversum, leg. W. Gams, 17 March 1974 (CBS 236.74, also CBS H-15156). – Italy, Sicily, Madonie, Pizzo Cervi, W. Gams, 2 June 2000 (CBS 109130, CBS H-15158). – Same region, Piana Pomo, W. Gams, 2 June 2000, ascospore isolate (CBS 109131). – Pizzo Cervi, W. Gams, 2 June 2000, conidial isolate (CBS 109132).

**Comments:** A closely related isolate, CBS 287.93, CBS H-5340, with slightly smaller ascospores and slender pedicellate asci is described here as *N. xanthorrhoeae*. *Niesslia clarkii* is well-characterised by large ascomata with numerous long spines. It differs from *N. ilicifolia* found on the same substrate by its shorter ascospores and longer spines. The anamorph closely resembles the phylogenetically distinct *N. tenuis*, but the occurrence of branched conidiophores in *N. clarkii* differentiates the two species.

*Niesslia elymi* W. Gams, spec. nov. Fig. 7a, b  
Mycobank MB 827222

**Holotype:** UK, Scotland, Moray, Culbin Forest, on *Elymus arenarius*, leg. S.M. Francis, 8 Sept. 1975, isol. W. Gams (IMI 196892); ex-type strains CBS 607.75, CBS 627.75 (from the same collection), also CBS H-495 and CBS H-591.

**Etymology:** In reference to its occurrence on *Elymus arenarius* (Poaceae).

**Description:** Perithecia formed on dead leaves of *Elymus arenarius*, dark brown, glossy, globose, collapsing cup-like when dry, 100–125  $\mu\text{m}$  diam. Spines numerous, dark brown, 35–45  $\mu\text{m}$  long, tapering from 4 to 5  $\mu\text{m}$  at base towards pointed apex. Asci clavate, 8-spored, ca. 30  $\mu\text{m}$  long. Ascospores obliquely 2–3-seriate in ascus, ellipsoidal-fusiform, straight or slightly curved, two-celled, smooth- and thin-walled, 8–10  $\times$  1.3–1.5  $\mu\text{m}$ , l/w 5–7. Colonies slow-growing, reaching 14 mm diam or less in 15 days at 20 °C on OA, finely powdery, orange, reverse similarly coloured. Vegetative hyphae 0.6–1.5  $\mu\text{m}$  wide, hyaline, thin-walled, cyanophilic. No crystals present. Sporulation abundant, phalacro-genous; phialides either aculeate, typical monocillium-like, 25–38  $\mu\text{m}$  long, sometimes ending in a sterile vesicle, or complex conidiophores forming

sporodochia, with somewhat shorter phialides; conidia adhering in slimy droplets, often coalescent. Conidia almost rod-shaped, one-celled, smooth-walled, 4–6  $\times$  1.2–1.5  $\mu\text{m}$ , l/w 5.3–6.6. Chlamydo-spores absent.

**Comments:** The phialides are much shorter than in *N. exosporioides* and *N. luzulae*; the narrow conidia and the frequent appearance of sporodochia are characteristic for *N. elymi*.

*Niesslia exigua* (Sacc.) Kirschst., Ann. Mycol. 37: 91. 1939.

Mycobank MB 264494.

$\equiv$  *Eriosphaeria exigua* Sacc., N. Giorn. Bot. Ital. 7: 325. 1875; Fungi ital. Delin. Fig. 138. 1877 [Saccardo, Syll. Fung. 1: 597. 1882].

$=$  *Venturia missionum* Speg., An. Mus. Nac. Buenos Aires 17: 121. 1908 (Hongos yerba mate No. 20) [Saccardo, Syll. Fung. 22: 150. 1913].

**Holotype:** Selva, on dead leaves of *Salix babylonica*, Sep. 1873 (PAD, filed under genus *Eriosphaeria* 2669).

**Description:** Perithecia scattered on dead host leaves and forming in vitro; dark brown, glossy, globose, collapsing cup-like when dry, (60–)75–100(–125)  $\mu\text{m}$  diam. Spines 4 to more than 20 on a perithecium, dark brown, somewhat transparent, 55–75  $\mu\text{m}$  long, tapering from 6.5–7.5  $\mu\text{m}$  at base towards pointed apex. Ascoma wall ca. 12  $\mu\text{m}$  thick. Asci cylindrical with slightly truncate apex, 8-spored, 30–33  $\times$  5–6  $\mu\text{m}$ . Ascospores obliquely uni- or biseriate, ellipsoidal, two-celled, slightly constricted at septum, smooth-walled, wall 0.5  $\mu\text{m}$  thick, becoming gelatinous at maturity, 4-guttulate, 7.0–8.5(–10.5)  $\times$  2.0–2.7(–3.0)  $\mu\text{m}$ , l/w 3.2–4.4. Ascomata formed on 2% MEA and OA after mating of compatible single-spore cultures, maturing after about 18 days. Colonies slow-growing, reaching 8 mm diam in 10 days at 20 °C on MEA, finely dusty, smooth, pale orange-ochre; reverse similarly coloured. Vegetative hyphae hyaline, thin-walled. Prismatic crystals abundant. Sporulation abundant, phalacro-genous, with conidia adhering in slimy droplets, often coalescent. Phialides arising from often metachromophilic subtending hyphae, consisting of a thick-walled (up to 0.5  $\mu\text{m}$ ), 1.5–2.5  $\mu\text{m}$  wide basal portion, slightly extending in middle to 2–3  $\mu\text{m}$  diam, and a thin-walled, 0.7–1.0  $\mu\text{m}$  wide conidiiferous tip, together 20–45  $\mu\text{m}$  long; rarely ending with a sterile vesicle, up to 3.5  $\mu\text{m}$  diam. Conidia ellipsoidal to cylindrical, not apiculate at base, one-celled, smooth-walled, 3.8–5.5  $\times$  1.0–1.5  $\mu\text{m}$ , l/w 2.5–4.5. Chlamydo-spores absent.

Published description also in Gams (1971: 161).

**Herbarium specimens examined:** Type of *Venturia missionum* Speg., Argentina, S. Pedro, Misiones, on dead twigs of *Ilex paraguariensis*, C. Spegazzini, Feb. 1907 (LPS 5757).

**Living culture:** Netherlands, Baarn, Cantonspark, conidial isolate from petiole of *Chamaerops humilis*, W. Gams, Oct. 1967 (CBS 152.68, also CBS H-15143).

**Comments:** The teleomorph obtained in vitro matched the type collection in size of ascospores, spines and ascospores and, particularly, the rather thick, gelatinizing ascospore wall. The anamorph can be distinguished from its relatives by slow growth and abundant plectonematogenous sporulation with relatively short phialides.

*Niesslia exilis* (Alb. & Schw.: Fr.) G. Winter, Rabenh. Kryptogamen-Flora 1(2): 196. 1887.

Mycobank MB 122462.

≡ *Sphaeria exilis* Alb. & Schw., Consp. Fung. Lusatiae 44, Pl. 9, Fig. 4. 1805, Fr., Syst. mycol. 2: 452. 1822.

≡ *Nitschkia exilis* (Alb. & Schw.: Fr.) Fuckel, Jahrb. Nassau. Ver. Natkd. 23–24 (Symb. mycol.): 165. 1870.

≡ *Coelosphaeria exilis* (Alb. & Schw.: Fr.) Sacc., Syll. Fung. 1: 92. 1882.

= *Venturia vaccinii* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 326. 1894, on dead leaves of *Vaccinium ovatum*, USA, Washington, Seattle, C.V. Piper 225, in NY, fide Barr 1993 (not seen).

**Lectotype for *Sphaeria exilis*, designated here:** Germany, Saxony, Niesky, unknown substrate, J.B. Albertini and L.D. Schweinitz, Herbarium Schweinitz (PH 00074792, the first collection in blue paper of a total of 4 collections; it contains poor material that is at least recognisable as *Niesslia*; MBT 383285).

**Description:** Perithecia ca. 150 µm diam, with numerous brown spines that are somewhat transparent and conspicuously thick-walled, 20–35(–45) µm long. Asci cylindrical, 40–50 × 4–5 µm (fide Winter 1887). Ascospores elongate ellipsoidal, slightly tapering towards ends, apparently mostly 1-celled, smooth- and thin-walled, (6–)7–8.5(–11) × 1.5–2.0 µm, l/w 3.5–4.3. Colonies reaching 12 mm diam in 10 days on PCA, on OA at first pale pink, in 3 weeks pale ochraceous, with phalacrogenous sporulation. Vegetative hyphae 0.8–1.5 µm wide. No crystals formed. Phialides aculeate, commonly 30–50 µm, but up to 100–115 µm long, base only slightly thick-walled and 1.2–1.5 µm wide. Conidia elongate ellipsoidal, 1- or 2-celled, rarely also multi-septate, 5–11 × 1.2–2.0 µm, l/w 2.2–5.

**Herbarium specimens examined:** *Sphaeria exilis*, UK, Wroxall, on *Pinus*, leg. C.E. Broome, 25 Jan. 1850, ex herb. Berkeley (K). – *Sphaeria exilis*, Germany, near Johannisberg, on decaying needle of *Pinus sylvestris*, collected in spring (Fuckel, Fungi rhenani 2023) (BR) [no ascospores seen]. – *Niesslia exilis*, Czech Rep., on *Pinus slyvestris*, leg. Petrak, Apr. 1926, Fl. Morav. (in B) [poor material]. – *Sphaeria exilis*, Finland, Wasa, on birch wood ('på björkved'), P.A. Karsten Finland Fungi 876, Aug. 1867 (in H) [examined and notes

provided by G.J. Samuels; this specimen has asci with a long, thread-like pedicel and might represent a different species].

**Living cultures:** Germany, Kaltenhofen, Kr. Eckernförde, from bark of *Picea abies*, leg. and isol. W. Gams, 4 Apr. 1965 (CBS 357.70, CBS H-1058) [conidial isolate that produced perithecia in vitro that matched the type of this species]. – Netherlands, N-Brabant, Kampina Heide, from dead petiole of *Pteridium aquilinum*, W.G., Apr. 1968 (CBS 358.70, CBS H-15146) [conidial isolate similar to CBS 357.70, not forming perithecia].

**Comments:** The species has often been synonymized with *N. pusilla*, which also grows on pine needles. Winter (1887) synonymized them but recognised the *N. pusilla* from Spegazzini & Roumeguère as distinct, which cannot be accepted for nomenclatural reasons. *Niesslia exilis* is distinguished from *N. pusilla* as described above by its ellipsoidal, slightly shorter ascospores that are (6–)7–8.5(–11) × 1.5–2.0 µm in the former and 8.5–12 × 1.2–2.5 µm in the latter. The CBS isolates previously preserved under this name turn out to be heterogeneous.

*Niesslia exosporioides* (Desm.) G. Winter, Rabenh. Kryptogamen-Flora 1(2): 197. 1887.

Mycobank MB 120441

≡ *Sphaeria exosporioides* Desm., Ann. Sci. Nat., Bot, Sér. 2, 19: 353. 1843.

≡ *Trichosphaeria exosporioides* (Desm.) Fuckel, Jahrb. Nassau. Ver. Natkd. 23–24, Symb. mycol.: 145. 1870.

≡ *Venturia exosporioides* (Desm.) Sacc., Rev. Mycol. Toulouse 3(11): 47. 1881.

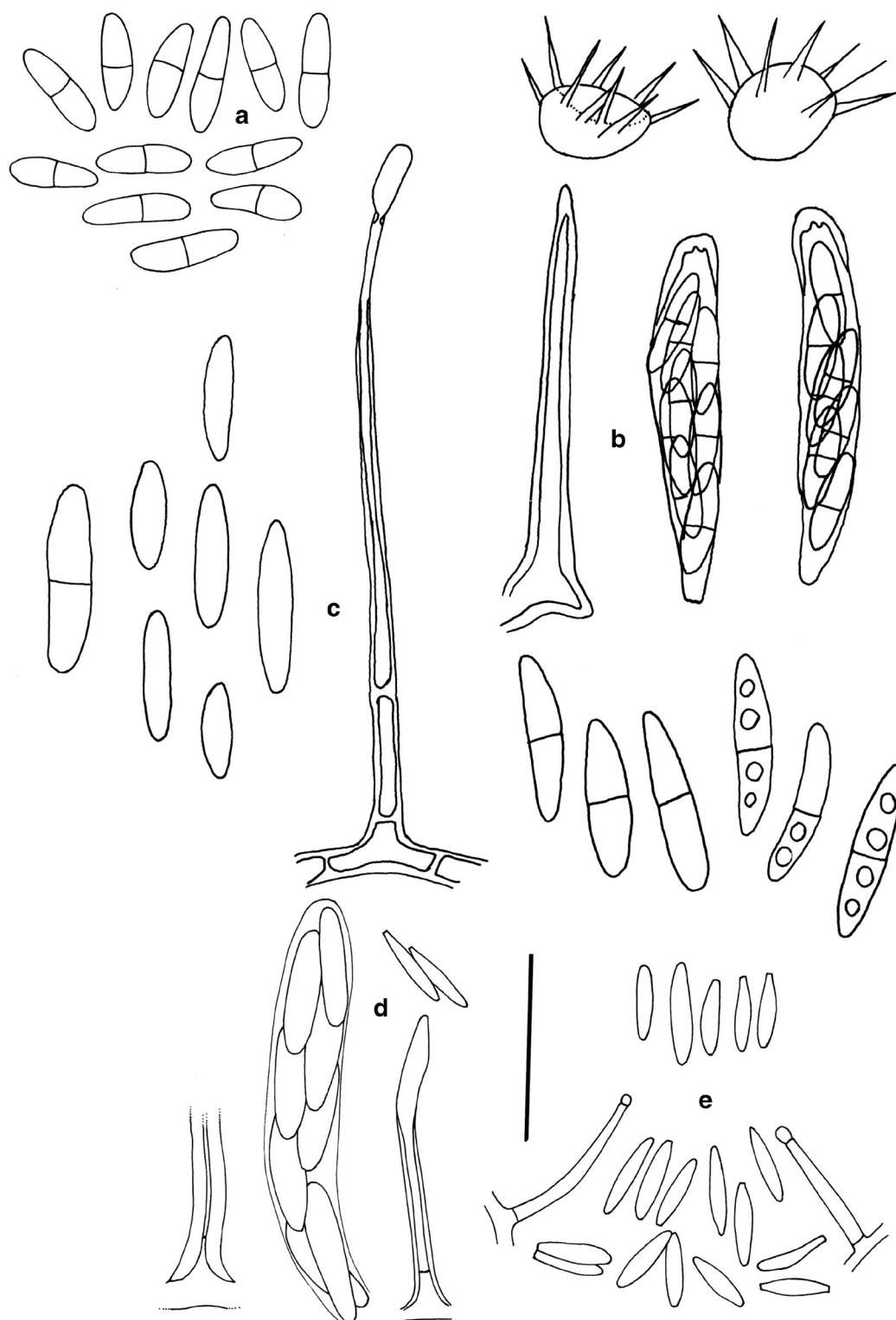
= *Venturia microspora* Speg., Boln Acad. Nac. Cienc. Córdoba 11 ('1887'): 210. 1888.

≡ *Niesslia microspora* (Speg.) Sivanesan, Bibl. mycol. 59: 116. 1977.

**Holotype:** France, Parc de Lébisey, on dead leaves of *Carex pendula*, Feb. 1842, Desmazières No. 1269 (PC).

**Description:** Perithecia scattered on dead host leaves, dark brown, glossy, globose, collapsing cup-like when dry, 100–150 µm diam. Spines numerous, dark brown, 70–100 µm long, tapering from 5 to 8 µm at base towards pointed apex. Ascoma wall 7–11 µm thick. Asci cylindrical with slightly truncate apex, 8-spored. Ascospores cylindrical to slightly fusiform or slightly clavate, two-celled, 4-guttulate, smooth- and thin-walled, 6.5–9.5(–11) × 1.5–2(–3) µm, l/w 4.3–6.3, apical cell slightly wider than basal one. Phialides on type 28–50 µm long, thick-walled basal part 1.5–2 µm wide, wall 0.5–0.7 µm thick, often ending in an elongate sterile vesicle, 2.5–3.5 µm diam, thin-walled apex tapering to ca. 1 µm. Conidia cylindrical, smooth- and thin-walled, 5–6 × 1.0–1.5 µm, l/w 5–6.

**Herbarium specimens examined:** *Venturia exosporioides*, Belgium, Malmédy, on leaves of various *Carex* species, C. Roumeguère, Fungi Gall. exs. 1621 (BR) [not recognisable]. – *Venturia microspora*, Argentina, Staten



**Fig. 8** *Niesslia fuegiana*. **a** Ascospores from natural substrate (LPS 5748). **b** Perithecia, perithecial spine, asci and ascospores from natural substrate (PDD 31800). **c** Monocillium-like conidiophore and conidia (PDA) (CBS 368.77). *Niesslia fusiformis*. **d** Thick-walled, monocillium-like conidiophores, conidia and partial ascus from natural

substrate (PDD 32573). **e** Short, thin-walled conidiophores and conidia (MEA, 14 days; uppermost row of conidia, MEA, 4 weeks) (CBS 325.77). Drawings in b, c prepared by G.J. Samuels, not drawn to scale. Scale bar for a, d, e, 20  $\mu$ m



Isl., Tierra del Fuego, on dead leaves of *Festuca magellanica*, C. Spegazzini, March 1882 (IMI 166743, ex LPS) [perithecia described as 120–150 µm diam, with dark spines, 20–30 µm long and 2–3 µm wide at base; asci short-stalked, 24–25 × 2–2.5 µm, 8-spored; ascospores ellipsoidal-elongated, sometimes slightly inequilateral and moderately curved, ends rounded or almost truncate, 5 × 1 µm]. – Possibly conspecific: As *Niesslia exilis*, New Zealand, Auckland, Waitemata Co., Wenderholm Scenic Reserve, on decorticated wood of ? *Sophora microphylla*, J.M. Dingley, G.J. Samuels et al., 25 Sept. 1973 (PDD 36870, G.J.S. 73–202). – Most other collections identified as *N. exosporioides* are *N. luzulae*.

**Living cultures:** Possibly related: Netherlands, Baarn, Cantonspark, from dead leaves of *Yucca* sp., Aug. 1968 (CBS 390.70) [anamorphic, phylogenetically related to and also filed under *N. ilicifolia*]. – Italy, Viterbo, Corviano, from *Carex pendula*, 29. June 2015 (CBS 140397) [anamorphic].

**Comments:** *Niesslia exosporioides* was previously synonymized with *N. luzulae* (= *Fusidium granulatum*, = *Monocillium granulatum*), which grows on similar substrates. Accordingly, Gams (1971: 157, Abb. 104 c) illustrated conidiophores and conidia of *F. granulatum* as *N. exosporioides*. The anamorph is similar to that of *N. luzulae*. It has narrow cylindrical conidia and thick-walled phialides, but the wall is thinner than in *N. luzulae*. For further comments on these two species, see under *N. luzulae*. Re-examinations of LPS 5747 (holotype of *Venturia microspora*) revealed pale brown spines and only a few ascospores, measuring 7.5–8 × 1.5–2.0 µm. These observed characters deviate from the original description, where spines were described as dark and ascospores as 5 × 1 µm. This suggests that *N. microspora* might actually be a synonym of *N. exosporioides*. Other published descriptions are based on a broad concept as in Petrak (1940) and Gams (1971: 157).

*Niesslia fuegiana* (Speg.) W. Gams & Samuels, comb. nov. Fig. 8a–c

Mycobank MB 827223.

Basionym: *Venturia fuegiana*, Speg., Boln Acad. nac. Cienc. Córdoba 11: 210. 1887.

**Holotype:** Argentina, Tierra del Fuego, Isla de los Estados, on wood of *Fagus betuloides*, leg. C. Spegazzini, March 1882 (LPS 5748).

**Description from protologue:** Perithecia on naked wood, 110–130 µm diam, with dark spines 25–40 × 5 µm; asci obclavate, below with a short stipe, 40–45 × 5 µm; ascospores ± oblique and biseriate, ellipsoidal-elongate to almost obovate, with obtusely rounded ends, straight or slightly inequilateral, 11–12 × 3 µm. **Observations of type by WG:** Perithecia black, glossy, globose, collapsing cup-like when dry, 160–200 µm diam. Spines numerous, dark brown, 25–40 µm long. Asci cylindrical, 8-spored, given as 40–45 × 5 µm. Ascospores

cylindrical-ellipsoidal, two-celled, smooth- and rather thick-walled, 9–12 × 3–3.5 µm, l/w 3.3–4.5. Phialides and conidia not seen. **Observations of PDD 31800 by G.J. Samuels** (Fig. 8b, c): Perithecia on palm sheathing base, entirely superficial, black, solitary or in groups of few, globose or deeply collabent, 120–150 µm diam, with black, pointed, unbranched spines arising from all over surface of perithecial wall. Perithecial wall smooth, shining, 10–15 µm thick. Spines 40–50 × 8–9 µm (base), wall 1.5 µm thick. Asci with a prominent ring, fusoid to clavate, 33–45 × 6–8 µm. Paraphyses not seen. Periphyses 15–20 µm long, cylindrical, less than 1 µm diam. Ascospores fusiform, equally 2-celled, smooth, typically with two drops per cell, 12–17 × 2.5–3.0 µm. Mycelium not visible. Phialides formed in culture, 45–60 µm long, wall 0.5 µm thick at base. Conidia formed in culture, fusiform, cylindrical, without an obvious abscission scar, 1-celled, 6–10 × 1.5–2(–3) µm, becoming 1-septate at germination.

**Herbarium specimen and living culture examined:** As *Niesslia exilis*, New Zealand, Auckland Prov., Waitemata County, Waitakere Range, Marguerite Track, on sheathing base of *Rhopalostylis sapida*, leg. J.M. Dingley, G.J. Samuels, S. Haydon, 30 May 1973 (PDD 31800 (G.J.S. 73–96, CBS 368.77)).

**Comments:** *Venturia fuegiana* was originally published with a question mark by Spegazzini who, aware of its similarity with *E. exigua*, hesitated about its classification in *Eriosphaeria* because of the absence of paraphyses. *Niesslia exigua* is certainly distinct from that species because of its thick-walled ascospores, which are shorter and 7.0–8.5(–10.5) × 2.0–2.7(–3.0) µm. The most similar species is *N. luzulae* with ascospores measuring 9–13.5 × 2.2–3.5 µm, thus slightly narrower, and with very prominent, thick-walled phialides. CBS 368.77 comes closest to this species morphologically. The different substrates may be taxonomically significant. CBS 368.77 grew slowly and no longer produces sporulating structures.

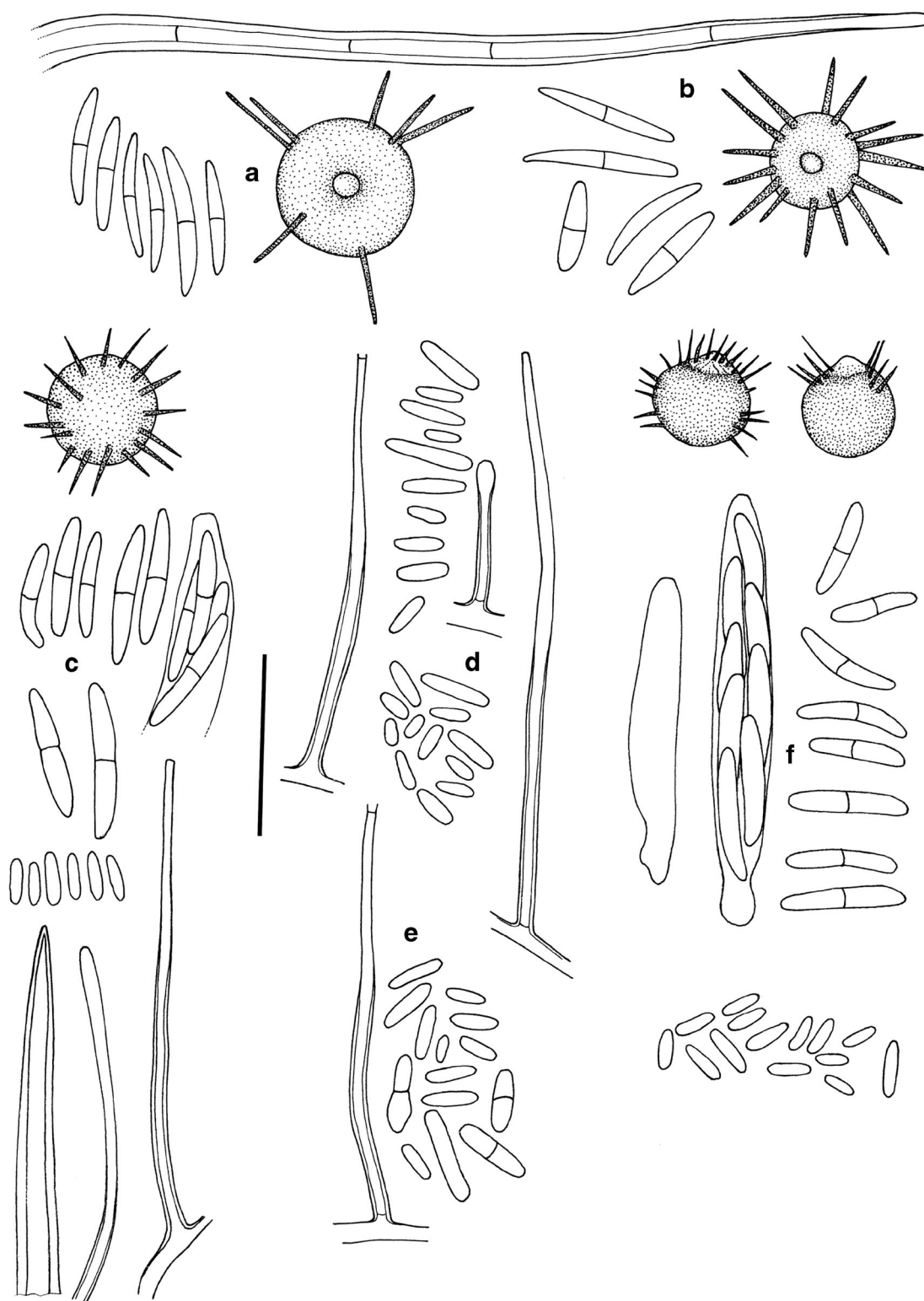
*Niesslia fusiformis* W. Gams & Samuels, spec. nov. Fig. 8d, e

Mycobank MB 827224.

**Holotype:** New Zealand, Auckland Province, Waitemata County, Waitakere Ranges, West Coast Rd., Home Track, from leaf of *Gahnia* sp., leg. G.J. Samuels, 10 July 1974; G.J.S. 74–101 (PDD 32573, as '*N. exilis*'); ex-type culture CBS 325.77.

**Etymology:** Latin *fusiform* = fusiform, indicating the shape of the conidia formed by the species.

**Description:** Perithecia 100–160 µm diam, with dark brown spines, to over 50 µm long; asci cylindrical, about 45–50 × 8–11 µm; ascospores ellipsoidal, 0- or 1-septate, 4-guttulate, 12–16 × 2.5–3.5(–4.5) µm, l/w 4.0–4.8. Phialides on specimen thick-walled, conidia fusiform 8.5–9 × 1.5 µm. Colonies 8 mm diam in 14 days on MEA, turning orange-



**Fig. 9** *Niesslia ilicifolia*. **a** Ascospores and perithecium with spines from natural substrate (type, Fungi Brit. exs. No. 696 in K). **b** Ascospores, perithecium and thick-walled, hyaline setum (Fungi Sel. Gallici exsiccati 679). **c** Perithecium with spines, partial ascus, ascospores, apical part of setum, monocillium-like conidiophores and conidia from

natural substratum (CBS 459.74). **d** Monocillium-like conidiophores and conidia (MEA, 12/23 days) (CBS 459.74). **e** Monocillium-like conidiophores and conidia (OA) (CBS 459.74). **f** Perithecia with spines, asci, ascospores (from natural substratum) and conidia (MEA, 12 days) (CBS 460.74). Scale bar, 20  $\mu$ m; for perithecia in a–c, f, 200  $\mu$ m

yellow with time; phialides aculeate, some thick-walled throughout, but mostly thin-walled, 18–30 µm long. Conidia fusiform with slightly rounded ends, (7.2–)8–10 × 1.5–2.3 µm, l/w 3.6–5.7. Chlamydospores absent.

**Comments:** The species resembles *Niesslia* sp. (CBS 478.73) but clearly differs by larger ascospores and conidia. Several species of *Niesslia* produce sporodochia. The septation of ascospores was observed by G.J. Samuels (pers. comm.) when he collected the fungus. According to a specimen record from W.G., CBS 325.77 produced sporodochia on MEA after 4 wk., while solitary phialides only were noted by G.J. Samuels.

***Niesslia ilicifolia*** (Cooke) G. Winter, Rabenh. Kryptogamen-Flora 1(2): 197. 1885; Hedwigia 24: 98. 1885. Fig. 9a–f

Mycobank MB 120662.

≡ *Venturia ilicifolia* Cooke, Handb. Brit. Fungi: 924. No. 2782. 1871.

= *Venturia ilicifolia* var. *brevisetata* Sacc., Syll. Fung. 9: 689. 1891.

**Holotype:** UK, England, Sphere, on leaf, Dr. Capron (ex herb. M.C. Cooke), 1866 (K 251648).

**Description:** Perithecia scattered on decaying leaves, more or less dark brown, glossy, globose with slightly projecting apical papilla, collapsing cup-like when dry, 100–155 µm diam. Spines numerous, brown, multi-septate, 40–125 µm long, tapering from 4.5 µm at base towards pointed apex; interspersed with some hyaline thick-walled setae (wall 1 µm thick in basal part, possibly conidiophores). Asci cylindrical with slightly truncate apex, 8-spored, 34–40(–48) × 5–6 µm. Ascospores obliquely 2–3-seriate in the ascus, slightly fusiform, often slightly curved, two-celled, smooth- and moderately thin-walled, 9–14(–17) × 1.3–2.0(–2.5) µm, l/w 7.4–9.5. Colonies on OA 11 mm diam in 9 days, pale ochraceous, dusty. Sporulation phalacrogenous, centrally nematogenous. Vegetative hyphae about 1.5 µm wide, but toruloid hyphae up to 5 µm, strongly cyanophilic near phialides. Phialides aculeate, (25–)40–50(–80) µm long, in basal part only slightly thick-walled, rarely to 0.5 µm, 1.0–1.5 µm wide, in middle part hardly widening to 1.5–2.0 µm and tapering again to about 0.5 µm. Conidia cylindrical, smooth- and thin-walled, 3.2–6.5 × 1.0–1.7 µm, l/w 3–3.8(–4.8). Chlamydospores absent.

**Herbarium specimens examined:** All on leaf litter of *Ilex aquifolium*: *N. ilicifolia*, Belgium, near Malmédy, on *Ilex balearica*, collected in spring, in C. Roumeguère, Fungi Sel. Gallici exsiccati, No. 679, Reliquiae Libertianae (PAD, BR, L 910.254–962). – *N. ilicifolia*, leg. W. Phillips, No. 95, 1875 (K).

**Living cultures:** UK, Warwickshire, Danzey, Mockley Wood, on decaying leaf of *Ilex aquifolium*, leg. M.C. Clark, 26 June 1974, isol. W. G. ex ascospores (CBS 459.74). – UK, Haseley near Warwick, on decaying leaf of *Ilex aquifolium*, leg. M.C. Clark, 25 June 1974, isol. W. G. ex ascospores (CBS 460.74). – Netherlands, Baarn, Cantonspark, from dead leaves

of *Yucca* sp., Aug. 1968 (CBS 390.70) [anamorphic, is phylogenetically related].

**Comments:** Another species of *Niesslia* is equally common on the same substrate, *Ilex* leaves, which is described above as *N. clarkii*. It is distinguished by shorter and less fusiform ascospores. Saccardo (1891) distinguished two varieties, var. *ilicifolia* as having spines 100–120 × 15 µm, and var. *brevisetata* as 50–60 × 5 µm. This criterion does not seem to warrant a species distinction. The anamorph is similar to *N. tenuis*, but isolates of this species did not show fan-shaped crystals and they are not phylogenetically related.

***Niesslia leucoula*** W. Gams & Schroers, spec. nov. Fig. 10a, b  
Mycobank MB 827225.

**Holotype:** USA, Puerto Rico, Caribbean National Forest, Luquillo Mts., El Verde Research Area, on dead petiole of *Prestoea* sp., H.-J. Schroers, 9 June 1998 (CBS H-15157); ex-type strain, CBS 101741, single-spore culture.

**Etymology:** Greek *leukos* = white, *oûlos* = curled. Indicating the conspicuous curly white subiculum.

**Description:** Perithecia on natural substrate, 110–150 µm diam, lacking spines, sitting on a white subiculum of curled, thick-walled hyphae. Perithecia also formed on PCA after 50 days. Asci 8-spored, biseriate. Ascospores fusiform with almost pointed tips, hardly constricted at septum, 4-guttulate, thin-walled, 9.5–12.5 × 2.0–2.5 µm, l/w 3.6–5.8. Colonies on OA reaching 10 mm diam in 10 days, slightly pigmented (6A3), on PDA reddish ochraceous. Vegetative hyphae 0.8–1 µm wide. Sporulation phalacrogenous, phialides monocillium-like: basal part moderately thick-walled, 12–25 µm long, 1.5–2 µm wide, then slightly widening to 2–3 µm and tapering into a short, 0.5–1 µm wide tip, occasionally ending as sterile vesicle, total length 25–35 µm. Conidia ellipsoidal, 3.0–4.5 × 1.0–1.5 µm, l/w 2.5–3.7. Chlamydospores absent.

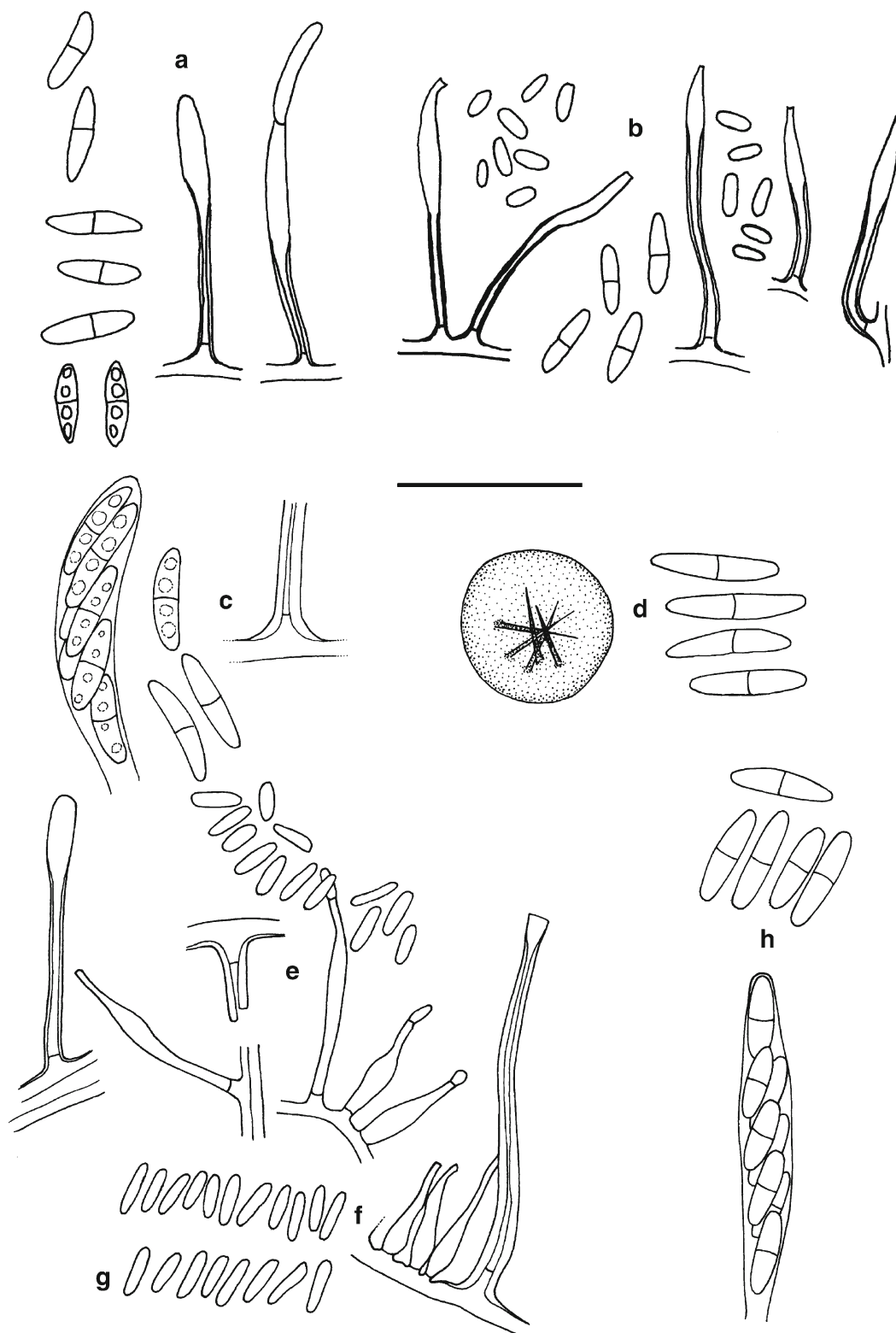
**Herbarium specimens and living cultures examined:** USA, Puerto Rico, Caribbean National Forest, Luquillo Mountains, El Verde Research Area, from leaf base of palm, G.J. Samuels, 9 June 1998 (CBS 101223 = G.J.S. 98–56). – Same location and substrate, W.G., conidial isolate (CBS 101685).

**Comments:** Similar perithecia lacking spines occur in *N. monociliata*. Conidia of *N. monociliata* are 4–4.5 × 1.5–2.2 µm, thus longer and wider than those of *N. leucoula*. Therefore we refrain from including the collections described here as *N. leucoula* under *N. monociliata*.

***Niesslia luzulae*** (Westend.) W. Gams, comb. nov.  
Fig. 10c–h

Mycobank MB 827226.

Basionym: *Vermicularia luzulae* Westend., Bull. Acad. R. Sci. Belg., Cl. Sci., sér. 2 2(7): 566.



**Fig. 10** *Niesslia leucoula*. **a** Ascospores from natural substratum (CBS H-15157), monocillium-like conidiophores ending in sterile vesicle (PDA, 21 days, CBS 101741). **b** In culture formed ascospores (CMA, >4 weeks) and conidia and monocillium-like conidiophores (OA, PCA, 10 days; CMA) (CBS 101223). *Niesslia luzulae*. **c** Partial ascus, ascospores and monocillium-like conidiophore base (type of *Vermicularia*

*luzulae* in BR). **d** Perithecium with spines and ascospores (Fungi rhenani No. 943). **e–g** Monocillium-like conidiophores and conidia (e, MEA, 6 weeks.; f, WA, 23 days; g, CMA, 23 days) (CBS 515.72). **h** Partial ascus and ascospores (Clark No. 633). Scale bar, 20  $\mu\text{m}$ ; for perithecium in d, 200  $\mu\text{m}$

≡ *Pyrenochaeta luzulae* (Westend.) Saccardo, Syll. Fung. 3: 221. 1884.

= *Fusidium granulatum* Fuckel, Jahrb. Nassau. Ver. Natkd. 23–24 (Symb. mycol.): 371. 1870.

≡ *Cylindrium granulatum* (Fuckel) Lindau in Rabenh. Kryptogamen-Flora 1(8): 73. 1907.

≡ *Monocillium granulatum* (Fuckel) W. Gams, Cephalosporium-artige Schimmelpilze: 157. 1971.

**Holotype:** Belgium, near Nassogne, on dead leaves of *Luzula maxima*, M. Crépin Herb. Cr. No. 1242 (BR 5020155193902).

**Description:** Perithecia scattered on dead leaves of *Luzula* species, dark brown, glossy, globose, collapsing cup-like when dry, 110–175(–200) µm diam. Spines sparse, dark brown, septate, 70–85(–130) µm long, tapering from 4.5–6 µm at base towards pointed apex. Asci cylindrical with slightly truncate apex, 8-spored, biseriate, about 40 × 5–7 µm. Ascospores cylindrical-ellipsoidal, or slightly clavate, moderately curved, two-celled, smooth and rather thick-walled, 4-guttate, 9–13.5 × 2.2–3.5 µm, l/w 4.4–5.8. Colonies moderately slow-growing, reaching 14–17-mm diam in 10 days at 20 °C on MEA or 6 mm diam in 9 days on OA, finely floccose, under day light pinkish; reverse similarly coloured, partly greyish brown due to stromatic structures. Vegetative hyphae 0.7–2 µm wide, tough, difficult to dissect, hyaline, partly strongly chromophilic. Prismatic crystals commonly present, in CBS 691.71 crystals brownish. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting of a thick-walled, 1(–1.5) µm, and 2–5 µm wide basal portion, extending into an elongate vesicular expansion, up to 2.5–3 µm wide, and a thin-walled, 0.5–1.0 µm wide conidiiferous tip, total length 60–85 to more than 200 µm. In CBS 691.71 phialides almost aculeate, only slightly widening from basal 1.0–1.5 µm to 1.7–2.0 µm, wall in basal part less than 0.5 µm thick. In CBS 515.72 and 700.79 also short, almost thin-walled phialides were seen, 7–11 µm long, in middle swollen to 2.5 µm. Conidia cylindrical, not apiculate at base, one-celled, smooth-walled, 4.0–6.5(–10) × 1.2–1.5 µm, l/w 3.6–5.2(–6.7). Chlamydospores absent.

For other species descriptions, see Petrak (1940) and Gams (1971, Abb. 104 b, type material of *Fusidium granulatum*, herb. BM).

**Herbarium specimens examined:** As *Sphaeria exosporioides*, UK, on *Aira caespitosa*, Batheaston, C.E. Broome 1843, Rabenhorst, Fungi europ. 140 (K, BR 5020096927246). – As *Niesslia exilis*, UK, Batheaston, on *A. caespitosa*, March 1859, Herb. Broome (K). – As *Niesslia exosporioides*, Germany, in sylvia Hostrichiensi (Östrich), on decaying leaves of Cyperaceae and Juncaceae, Fuckel, Fungi rhenani No. 943 (BR and K). – As *Fusidium granulatum*, Germany,

Östrich, on *L. maxima*, Fuckel, Fungi rhenani 1916 (M, K, BM, S) [phialides 30–60(→80) µm long, consisting of a thick-walled basal part (0.5–1.5 µm thick), with a lumen 0.5–1.6 µm wide, sometimes widening into an elongate vesicle of 4–5 µm diam and ending sterile, or tapering into a 1 µm wide conidiiferous tip, total length 30–60 µm; conidia adhering in heads or irregular slimy masses, almost cylindrical, with broadly truncate ends, smooth-walled, 5.6–6.5 × 1.2–1.5 µm, l/w 2.5–5.2; specimen ex M also with some globose conidia, 5–6 µm diam]. – As *Niesslia exosporioides*, UK, Soye Park, on *Carex paniculata*, Feb. 1850, herb. Broome (K). – UK, Cockery, on *Holcus*, 23 Sept. 1932, Flora of Sussex (K). – UK, Leighton, Somersetshire, Strumpshaw Broad, on *Glyceria maxima*, E.A. Ellis, 31 Aug. 1944, herb. W.A.. – UK, Warwicksh, Oversly Wood, on *L. sylvatica*, M.C. Clark, 1 March 1970, No. 633 (K). – UK, Isle of Mull, on *L. sylvatica*, R.W.G. Dennis, 17 March 1971 (K). – *Niesslia ?exilis*, New Zealand, Auckland, Wenderholm Scenic Reserve, Waitemata Co., on decorticated wood of ? *Sophora microphylla*, leg. J.M. Dingley, G.J. Samuels, S. Haydon, J. Fletcher (PDD 36870); G.J.S. 73–202.

**Living cultures:** UK, Exmoor, East Lyn River, from decaying leaves of *L. sylvatica*, W.G., 12 Sep. 1971 (CBS 691.71, CBS H-14568) [anamorphic]. – Germany, Mariawald, Eifel, from decaying leaves of *L. sylvatica*, W.G., May 1972 (CBS 515.72) [conidial isolate next to perithecia]. – Germany, Büscheich near Gerolstein, Eifel, from *L. sylvatica*, W.G., Oct. 1979 (CBS 700.79 (CBS H-15152)). – Possibly related: New Zealand, Auckland Prov., Waitemata Co., Waitakere Ranges, Piha Road, Kitekite Stream, on *Rhopalostylis sapida*, G.J. Samuels 30 May 1973 (CBS 368.77 (PDD 31800, G.J.S. 73–96)) [*N. fuegiana*].

**Comments:** The fact that this long-forgotten species belongs to *Niesslia* was discovered by Schneider (1979: 57). It is close to *N. exosporioides*, which occurs on dead leaves of grasses; the species have similar anamorphs and were generally confused with each other from the time of Fuckel (1870) to Gams (1971). *Niesslia luzulae* is, however, distinct by its broader, more rounded and thick-walled ascospores, 9–13.5 × 2.2–3.5 µm, compared with 7.0–9.5 × 1.5–1.8 µm for those of *N. exosporioides*. The anamorph has narrow cylindrical conidia and thick-walled phialides and resembles that of *N. fuegiana*. Phylogenetically, *N. luzulae* is related to *N. curvisetosa*. The anamorph was associated with *N. exosporioides* by Fuckel (1870) and other authors including Gams (1971), but is obviously connected with the present species, which Gams (1971) had not then recognised as distinct. It is well-characterised by narrow cylindrical conidia and thick-walled phialides. Some heterogeneity among the isolates listed is noted and

is reflected in the molecular findings. In the similar *N. bellotae*, the ascospores are more fusiform and slightly shorter. In one of the specimens of *F. granulatum* (Fungi rhen. 1916 in M) also some globose conidia, 5–6 µm diam, were observed. The affinity of these could not be established; similar globose conidia are considered a synanamorph in *N. aemula* and *N. dimorphospora*.

*Niesslia nolinae* (A.W. Ramaley) W. Gams, comb. nov.  
Fig. 11a

Mycobank MB 827227.

Basionym: *Hyaloseta nolinae* A.W. Ramaley, Mycotaxon 79: 269. 2001.

≡ *Monocillium nolinae* A.W. Ramaley, Mycotaxon 79: 270. 2001.

**Holotype:** USA, New Mexico, Lincoln County, Valley of Fires, on dead leaves of *Nolina micrantha*, leg. and isol. A. Ramaley, 22 Oct. 1997 (UC 9706B, not seen); ex-type strain, CBS 109837.

**Description from protologue:** Perithecia sitting on a white hyphal subiculum, (50–)75–125(–150) µm diam, spines hyaline, thick-walled, aseptate, to 48 µm long, expanding in a glistening elongate, swollen, more or less ellipsoidal tip, up to 3.2 µm wide. Peridium 6.5–16 µm thick. Asci 28–48 × 3.2–4.8 µm, 8-spored, biseriata. Ascospores oblong-ellipsoidal, 5.6–7.2(–9.6) × 2.4 µm, smooth- and thin-walled.

**Observations from type by WG:** Colonies on OA reaching 9 mm diam in 10 days (on SNA hardly growing), whitish, dry; sporulation densely phalacrogenous; phialides aculeate with a slightly thick-walled lower part, 18–40 µm long, from (1.0–)1.2–1.5 µm tapering to 0.5 µm, often ending in an elongate vesicle; conidia ellipsoidal-cylindrical, (3.0–)4.0–6.5 × 1.0–1.5(–2.5) µm, l/w 3.0–4.5.

**Comments:** The character of hyaline spines on the perithecia is no longer unique in *Niesslia*, and is shared by *N. lampracantha* and *N. pandani*.

*Niesslia pandani* W. Gams & Stielow, spec. nov. Fig. 11b–e  
Mycobank MB 827228.

**Holotype:** Sri Lanka, Peradeniya Botanic Garden, on dead petiole of *Pandanus leram*, Jan. 1973, isol. from ascospores (CBS H-15137); ex-type culture CBS 583.73.

**Etymology:** In reference to its occurrence on *Pandanus leram* (Pandanaceae).

**Description:** Perithecia about 125 µm diam, collapsing cup-shaped, marginally covered with almost hyaline spines up to 65 µm long. Asci clavate. Ascospores ellipsoidal, slightly tapering towards ends, slightly constricted in middle and partly slightly curved, 9–10.5 × 2–2.5 µm, l/w 3.6–5. Colonies on OA reaching 11 mm diam in 12 days, pale orange, almost moist; sporulation phalacrogenous, in slimy confluent heads. Phialides almost aculeate, from a moderately thick-walled (to 0.5 µm) 1.5(–2.0) µm wide basal portion slightly widening to 1.7–2.0(–

2.5) µm and tapering to a 0.7–1.3 µm wide tip. Conidia elongate ellipsoidal, smooth- and thin-walled, 3–4.5(–6) × 0.8–1.3(–1.5) µm, l/w 2.7–4.4(–4.8).

**Comments:** *Niesslia kapitiana* and *N. philippinensis*, isolated from *Freycinetia* (Pandanaceae), and *N. pacifica* isolated from *Pandanus*, differ from *N. pandani* by having ascospores that are longer than 13.5 µm. Less clearly differing ascospore sizes occur in *N. cinctiostiolata* (9–14 × 1.8–2.2 9–14 × 1.8–2.2 µm), *N. monociliata* (11–15 × 2.2–4 µm) and *N. vaginata* (9.5–13 × 2–3 µm), which also grow on Pandanaceae. The types of these species could not be examined.

*Niesslia physacantha* W. Gams & Stielow, spec. nov.  
Fig. 11f

Mycobank MB 827229.

**Holotype:** UK, near Bedford-on-Avon, Warwickshire, on decayed leaf of *Ulmus* sp., M.C. Clark, 4 May 1974 (CBS H-15140); ex-type culture CBS 474.74, isol. W. Gams.

**Etymology:** Greek *physis* = vesicle, *akanthos* = spine, addressing the vesiculate spines.

**Description:** Perithecia formed on dead leaves of *Ulmus* sp. and in vitro on CMA after about 2 months, pale brown, globose to pyriform, collapsing cup-like when dry, 85–>200 µm diam. Spines numerous, pale brown, often with one additional septum, wall at base ca. 2 µm thick, 36–40 µm long, tapering from 4 to 6 µm at base to 1.5–2 µm near tip and then expanding into a thin-walled vesicle, about 7–10 × 3–5 µm, occasionally with pointed tip, breaking off easily. Ascoma wall 8–10 µm thick. Asci cylindrical-clavate, 8-spored, 30–40 × 5–5.5 µm. Ascospores ellipsoidal–fusiform, straight, two-celled, smooth- and slightly thick-walled, 8–10.5 × 2.0–2.5 µm, l/w 3.4–5.2. Colonies slow-growing, reaching 5 mm diam in 12 days at 20 °C on OA, finely powdery, orange, reverse similarly coloured. Vegetative hyphae hyaline, thin-walled, cyanophilic. No crystals present. Sporulation scanty, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting of a thick-walled (0.7–1.0 µm), 1.5–2.5 µm wide basal portion, extending into a widened part up to 2.5–3 µm diam, and a short thin-walled, 1 µm wide conidiiferous tip, total length 40–60 µm. Conidia not recorded. Chlamydospores absent. Culture presently remaining sterile.

**Herbarium specimen examined:** UK, Bidford-on-Avon, Warwickshire, on decayed *Ulmus* leaf, M.C. Clark, 1 Nov. 1972 (K).

**Comments:** *Niesslia physacantha* is to be compared with *N. antarctica*. Both species produce pale brownish or ochraceous spines on perithecia and similarly sized ascospores.

*Niesslia* sp. Fig. 12a–d

**Description:** Perithecia known only from cultures, maturing on CMA or PCA after 19–20 days, brown, globose, collapsing cup-like when dry, 60–150 µm diam. Spines

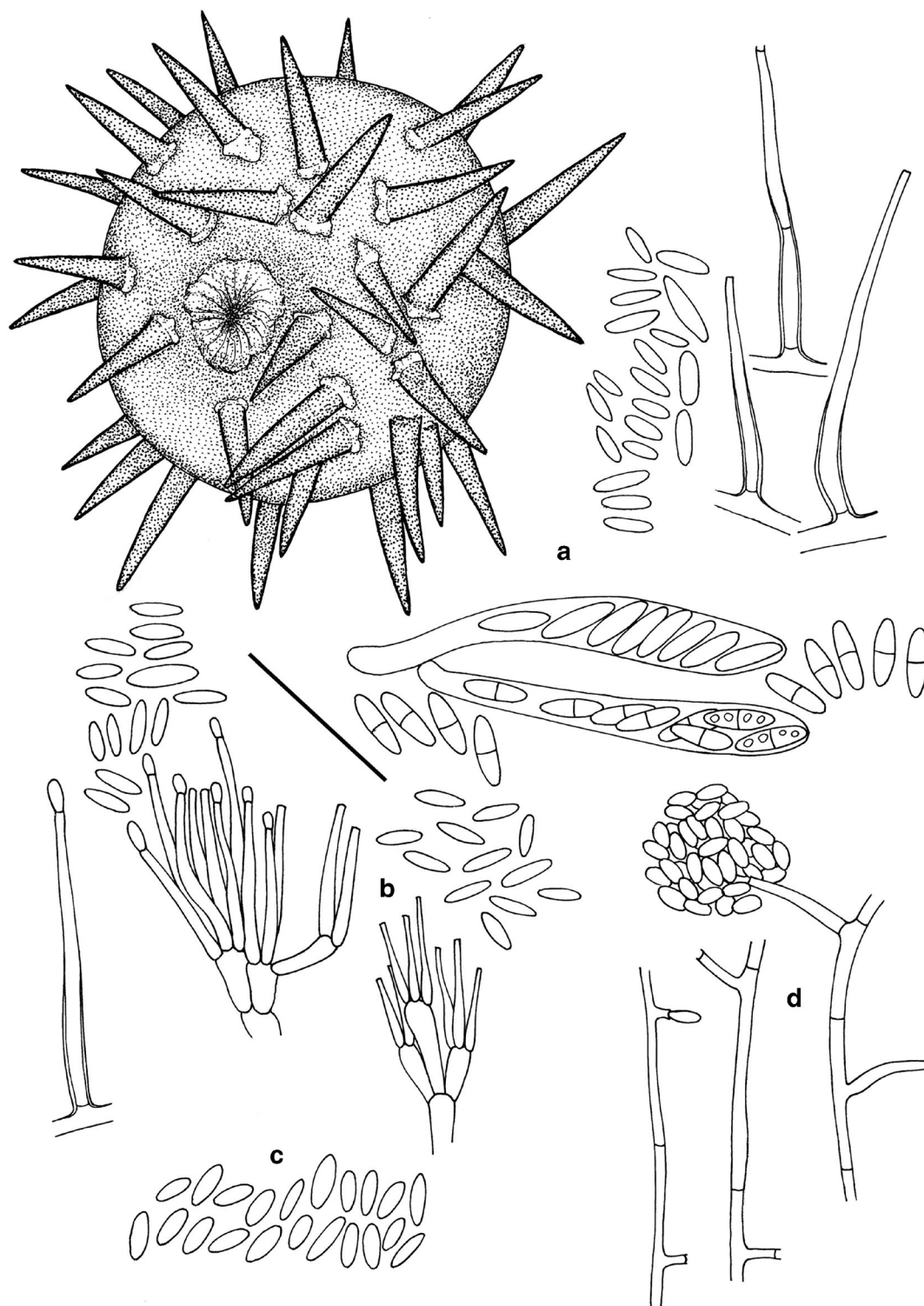


**Fig. 11** *Niesslia nolinae*. **a** Conidiophores and conidia (OA; SNA, 10 days) (CBS 109837). *Niesslia pandani*. **b** Perithecium with spines and ascospores (natural substrate). **c–e** Conidiophores and conidia (**c**, MEA, 12 days; **d**, CMA, 4 weeks.; **e**, MEA, 36 days) (CBS 583.73).

*Niesslia physacantha*. **f** Perithecium, monocillium-like conidiophores, ascospores and asci (MEA, 75 days) (CBS 474.74). Scale bar, 20  $\mu\text{m}$ ; for perithecium in **b**, 200  $\mu\text{m}$  and **f**, 40  $\mu\text{m}$

numerous, dark brown, not septate, 25–50  $\mu\text{m}$  long, strongly tapering from 5 to 7  $\mu\text{m}$  at base towards pointed apex. Asci clavate-cylindrical with rounded apex, 8-spored, 44–47  $\times$  5.5–7  $\mu\text{m}$ . Ascospores obliquely uniseriate to biseriate, ellipsoidal to slightly fusiform, two-celled, smooth- and thin-walled, 4-guttate, 7.0–7.5  $\times$  2.0–2.5  $\mu\text{m}$ , l/w 2.8–4. Ascospores appearing in freshly isolated CBS 478.73 on CMA after 3 weeks at room temperature. Colonies moderately slow-growing, reaching

25 mm diam in 16 days at 20  $^{\circ}\text{C}$  on MEA, moist, pinkish-orange; reverse similarly coloured or more yellow. Vegetative hyphae 1–2.5  $\mu\text{m}$  wide, hyaline, thin-walled, cyanophilic. Crystals absent. Sporulation abundant, phalacrogenous, solitary phialides with conidia adhering in slimy droplets, sporodochial conidiophores forming coalescent slimy masses. Phialides either solitary, aculeate, in basal portion moderately thick-walled (up to 0.3  $\mu\text{m}$ ), 2.0–2.5  $\mu\text{m}$  wide, tapering to



**Fig. 12** *Niesslia* sp. **a** Perithecium, asci, ascospores (CMA, 19 days), monocillium-like conidiophores and conidia (MEA, 12 days). **b** Monocillium-like conidiophore, sporodochial conidiophores and conidia

(MEA, 16 days). **c** Conidia formed on sporodochia (WA, 27 days). **d** Submersed sporulation from thin-walled conidiophores (WA, 27 days). All from CBS 478.73. Scale bar, 20  $\mu\text{m}$ ; for perithecium in **a**, 40  $\mu\text{m}$

thin-walled, 1  $\mu\text{m}$  wide tip, total length 24–38  $\mu\text{m}$ ; or forming on densely branched conidiophores in orange-coloured sporodochia, thin-walled throughout, altogether 25–35  $\mu\text{m}$

long, phialides thin-walled, aculeate, 12–23  $\mu\text{m}$  long. Conidia on solitary phialides slightly fusiform, not apiculate at base, one-celled, smooth-walled, (3–)4–7.5  $\times$  1.5–2.2  $\mu\text{m}$ ,



l/w 2.8–4.1. In sporodochia richly branched conidiophores with unthickened phialides, 35–50 µm long, tapering from 2.0–2.5 µm to 1.5–1.7 µm at tip with visible short collarette, or in dense clusters on subtending cells, 7.5–12 µm long; conidia shorter ellipsoidal, 3.0–3.5 × 1.5–2.0 µm, on longer phialides also cylindrical, 4.5–7 × 1.2–2.5 µm. Chlamydo-spores absent.

**Living cultures:** Sri Lanka, Hakgala Botanical Garden, from dead leaves of *Araucaria bidwellii*, W.G., Jan. 1973 (CBS 478.73) [conidial isolate, ascomata formed in vitro, culture no longer viable]. – Italy, Prov. Viterbo, Bomarzo, isolated from leaf litter of *Laurus nobilis*, W. Gams, 17 June 2013 (CBS 135939) [conidial isolate, producing no perithecia]. – Possibly related: Thailand, from dead petiole of *Pandanus* sp. (CBS 139718) [growing slower, reaching 5 mm diam in 9 days on PDA, or 12 mm on SNA in 30 days; phialides mostly aculeate, sometimes densely aggregated to form sporodochial conidial masses with almost fusiform conidia 3.5–5.5 × 1.5–2.0 µm].

**Comments:** We have elected not to name this species at this time in the absence of herbarium or culture material producing the teleomorph that could be used for a holotype. Thick-walled solitary phialides typical of the genus were seen in CBS 135939 and CBS 478.73.

*Niesslia subiculosa* Sydow, Ann. Mycol. 38: 463. 1940. Fig. 13a–c

Mycobank MB 288798.

**Holotype:** Germany, Brandenburg, Kr. Lebus, near Dahmsdorf, Großer Schlagenthin-See, on dead stem of *Epilobium hirsutum*, H. Sydow, 26 July 1939, Mycoth. Germ. 3302 (BR 5020096932295); **isotype** in S, L 941.313–341).

**Description:** Perithecia scattered on decaying stems of host, without or with a white subiculum, rather pale brown, glossy, globose with slightly projecting apical papilla, collapsing cup-like when dry, 80–125 µm diam. Spines numerous, rather pale brown, repeatedly septate, 20–40 µm long, tapering from 3 to 5 µm at base towards pointed apex. Asci cylindrical-clavate with slightly truncate apex, 8-spored, 27–45 × 4–5 µm (originally given as 32–40 × 4–6 µm). Ascospores obliquely 2–3-seriate in ascus, oblong ellipsoidal to slightly fusiform, mostly slightly curved, two-celled, smooth- and thin-walled, 4-guttulate, 9–12(–15) × 1.3–2.0(–2.5) µm, l/w 6–8. Phialides thick-walled (0.5 µm), 1.5–2.0(–2.5) µm wide, generally aculeate, 15–40 µm long, often ending in a sterile vesicle. Conidia cylindrical-ellipsoidal, 4–8 × 1.5 µm.

**Herbarium specimens examined:** Possibly conspecific: New Zealand, Auckland Prov., Waitemata County, Waitakere Ranges, Marguerite Track, near Kitekite Stream, on stipe of *Cyathea dealbata*, leg. J.M. Dingley, G.J. Samuels, S. Haydon, 30 May 1973 (PDD 31806, G.J.S. 73–107; also CBS H-1227) [this material has conspicuous dense spines, 16–23 µm long and 3–4 µm wide at base, strictly cylindrical, ascospores, 10–11 × 1.2–1.5 µm; conidia are

rather clavate and (5–)7–9(–11) µm long; conspicuous white subiculum present, culture not viable]. – New Zealand, Riverhead State Forest, Ararimu Road, from stipe of *Cyathea medullaris*, G.J. Samuels, 2 Aug. 1973 (PDD 31896, G.J.S. 73–149) [this material had slightly longer, minimally curved ascospores, 13–14 × 1.5–1.7 µm; conspicuous white subiculum present, culture not viable].

**Comments:** The presence of a white subiculum is by no means unique to this species. Its closest relative is *N. elymi*; other species with a white subiculum are *N. albosubiculosa*, *N. subiculosella* and *N. leucoula*. *Niesslia subiculosa* is also rather close to *N. ilicifolia*; its distinction seems justified not only because of the subiculum but also because of the shorter spines in the former, which do not normally exceed 40 µm in length. The anamorph resembles *N. tenuis*.

*Niesslia subiculosella* W. Gams & Samuels, spec. nov. Fig. 13d

Mycobank MB 827230.

**Holotype:** New Zealand, Thames County, Coromandel Peninsula, Kavaeranga Valley, from rachis of *Cyathea dealbata*, J.M. Dingley, S. Haydon, G.J. Samuels, 27 Aug. 1974 (PDD 34505); ex-type culture, CBS 326.77 (= G.J.S. 74–120).

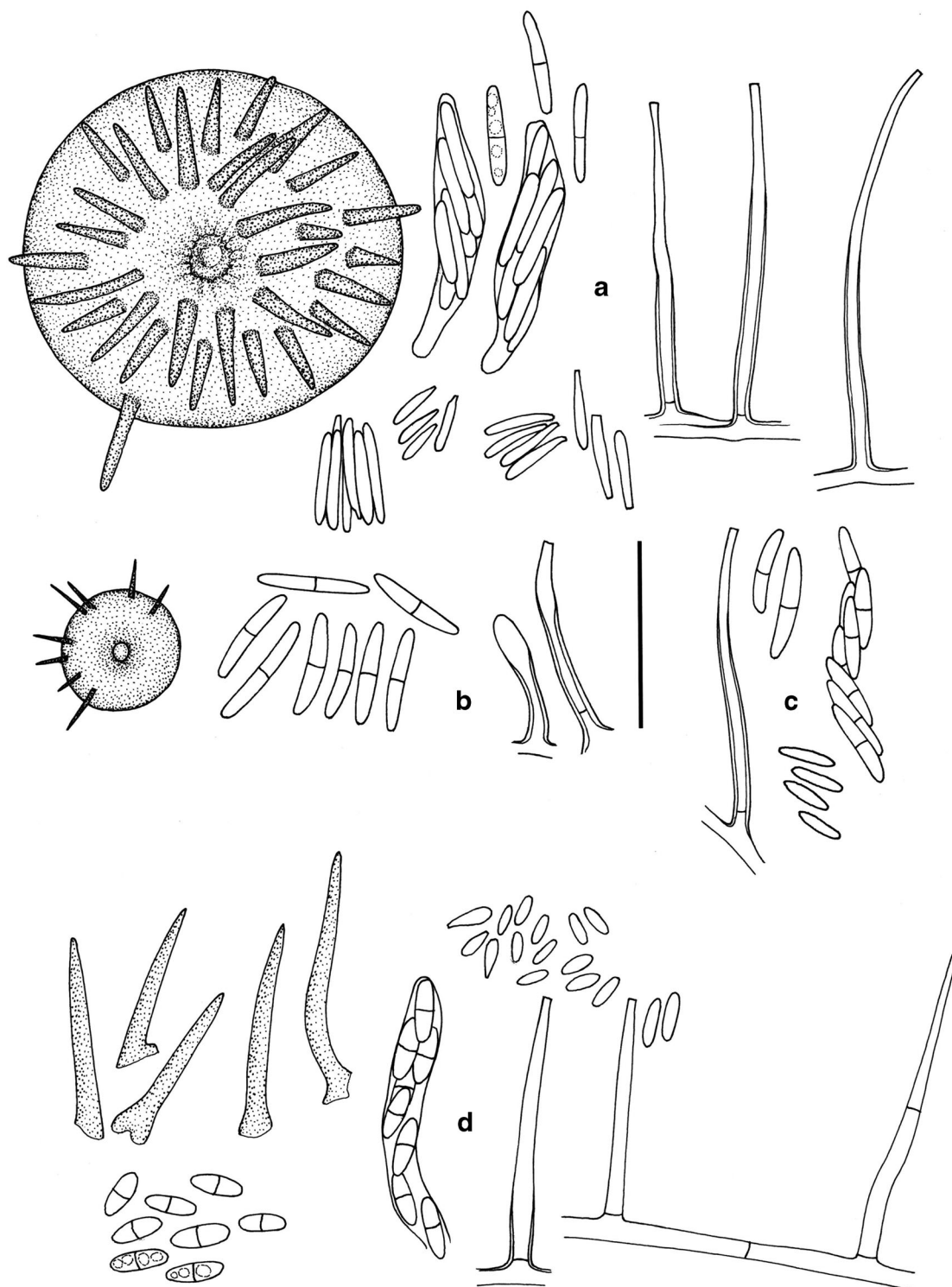
**Etymology:** *Subiculosella* deriving from Latinized term *subiculum*, referring to the perithecia supporting structures encountered on the natural substrate of the species.

**Description:** Perithecia sitting on a whitish subiculum of hyaline curled hyphae, dark brown, glossy, globose, collapsing cup-like when dry, 100–125 µm diam. Spines numerous, dark brown, 40–70 µm long, tapering from 5 to 6 µm at base towards pointed apex. Asci cylindrical with slightly truncate apex, 8-spored, about 35 × 4.5 µm. Ascospores obliquely 1–2-seriate in ascus, ellipsoidal, two-celled, smooth- and rather thick-walled, 4-guttate, 5–7 × 1.7–2.0 µm, l/w 2.6–3.9. Colonies slow-growing, reaching 9–12 mm diam in 10 days at 20 °C on MEA, 7 mm on OA, moist, smooth, cream-coloured. Vegetative hyphae hyaline, thin-walled, cyanophilic. Crystals absent. Sporulation moderate, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides aculeate, basal part thick-walled (up to 0.5 µm) and 2–2.5 µm wide, tapering to 0.7–1 µm in thin-walled tip, 20–30 µm long, sometimes integrated in a ca. 35 µm long conidiophore. Conidia ellipsoidal–fusiform, not apiculate at base, one-celled, smooth-walled, 3.5–5.5 × 1.0–1.5 µm, l/w 2.8–3.6 (after long preservation sporulating only on PCA). Chlamydo-spores absent.

**Comments:** *Niesslia subiculosella* differs significantly from *N. subiculosa* by much shorter and broader ascospores and fusiform conidia.

*Niesslia typhae* W. Gams, P. Thompson & Stielow, spec. nov. Fig. 14a, b

Mycobank MB 827231.



**Fig. 13** *Niesslia subiculosa*. **a** Perithecium with spines, asci, ascospores from natural substrate and monocillium-like conidiophores, and conidia (dried culture) (PDD 31806 = G.J.S. 73–107). **b** Perithecium with spines, ascospores and monocillium-like conidiophores (isotype in L). **c** Monocillium-like conidiophore, ascospores and conidia (holotype in S).

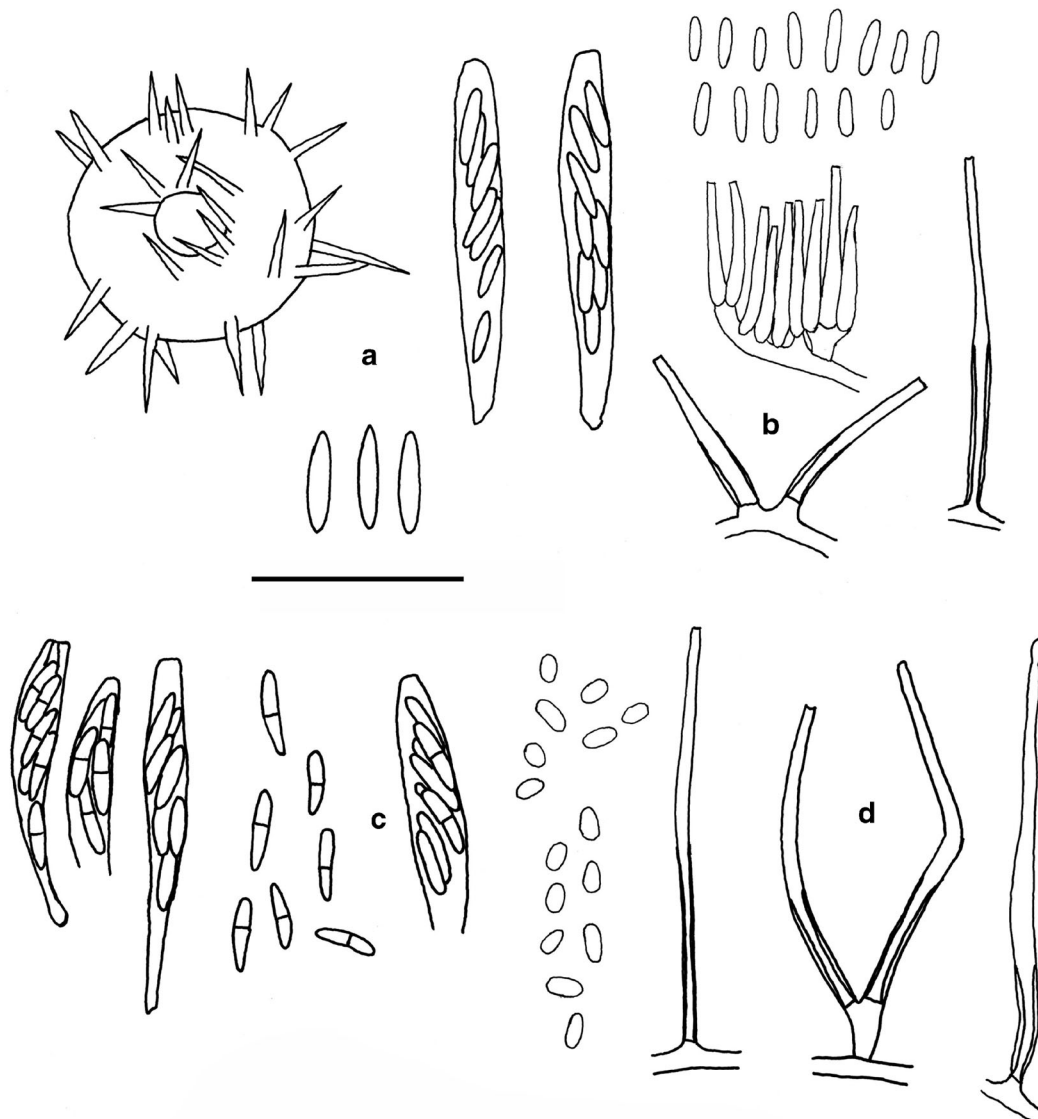
*Niesslia subiculosella*. **d** Perithecial spines, partial ascus, ascospores from natural substrate, monocillium-like conidiophores and conidia (dried culture) (PDD 34505, CBS 326.77). Scale bar, 20  $\mu\text{m}$ ; for perithecium in a, 40  $\mu\text{m}$ ; for perithecium in b, 200  $\mu\text{m}$ ; for perithecial spines in d, 50  $\mu\text{m}$

**Holotype:** UK, Pelrall North Common, West Midlands, Ordn. Survey Grid Ref. SK013044, on dead leaf of *Typha latifolia*, leg. P. Thompson, 30 Apr. 2015, isol. W.G. (CBS 140342, alive, metabolically inactive deposit).

**Etymology:** In reference to its occurrence on *Typha latifolia* (Typhaceae).

**Description:** Perithecia densely aggregated on substrate, globose, 95–135  $\mu\text{m}$  diam, collapsing cup-like when dry, with rather transparent peridium, beset with numerous pointed dark spines, 28–50  $\mu\text{m}$  long, base 4–6.5  $\mu\text{m}$  wide. Asci clavate, short-pedicellate, 30–35  $\times$  4.5  $\mu\text{m}$  with 8 obliquely uniseriate ascospores.

Ascospores elongate, slightly fusiform, thin-walled and appearing 1-celled (median septum visible only with Nomarski optics), 9.5–10  $\times$  1.5–2  $\mu\text{m}$ , l/w 5–6. Colonies on OA reaching 25 mm diam in 30 days, white floccose with an orange sporodochial zone. Sporulation phalacrogenous–nematogenous in white area, with aculeate, moderately thick-walled phialides, 16–33  $\mu\text{m}$  long, tapering from 1.7–2.0  $\mu\text{m}$  to 1  $\mu\text{m}$  at tip; sporodochial phialides densely aggregated, thin-walled, 11–15  $\mu\text{m}$  long, tapering from 1.5  $\mu\text{m}$  to 0.5  $\mu\text{m}$ ; conidia on all phialides rod-shaped, cylindrical, 4.0–5.5(–6)  $\times$  0.7–1.0  $\mu\text{m}$ , l/w 4.7–6.5(–8). Chlamydozoospores absent.



**Fig. 14** *Niesslia typhae*. **a** Perithecium, asci and ascospores from natural substrate (median septum of ascospores visible only with Nomarski optics). **b** Conidia, sporodochial and monocillium-like conidiophores (OA, >4 weeks) (CBS 140342) *Niesslia xanthorrhoeae*. **c** Asci and ascospores

from natural substrate (CBS 287.93). **d** Conidia and monocillium-like conidiophores (OA, PCA, 10 days) (CBS 287.93). Scale bar, 20  $\mu\text{m}$ ; for perithecium in a, 100  $\mu\text{m}$

**Comments:** The only other *Niesslia* species growing on *Typha* known so far is *N. aemula*, which has 4-spored asci and much larger ascospores.

*Niesslia xanthorrhoeae* W. Gams, spec. nov. Fig. 14c, d  
Mycobank MB 827232.

**Holotype:** Australia, Yanchep National Park, West Australia, on leaf base of *Xanthorrhoea preissii*, leg. H. Yang and W. Gams, Oct. 1991 (CBS 287.93, alive, metabolically inactive deposit).

**Etymology:** In reference to its occurrence on *Xanthorrhoea preissii* (Xanthorrhoeoideae).

**Description:** Perithecia formed on dead leaf bases of *Xanthorrhoea preissii*, dark brown, glossy, globose, collapsing cup-like when dry, 120–130 µm diam. Spines numerous, dark brown, 85–150(–170) µm long, tapering from 6 to 8 µm at base towards pointed apex. Asci clavate with slender stipe, 8-spored, 27–35 × 4 µm. Ascospores obliquely biserial in ascus, fusiform–clavate, slightly curved, 1- or 2-celled, smooth- and thin-walled, (5.5–)6–8 × 1.2–1.5 µm, l/w 4–6. Colonies reaching 14 mm diam in 10 days at 20 °C on OA, finely powdery, orange, reverse similarly coloured. Vegetative hyphae 1–2 µm wide, hyaline, thin-walled; basal hyphae strongly metachromophilic. Prismatic crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides aculeate, from thick-walled (less than 0.5 µm) 1.5–1.7 µm wide basal portion tapering gradually to 0.7–1.0 µm in thin-walled tip, total length 35–65 µm, rarely ending in a sterile elongate vesicle. Conidia short-cylindrical to somewhat clavate, tapering towards truncate base, one-celled, smooth-walled, 2.5–4.5 × 1.0–2.0 µm, l/w 1.7–2.5(–3.5). Chlamydozoospores absent.

**Comments:** The species resembles *N. clarkii* and *N. bellotae*, and is phylogenetically closely related to the former. Morphologically it has somewhat more clavate and basally more pointed asci, and somewhat clavate ascospores.

#### Anamorphic species.

*Niesslia aeruginosa* W. Gams & Stielow, spec. nov.  
Fig. 15a  
Mycobank MB 827233.

**Holotype:** Germany, near Braunschweig, from agricultural loess soil, H.I. Nirenberg, 1989 (CBS 264.89, alive, metabolically inactive deposit).

**Etymology:** Latin *aeruginosus* = verdigris green, indicating the discoloration of the colonies.

**Description:** Colonies reaching 21 mm diam in 10 days on PCA or 15 mm in 9 days on OA, pale ochraceous, powdery, in the middle turning greyish (5D2) or greenish (29B3), the pigment located in the conidia. Vegetative hyphae 0.7–2.0 µm wide, often merging with toruloid, thick-walled hyphae

resembling chlamydozoospores in chains, with cells 4.5–6 µm diam; basal hyphae strongly chromophilic. Sporulation abundant, phalacrogenous. Phialides often aggregated in groups of 2–3 or more, aculeate, 40–65 µm long, moderately thick-walled in the 1.5–2 µm wide basal part, not or only hardly widening in the middle to 1.5 µm. Conidia cylindrical, smooth- and thin-walled, 2.5–4.7 × 1.0–1.5 µm, l/w 2.3–4.7.

**Comments:** With the chains of toruloid cells, the species is comparable only with *N. loricata*. Phylogenetically, it is close to *N. artocarpi* and *N. clarkii*, but morphologically sufficiently distinct by its chlamydozoospore chains and green colonies. DNA barcode based inferences (not shown) suggest that *N. aeruginosa* is not closely related to *Niesslia* species that produce microsclerotia in culture, including, e.g., *N. bulbilosa* and *N. aterrima*.

*Niesslia arcticola* (W. Gams) W. Gams, comb. nov.  
Fig. 15b, c

Basionym: *Monocillium arcticola* W. Gams, Cephalosporium-artige Schimmelpilze: 155. 1971.

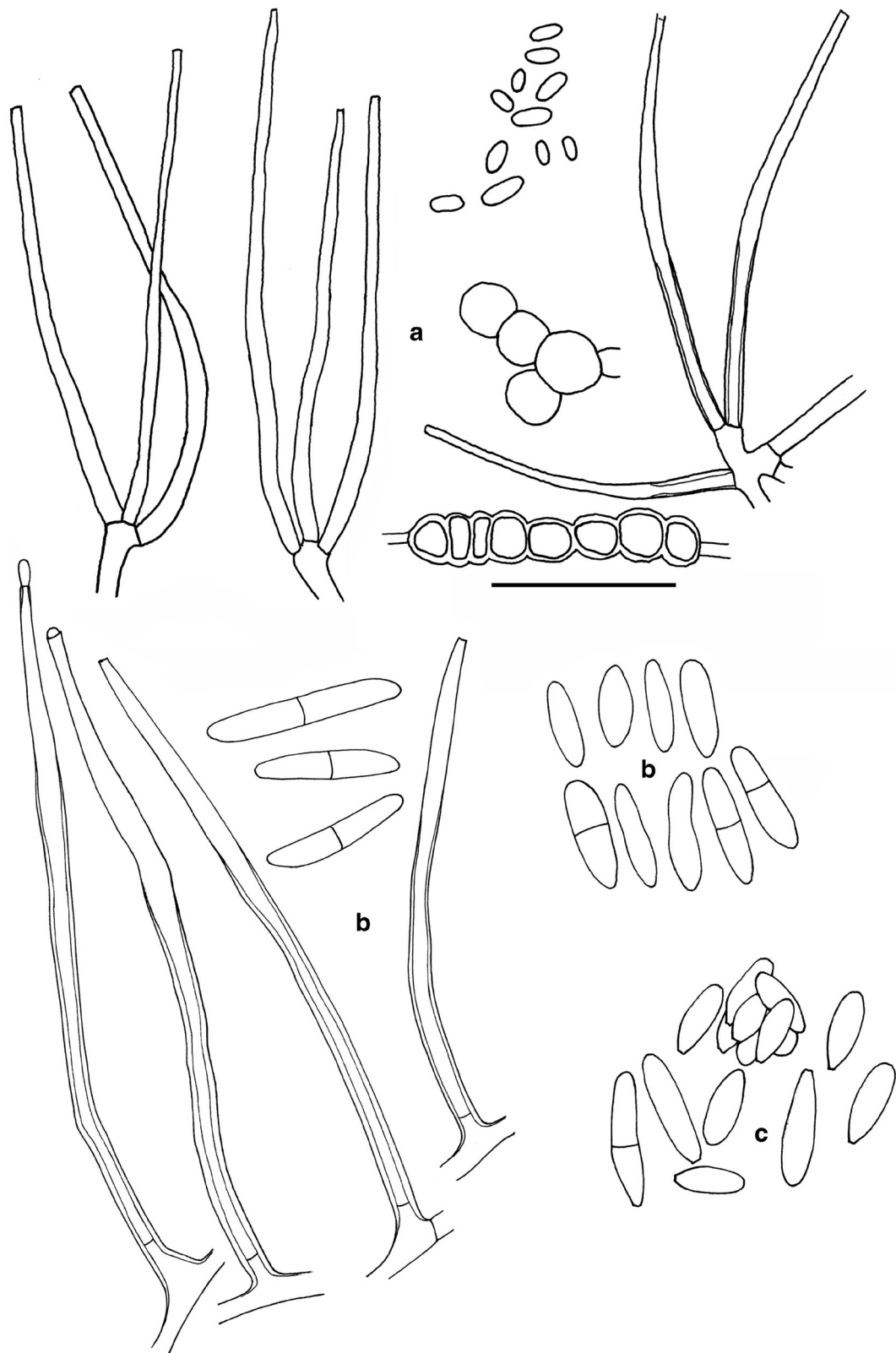
Mycobank MB 827234.

**Holotype:** Germany, Kr. Lorsch, Steiner Wald near Wattenheim, from fruits of *Arctium minus*, W. Gams, 5 Oct. 1968 (CBS H-7355); isotype CBS H-7356 [the living CBS 994.69 presently no longer represents this species].

**Description:** Colonies reaching 20 mm diam. In 20 days on MEA, whitish or pale pink, thinly floccose, finely granular, whitish to pinkish; reverse similarly coloured. Vegetative hyphae 0.7–1.5 µm wide. Sporulation abundant plectonematogenous to synnematomogenous; sometimes several phialides arising from a common base, 65–80(–125) µm long, in 20–45 µm long basal part thick-walled (0.5–1 µm), 2.0–2.5 µm wide, then only slightly expanding to 2.5–3.5 µm and tapering gradually to 1–1.5 µm wide tip; conidia adhering in slimy heads, ellipsoidal with tapering and truncate base, smooth-walled, 6–10 × 2.5–3.5 µm, l/w 2.4–3.2; mostly 0- to 1-septate, in old cultures on PCA sometimes 2- or 3-celled. Chlamydozoospores absent.

**Living cultures:** Netherlands, S.-Flevoland, Dasselaweg, from spine of *Cirsium arvense*, W.G. 20 Oct. 1976 (CBS 604.76). – Netherlands, S.-Flevoland, willow forest, on stem of *Epilobium angustifolium*, W.G., 26 June 1980 (CBS 430.80, CBS H-1478). – Netherlands, O.-Flevoland, Harderbos, on old leaf of *C. arvense* (CBS 476.80).

**Comments:** The large conidia with slightly truncate base are characteristic of this species. CBS 604.76 deviates in having even longer (11–15 × 2–3 µm), often 2-celled conidia. The species morphologically resembles *N. dimorphospora*. Phylogenetically, however, it is close to *N. luzulae* and *N. aemula*. *Monocillium*-like conidiophores and 0-septate conidia of the ex-type strain CBS 994.69 were described and illustrated by Gams (1971: 155, Abb. 101).



**Fig. 15** *Niesslia aeruginosa*. **a** In groups aggregated monocillium-like and aculeate phialides and conidia (MEA, 14 days) and toruloid, thick-walled hyphae (PCA, 10 days) (CBS 264.89). *Niesslia arcticola*. **b, c**

Monocillium-like conidiophores and conidia (MEA, 18–20 days) (b, CBS 604.76; c, CBS 430.80). Scale bar, 20  $\mu$ m

*Niesslia aterrima* W. Gams & Stielow, spec. nov. Fig. 16a, b MycoBank MB 827235.

? = *Cephalosporium sclerotiorum* Gangawane & Deshpande, Curr. Sci. 43: 763. 1974. (nom. inval., Turland et al. 2018: Art. 40).

**Holotype:** Italy, Sicily, Palermo Botanical Garden, from litter of *Ficus rubiginosa* (CBS 388.85, alive, metabolically inactive deposit).

**Etymology:** Latin *ater* = black, indicating the black colonies.

**Description:** Colonies reaching 13 mm diam in 10 days on PCA; no crystals formed. On OA colonies initially pale pink, but soon turning black because of abundant sclerotia. Sporulation abundantly phalacrogenous. Phialides usually monocillium-like with moderately thick-walled 1–2  $\mu\text{m}$  wide basal portion, slight expansion to 2.0–2.5  $\mu\text{m}$ , and extension into a short, 0.8–1.0  $\mu\text{m}$  wide conidiiferous tip, sometimes ending with a sterile vesicle, total length 30–50(–90)  $\mu\text{m}$ , rarely also completely aculeate. Conidia cylindrical, hardly truncate at base, smooth- and thin-walled, 4.5–7  $\times$  1.0–1.5  $\mu\text{m}$ , l/w 3.0–4.7. Chlamydospores absent, but darkening sclerotia abundantly formed, ellipsoidal or irregularly shaped, sometimes aggregated in radiating chains and confluent, 20–60  $\mu\text{m}$  and more diam, surface of polygonal or elongate cells, usually 5–7  $\mu\text{m}$  diam.

**Living culture:** Italy, Sicily, Palermo Botanical Garden, from litter of *Laurus nobilis*, W.G., 11 Nov. 1984 (CBS 390.85, also CBS H-3687).

**Comments:** At least three *Niesslia* species, *N. aterrima*, *N. bulbilosa* and *N. gamsii*, form microsclerotia abundantly, even in relatively young cultures, while *N. indica* produces microsclerotia only in older cultures. *Niesslia aterrima* is hardly distinct from *N. bulbilosa*, with the exception that the conidia are cylindrical and longer; furthermore, the phialides of *N. aterrima* are slightly longer. *Niesslia gamsii* forms conidia about the same length as *N. aterrima*. Phylogenetically, *N. aterrima* is closely related to *N. sphaeropedunculata*, while *N. bulbilosa* and *N. gamsii* are distantly related to *N. aterrima*. *Cephalosporium sclerotiorum* Gangawane & Deshpande, may have been this species, though no material could be obtained; alternatively, the latter species might also represent *Acremonium nigrosclerotium* W. Gams. *Acremonium nigrosclerotium* produces gently curved conidia (Gams 1975: 390, Fig. 1) that were not seen in *N. aterrima*.

*Niesslia aurantiaca* (Giraldo, Gene & Guarro) Giraldo & Schroers, comb. nov. Fig. 17a–c

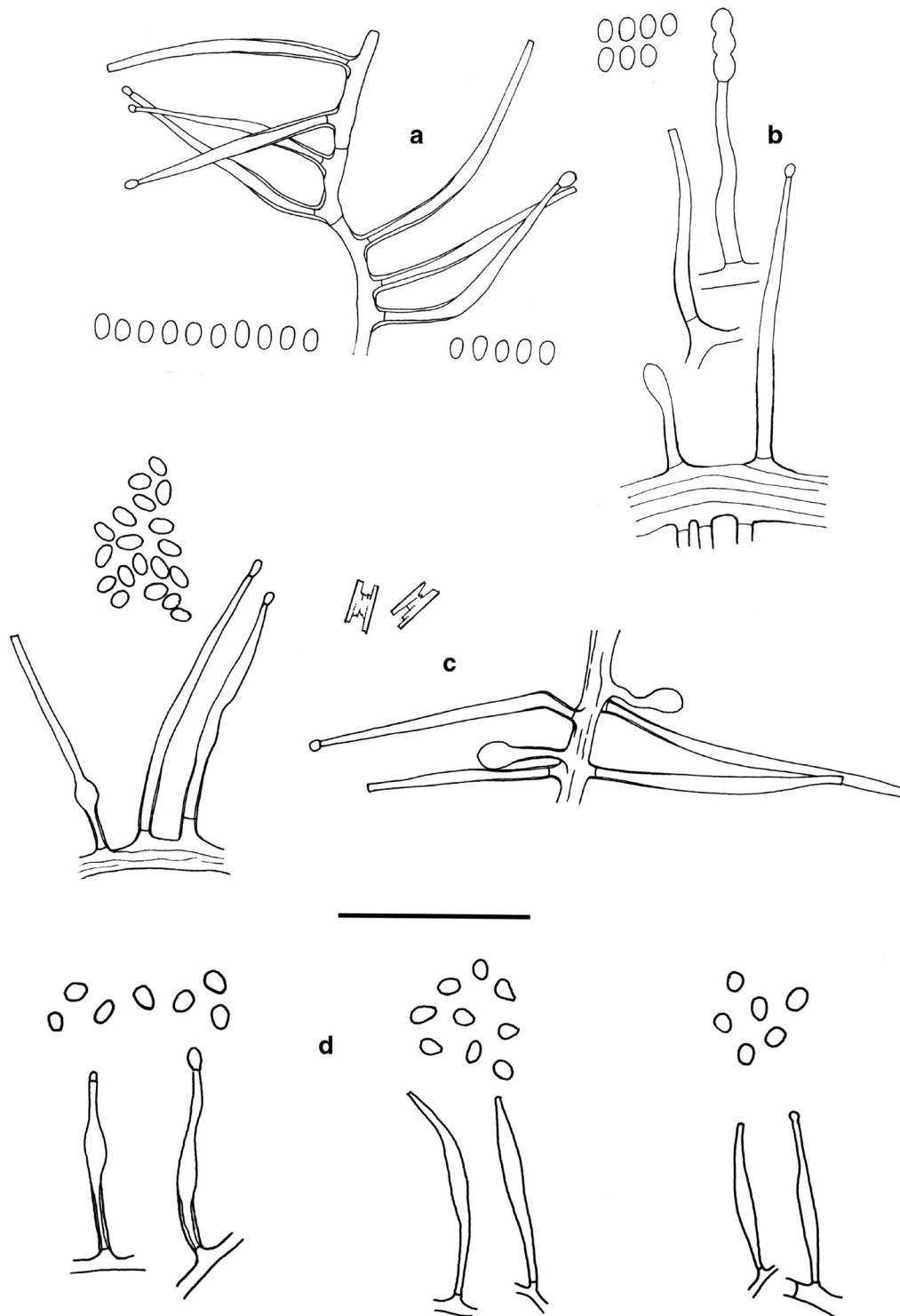
MycoBank MB 827236.

Basionym: *Collarina aurantiaca* Giraldo, Gene & Guarro, Persoonia 33: 271. 2014, MB 809408.

**Holotype:** Spain, Aragón, Huesca province, Ordesa y Monte Perdido National Park, isolated from sediments of Ara River, leg. A. Giraldo, M. Hernández & J. Capilla, 23 Mar. 2011, isol. A. Giraldo (CBS H-21781, not seen); ex-type culture, CBS 138274, = FMR 11784.



**Fig. 16** *Niesslia aterrima*. **a, b** Monocillium-like conidiophores, conidia and cell aggregates of partial sclerotia (a, OA, 22 days) (CBS 388.85, 390.85), (b, CHA, 22 days) (CBS 390.85). Scale bar, 20  $\mu\text{m}$



**Fig. 17** *Niesslia aurantiaca*. **a–c** Monocillium-like conidiophores and conidia (a, CBS 232.74; b, MEA, 20 days, CBS 233.74; c, MEA, 10 days, with prismatic crystals, CBS 239.80). *Niesslia brevis*. **d** Monocillium-like

conidiophores and conidia (from left to right, OA, 9 days; PCA, 10 days; PCA, 22 days) (CBS 125922). Scale bar, 20  $\mu\text{m}$

**Description:** Colonies slow-growing, reaching 5–6 mm diam in 10 days at 20 °C on MEA, finely granular, ochraceous-tan or reddish-grey (7B–C2–3), granular; reverse similarly coloured, sometimes with yellow diffusing pigment

(4B4), temperature optimum 25 °C, maximum (above 30°). Vegetative hyphae 0.5–1.0(–1.5)  $\mu\text{m}$  wide, hyaline, thin-walled, cyanophilic. Prismatic crystals present. Sporulation abundant, phalacrogenous, with conidia adhering in greyish

slimy droplets. Phialides aculeate, consisting of a thick-walled (up to 0.3  $\mu\text{m}$ ) and 1.0–1.5  $\mu\text{m}$  wide basal portion, sometimes slightly widening to 1.5–1.7  $\mu\text{m}$  and then gradually merging into thin-walled conidiiferous tip, total length 15–30(–35)  $\mu\text{m}$ , occasionally ending in a sterile vesicle. Conidia short-ellipsoidal to subglobose, not apiculate at base, one-celled, smooth- and rather thick-walled, greyish en masse, 2.2–3.0(–3.7)  $\times$  1.0–1.5(–1.9)  $\mu\text{m}$ , l/w 1.4–1.7(–2.5). Chlamydospores absent.

**Living cultures:** Netherlands, Wageningen, isolated from agricultural soil, J.W. Veenbaas-Rijks, Apr. 1971 (CBS 683.71). – Netherlands, Wageningen, isolated from agricultural soil, J.W. Veenbaas-Rijks, Apr. 1971 and Nov. 1972 (CBS 799.71, 158.72 and 597.73). – Italy, Torino, isolated from mycorrhiza, A. Fontana (CBS 232.74) [slightly deviating]. – Germany Gießen, isolated from compost, A. von Klopotek (CBS 233.74). – Australia, Canberra, isolated from root of *Eucalyptus* sp., G.C. Johnson (CBS 658.75). – USA, Adirondack Mts., from forest litter, C.J.K. Wang, no. NBX-247, supplied May 1980 (CBS 239.80). – Japan, T. Yokoyama (CBS 695.88, = IFO 1722–2) [has pinkish conidial masses]. – Switzerland, on *Alnus*, O. Petrini (CBS 170.89) [slightly deviating].

**Comments:** Like *N. mucida*, this is a commonly occurring soil-borne species. Therefore, several isolates are available from quite different countries. The slow-growing species is easily recognised by its pigmented conidial masses.

*Niesslia brevis* W. Gams & Stielow, spec. nov. Fig. 17d  
Mycobank MB 827237.

**Holotype:** UK, Scotland, Shetland, Fair Isle, Ler Ness, from arctic tundra soil under grassland (CBS 125922, alive, metabolically inactive deposit).

**Etymology:** Latin *brevis* = short, indicating the short phialides and conidia, as well as slow-growing colonies, that distinguish it from *N. mucida*.

**Description:** Colonies on OA reaching 20 mm diam in 9 days, whitish to yellowish-white (4A2), finely floccose. Sporulation abundant, nematogenous, scanty short phialides with moist conidial heads. Phialide base and adjacent hyphae often cyanophilic, phialides expanding from a short, 2–9  $\mu\text{m}$  long, moderately thick-walled, 0.5–1  $\mu\text{m}$  wide basal portion to a thin-walled, 1.5–2.0  $\mu\text{m}$  wide venter and again tapering to a 0.5  $\mu\text{m}$  or less wide neck, total length 16–20(–25)  $\mu\text{m}$ . Conidia subglobose or with slightly truncate base, rather thick-walled, 2.0–2.5  $\times$  1.5–2.0  $\mu\text{m}$ , l/w 1.1–1.7(–2). Chlamydospores absent.

**Comments:** This strain was previously identified as *M. bulbillosum*, a similar species, from which it differs by absence of dark bulbils. It is phylogenetically unrelated but close to *N. allantoidea*. With its small, subglobose conidia, *N. brevis* resembles *N. mucida*; it differs by its slow and not slimy growth.

*Niesslia bulbilloso* (W. Gams) W. Gams, comb. nov.  
Mycobank MB 827238.

Basionym: *Monocillium bulbillosum* W. Gams, Cephalosporium-artige Schimmelpilze: 166. 1971.

**Holotype:** Germany, Kiel-Kitzeberg, from mouldy wall paper, leg. and isol. W. Gams, 28 Mar. 1967 (CBS H-7357); ex-type culture, CBS 344.70.

**Description:** Colonies slow-growing, reaching 8–9 mm diam in 10 days at 20 °C on MEA, whitish, powdery, pale pink underneath, becoming centrally black due to formation of sclerotia. Vegetative hyphae hyaline, thin-walled, cyanophilic. Crystals absent. Sporulation abundant, phalacrogenous to nematogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting of a moderately thick-walled (up to 0.5  $\mu\text{m}$ ) or sometimes thin-walled, 1.7–2.5  $\mu\text{m}$  wide basal portion, extending into a 2–3  $\mu\text{m}$  wide vesicular expansion, and a 0.7–1.0  $\mu\text{m}$  wide thin-walled conidiiferous tip, total length 17–40(–55)  $\mu\text{m}$ , sometimes ending with a sterile vesicle. Conidia ovoid with slightly truncate base, one-celled, smooth-walled, 2.7–3.2  $\times$  1.5–2.2  $\mu\text{m}$ , l/w 1.3–1.8. Chlamydospores absent, black sclerotia abundant in colony centre after about 2 weeks, ellipsoidal or of irregular shape, often forming elongate complexes in radial direction, smooth-walled, 35–75  $\mu\text{m}$  diam, surface consisting of opaque polygonal cells, about 5  $\mu\text{m}$  diam.

**Comments:** The species differs from the similar *N. aterrima*, *N. gamsii* and CBS 389.85 by shorter, ovoid-ellipsoidal conidia. For a comparison with *Cephalosporium sclerotiorum* Gangawane & Deshpande, see under *N. aterrima*.

*Niesslia catenata* W. Gams & Stielow, spec. nov. Fig. 18  
Mycobank MB 827239.

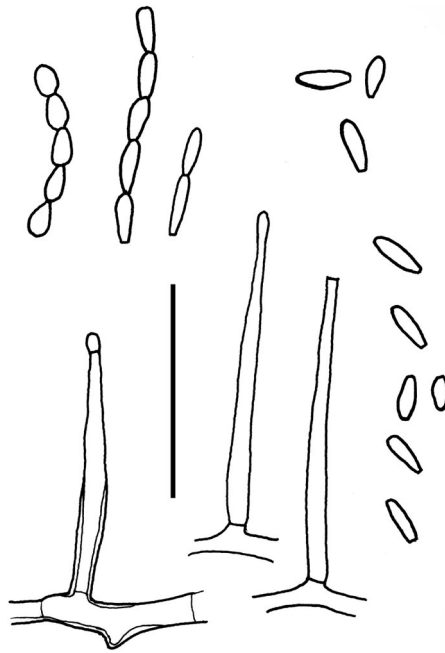
**Holotype:** Netherlands, Kampinaheide, N. Br., from bark of *Pinus sylvestris*, W.G., May 1970 (CBS 694.70, alive, metabolically inactive deposit).

**Etymology:** Latin *catena* = chain, indicating catenate conidia.

**Description:** Colonies reaching 12 mm diam in 9 days on OA, orange-white (6A2), finely dusty. Vegetative hyphae 0.8–1.5  $\mu\text{m}$  wide. Sporulation abundant, phalacrogenous to plectonematogenous. Phialides regularly aculeate, moderately thick-walled in lower part and 1–2  $\mu\text{m}$  wide, tip 0.8–1.0  $\mu\text{m}$ , total length 35–45  $\mu\text{m}$ , chromophilic throughout; conidia adhering in chains or dry heads, clavate with broadly truncate base, smooth- and thin-walled, (2–)3–5  $\times$  1.0–1.5  $\mu\text{m}$ , l/w 2.2–3(–5). Chlamydospores absent.

**Comments:** This strain was previously identified as *M. nordinii*, a species that also has dry conidial heads, but differs by its catenate conidia. Conidiophores of *N. catenata* are shorter than those of *N. tenuis*. While the former produces clavate conidia, those of the latter are cylindrical and not apiculate at the base.





**Fig. 18** *Niesslia catenata*. Monocillium-like conidiophores and conidia, partly arranged in chains (OA, 4 weeks) (CBS 694.70). Scale bar, 20  $\mu$ m

Accordingly, *N. catenata* is recognised as a distinct species, although it clusters within the *N. tenuis* species clade (data not shown).

***Niesslia constricta*** (W. Gams) W. Gams & Stielow, comb. nov.

Mycobank MB 827240.

Basionym: *Monocillium constrictum* W. Gams, Cephalosporium-artige Schimmelpilze: 164. 1971.

**Etyymology:** Named for the basally constricted phialides.

**Holotype:** Netherlands, Noord Brabant, Kampinaheide, from bark of *Pinus sylvestris*, leg. W. Gams, Apr. 1968 (CBS 760.69); isotype, MUCL 11558.

**Description:** Colonies slow-growing, reaching 7–8 mm diam in 10 days at 20 °C on MEA, finely granular to tufted, whitish to pinkish or pale orange (5B4); reverse similarly coloured or more ochraceous. Vegetative hyphae hyaline, thin-walled. Sporulation abundant, phalacrogenous to plectonematogenous, with conidia adhering in dry heads. Phialides densely formed next to each other, consisting of a moderately thick-walled, in young stages thin-walled, 1.0–1.5  $\mu$ m wide basal portion, distinctly narrowed at basal septum, slightly extending in middle up to 1.6–2.4  $\mu$ m diam, and a 1.0–1.3  $\mu$ m wide thin-walled conidiiferous tip, total length (8–)12–17(–21)  $\mu$ m; rarely ending with a sterile vesicle. Conidia obovate to clavate (to short-ellipsoidal), apiculate at base, one-celled, smooth- and rather thick-walled, 3.0–7.5  $\times$  1.8–2.4  $\mu$ m, l/w 1.5–3.3. Chlamydospores and sclerotia absent.

**Living cultures:** Netherlands, Groeneveld near Baarn, isolated from conidial stroma of *Hypoxyylon deustum*, H.A. van der Aa, May 1968 (CBS 407.70A). – Netherlands, N.-

Brabant, Kampinaheide, isolated from decaying leaves of *Carex* sp., isol. G.L. Hennebert, Apr. 1968 (CBS 407.70B, MUCL 11559, CBS H-14565). – Norway, from cold-stored *Picea abies*, isolated by K. Venn, Norwegian Institute of Forest Pathology, Norway, Ås, Vollebek (CBS 562.74, Herb. IMI 188383).

**Comments:** Phylogenetically and morphologically, *N. constricta* is close to *N. nordinii*. It can be distinguished from it by shorter and broader phialides, which are narrower at the basal septum. The conidia are typically clavate. The two isolates formerly assigned to this species, CBS 149.70 and 150.70 (Gams 1971), are unrelated; they have inconspicuously clavate conidia and are now identified as *N. heterophora*.

***Niesslia curvisetosa*** (W. Gams & Turhan) W. Gams & Stielow, comb. nov.

Mycobank MB 827241.

Basionym: *Monocillium curvisetosum* W. Gams & Turhan, Mycotaxon 59: 344. 1996.

**Holotype:** Turkey, Izmir, from an aphid, leg. and isol. G. Turhan, 1994 (CBS 660.94, exsiccatus et vivus praeservatus); isotypes, CBS H-5655, CBS H-5571.

**Etyymology:** Named for the curved, thick-walled setae, which are interpreted as monocillium-like conidiophores that have become sterile.

**Description:** Colonies reaching 18–20 mm diam in 6 days on MEA, OA or CMA at 21 °C, 21–28 mm at 24–30 °C, pale buff, on PDA sometimes turning brick-vinaceous under light; surface finely granular due to aggregation of hyphae densely covered with phialides. Good growth and sporulation also on SNA. Vegetative hyphae 0.7–1.7  $\mu$ m wide. Sterile curved

setae abundantly produced and interspersed with superficial or aerial hyphae bearing numerous phialides; setae hyaline, smooth- and thick-walled (0.5–1.5 µm), 100–300(–330) µm long, 2–3 µm wide near base, then mostly widening to 3–4 µm, and remaining so until thin-walled, rounded tip; basal septum usually absent. Sporulation with short phialides phalacrogenous to synnemato-genous. Phialides beginning with a more or less short slender stipe, inflated into a venter and tapering again into a conidiiferous tip, usually thin-walled throughout, but sometimes with an up to 0.3 µm thick-walled, more or less short stipe, usually 7–13 × 2.5–3 µm (width in middle part); stipe of thin-walled phialides showing considerable variation in length, longer ones often being considerably thick-walled. Conidia aggregated in small, more or less dry heads, dimorphic: mostly globose, hyaline, rather thick-walled (0.5 µm), (3.5–)4.0–4.5 µm diam; ellipsoidal conidia produced on poor media (PCA), 3.5–6 × 1.5–2.0 µm, l/w 2.6–4, in roughly equal numbers as globose ones. A broad temperature optimum for growth extends from 24 to 30 °C, at 36 °C strongly reduced growth is possible.

**Living cultures:** Finland, from recycled fibre pulp, 1994, preserved in VTT Culture Collection, Espoo, Finland, commun. M.-L. Suihko (VTT D-95456, CBS H-5634; VTT D-95457, CBS H-5635; VTT D-95460).

**Comments:** As in *Niesslia clarkii*, the thick-walled conidiophores of *N. curvisetosa* are associated with short, thin-walled ones that are more fertile. In this species, the long conidiophores are entirely transformed into sterile setae and therefore differing with those of most other *Niesslia* species. The stipe of the short phialides vary considerably in length, the longer ones being noticeably thick-walled. Phylogenetically, *N. aemula* (CBS 261.70) is closely related, but does not show this strong differentiation of the conidiophores and also has dimorphic conidia. Such dimorphic conidia are typical of *N. dimorphospora*, in which the globose conidia are 4.8–5.5 µm diam; it regularly also produces ellipsoidal to allantoid conidia, both kinds on 55–85 µm long, moderately thick-walled phialides. Mating of the available cultures on OA and PCA did not yield any perithecia.

***Niesslia dimorphospora*** (W. Gams) W. Gams & Stielow, comb. nov.

Mycobank MB 827242.

Basionym: *Monocillium dimorphosporum* W. Gams, *Cephalosporium-artige Schimmelpilze*: 156. 1971.

**Holotype:** Central African Republic, Oubangui-Chari, from soil, isol. J. Guillemat, A.E.F., 1955, obtained from M. Massenet, Grignon (CBS H-7359); isotype, CBS H-6668; ex-type culture, CBS 785.69.

**Description:** Colonies reaching 20 mm diam in 10 days at 20 °C on MEA, finely powdery, in middle floccose, later slimy, pinkish; reverse similarly coloured. Vegetative hyphae 0.7–1.5 µm wide, hyaline, thin-walled, partly chromophilic.

Crystals absent. Sporulation abundant, nematogenous to plectonematogenous, with conidia adhering in slimy droplets. Phialides 55–85(–130) µm long, consisting of a thick-walled (0.5–1.0 µm), 1.5–2.5 µm wide basal portion, minimally extending in middle part to 2.5–3.0 µm, and gradually tapering into a thin-walled, 1.0–1.4 µm wide conidiiferous tip. Conidia one-celled, smooth-walled, either ellipsoidal, slightly curved, slightly truncate at base, 6.5–9.5(–10.5) × 1.8–2.5 µm, l/w 2.9–4.6; or globose, 4.8–5.5 µm diam. Chlamydospores absent.

**Living cultures:** Taiwan, isolated from soil under sugar cane, T. Watanabe, X85–648 (CBS 361.76) [with thick-walled phialides, only elongate conidia seen, formerly identified as *N. arcticola*, but phylogenetically matching the type of *N. dimorphospora*].

**Comments:** The large, only slightly widening phialides and slightly curved, large conidia resemble those of *N. arcticola*, a species not closely related to *N. dimorphospora*.

***Niesslia gamsii*** (Ashrafi & W. Maier) Ashrafi, W. Maier & Schroers, comb. nov.

Mycobank MB 827243.

Basionym: *Monocillium gamsii* Ashrafi & W. Maier, *Mycobank* 27: 29 (2017).

**Holotype:** Turkey, Yozgat, experimental wheat field: dried PDA culture, from egg of *Heterodera filipjevi* extracted from cyst, isol. Samad Ashrafi, August 2013 (B 700016491, not seen); ex-type culture, DSM 105458.

**Description:** Ashrafi et al. (2017).

**Comments:** For a recently compiled description, see Ashrafi et al. (2017). The strain CBS 389.85 (also CBS H-3686b), isolated from litter of *Ficus bengalensis* (Italy, Sicily, Palermo Botanical Garden, W.G., 11 Nov. 1984) forms long conidia similar to those of *N. gamsii* with which *N. bulbilosa* and CBS 389.85 form a monophyletic group. Accordingly, CBS 389.85 is included in *N. gamsii*, at least provisionally. Because of several nucleotide differences it may, however, represent a distinct microclerotium forming species. Ashrafi et al. (2017) observed that *N. gamsii* and *N. bulbilosa* form microsclerotia inside the eggs of the plant pathogenic nematode *Heterodera filipjevi*, as the eggs are destroyed.

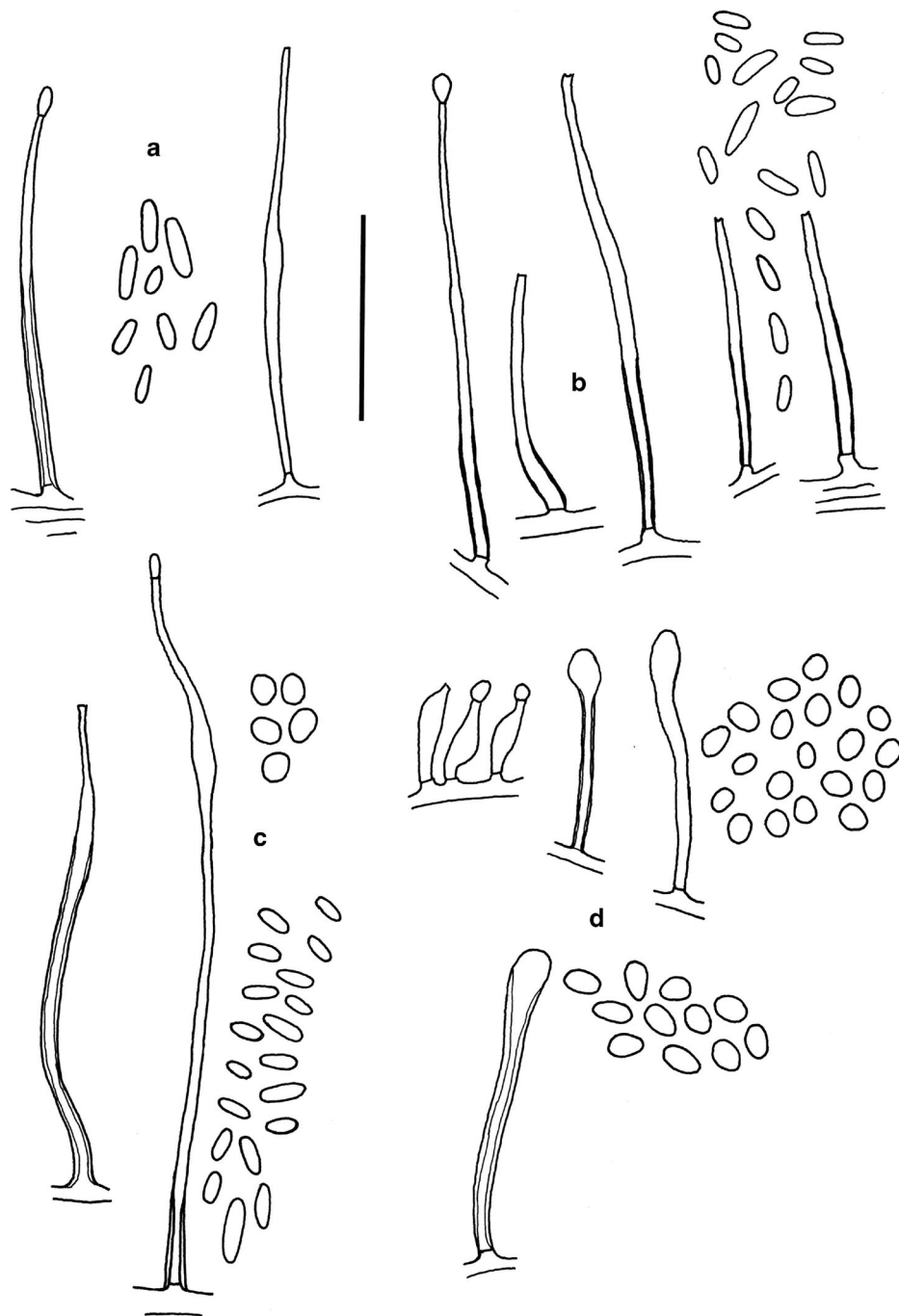
***Niesslia griseo-scens*** W. Gams & Stielow, spec. nov. Fig. 19a

Mycobank MB 827244.

**Holotype:** New Zealand, near Onemana, Tairua State Forest, from bark beetle gallery, J. Reid, 20 May 1982 (CBS 599.88, alive, metabolically inactive deposit).

**Etymology:** Latin *griseo-scens* = grey, indicating the discoloration of the colonies.

**Description:** Colonies reaching 15 mm diam on OA in 10 days (19 mm on PCA), pale ochraceous with greyish



**Fig. 19** *Niesslia grisescens*. **a** Monocillium-like conidiophores and conidia (OA, PCA, 9–10 days) (CBS 599.88). *Niesslia hennebertii*. **b** Monocillium-like conidiophores and conidia (OA, 23 days; PCA, 10 days) (CBS 389.70B). *Niesslia heterophora*. **c** Elongate monocillium-like

conidiophores (SNA, 22 days), ellipsoidal-cylindrical conidia (PCA, OA, 22 days) and ovoid conidia (SNA) (CBS 134429). **d** Relatively short, monocillium-like conidiophores and ovoid conidia (top, MEA, 18 days, CBS 149.70; bottom, MEA 6 weeks, CBS 150.70). Scale bar, 20  $\mu$ m

subperipheral zone (4C2), finely granular; sporulation plectonematogenous; phialides almost aculeate, 30–45  $\mu$ m long, moderately thick-walled in 0.7–1.5  $\mu$ m wide basal part, just slightly expanding in middle part, and ending in a long slender conidiiferous tip; conidia adhering in wet heads, often

confluent, cylindrical, smooth- and thin-walled, 3–6  $\times$  1.0–1.5  $\mu$ m, l/w 2.2–4.4. Chlamydospores absent.

**Comments:** Phylogenetically, the species occupies an isolated position with the nearest neighbours *N. loricata* (CBS 778.69), *N. subiculosella*, and *N. hennebertii*.

*Niesslia hennebertii* W. Gams & Stielow, spec. nov.  
Fig. 19b

Mycobank MB 827245.

**Holotype:** Belgium, Lovenjoel, on twig of *Populus* sp., G.-L. Hennebert, Dec. 1965 (CBS H-15147); ex-type culture, CBS 389.70B; isotype, Herb. MUCL 8386 [previously preserved as *N. exilis*].

**Etymology:** Dedicated to the senior author's teacher and friend, Grégoire L. Hennebert, who also collected the type of this species.

**Description:** Colonies reaching 8–12 mm diam in 9 days on OA, pale orange, Methuen 6B2, scanty phalacrogenous phialides; on PCA in 10 days 12 mm diam at 24 °C, with central phalacrogenous sporulation; vegetative hyphae 0.5–1.5(–2.0) µm wide. Phialides aculeate, with wall slightly thickened in basal part, 30–40 µm long, tapering from 1.0–1.7 µm to 0.5–1.0 µm at tip. Conidia almost cylindrical, smooth- and thin-walled, 3.0–6.0 × 1.0–1.5 µm, l/w 2.3–4(–4.8). Chlamydo spores absent.

**Comments:** Phylogenetically, the species is closely related to *N. loricata*, which has conspicuous chlamydo spores, and *N. grisescens*. Morphologically, it is hardly distinct from the anamorph of *N. exilis* and also *N. tenuis*.

*Niesslia heterophora* W. Gams & M. Nuñez, spec. nov.  
Fig. 19c, d

Mycobank MB 827246.

**Holotype:** Norway, M. Nuñez, on wall building paper (CBS 134429, alive, metabolically inactive deposit).

**Etymology:** Greek *hétēros* = unequal, indicating the two kinds of phialides and conidia.

**Description:** Colonies reaching 9 mm diam in 9 days on OA or PCA (poor growth on SNA), whitish to cream-coloured, powdery; sporulation abundant phalacrogenous to plectonematogenous. Vegetative hyphae 1.0–1.3 µm wide. Phialides of two kinds: (a) elongate monocillium-like, with a thick-walled (to 0.5 µm), 30–50 µm long, 1.5–2.5 µm wide basal part, then widening to 2–2.5 µm and tapering to 0.5–1.0 µm, total length 45–75(–90) µm; conidia ellipsoidal-cylindrical, thin-walled, 2.2–3.2(–6) × 1.0–1.5 µm, l/w 2–3.2(–4); (b) short phialides, with 2.5–4 µm long, 1 µm wide thick-walled base, inflation to 1.5–2.5 mm and a short, 0.5–1.0 µm wide conidiiferous neck, total length 10–15 µm; conidia adhering in dry heads, ovoid with somewhat truncate base, rather thick-walled, 3.0–3.5(–4) × 2.0–2.5 µm, l/w 1.3–1.5. Chlamydo spores absent.

**Living cultures:** Austria, Tyrol, Imst, aerial contaminant, W.G., 1965 (CBS 149.70). – Netherlands, Baarn, aerial contaminant, W.G., 1968 (CBS 150.70). – Norway, Oslo, Fjell bustadstifting, on foundation wall paper, M. Nuñez 201302223, Odd Ivar Holt, 20 Apr. 2013 (CBS 135619). – M. Nuñez 201302047.1 (CBS 135617). – Norway, Oslo,

Kurlandråsen 1, on foundation wall building paper, M. Nuñez 201302047.2, K.E. Pettersen, 5 Feb. 2013 (CBS 135618).

**Comments:** The short phialides of this rather isolated species resemble those of *N. constricta*, a species to which this taxon is not related. Its closest relative is CBS 152.68, *N. exigua*. Gams (1971: 80, Abb. 43) erroneously cited CBS 149.70 (*N. heterophora*) when illustrating conidiophores and conidia of *Acremonium incrustatum*.

*Niesslia indica* (S. B. Saksena) W. Gams & Stielow, comb. nov.

Mycobank MB 827247.

Basionym: *Monocillium indicum* S. B. Saksena, Indian Phytopathol. 8: 9. 1955.

≡ *Torulomyces indicus* (Saksena) Hashmi, Kendrick & Morgan-Jones, Canad. J. Bot. 50: 1463. 1972.

**Ex-type culture:** India, Madhya Pradesh, Patharia village near Sagar, isolated from grassland soil, obtained from Indian Agricultural Research Institute (G.C. No. 968).

**Description:** Colonies slow-growing, reaching 20–22 mm diam in 10 days at 20 °C on MEA, finely granular, whitish to pale ochraceous; reverse similarly coloured. Odour sweetish. Vegetative hyphae hyaline, thin-walled, sometimes with moniloid swellings. Crystals absent. Sporulation moderate, phalacrogenous or plectonematogenous, with conidia usually adhering in chains, sometimes in droplets. Phialides consisting of a thick-walled (up to 0.2–0.4 µm), to 25 µm long and 1.0–1.5 µm wide cylindrical basal portion, extending into a vesicular expansion, up to 2.5–3 µm diam, and a 6–9 µm long, often undulate, thin-walled, 0.8–1.0 µm wide conidiiferous tip, total length 32–50 µm. Abortive phialides ending in a sterile vesicle often observed. Conidia guttuliform to clavate, truncate at base, one-celled, smooth-walled, 3.5–4.7 × 1.8–2.2(–3) µm, l/w 1.4–2.3. Chlamydo spores absent, but pale brown sclerotia of irregular size and shape occurring in old cultures, giving colony a dotted appearance.

**Living cultures:** Canada, Ontario, Guelph, isolated from soil, G.L. Barron (CBS 182.65, = IMI 109886, = ATCC 16249, = OAC 10173; also CBS H-14570). – Canada, isolated from cultivated soil, G. C. Bhatt (IBP 69), det. G.L. Barron (CBS 605.69, also CBS H-14572). – West Australia, isolated from wheat rhizosphere, K. Sivasithamparam (CBS 313.74, also CBS H-14571).

**Comments:** With its dry conidia, *Niesslia indica* can only be compared with *N. catenata* and *N. nordinii*, species with cylindrical conidia cohering in irregular dry heads. Barron (1961) regarded *Monocillium indicum* and *M. humicola* Barron as congeneric; later Barron (1967) recognised the differences and adopted the older *Torulomyces lagenae* Delitsch as the accepted name for *M. humicola*, which is now classified in *Penicillium* on phylogenetic grounds (Houbraken and Samson 2011; Visagie et al. 2016). The available isolates show some degree of genetic variation. All of them form a well-defined

subclade with its closest relatives *N. curvisetosa*, *N. aemulans* and *N. luzulae* forming a distinct clade. This is another *Niesslia* species that is able to form, at least in older cultures, microsclerotia (see also *N. gamsii*, *N. bulbilosa*, *N. aterrima*). Additional descriptions were published by Barron (1961), Gams (1971: 152), Fassatiová (1982: 101), and Matsushima (1989: 42) and for conidiogenesis by Hashmi et al. (1972).

*Niesslia ligustica* (Girlanda & Luppi-Mosca) W. Gams & Stielow, comb. nov.

Mycobank MB 827248.

Basionym: *Monocillium ligusticum* Girlanda & Luppi-Mosca, Mycotaxon 67: 266. 1998.

**Holotype:** Italy, Liguria, Varigotti, 200 m alt., from serially washed and surface-disinfected ectomycorrhiza of *Pinus halepensis*, isol. M. Girlanda CLM 307.93, Sep. 1993 (CBS 684.95, as dried culture).

**Etymology:** Latin *ligusticus* = from Liguria.

**Description:** Colonies reaching 19–26 mm diam on MEA in 10 days, white, sometimes pale orange and pale luteous to ochraceous reverse, dry but with moist regions in some isolates, powdery to granular to minutely floccose, becoming dark grey-brown because of the formation of sclerotial bodies; sclerotia originating from aggregates of toruloid hyphae, with cells 4–7 µm diam, pale at the margin, darkening towards the centre, confluent to irregular masses of ca. 15–125 µm diam. Sporulation abundant, nematogenous to synnematogenous, phialides (35–)40–70(–140) µm long, aculeate, 1.0–1.5 µm wide at the moderately thick-walled base, hardly widening above and tapering to 0.5–1 µm at the tip; conidia adhering in slimy heads, cylindrical, smooth- and thin-walled, 3.5–5.5(–6.5) × 1.0–1.5 µm, l/w 2.5–3.8(–4.4). Other chlamydospores absent.

**Living cultures:** Same origin as CBS 684.95 (CBS 683.95, = CLM 305.93). – India, from leaf litter, Vasant Rao, No. 17, Dec. 1986 (CBS 697.86). – Papua-New Guinea, Madang, Jais Aben, ex stony soil along coast, leg. A. Aptroot, Nov. 1995, isol. A. van Iperen, Apr. 1996 (CBS 426.96). – Iran, endophyte in *Vitis vinifera*, T. Gräfenhan and R. Zare, Aug. 2004 (CBS 116433). – Netherlands, Baarn, Cantonspark, from dead leaves of *Canna indica*, Apr. 1968 (CBS 359.70).

**Comments:** In contrast with *N. bulbilosa* and *N. aterrima*, to which *N. ligustica* is unrelated, this species forms irregular, ill-defined aggregates of toruloid, pigmented cells. Phylogenetically it is a well-resolved species.

*Niesslia loricata* (Nicot & W. Gams) W. Gams & Stielow, comb. nov. Fig. 20a

Mycobank MB 827291.

Basionym: *Monocillium loricatum* Nicot & W. Gams, Cephalosporium-artige Schimmelpilze: 156. 1971.

**Holotype:** Algeria, Béni-Abbès, Sahara, from surface soil, alluvial sand, sent by J. Nicot (CBS H-7362); ex-type culture, CBS 778.69, = PC 2129.

**Etymology:** Latin *lorica* = armour, indicating the thick-walled chlamydospores.

**Description:** Colonies moderately slow-growing, reaching 24 mm diam in 10 days at 20 °C on MEA, dusty to floccose, white to pale ochraceous; reverse similarly coloured. Vegetative hyphae hyaline, thin-walled, chromophilic. Fan-shaped crystals present. Sporulation abundant, plectonematogenous, with conidia adhering in slimy droplets. Phialides consisting of a thick-walled (0.2–0.4 µm), 1.5 µm wide basal portion, then slightly extending and forming a thin-walled, 0.6–0.8 µm wide conidiiferous tip, total length 45–50(–> 80) µm. Conidia obovate, not apiculate at base, one-celled, smooth-walled, 3.0–3.7 × 1.4–1.8 µm, l/w 1.9–2.5. Chlamydospores forming long chains of globose cells, grey-brown, 4.5–5.5 µm diam.

**Comments:** The catenate chlamydospores of *N. loricata* are only comparable to those of *N. aeruginosa*, which has cylindrical conidia, 2.5–4.7 × 1.0–1.5 µm and somewhat shorter (40–65 µm), sometimes widening phialides.

*Niesslia mucida* (W. Gams) W. Gams & Stielow, comb. nov. Fig. 20b, c

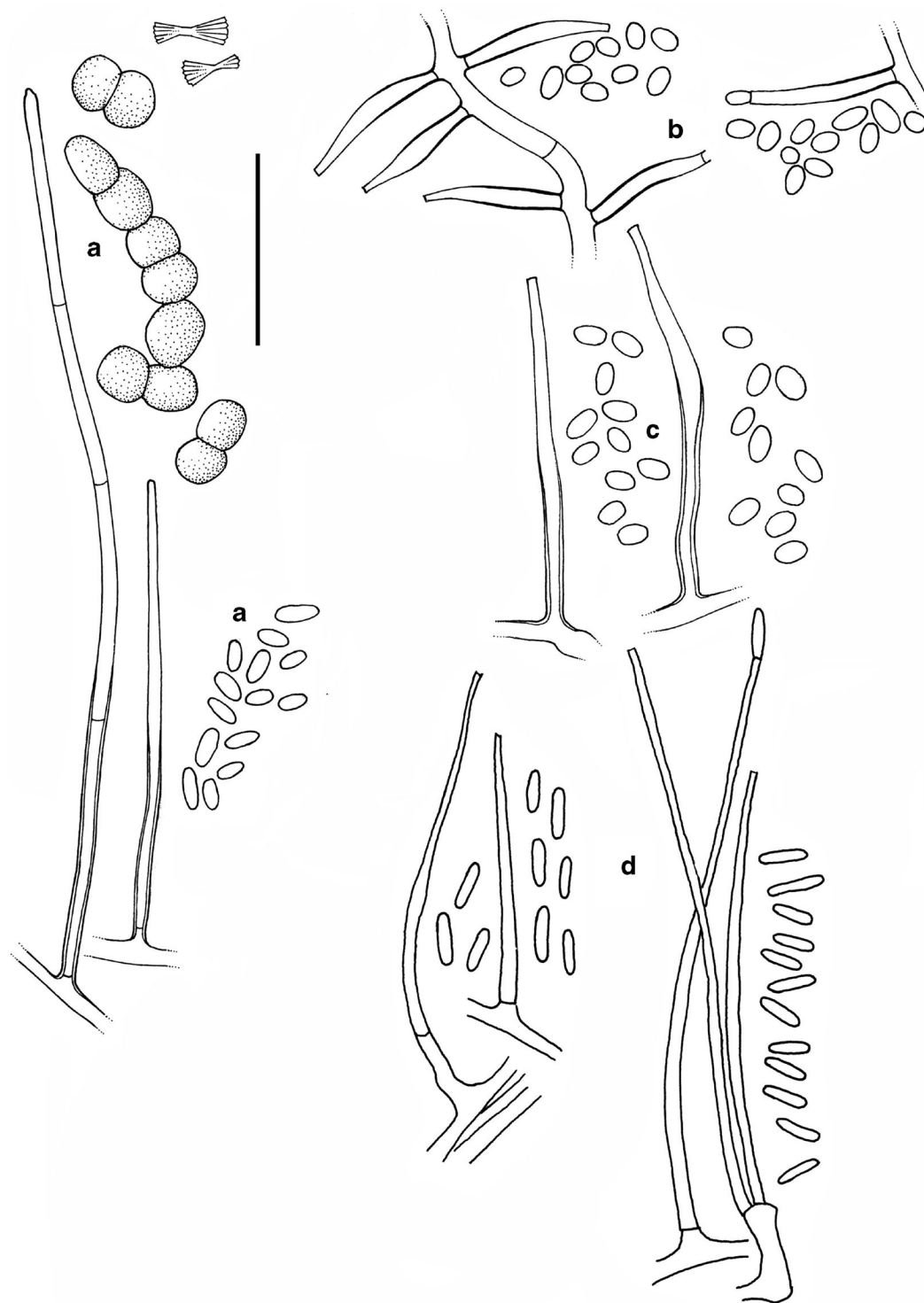
Mycobank MB 827292.

Basionym: *Monocillium mucidum* W. Gams, Cephalosporium-artige Schimmelpilze: 165. 1971.

**Holotype:** Germany, Kiel-Kitzeberg, from wheat-field soil, leg. and isol. W. Gams, 1964 (CBS H-7363); ex-type culture, CBS 404.66.

**Description:** Colonies fast-growing, reaching 20–30 mm diam in 10 days at 20 °C on MEA, thin, moist, pinkish (6A3 to 6B4); reverse pale pink. Vegetative hyphae 0.7–1.3 µm wide, hyaline, thin-walled, some toruloid hyphae to 3 µm wide, chromophilic. Crystals absent. Sporulation abundant, phalacrogenous. Phialides arising densely from creeping hyphae, sometimes even 2–3 aggregated at base, often somewhat bent, aculeate, 15–30(–40) µm long, moderately thick-walled and 1.5–2.0 µm wide at base, minimally extending in middle, and tapering into a thin-walled, 1.0–1.2 µm wide conidiiferous tip. Conidia adhering in slimy heads, often confluent and forming slimy masses, short-ellipsoidal, sometimes slightly apiculate at base, one-celled, smooth- and slightly thick-walled, (2.2–)2.8–4 × (1.2–)1.8–2.2 µm, l/w 1.4–2.1(–2.8). Catenate chlamydospores sometimes present in old cultures.

**Living cultures:** Germany, Kiel-Kitzeberg, from wheat-field soil, 1964–65 (CBS 191.70, 192.70, 193.70). – Germany, Gießen, isol. from compost, A. von Klopotek (CBS 306.70A). – Germany, Freising, J. Rintelen (CBS H-14576). – France, from agricultural soils, isolated by J. Guillemat, sent by M. Massenot, Grignon, France (CBS 306.70B–D). – Netherlands, Northeast Polder, from agricultural soil, H. Nielander (CBS 232.82) [with larger conidia, 3.5–4.5 × 1.5–2.0 µm, l/w 2.0–2.6]. – Netherlands, J.H. van Emden, 11 Oct. 1968 (CBS H-14574). – South Africa,



**Fig. 20** *Niesslia loricata*. **a** Monocillium-like conidiophores, conidia, chlamydospores, and crystals (MEA, 11 days) (CBS 778.69). *Niesslia mucida*. **b, c** Monocillium-like conidiophores and conidia (**b**, CHA,

7 days, CBS 191.70; **c**, MEA, 9 days, CBS H-14576). *Niesslia tenuis*. **d** Aculeate conidiophores and conidia (left, CMA, 9 days; right, OA, 4 weeks) (CBS 109396). Scale bar, 20  $\mu$ m

Potchefstroom, from wheat straw, M.C. Papendorf (CBS 940.72). – Canada, Ontario, Ottawa, from soil, D. Overy, Sep. 1998, commun. K.A. Seifert (CBS 113462, = DAOM 226847). – And some additional isolates from soil.

**Comments:** *Niesslia mucida* is the commonest species of the genus in agricultural soils and has apparently cosmopolite distribution. It has strong capacities for decomposition of xylan and cellulose (Domsch and Gams 1969) and causes

damage to pea roots in vitro (Domsch and Gams 1968, in both papers cited as '*M. nordinii*').

*Niesslia nordinii* (Bourchier) W. Gams & Stielow, comb. nov.

Mycobank MB 827293.

Basionym: *Cephalosporium nordinii* Bourchier, Can. J. Bot. 39: 1781. 1961.

≡ *Monocillium nordinii* (Bourchier) W. Gams, Cephalosporium-artige Schimmelpilze: 162. 1971.

**Holotype:** Canada, Alberta, Strachan, from splint wood of living *Pinus contorta* var. *latifolia*, leg. R. J. Bourchier (DAOM 59811); ex-type culture CBS 101.63; isotype, CBS H-7364.

**Description:** Colonies slow-growing, reaching 7–11 mm diam in 10 days at 20 °C on MEA, finely granular to slightly tufted, orange-pinkish, in darkness pale ochraceous-yellow; reverse similar but more strongly coloured. Vegetative hyphae hyaline, thin-walled, partly chromophilic. Crystals absent. Sporulation abundant, plectonematogenous to almost synnematomogenous, with conidia adhering in dry heads, occasionally in irregular chains. Phialides monocillium-like, consisting of a thick-walled (0.3–0.5 µm) 1.3–1.6 µm wide basal portion, extending into a broadened portion, of 1.5–2.5 µm diam, and a thin-walled, often flexuous, 0.6–1.2 µm wide conidiiferous tip, total length 23–45(–62) µm. Conidia obovate to clavate or almost cylindrical, slightly apiculate at base, one-celled, smooth-walled, (2.7–)3.2–4.8(–5.5) × 1.2–2.1 µm, l/w 1.8–2.1 in ex-type, l/w 3.2–4.5 in CBS 116.70. Chlamydospores absent.

**Living cultures:** Canada, Alberta, Kananaskis, from pink-stained wood of *Pinus contorta*, leg. V.J. Nordin (CBS 116.70, = DAOM 75184). – Finland, sent by Y. Norokorpi, Finnish Forest Research Institute, Rovaniemi (CBS 366.76). – Canada, Quebec, Gatineau Park, King Trail, from dead wood of *Carya* sp., G.L. Hennebert (Herb. MUCL 2553). – Belgium, Heverlee, Arboretum, from decaying wood of *Pinus sylvestris*, G.L. Hennebert (Herb. MUCL 4053).

**Comments:** Based on sequence data *N. nordinii* is close to *N. constricta*, which has much shorter phialides that are narrowest near the basal septum. In one of the original isolates, CBS 116.70, the conidia are longer and almost cylindrical, whilst in CBS 101.63 they are shorter and clavate. This difference does not correlate with significance differences in the phylogenetic analysis. Another isolate listed by Gams (1971), CBS 694.70, with similar pigmentation is now treated as *N. catenata*. Antifungal metabolites labelled monorden (also called radicicol) were found by Ayer et al. (1980, 1981); sterigmatocystin was also identified (Ayer et al. 1981). Tsuneda and Hiratsuka (1980) reported hyperparasitism on rust fungi by *N. nordinii*.

*Niesslia rhizomorparum* W. Gams & Stielow, spec. nov. Fig. 21a–c

Mycobank MB 827294.

**Holotype:** Sweden, Skåne, Örup's Almskog, from rhizomorphs of *Armillaria* sp. on *Ulmus scabra*, W. Gams and B.E. Söderström, 25 Aug. 1985 (CBS 642.85, alive, metabolically inactive deposit); isotype, CBS H-3996 and 4015.

**Etymology:** Referring to the substrate, rhizomorphs of *Armillaria* sp.

**Description:** Colonies reaching 12 mm diam in 11 days on MEA, 14 mm in 9 days on OA, orange-luteous, powdery, thin. Sporulation abundant, phalacrogenous. Phialides 22–60 µm long, aculeate, above thick-walled (to 0.5 mm) 1.5–2 mm wide basal part rarely widening to 2–3 µm and tapering again to 0.5–1.0 µm, or often ending in a sterile vesicle to 4–5 µm wide. Conidia forming dry heads, elongate ellipsoidal, occasionally with slightly truncate base, also sometimes slightly curved, smooth- and thin-walled, (3.2–)4–7 × (1.0–)1.5–2.0 µm, l/w 3.3–4(–5.2). Chlamydospores absent.

**Comments:** *Niesslia rhizomorparum* resembles *N. nordinii*, but is phylogenetically unrelated. The ecological aspect of the substrate and the slightly longer conidia encountered in *N. rhizomorparum* distinguish these two species.

*Niesslia rollhanseni* W. Gams & Stielow, spec. nov. Fig. 21d, e

Mycobank MB 827295.

**Holotype:** Norway, from *Picea abies*, leg. F. Roll-Hansen, 1984, isol. K. Venn (CBS H-3729); **isotype**, IMI 188381; ex-type culture, CBS 686.74.

**Etymology:** Dedicated to memory of the keen Norwegian mycologist Finn Roll-Hansen, who contributed both isolates of this species.

**Description:** Colonies reaching 14 mm diam in 16 days on MEA. Sporulation phalacrogenous. Conidiophores rarely branching in lower part. Phialides aculeate, hardly thick-walled in lower part, 80–96 µm long, from 1.5–2.0 µm gradually tapering to 0.8–1.0 µm at tip. Conidia cylindrical, thin- and smooth-walled, 4.0–6.5(–7) × 1.0–2.0 µm, l/w (2.3–)3–4.7(–6). Chlamydospores and crystals absent.

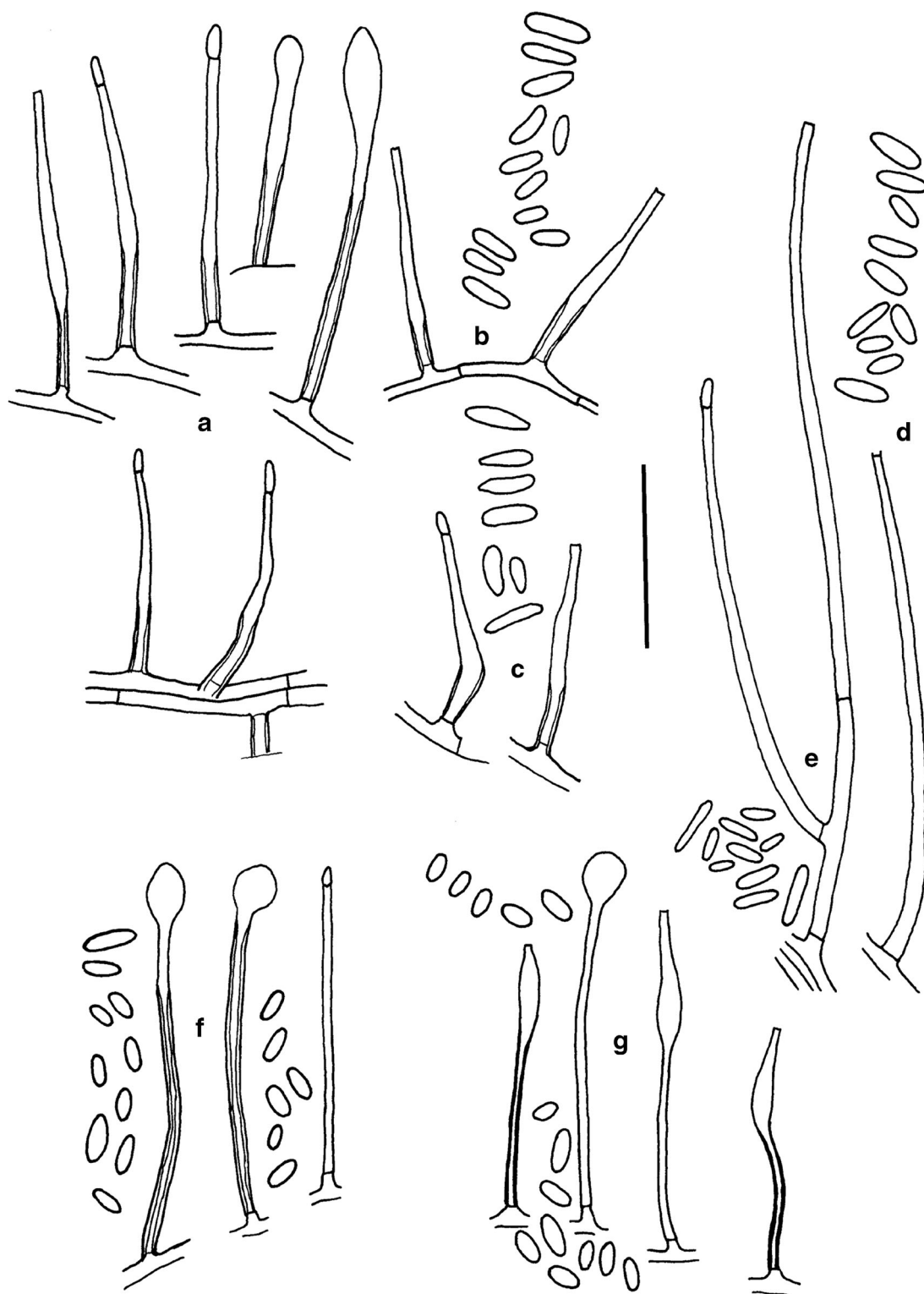
**Comments:** *Niesslia rollhanseni* resembles and is also phylogenetically related to *N. nordinii* but differs in having conidia in slimy heads and more regularly aculeate phialides.

*Niesslia sphaeropedunculata* W. Gams & Stielow, spec. nov. Fig. 21f, g

Mycobank MB 827296.

**Holotype:** USA, Connecticut Agricultural Experimental Station, Windsor, CT06095, from dry wall in water damaged building, leg. Li De-Wei SA2, 22 July 2008 (CBS 123802, alive, metabolically inactive deposit).

**Etymology:** *Sphaero* (Greek) for globose and *pedunculus* (Latin) for stalk/pedicel in reference to hyphal spines / setae, thus sterile phialides, terminating in globose vesicles.



**Fig. 21** *Niesslia rhizomorparum*. **a–c** Monocillium-like conidophores and conidia (**a**, natural substratum; **b**, MEA, 9 days; **c**, MEA, 19 days) (CBS 642.85). *Niesslia rollhansenii*. **d, e** Conidiophores with aculeate phialides and conidia (**d**, MEA, 9 days; **e**, MEA 16 days) (CBS

686.74). *Niesslia sphaeropedunculata* **f, g** Monocillium-like conidophores and conidia (**f**, OA, 9/16 days; **g**, PCA, 10 days) (CBS 123802). Scale bar, 20  $\mu\text{m}$

**Description:** Colonies on OA reaching 14 mm diam in 16 days, intensely orange, also in reverse. Sporulation

phalacrogenous. Phialides aculeate, rather thick-walled, up to 0.7  $\mu\text{m}$ , 30–50(–80)  $\mu\text{m}$  long, from 1.2–1.5  $\mu\text{m}$  tapering



to 1.0–1.5  $\mu\text{m}$  and sometimes quickly widening to a globose to ellipsoidal vesicle, 4–5  $\mu\text{m}$  diam, sphaeropedunculate. Conidia ellipsoidal, smooth- and thin-walled, 3–5  $\times$  1.5–2.0(–2.5)  $\mu\text{m}$ , l/w 1.7–3. Chlamydo spores absent.

**Comments:** *Niesslia sphaeropedunculata* is phylogenetically related to *N. aterrima*. Both species produce short monocillium-like conidiophores and ellipsoidal conidia. Microsclerotia that characterise *N. aterrima* were not observed in *N. sphaeropedunculata*.

*Niesslia tenuis* (W. Gams) W. Gams, comb. nov. Figs. 20d and 22a–d

Mycobank MB 827297.

Basionym: *Monocillium tenue* W. Gams, *Cephalosporium-artige Schimmelpilze*: 153. 1971.

? = *Cephalosporium rubrobrunneum-cerebriforme-hartmannii* Benedek, *Arch. Dermatol. Syph.* 154: 166. 1928.

≡ *Cephalosporium rubrobrunneum* Benedek ex Nann., *Tratt. Micopatol. umana* 4: 455. 1934.

≡ *Hyalopus rubrobrunneus* (Nann.) M.A.J. Barbosa, *Subsidios para o estudo do genero Hyalopus*: 44. 1941.

**Holotype:** Germany, Kr. Plön, Preetzer Forst, from *Hypoxylon coccineum*, 1965 (CBS 432.66).

**Etymology:** Latin *tenuis* = tender, indicating the relatively tender and slender phialides compared with other species of the genus.

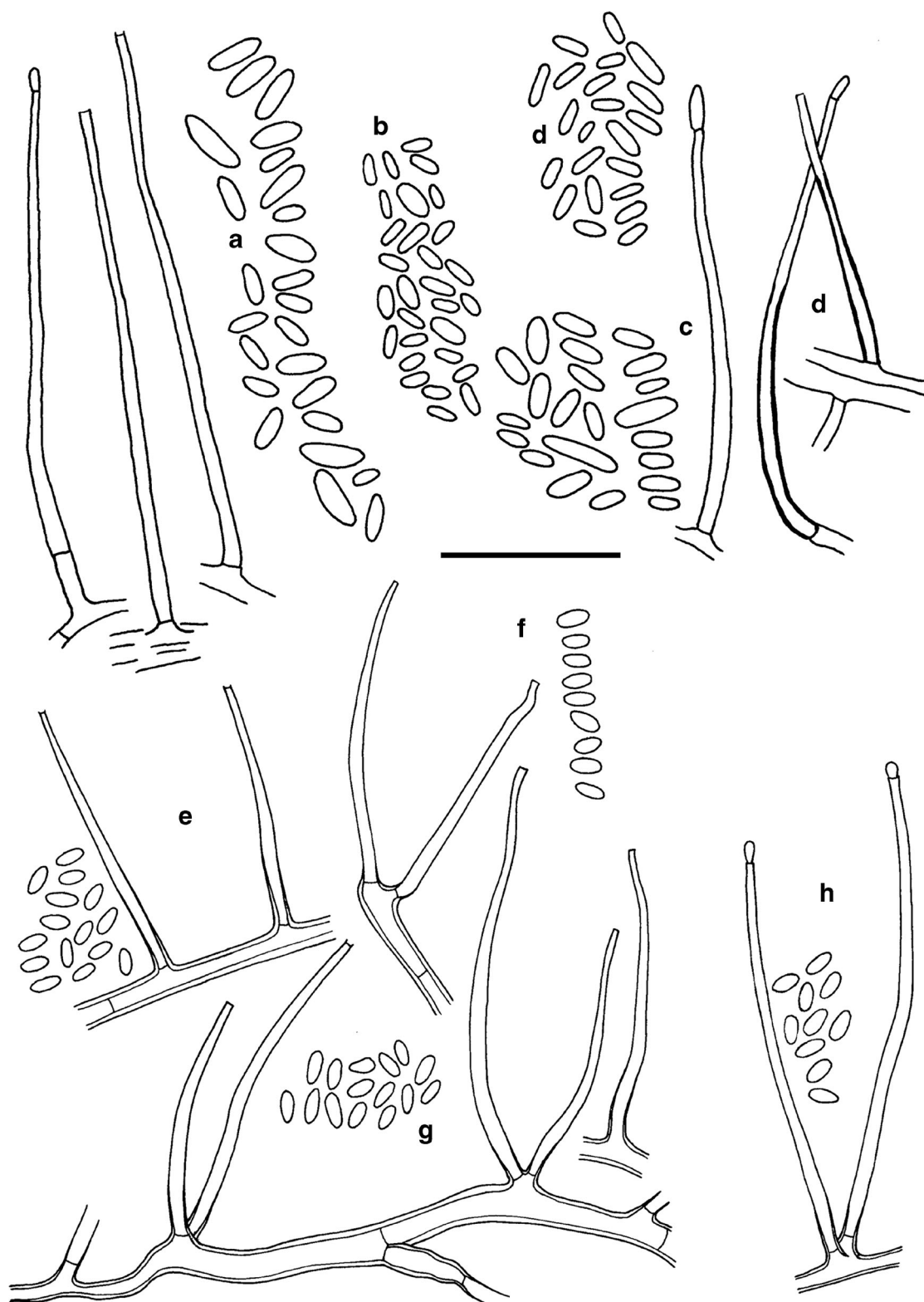
**Description:** Colonies moderately slow-growing, reaching 7–16 mm diam in 10 days at 20 °C on MEA, dry, dusty, granular, partly also lanose, whitish to pinkish, orange-ochre or salmon; reverse similarly coloured. Vegetative hyphae 0.5–1.5  $\mu\text{m}$  wide, hyaline, thin-walled, basal hyphae often conspicuously chromophilic, as well as base of phialides. Crystals commonly present, characteristically fan-shaped (especially on MEA, but recently not reproduced). Sporulation abundant, plectonematogenous to synnematogenous. Rarely basally branched conidiophores present. Phialides aculeate, usually straight, merging from a slightly thick-walled base into thin-walled conidiiferous tip, not inflated in middle, variable in length, 30–60(–80)  $\mu\text{m}$ , from 1.5–2.0  $\mu\text{m}$  tapering to 0.5–1.0  $\mu\text{m}$  at tip. Conidia adhering in slimy heads, cylindrical, not apiculate at base, 1-celled, smooth- and thin-walled, 3.0–7.0  $\times$  1.1–2.0  $\mu\text{m}$ , l/w 1.9–4.3; some long conidia occurring in young colonies. Chlamydo spores absent.

**Living cultures:** Germany, Kr. Plön, Schrevenborn, from *Bulgaria inquinans*, Sep. 1965 (CBS 772.69). – Germany, Kr. Plön, Preetzer Forst, from *Hypoxylon* sp. (CBS 196.70) – Germany, Kr. Plön, bei Dobersdorf, from *Camarops polyspermum* on *Alnus glutinosa*, 6 June 1965 (CBS 197.70). – Germany, Kr. Plön, Schüttbrehm, from *Hypoxylon* sp. (CBS 199.70) – Germany, Kr. Plön, bei Dobersdorf, from *Hypocrea pulvinata* on *Piptoporus betulinus* (CBS 200.70). – Austria, Tirol, Kranebitter Klamm from *Fomitopsis pinicola* (CBS 198.70). – Germany, near Kiel, on *Hypoxylon*, W. Gams,

W.G. 650 (CBS 199.70). – Denmark, Isle of Møn, from *Inonotus radiatus*, isol. W. Gams, 511 (CBS 201.70, CBS H-14581). – Denmark, Isle of Møn, from *Libertella faginea*, W.G., 1970 (CBS 202.70). – Denmark, Isle of Møn, from *Phellinus ferruginosus*, W.G., 1970 (CBS 203.70). – Netherlands, Baarn, on *Venturia inaequalis* on an apple (CBS 396.70B). – Netherlands, Baarn, on dead leaves of *Ilex aquifolium* (CBS 396.70C) – UK, Hampton Court Park near London, from *Ganoderma adpersum* (CBS 773.69). – UK, London, Kew Gardens, from dead leaves of *Buxus sempervirens*, together with *Clonostachys buxi*, W.G. (CBS 396.70A). – Netherlands, Schouwen-Duiveland, Biesterveld near Haamstede, isolated from conidial stroma of *Poria punctata* on horse dung, leg. D. Tjallingii, Nov. 1978 (H.A. 6831). – Colombia, Cundinamarca, Andean forest near Cogua, ca. 3000 m alt., hyperparasitic on leaf-inhabiting fungi, Nov. 1979 (CBS 285.80). Slightly deviating phylogenetically: Australia, West Australia, Nedlands University, Botanical Garden, from *Podocarpus* litter, W.G., 2011 (CBS 109396). – Netherlands, Delft, from human skin (CBS 478.80) [has thin-walled phialides]. – Japan, Tokyo, Shinjuku Gyoen Gardens, from litter of *Podocarpus* sp., Sept. 1983 (CBS 667.83, CBS H-3495 and 3508). – Australia, West Australia, Dwellingup, from decaying bark of *Eucalyptus calophylla*, Aug. 1983 (CBS 743.83A). – Australia, West Australia, Dwellingup, from dead leaf of *Xanthorrhoea* sp., Aug. 1983 (CBS 743.83B). – Australia, West Australia, Perth, King's Park, from male inflorescence of *Macrozamia riedlei*, Aug. 1983 (CBS 743.83C). – See also Gams (1971) citing additional strains from decaying fungi.

**Comments:** *Niesslia tenuis* is characterised by slender, relatively thin-walled phialides and the formation of fan-shaped fasciculate crystals. These crystals were not observed in otherwise similar isolates of *N. ilicifolia*. This is a common species occurring on decaying fungal fruiting bodies, especially on the hymeno- or carpophore of wood-inhabiting basidiomycetous polypores, and on ascomycetous *Hypoxylon*, *Libertella* (conidial tendrils), etc. For discussions about the relationship of *N. tenuis* and two ascospore isolates identified as *N. barbula* (CBS 560.74) or *N. aff. Barbula* (CBS 692.94), see under *N. barbula*. Although the phylogenetic distance between *N. barbula* and *N. tenuis* is minute, we hesitate to classify anamorphic fungicolous isolates as *N. barbula* and retain the epithet *tenuis* for the taxon. Also *N. catenata* is a member of the *N. tenuis/N. barbula* complex, but it forms catenate conidia with a truncate base and is therefore morphologically distinct.

The ex-type isolate CBS 124.29 of *Cephalosporium rubrobrunneum* forms moist, poorly sporulating colonies, few fan-shaped crystals, and has relatively thin-walled phialides. It is by no means characteristic of *N. tenuis*. Neither does it agree with the meagre original diagnoses in which a red-brown pigmentation and lanose structure were



**Fig. 22** *Niesslia tenuis*. **a–d** Monocillium-like conidiophores and conidia (a, MEA; b, MEA, 8 weeks.; c, MEA, 13 days; d, OA, 9 days) (CBS 432.66). *Niesslia tenuissima*. **e–h** Monocillium-like conidiophores and

conidia (e, original culture, CBS 586.73B; f, CMA, 18 days, CBS 586.73B; g, CMA 18 days, CBS 586.73A; h, MEA, 14 days, CBS 586.73A). Scale bar, 20  $\mu$ m

mentioned. Therefore, this taxon cannot be synonymized with certainty with *N. tenuis*.

The strain CBS 478.80 had clinical relevance but there is no other indication of human pathogenicity for *N. tenuis*. A strong antibiotic action against *Cladosporium sphaerospermum* Penzig was observed in vitro (Gams 1971).

***Niesslia tenuissima*** W. Gams & Stielow, spec. nov. Fig. 22e–h

Mycobank MB 827299.

**Holotype:** Surinam, from soil under *Elaeis guineensis*, J. H. van Emden, 1973 (CBS 586.73A, alive, metabolically inactive deposit).

**Etymology:** Latin *tenuissimus* = very thin. The species has the thinnest phialide walls in the genus.

**Description:** Colonies slow-growing, reaching 16 mm diam in 14 days at 20 °C on MEA, finely granular, pinkish. Vegetative hyphae 1.0–1.5 µm wide, hyaline, thin-walled, cyanophilic. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides often 2 arising side-by-side from ± thick-walled subtending hyphae (occasionally also 2 on a short conidiophore stipe cell), aculeate, often somewhat bent, consisting of a thick-walled (up to 0.5 µm), 15–20 µm long and 1.5–2.0 µm wide basal portion, hardly extending into a vesicular expansion, and a thin-walled distal part, tapering to 0.8–1.0 µm; total length 25–55 µm. Conidia ellipsoidal, not apiculate at base, one-celled, smooth- and thin-walled, (2.5–)3.0–3.7 × 1.0–1.5 µm, l/w 2.0–3.0. Chlamydospores absent.

**Living culture:** Same origin as 586.73A (CBS 586.73B).

**Comments:** The species is comparable to *N. tenuis*, from which it differs by having more flexible, thinner-walled phialides and somewhat broader conidia.

#### Teleomorphic species known only from herbarium material.

***Niesslia agavacearum*** A.W. Ramaley, Mycotaxon 79: 272. 2001.

Mycobank MB 474507.

**Holotype:** USA, New Mexico, Lincoln County, Valley of Fire, on dead leaf of *Dasyilirion leiophyllum*, A. Ramaley No. 9815A, 28 Oct. 1998 (BPI, not seen).

**Comments:** Despite repeated efforts, Ramaley (2001) could not obtain a culture.

**Description from protologue:** Perithecia globose, 36–60(–72) µm diam, pale brown, bearing 4–8, up to 50 µm long, brown spines. Asci ellipsoidal to short oblong, 19–22.5 × 6.5 µm, 8-spored. Ascospores narrowly cylindrical to fusiform, 12–15(–19) × 1.5–2.5 µm, 4-guttulate.

***Niesslia andicola*** (Speg.) W. Gams, comb. nov. Fig. 23a  
Mycobank MB 827301.

Basionym: *Venturia andicola* Speg., An. Mus. Nac. B. Aires (Mycetes Argent. ser. 6) 23: 50. 1912.

**Holotype:** Argentina, Mendoza, Cerro del Plata (Cordón del Plata), on dried culms and sheaths of *Elymus barbatus*, C. Spegazzini, Oct. 1909 (LPS 5742).

**Description:** Perithecia ca. 120 µm diam, densely spinose. Spines dark brown, 55–65 µm long. Asci 8-spored, 2–3-seriate. Ascospores elongated ellipsoidal but gradually tapering towards ends, sometimes slightly curved, finely punctate, 15.5–17 × 3.5–4 µm, l/w 3.6–5 (described as 17–20 × 5–6 µm).

***Niesslia antarctica*** (Speg.) W. Gams, comb. nov. Fig. 23b, c  
Mycobank MB 827302.

Basionym: *Venturia antarctica* Speg., Bol. Acad. nac. Ci. Córdoba 11 ('1887'): 209. 1888.

**Holotype:** Argentina, Tierra del Fuego, Isla de los Estados, near Shammacus, on decaying leaves of *Maytenus* sp. (Celastraceae), leg. C. Spegazzini, 26 May 1882 (LPS 5746); **isotype**, IMI 166742.

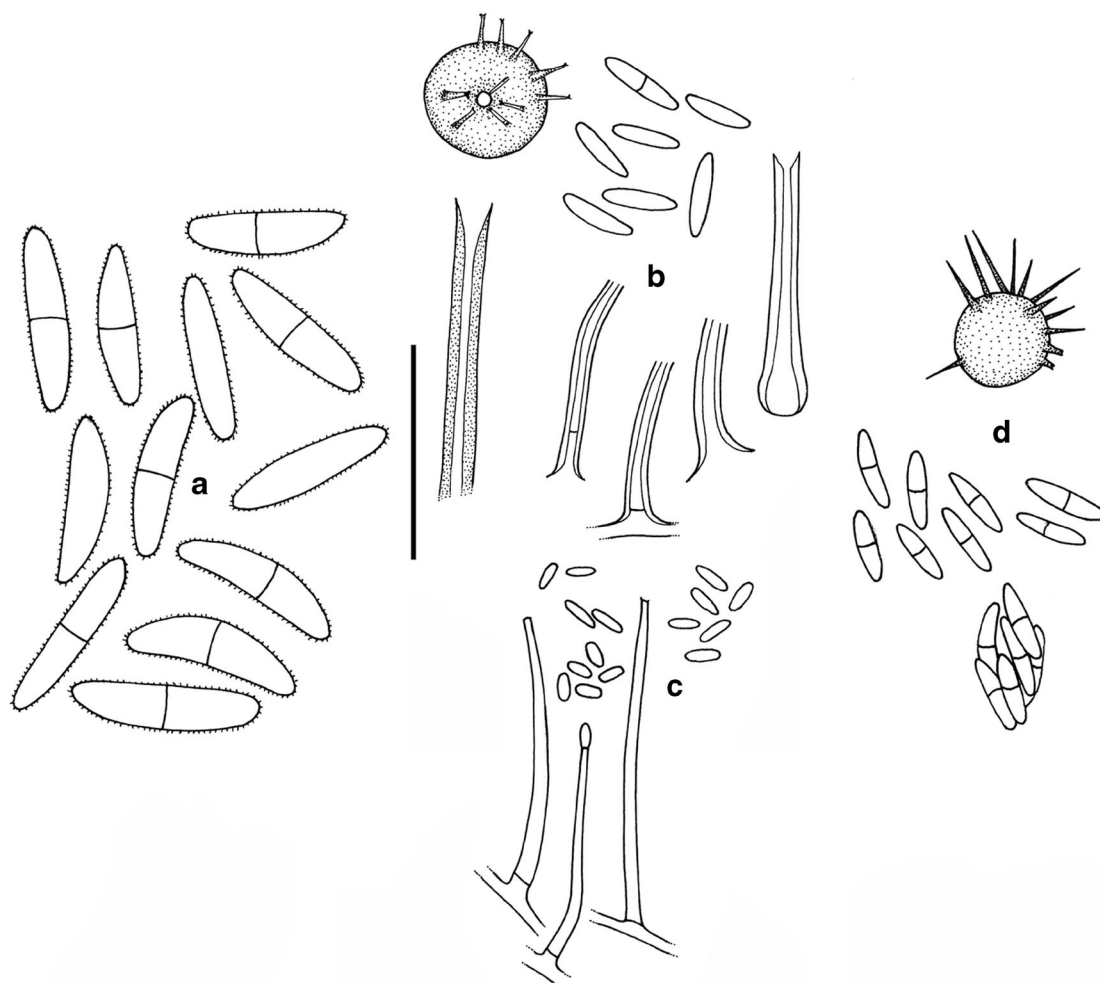
**Description:** Perithecia scattered on substrate, pale brown, glossy, globose to ovoid, collapsing cup-like when dry, 70–110 µm diam. Spines not numerous, pale ochraceous, not septate, ca. 30 µm long, thick-walled, tapering from 4.5–6.5 µm at base to 2–2.5 µm near tip and widening into a thin-walled elongate vesicle, 3–4 µm diam, which collapses cup-like when dry; ascoma wall of textura prismatica, covered with some hyphae. Asci cylindrical-clavate, with rounded or tapering apex, 8-spored, 33–40 × 5–6 µm. Ascospores irregularly biseriolate, ellipsoidal to slightly fusiform, two-celled, minutely punctate, almost smooth- and thin-walled, 8–11.5 × 2.0–3.0 µm, l/w 3.5–4.3. Phialides aculeate, either thick-walled (up to 1 µm) and 2.5 µm wide in basal portion, or almost thin-walled and 1.5 µm wide, gradually tapering to thin-walled, 0.6–1.0 µm wide tip, total length 20–40(–75) µm. Conidia cylindrical, not apiculate at base, one-celled, smooth-walled, 2.5–3 × 0.8–1.2 µm, l/w 2.6–3.5.

**Comments:** Previously, isolates CBS 583.73 from *Pandanus lerum* in Sri Lanka and 652.79 from *Cladium mariscus* in the Netherlands with slightly wider ascospores and lacking the vesiculate spine ends were identified as this species. Now, CBS 652.79 was reidentified as *N. cladii* and CBS 583.73 as *N. pandani*. *Niesslia antarctica* is to be compared with *N. physacantha*. Both species produce pale brownish or ochraceous spines on perithecia and similarly sized ascospores.

***Niesslia bellotae*** (Speg.) W. Gams, comb. nov. Fig. 23d  
Mycobank MB 827305.

Basionym: *Venturia bellotae* Speg., Revta Fac. Agron. Vet. La Plata 6: 50. 1910.

**Holotype:** Chile, Cerro Caracol de Concepción, on dead leaf of *Cryptocarya bellota*, leg. C. Spegazzini, Jan. 1909 (LPS 5637).



**Fig. 23** *Niesslia andicola*. **a** Ascospores (holotype LPS 5742). *Niesslia antarctica*. **b** Perithecium with spines, perithecial spine, ascospores and monocillium-like structures from natural substrate ((LPS 5746). **c** Aculeate phialides and conidia associating holotype (LPS 5746).

*Niesslia bellotae*. **d** Perithecium with spines and ascospores (holotype LPS 5637). All from natural substrates. Scale bar, 20  $\mu\text{m}$ ; for perithecia in b, d, 200  $\mu\text{m}$

**Description from protologue:** Perithecia 90–110  $\mu\text{m}$  diam, with 3–10 spines 50–60  $\times$  4–5  $\mu\text{m}$ . Asci with shape of a lance head with blunt end and a short stipe, 30  $\times$  4  $\mu\text{m}$ . Ascospores almost fusiform, 9–10  $\times$  2–2.5  $\mu\text{m}$ . **Observations from type by WG:** Perithecia dark brown, glossy, globose, collapsing cup-like when dry, 85–110  $\mu\text{m}$  diam. Spines numerous, dark brown, 50–75  $\mu\text{m}$  long, tapering from 4 to 5  $\mu\text{m}$  at base towards pointed apex. Asci clavate, 8-spored. Ascospores 2–3-seriate in ascus, ellipsoidal–fusiform, two-celled, smooth- and thin-walled, 6.5–7.5  $\times$  1.5–1.7  $\mu\text{m}$ , l/w 3.5–4.7.

**Comments:** The species is comparable to *N. ilicifolia* and resembles *N. clarkii* in having long perithecial spines and slightly fusiform ascospores.

*Niesslia cinctiostiolata* Whitton, K.D. Hyde & McKenzie, Fungi associated with Pandanaceae, Springer, Fungal Divers. Res. Ser. 21: 76. 2012.

Index Fungorum number IF 563769.

**Holotype:** Philippines, Luzon Island, Quezon Region, Baranggay Papalong Infanta, on decaying leaves of *Pandanus copelandii*, S.R. Whitton, 22 Oct. 1996 (IFRD8997, not seen).

**Description from protologue:** Perithecia 60–105  $\mu\text{m}$  diam, spines forming a circle around ostiole, 15–29  $\mu\text{m}$  long, 3.2–5  $\mu\text{m}$  wide at base. Asci 24–31  $\times$  4.5–6  $\mu\text{m}$ , 8-spored. Ascospores cylindrical, apparently aseptate, 9–14  $\times$  1.8–2.2  $\mu\text{m}$ . Phialides aculeate, 55–130  $\mu\text{m}$  long, with thick-walled basal part. Conidia not described.

*Niesslia coloradensis* (E.K. Cash & R.W. Davidson) W. Gams, Cephalosporium-artige Schimmelpilze: 163. 1971.

Mycobank MB 318654.

$\equiv$  *Acanthonitschkea coloradensis* E.K. Cash & J.W. Davison, Mycologia 32: 728. 1940.

Misapplied name: *Niesslia barbula* (Berk. & Broome) Cooke sensu Rehm, Ascomyceten: 293. 1874.

**Holotype:** USA, Colorado, Mesa Lakes, Grand Mesa, on dead twigs of *Abies lasiocarpa*, together with *Dasyscyphus acanthonitschkeae*, leg. R. W. Davidson, 1 June 1938 (F.P. 71992 in BPI 699442A).

**Description:** Perithecia on twigs of *Abies* species, often erumpent through bark in dense clusters, dark brown, not glossy, globose, rarely collapsing cup-like when dry, 200–300(–400)  $\mu\text{m}$  diam. Spines numerous in upper part, dark brown, not septate, 20–35  $\mu\text{m}$  long, tapering from 6 to 7(–10)  $\mu\text{m}$  at base towards slightly pointed apex. Asci cylindrical with truncate apex, 8-spored, uniseriate, about  $60 \times 4.5\text{--}6$   $\mu\text{m}$ , rather persistent; a barrel-shaped apical apparatus, about 4.5  $\mu\text{m}$  long, sometimes recognisable. Ascospores ellipsoidal, two-celled, thick- and smooth-walled,  $7\text{--}9\text{--}(10) \times 3.0\text{--}3.5$   $\mu\text{m}$ , l/w 2.3–3.3 in type and some other collections,  $8.5\text{--}12 \times 2.5\text{--}3$   $\mu\text{m}$ , l/w 3–4 in specimen Parks 6867. Anamorph monocillium-like.

**Herbarium specimens examined:** USA, California, Trinity Co., South Fork Mt., on twigs of *Abies shastensis*, leg. H.E. Parks 6867, 29 Aug. 1941, det. E.K. Cash (BPI 699735). – USA, California, Mt. Shasta, Camp Creek below Horse Camp, 2930 m alt., on twigs of *Abies magnifica* var. *shastensis*, 10 July 1946 (No. 18201), det. J.H. Miller, Herb. Wm. B. Cooke No. 222 (BPI 866247). – USA, California, Mt. Shasta, on twigs of *Pinus ponderosa*, leg. Wm. B. Cooke, 17 Aug. 1946 (No. 18369), det. E. K. Cash (BPI 699734). – USA, California, on needles of *Sequoiadendron giganteum*, leg. Harkness, Ellis, North Amer. Fungi 1337, det. M.E. Barr as *Niesslia lanea* (probably mixed material) (NY 914430). – Austria, Tyrol, near Kühtai, on dry twigs of *Pinus mugo* lying on the ground, leg. Rehm, as *Venturia barbula* in Rehm, Aug. 1874, Ascomyceten, No. 293 (K).

**Comments:** *Niesslia coloradensis* is a distinct species with large, broad ascospores, growing on coniferous substrates. The specimen W.B. Cooke 18369 deviates by more strongly collapsing cupulate ascomata with longer spines (–55  $\mu\text{m}$ ) and broader ascospores (3–4.5  $\mu\text{m}$ ); it may represent a different species. The short original description of the anamorph might fit *M. nordinii* among the conifer-inhabiting species. This species is unavailable in culture. It was originally described as forming strawberry-pink colonies, with phialides  $12\text{--}35 \times 3\text{--}5$   $\mu\text{m}$  and conidia of  $2\text{--}5 \times 1.0\text{--}1.6$   $\mu\text{m}$  (Cash and Davidson 1940). No conidia were seen on the herbarium specimens.

The genus *Acanthonitschkea* Speg. is distinct from *Niesslia* and belongs to the Sordariales, Nitschkiaceae (Fitzpatrick 1923; Nannfeldt 1975a, b); it is characterised by bristles arising from the subiculum and one-celled allantoid ascospores, and is thus not an appropriate classification for the present fungus.

*Niesslia erysiphoides* (Ellis & Everh.) M.E. Barr, Mycotaxon 46: 50. 1993 (as ‘*erysiphoides*’).  
Mycobank MB 359263, 535240.

≡ *Venturia erysiphoides* Ellis & Everh., J. Mycol. 3: 128. 1887 (as ‘*erysiphoides*’).

**Holotype:** USA, Louisiana, Pointe à la Hache, on dead culms of *Panicum curtisii*, A.B. Langlois, No. 1023, 24 Feb. 1887 (NY 938212); isotype, NY 938213.

**Description from protologue:** Perithecia about 100  $\mu\text{m}$  diam, with rather scanty, fewer than 10–12, black spines, 40–70  $\mu\text{m}$  long, 5–6  $\mu\text{m}$  wide at base. Asci 40–45  $\times$  7–8  $\mu\text{m}$ . Ascospores fusiform, slightly curved,  $20 \times 2.5$   $\mu\text{m}$ .

**Observations of type specimen by WG:** Perithecia aggregated in grooves of leaf sheath, 100–180  $\mu\text{m}$  diam; spines rather scanty, thick, to  $50\text{--}(90) \times 7.5$   $\mu\text{m}$ . Asci 35–40  $\mu\text{m}$  long, spores 2–3-seriate. Ascospores cylindrical, slightly tapering in both directions, almost straight, 4-guttulate,  $12.5\text{--}20.5 \times 2.0\text{--}2.7$   $\mu\text{m}$ , l/w 4.0–5.5. Some thick-walled (0.7–1.0  $\mu\text{m}$ ) phialide remnants present.

**Herbarium specimens examined:** USA, Louisiana, on dead grasses, A.B. Langlois, 4 parquets in Ellis collection (NY).

*Niesslia haglundii* Starb., Bihang till K. Sv. Vet.-Akad. Handl. 14, Afd. 3, no. 5: 9; Skand. Pyrenom.: 9. 1889.

Mycobank MB 148899.

≡ *Venturia haglundii* (Starb.) Sacc., Syll. Fung. 9: 694. 1891.

**Holotype:** Sweden, Östergötland, Simonstorp, on *Lycopodium complanatum*, together with *Mycosphaerella lycopodina*, E. Haglund (UPS, not seen).

**Description from protologue:** Perithecia ca. 100  $\mu\text{m}$  diam, with spines ca.  $40 \times 5$   $\mu\text{m}$ . Asci 25–30  $\times$  2.5–3.5  $\mu\text{m}$ . Ascospores fusiform,  $10\text{--}13 \times 1.5\text{--}2.5$   $\mu\text{m}$ .

**Material examined:** Sweden, Norrbotten, Nederkalix par., Kalix kommun, on *Lycopodium complanatum*, G. Sandberg, 14 June 1981, (UPS:BOT:F-130876) [no asci or ascospores seen]. Other material cited by Holm and Holm (1981): Petrak, F. Bohem. Mor. II: 1, No. 1246b. – Norway, Finnmark, Varanger, N om Nyborg, on *Lycopodium alpinum*, C. Sommerfelt, 8 Sept. 1851 (UPS:BOT:F-130878).

**Comments:** Holm and Holm (1981) re-studied this fungus and found it hardly distinct from *N. exilis*, apart for the unusual substrate, *Lycopodium alpinum* and *L. complanatum*. Ascospores were reported as  $9\text{--}11 \times 1.5$   $\mu\text{m}$  with several oil droplets. The species is regarded as rather common on *Lycopodium* subgen. *Diphysium* in Scandinavia, especially on the underside of young branches. The material examined here had perithecia 100–110  $\mu\text{m}$  diam, spines 25–50(–62)  $\mu\text{m}$  long, at the base 4–5  $\mu\text{m}$  wide, rather dark brown. Aculeate phialides were present.

*Niesslia kapitiana* Whitton, K.D.Hyde & McKenzie, Fungi associated with Pandanaceae, Springer, Fungal Divers. Res. Ser. 21: 78. 2012.

Index Fungorum number IF 563768.

**Holotype:** New Zealand, North Island, Kapiti Coast, north of Paraparaumu, Nikau Reserve, on decaying leaves of *Freycinetia banksii*, S.R. Whitton, 1 May 1997 (IFRD, not seen; isotype, HKU(M)12879).

**Description from protologue:** Perithecia 160–260 µm diam, black, surface densely covered with black spines, 10–26 µm long, 3–10 µm wide at base, straight or often curved or hooked; asci 58–80 × 8.5–11.5 µm, 8-spored; ascospores narrowly ellipsoidal, sometimes inequilateral, spinulose, 0- to 1-septate, 4-guttulate, surrounded by a gelatinous sheath, 13.5–21.5 × 4–5.5 µm. Monocillium-like anamorph with 50–130 µm long phialides, 2.0–3.2 µm wide at base, thick-walled, apex often spatulate. Conidia cylindrical, smooth-walled, 4–7.5 × 1.2–1.8 µm.

**Comments:** As noted above, the status of many *Niesslia* species described by Whitton et al. (2012) requires revision as their types seem to be lost (K.D. Hyde, pers. comm.).

*Niesslia lampracantha* W. Gams, spec. nov. Fig. 24a  
Mycobank MB 827307.

**Holotype:** France, Guernsey, Pleinmont, on *Cortaderia selloana*, leg. M.B. and J.P. Ellis, 22 Sep. 1948 (IMI 34465).

**Etymology:** Lampros (Greek) for bright and akantha (Greek) meaning thorn in reference to the relatively pale perithecial spines formed by this species.

**Description:** Perithecia scattered on dead leaves of *Cortaderia selloana* (Poaceae), brown, glossy, globose, collapsing cup-like when dry, about 100–125 µm diam. Spines not numerous, pale brown, thick-walled, not septate, 40–55 µm long, not sharply pointed. Asci cylindrical-clavate, with rounded apex, 8-spored, about 35 × 4–5 µm. Ascospores obliquely biserial in ascus, cylindrical, two-celled, smooth- and rather thick-walled, 6.5–7.5 × 1.5–1.7 µm, l/w 3.7–4.7. Monocillium-like phialides on natural substrate up to 80 µm long, with up to 0.5 µm thick walls, thick-walled in most of lower part, often ending in a sterile vesicle.

**Comments:** The pale brown, blunt perithecial spines are a conspicuous character unique to this species. The species should be compared with *N. nolinae*, which has hyaline spines often ending in a vesicle.

*Niesslia lanuginosa* Butin, Sydowia 27: 285. 1975 ('1973/74'). Fig. 24b, c  
Mycobank MB 318655.

**Holotype:** Chile, Valdivia, on *Araucaria araucana*, H. Butin, 20 June 1968 (ZTH 52541).

**Description from protologue:** Perithecia on a 50–250 µm thick, white subiculum of curled hyphae, 150–190 µm diam, spines dark brown, 40–60 µm long. Asci fusiform-cylindrical, 35–45 × 6.5 µm, uni- or biserial, 8-spored. Ascospores

ellipsoidal, 8–10 × 2.8–3.2 µm. **Observations from type by WG:** Spines up to 30 µm long, base 4–6.5 µm wide. Almost mature ascospores 7.5–9 × 2.2–2.7 µm, l/w 3.0–3.8, almost fusiform.

*Niesslia lobariae* Etayo & Diederich, Bull. Soc. Nat. Luxemb. 97: 107. 1996.

Mycobank MB 415601.

**Isotype:** Spain, Navarra, Valle de la Ulzama, Olcoz, on old thallus of *Lobaria pulmonaria*, J. Etayo, March 1993. No. 2551 (Herbarium Paul Diederich).

**Description from protologue:** Perithecia 50–90(–150) µm diam. Spines not numerous, 50–85 µm long, 5–7 µm wide in middle, with bulbous base, 9–16 µm diam. Asci 8-spored, clavate, 25–40 × 3–6 µm, uni- or biserial. Ascospores narrowly ellipsoidal to slightly fusiform, 4-guttulate, 4.5–8.5 × 1.5–2.5 µm.

**Herbarium specimens examined:** Papua New Guinea, Madang Prov., Huon Peninsula, Finisterre range, Yupna valley, Teptep village, trail in NNW and deep valley in N direction, 2500 m alt., P. Diederich, 30. Jul 1992. (Herb. P. Diederich 10804) [notes provided with specimen: asci 24–31 × 2.5–3.5 µm, ascospores 4.5–6 × 1.4–2 µm (measured in lactophenol); own observations: ascospores 4.0–4.5 × 1.5–1.7 µm, ellipsoidal, l/w 2.6–3.2; phialides aculeate, 20–40 µm long]. – Ecuador, Imbabura, Reserva Ecológica Regional Cotacachi-Cayapas, on *Lobaria subdissecta*, J. Etayo & Z. Palice, 1 Mar 2003 (Herb. Etayo 25474, no *Niesslia* seen). – Ecuador, Tulcán, Páramo El Ángel, de Tufiño a Maldonado, ca. km 10, zona de las Lagunas Verdes, páramo con frailejones, 4000 m alt., on *S. humboldtii* (Herb. Etayo 26983) [perithecia 160 µm diam.; ascospores ellipsoidal, rather firm-walled, 5.5–7 × 2.0–2.5 µm; phialides moderately thick-walled, aculeate, sometimes spatulate, 55–65 µm long].

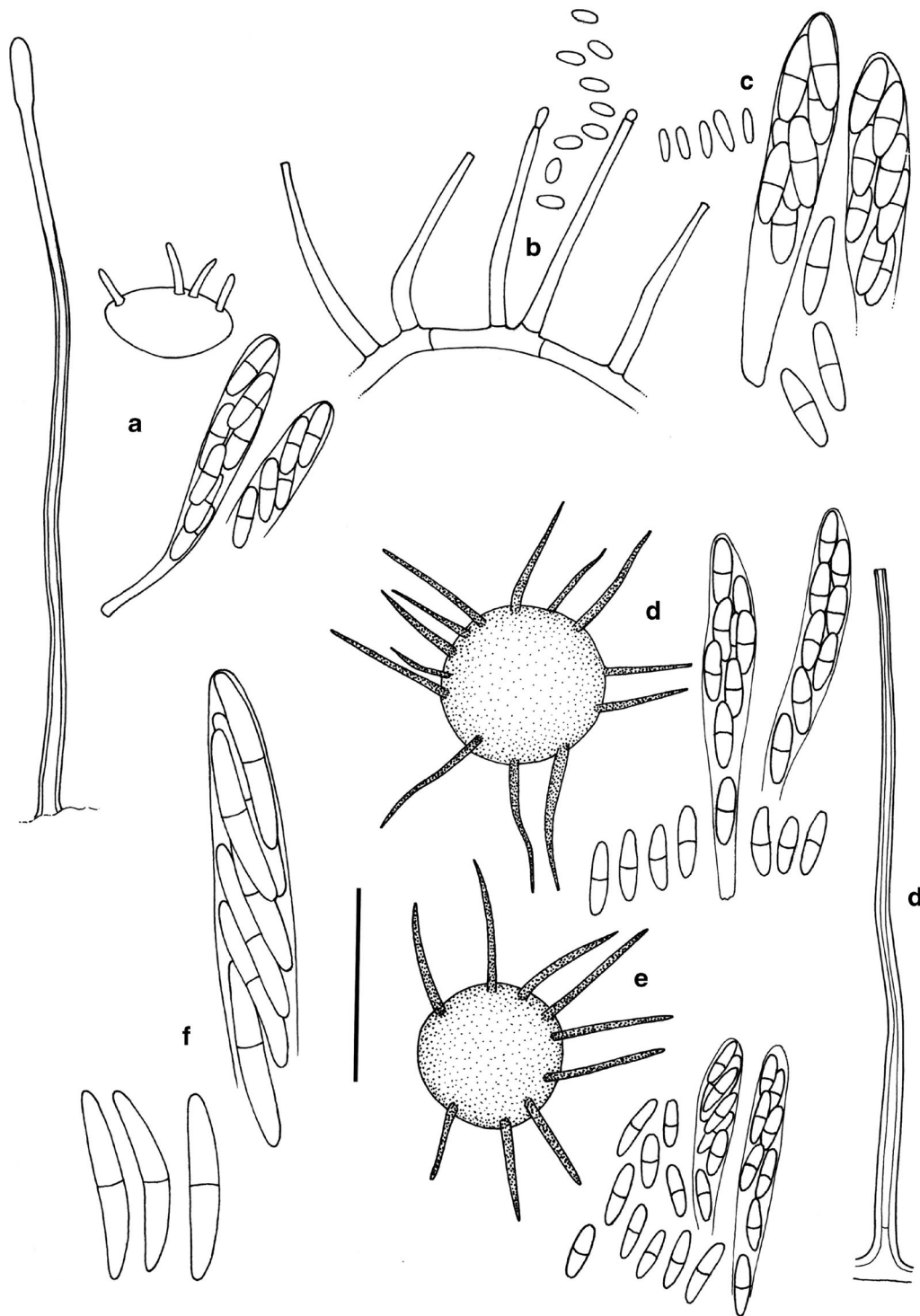
**Comments:** *Niesslia lobariae* has also been reported from France, Papua New Guinea and Spain; it differs from *N. cladoniicola* by much longer and wider spines and smaller ascospores.

*Niesslia macrospora* (Matsushima) W. Gams, comb. nov.  
Mycobank MB 827309.

Basionym: *Torulomyces macrosporus* Matsushima, Matsushima Mycol. Mem. 5: 31. 1987.

**Holotype:** Taiwan, Kenting Park, 'in rhachide floris mortuae *Arecae catechu*', 28 Feb. 1986 (MFC 6 T229, not seen, possibly lost in the 1995 Kobe earthquake).

**Description from protologue:** Colonies of anamorph slow-growing, finely granular, on V8-juice agar whitish. Vegetative hyphae 1.0–3.0 µm wide, hyaline, thin-walled, cyanophilic. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides consisting of a thick-walled, up to 0.5 µm, 30–70 µm long



**Fig. 24** *Niesslia lampracantha*. **a** Perithecium with spines (not drawn to scale), monocillium-like conidiophore, and ascus and partial ascus with ascospores from natural substratum (holotype IMI 34465). *Niesslia lanuginosa*. **b, c** Monocillium-like conidiophores, conidia, ascus, partial

ascus and ascospores (holotype ZTH 52541). *Niesslia muelleri*. **d, e** Perithecia with spines, asci, ascospores and monocillium-like conidiophore (d, IMI 100560a; e, IMI 112388). *Niesslia petrakii*. **f** Partial ascus and ascospores (K 249486). Scale bar, 20  $\mu\text{m}$ ; for perithecia in d, e, 200  $\mu\text{m}$

and 1.5–2.5(–4)  $\mu\text{m}$  wide basal portion, extending into an elongate vesicular expansion, 25–35  $\times$  4–6  $\mu\text{m}$ , and a short, thin-walled, 1.5–2  $\mu\text{m}$  wide conidiiferous tip, total length 60–

110  $\mu\text{m}$ . Conidia broadly fusiform, almost pointed at tip, slightly truncate at base, one-celled, smooth- and thick-walled, 14–20  $\times$  7–10  $\mu\text{m}$ , l/w 1.6–2.0. Chlamydo-spores absent.

**Comments:** The relatively thick-walled, large, lemon-shaped conidia formed by *N. macrospora* are unusual for *Niesslia*. The species is also illustrated in Matsushima (1989).

*Niesslia monocilliata* (Whitton, K.D. Hyde & McKenzie) W. Gams, comb. nov.

Mycobank MB 827582.

Basionym: *Melanopsamma monocilliata* Whitton, K.D. Hyde & McKenzie, Fungi associated with Pandanaceae, Springer, Fungal Divers. Res. Ser. 21: 73. 2012. MycoBank MB 563767.

**Holotype:** Hong-Kong, Hong Kong Island, Pokfulam, in forest off Hatton Road above Hong Kong University, on decaying leaves of *Pandanus furcatus*, S.R. Whitton, 25 Aug 1997 (IFRD218-014, not seen).

**Description from protologue:** Perithecia 60–140 µm diam, glabrous, without spines, covered with monocillium-like conidiophores, surrounded by a copious subiculum composed of the monocillium-like anamorph. Asci 31–42 × 6–8.5 µm, cylindrical to narrowly clavate, 8-spored, biseriate. Ascospores fusoid, narrowly ellipsoidal or cylindrical, straight or slightly curved, often somewhat inequilateral, 11–15 × 2.2–4 µm, smooth to finely verrucose, wall slightly thickened, often 4- to 6-guttulate. Phialides 45–110 µm long, 2–5 µm wide at base, wall strongly thickened, spatulate when immature. Conidia 4–4.5 × 1.5–2.2 µm, short-cylindrical, probably 2-guttulate.

**Comments:** The species was also found on *Pandanus furcatus* and *Freycinetia banksii*, in Hong Kong, Philippines and New Zealand. Because of the absence of spines, this species was classified in *Melanopsamma*, a genus that otherwise has *Stachybotrys* anamorphs; the absence of spines on the ascomata does not justify another generic classification. This is not the only species of *Niesslia* that lacks dark spines. This species is similar to *N. leucoula*.

*Niesslia muelleri* Ramchandra Rao, Curr. Sci. 35: 395. 1966. Fig. 24d, e

Mycobank MB 335162.

**Isotype:** India, Aurangabad, on dried leaves of *Ficus bengalensis* (IMI 112020) [the number IMI 112019 appearing in the original publication was based on incorrect information, D.L. Hawksworth, pers. comm. 22 May 1974].

**Description:** Perithecia scattered on dead leaves of *Ficus bengalensis*; ascomata dark brown, glossy, globose, collapsing cup-like when dry, up to 150 µm diam. Spines numerous, black, about 100–150 µm long, tapering from 8 to 9 µm at base towards moderately pointed apex. Asci cylindrical-clavate, 8-spored, about 40 × 5–8 µm. Ascospores irregularly biseriate, ellipsoidal, often slightly curved, two-celled, smooth-walled, (5–)6–7.5 × 1.3–1.6(–2.0) µm, l/w 2.5–4.7. A few thick-walled phialides (0.5 µm), exceeding 70 µm in length, were seen on specimens.

**Herbarium specimens examined:** Additional specimens from same origin in India (IMI 110967, 112388). – Republic of Zambia, on dead leaves of *Cassia siamea* on the ground, leg. A. Angus, 11 Feb. 1962 (IMI 100560a).

*Niesslia nobilis* (Sacc.) W. Gams, comb. nov.

Mycobank MB 827310.

Basionym: *Venturia nobilis* Sacc., N. Giorn. Bot. Ital. 8: 174. 1876.

**Holotype:** Italy, Selva, on decaying leaf of *Laurus nobilis* (PAD, filed under genus *Venturia* 2814).

**Description from protologue:** Perithecia scattered on substrate, 60–70 mm diam, dark brown, glossy, globose, collapsing cup-like when dry. Spines numerous, dark brown, 50 × 1.5 µm. Asci cylindrical with slightly truncate apex, 8-spored, biseriate, 35–40 × 4–5 µm. Ascospores biseriate, cylindrical-ellipsoidal, curved, two-celled, smooth-walled, 10 × 3 µm.

**Comments:** Own observation of the type supports classification of *Venturia nobilis* in *Niesslia*. Encountered monocillium-like conidiophores were 50 and 75 µm long, cylindrical conidia 3–3.5 × 1.2–1.5 × µm, and thick-walled spine 65 µm long. This species was excluded from *Venturia* by Sivanesan (1977). It should be compared with species forming dark brown spines and similarly sized ascospores such as *N. exosporioides*, *N. luzulae*, *N. puyae*, and *N. secedens*.

*Niesslia pacifica* Whitton, K.D. Hyde & McKenzie, Fungi associated with Pandanaceae, Springer, Fungal Divers. Res. Ser. 21: 80. 2012.

Index Fungorum number IF 563770.

**Holotype:** Republic of Vanuatu, Espiritu Santo Island, South Santo, on decaying leaves of *Pandanus* sp., E.H.C. McKenzie, 31. Oct 1996 (IFRD8996, not seen).

**Description from protologue:** Ascomata 60–100 µm diam, not collapsing when dry; surrounded by hyphal subiculum composed of the monocillium-like anamorph; spines black, 20–36 µm long, 8.5–15 µm wide at base. Asci narrowly clavate, 44–57 × 8–12 µm, 8-spored. Ascospores cylindrical to fusoid, straight or slightly curved, constricted at the septum, smooth- and slightly thick-walled, 15–23 × 4–5 µm. Monocillium-like phialides 42–90 µm long, 1.2–2.2 µm wide and very thick-walled at the base, sometimes spatulate or aculeate. Conidia not seen.

*Niesslia palmicola* K.D. Hyde, Goh, Joanne E. Taylor & J. Fröhl., Mycol. Res. 103: 1430. 1999.

Mycobank MB460792.

**Holotype:** Hong Kong, Lamma Island, on dead petiole of *Cocos nucifera*, 9 July 1994, J.E. Taylor & I.C. Taylor (HKU(M) 4219, not seen).

**Description from protologue:** Perithecia 125–135 µm diam. Spines absent, only conidiophores of anamorph seen



on surface. Asci cylindrical to broadly fusiform,  $36\text{--}46 \times 6.5\text{--}9 \mu\text{m}$ , 8-spored, uni- to biseriata. Ascospores cylindrical, tapering slightly towards ends,  $10\text{--}15 \times 2.5\text{--}4 \mu\text{m}$ . Monocillium-like phialides  $38\text{--}52 \mu\text{m}$  long,  $1.5\text{--}2 \mu\text{m}$  wide at base, widening at the apex. Conidia ellipsoidal,  $3\text{--}6 \times 1.5\text{--}2 \mu\text{m}$ .

**Comments:** This species is also known from the Seychelles.

*Niesslia pandanicola* Dulymamode, P. Cannon, K.D. Hyde & Peerally, Fungal Divers. 8: 92. 2001.

Mycobank MB 485104.

**Holotype:** Mauritius, Petrin Reserve, outside fence, on abaxial surface of dead, fallen leaf of *Pandanus palustris*, R. Dulymamode, 30 April 1995 (MHUM, Dulymamode P 48, not seen).

**Description from protologue:** Perithecia  $110\text{--}180 \mu\text{m}$  diam. Spines  $160\text{--}210 \mu\text{m}$  long,  $6\text{--}7 \mu\text{m}$  wide at base. Asci cylindrical,  $72\text{--}105 \times 7\text{--}10 \mu\text{m}$ , uni- or biseriata. Ascospores fusiform, straight or slightly curved,  $17.5\text{--}22.5 \times 3\text{--}4 \mu\text{m}$ . Phialides  $44\text{--}96 \mu\text{m}$  long,  $2\text{--}3 \mu\text{m}$  wide at base, apparently thin-walled, with swollen, sterile apex.

*Niesslia peltigericola* (D. Hawksw.) Etayo, Biblioth. Lichenol. 98: 153. 2008.

≡ *Wentomyces peltigericola* D. Hawksw., Trans. Br. Mycol. Soc. 74: 384. 1980.

≡ *Raciborskiomyces peltigericola* (D. Hawksw.) M.E. Barr, Mycotaxon 64: 165. 1997.

Mycobank MB 536938.

**Holotype:** UK, Scotland, Banff, on *Peltigera leucophlebia*, B.J. Coppins, 9 July 1975 (E, not seen).

**Description from protologue:** Perithecia  $80\text{--}125 \mu\text{m}$  diam, wall  $7\text{--}10 \mu\text{m}$  thick; spines to  $55 \times 4\text{--}5 \mu\text{m}$ . Asci ca.  $65 \times 10 \mu\text{m}$ . Ascospores ellipsoidal, tapering towards ends,  $12\text{--}16 \times 3.5\text{--}4.5 \mu\text{m}$ .

**Additional material examined:** Canada, British Columbia, Wells Grey Prov. Park, 8 km N of Clearwater, Spahats Creek Falls, 740 m alt., on *Peltigera leucophlebia*, P. Diederich et al., 24 Jul 2008 (Herb. P. Diederich No. 17705) [ascospores straight, ellipsoidal to almost fusiform,  $13\text{--}14 \times 4.5\text{--}5 \mu\text{m}$ ]. – Norway, Hordaland, W of Odda, Sundal, along path to Lake Bondhus, on *Peltigera britannica*, on a rock over mosses, parts of thallus with *Endococcus* sp., P. Diederich, 28 Jul 2009 (Herb. P. Diederich No. 16857) [perithecia about  $100\text{--}125 \mu\text{m}$  diam, spines  $20\text{--}32 \mu\text{m}$  long, ascospores almost fusiform,  $12.5\text{--}14.5 \times 4\text{--}5 \mu\text{m}$ ]. – Ecuador, Sierra sur, Parque Nacional *Podocarpus*, bajada hacia la salida, taludes y árboles de cuneta, 2500–2700 m alt., on *Peltigera polydactyla*, J. Etayo & Z. Palice, 5 Aug. 1999 (Herb. Etayo 25771) [only broken perithecia seen].

**Comments:** The species was originally described as having bitunicate asci. Subsequent to its description, several other species of *Niesslia* were found on *Peltigera* species. Thus this species is not restricted to this substrate.

*Niesslia petrakii* W. Gams, spec. nov. Fig. 24f

Mycobank MB 827311.

**Holotype:** Austria, Niederösterreich, on *Carex pilosa*, F. Petrak, Jun. 1939 (K 249486, as *Niesslia exosporioides*).

**Etymology:** The species is named to honour the memory of Franz Petrak, Vienna, who collected two cited specimens.

**Description:** Perithecia scattered on dead leaves of *Carex pilosa*, dark brown, glossy, globose, collapsing cup-like when dry,  $300\text{--}325 \mu\text{m}$  diam. Spines numerous, pale brown,  $300\text{--}320 \mu\text{m}$  long, about  $2 \mu\text{m}$  thick-walled, tapering from ca.  $8 \mu\text{m}$  at base towards pointed apex, repeatedly septate, some subhyaline spines ending in a vesicular expansion. Asci cylindrical with slightly truncate apex, 8-spored, ca.  $60 \mu\text{m}$  long. Ascospores curved, ellipsoidal-fusiform, two-celled, rather thick-walled, finely roughened,  $19\text{--}20(23) \times 2.5\text{--}2.7(3.5) \mu\text{m}$ , l/w 5.9–7.6. Not known in culture.

**Additional material examined:** Austria, Niederdonau, on *Carex pilosa*, F. Petrak, May 1940. – Belgium, Prov. Liège, Chaudfontaine, Beupays, on *Carex pendula*, leg. Mouton (BR, as *Niesslia exosporioides*) [this material has slightly larger ascospores,  $23\text{--}24 \times 3\text{--}4 \mu\text{m}$ ; second specimen on the sheet is *N. luzulae*].

*Niesslia philippinensis* Whitton, K.D. Hyde & McKenzie, Fungi associated with Pandanaceae, Springer, Fungal Divers. Res. Ser. 21: 82. 2012.

Index Fungorum number IF 563771.

**Holotype:** Philippines, Luzon Island, Quezon Region, Baranggay Llabac Luisiana, on decaying leaves of *Freycinetia negrosensis*, S.R. Whitton, 21 Oct 1996 (IFRD9000, not seen).

**Description from protologue:** Perithecia  $100\text{--}220 \mu\text{m}$  diam; spines numerous,  $88\text{--}138 \mu\text{m}$  long,  $6\text{--}9 \mu\text{m}$  wide at base, black, straight or slightly flexuous. Asci narrowly clavate,  $52\text{--}66 \times 11\text{--}14 \mu\text{m}$ , 8-spored, biseriata. Ascospores narrowly ovoid, ellipsoidal or fusoid, coarsely verrucose,  $17\text{--}20.5 \times 5\text{--}6.5 \mu\text{m}$ . Anamorph not observed.

**Comments:** *Niesslia philippinensis* may be a species of the similar genus *Ornatipora* erected for species with warted ascospores (Hyde et al. 1999).

*Niesslia pseudocyphellariae* Etayo & Diederich, in Etayo, Bull. Soc. Linn. Provence 51: 157. 2000.

Mycobank MB 328982.

**Description from protologue:** Perithecia  $90\text{--}110 \mu\text{m}$  diam; spines  $30\text{--}50 \mu\text{m}$  long,  $3.5\text{--}4 \mu\text{m}$  broad in middle; ascospores  $6.5\text{--}8 \times 2.0\text{--}2.2 \mu\text{m}$ , on material examined they were ellipsoidal to slightly fusiform, rather thin-walled,  $4.5\text{--}6.5 \times 1.7\text{--}2.2 \mu\text{m}$ , l/w 2–3.

**Herbarium specimen examined:** Papua New Guinea: Simbu Prov., Mount Wilhelm area, ca. 16 km on new road under construction from Gembogl to Goroka, 2800 m alt., on

*Pseudocyphellaria beccarii*, P. Diederich, 9 Aug. 1992 (Herb. P. Diederich 11109).

***Niesslia pulchriseta*** (Peck) M. E. Barr, apud Barr et al., Bull. New York St. Mus. 459: 38. 1986.

Mycobank MB 128518.

≡ *Sphaeria pulchriseta* Peck, Ann. Rep. New York St. Mus. 31: 50. 1879.

≡ *Acanthostigma pulchrisetum* (Peck) Sacc., Syll. Fung. 2: 208. 1883.

≡ *Eriosphaeria pulchriseta* (Peck) Sacc., Syll. Fung., adenda: XLVII. 1883, and 9: 698. 1891.

≡ *Trichosphaeria pulchriseta* (Peck) Ellis & Everh., N. Amer. Fungi: 151. 1892.

≡ *Lohwagiella pulchriseta* (Peck) Petrak, Sydowia 23: 280. 1970. Petrak (1970) differentiated *Lohwagiella* from *Trichosphaeria* for this fungus.

= *Venturia parasitica* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 2: 233. 1890 (fide Barr 1993).

= *Trichosphaeria flavida* Ellis & Everh., N. Amer. Pyrenomyc.: 152. 1892 (fide Barr 1993).

= *Trichosphaeria cellaris* Ellis & Everh. In herb. 1890 (fide Barr 1993).

**Lectotype, here designated:** USA, New York, Delaware Co., Griffins, on poplar wood chips, C.H. Peck, Sept. 1877, North American Fungi, Ser. II (NYS f2492, MBT 383288).

**Description:** Perithecia densely scattered, black, glossy, globose, with inconspicuous ostiole, collapsing cup-like when dry, 100–115 µm diam. Spines numerous, dark brown, (15–)30–50 µm long, tapering from 3 to 4 µm at base towards pointed apex. Ascoma wall 12–18 µm thick. Asci cylindrical-clavate, with slightly truncate apex, 8-spored, 25–30 × 5 µm. Ascospores ellipsoidal-fusiform, straight, two-celled, smooth- and thin-walled, septum hardly visible, 6–7 × 1.2–1.5 µm, l/w 4.0–5.0.

**Additional material examined:** Other specimens cited by Barr et al. (1986) and deposited in herb. Petrak.

**Comments:** Petrak (1970) gave a full description of *N. pulchriseta*; he observed minute, globose, non-ostiolate ascomata with scanty paraphyses, which would not support classification of this species in *Niesslia*. However, Barr et al. (1986) observed a minutely papillate ostiole and periphysate apical canal in the type. According to Barr (l.c.) the small ascospores, 5.5–7.5 × 1.0–1.5(–2.0) µm, and habitat on wood distinguish it from *N. exilis*. A living culture, CBS 914.96, F. Candoussau No. 6240, was initially identified as *N. pulchriseta*. It has more allantoid and slightly longer ascospores and is probably not identical with Peck's species. It is described above as *N. allantoides*.

***Niesslia puyae*** (Speg.) W. Gams, comb. nov. Fig. 25a  
Mycobank MB 827312.

Basionym: *Venturia puyae* Speg., Revta Fac. Agron. Vet. La Plata 6: 51. 1910, Fungi Chil. No. 84.

**Holotype:** Chile, Santiago, Cerro San Cristobal de Santiago, on dead leaf of *Puya coerulea* (Bromeliaceae), leg. C. Spegazzini, 1909 (LPS 5639).

**Description:** Perithecia scattered on substrate, dark brown, glossy, globose, collapsing cup-like when dry, 100–140 µm diam. Spines numerous (10–20), dark brown, 40–80 µm long, tapering from 6 to 10 µm at base towards pointed apex. Asci cylindrical, slightly tapering upwards, with slightly truncate apex, 50–55 × 7–8 µm, 8-spored. Ascospores biseriolate, ellipsoidal, two-celled, smooth- and moderately thick-walled, 4-guttulate, 8–12 × 3.5–5 µm, l/w 2.4–3. Phialides aculeate, basally aggregated, thick-walled (ca. 0.5 µm), fragmented, monocillium-like.

**Comments:** The species differs from the similar *N. coloradensis* by biseriolate ascospores with a thinner wall. It is not known in culture. Sivanesan (1977) did not find any ascospores in some ascomata of the type. The observation of a few monocillium-like phialides supports classification of this species in *Niesslia*.

***Niesslia robusta*** Tretiach, Nova Hedwigia 75: 358. 2002.  
Mycobank MB 373714.

**Holotype:** Italy, Toscana, Mte Amiata, loc. Acquapassante (Abbadia S. Salvatore, SI), trachytic rocks, ca. 1100 m alt., on crustose lichen *Tephromela grumosa*, TSB 33,871 (not seen); isotype, UPS:BOT:L-122329, not seen.

**Description:** Perithecia formed on lichen thallus, dark brown, glossy, globose, collapsing cup-like when dry, 130–200(–350) µm diam. Spines numerous, dark brown, sometimes 1-septate, 25–35(–45) µm long, tapering from 3 to 4 µm at base towards pointed apex. Ascoma wall 20–25 µm thick. Asci clavate, 4–8-spored, 50–55 × 6–8 µm. Ascospores ellipsoidal, straight, two-celled, smooth- and rather thick-walled, in 8-spored asci 9.5–12.5 × 2.5–3 µm, l/w 3.5–4.4, in 4-spored asci 14.5–17.5 × 4.5–5.2 µm, l/w 2.6–3.4.

**Herbarium specimen examined:** Italy, Umbria, Monte Amiata, Acquapassante, Trieste, 1100 m alt., on *Tephromela grumosa*, M. Tretiach, 8 June 2001 (paratype, Herb. Lich. P.L. Nimis TSB 34,122).

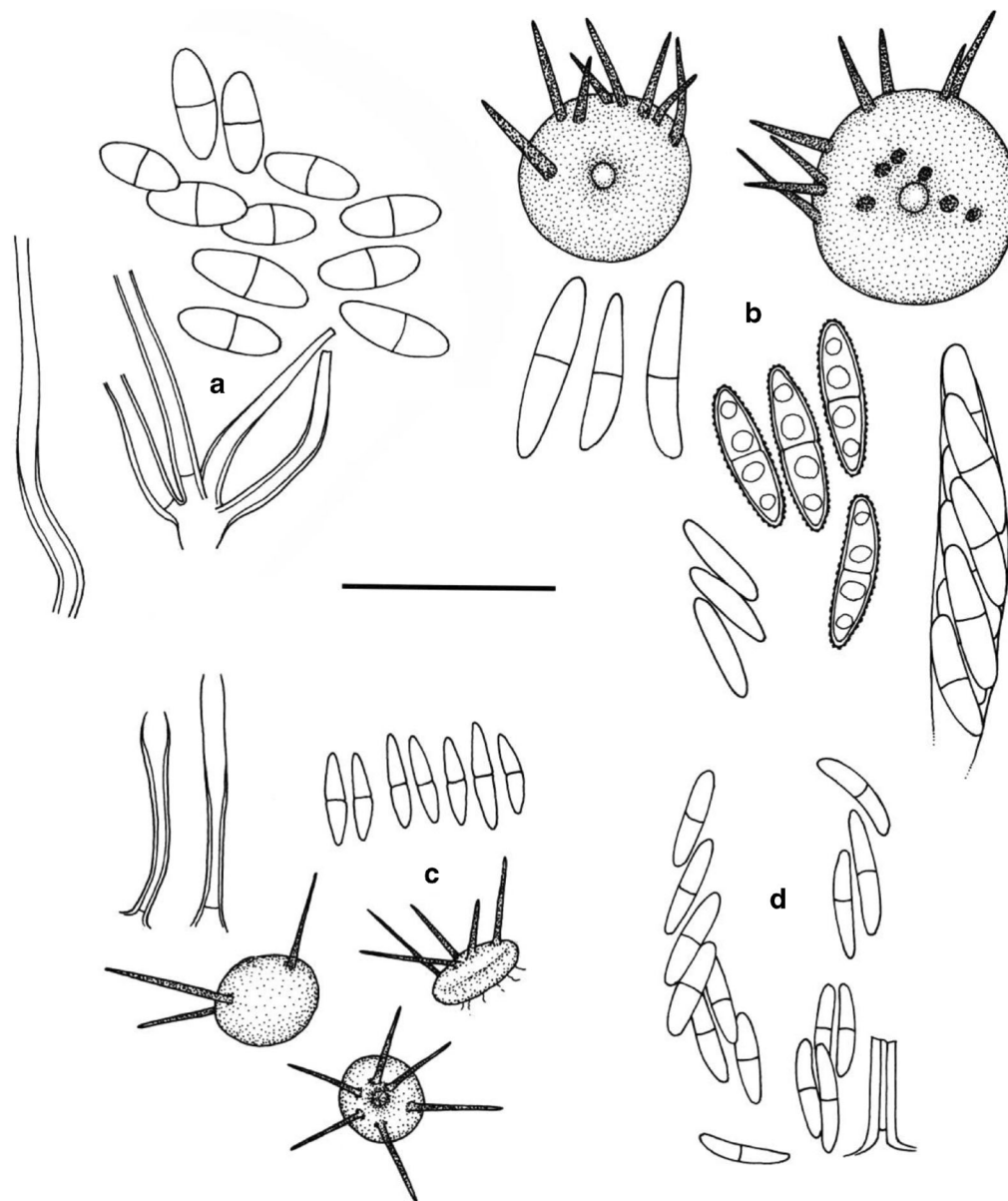
**Comments:** Attempts at isolation from another, secondary specimen were unsuccessful.

***Niesslia sabalicola*** (Ellis & Everh.) W. Gams, comb. nov. Fig. 25b

Mycobank MB 827318.

Basionym: *Venturia sabalicola* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 42: 233, 1890.

? = *Venturia andicola* Speg., An. Mus. Nac. Hist. Nat. Buenos Aires 23: 50: Mycet. Argent. VI, 1912.



**Fig. 25** *Niesslia puyae*. **a** Ascospores and monocillium-like conidiophores (holotype, LPS 5639). *Niesslia sabalicola*. **b** Perithecia with spines, partial ascus, ascospores and conidia (holotype NY). *Niesslia secedens*. **c** Monocillium-like conidiophores, ascospores

and perithecia (holotype). *Niesslia spegazziniana*. **d** Ascospores and base of monocillium-like conidiophore (lectotype ex BR). All from natural substrates. Scale bar, 20  $\mu\text{m}$ ; for perithecia in **b**, **c**, 200  $\mu\text{m}$

**Holotype:** USA, Louisiana, Pointe à la Hache, P.O., Bayou, Chene, on dead leaves of *Sabal palmetto*, leg. A.B. Langlois, 25 Oct. 1888, Flora Ludoviciana No. 1546 (NY 00938203).

**Description:** Perithecia, dark brown, glossy, globose, collapsing cup-like when dry, 150–200  $\mu\text{m}$  diam. Spines sparse, dark brown to black, 90–200  $\mu\text{m}$  long, 2 to 3 times diameter of perithecium, tapering from 7 to 10  $\mu\text{m}$  at base towards pointed apex. Asci 8-spored, ca. 50–60  $\times$  8–9  $\mu\text{m}$ . Ascospores biseriate, oblong ellipsoidal–naviculoid, slightly curved, two-celled, 4-guttulate, thick-walled and distinctly roughened, 15.5–17.5  $\times$  3–4  $\mu\text{m}$ , l/w 3.7–5.4.

**Herbarium specimen examined:** Argentina, Prov. Mendoza, Mendoza, Cerro del Plata, on culms and sheaths of *Elymus barbatus*, leg. C. Spegazzini, Oct. 1909 (holotype of *Venturia andicola*, LPS 5742).

**Comments:** The large, thick-walled, warted ascospores should allow recognition of this species when it is recollected. The species was probably incorrectly synonymized with *N. exosporioides* by Barr (1993) and Hyde et al. (1999).

*Niesslia secedens* (Tassi) W. Gams, comb. nov. Fig. 25c  
Mycobank MB 827319.

Basionym: *Venturia secedens* Tassi, Boll. Lab. Orto Bot. Siena 1900: 53.

**Holotype:** Italy, Siena, Botanical Garden, on decaying leaves of *Trachelospermum jasminoides*, F. Tassi, July 1900 (SIENA Vol: 37, Fo: 27).

**Description from protologue:** Perithecia 40–50 µm diam. Spines 8–10. Asci oblong, 8-spored, 32–36 × 6–7 µm. Ascospores oblong ellipsoidal, 1-septate, 10 × 2 µm.

**Observations by WG:** Perithecia scattered on lower surface of decaying leaves, dark brown, glossy, collapsing cup-like when dry, 80–100 µm diam. Spines few in number, dark brown, 50–90 µm long, often longer than diameter of perithecium, tapering from about 5 µm at base towards pointed apex. Asci 8-spored. Ascospores slightly fusiform, two-celled, smooth- and thin-walled, 7.5–10 × 1.5–1.7 µm, l/w 4.9–5.9. A few monocillium-like phialides present, 20–25 µm long, wall 0.5 µm thick, mostly ending in an elongate sterile vesicle.

**Comments:** The name *secedens* apparently suggests that the perithecia secede easily from the substrate, a character that is not particularly diagnostic among species of this genus.

*Niesslia spegazziniana* (Cooke) W. Gams, comb. nov. Fig. 25d

Mycobank MB 827320.

Basionym: *Venturia spegazziniana* Cooke, apud Saccardo in *Michelia* 1: 440. 1878.

**Lectotype, designated here:** Italy, Belluno, Conegliano, ‘in sarmentis corticatis emortuis *Vitis viniferae*’, P.A. Saccardo, Oct 1878 (BR 5020096940375, MBT 383283) [best material, matching protologue].

**Description from protologue:** Perithecia 100–125 µm diam. Spines 40 × 3.5–4 µm. Asci cylindrical-clavate, 35–40 × 5.5–6 µm. Ascospores biseriate or obliquely uniseriate, cylindrical to fusiform, 10–11 × 3 µm. **Observations by WG:** Perithecia formed on dead stem of *Vitis vinifera*, dark brown, glossy, globose, collapsing cup-like when dry, 130–150 µm diam. Spines sparse, dark brown, 40–70 µm long. Asci clavate, 8-spored, 30–45 × 5–5.5 µm. Ascospores ellipsoidal-fusiform, straight or slightly curved, two-celled, smooth- and thin-walled, 8.5–10(–12) × 1.5–2.5 µm, l/w 3.8–6.2. Fragments of phialides with 1 µm thick walls, longer than 50 µm. Conidia in the Roumeguère material aculeate, 4.5–6 × 1.0–1.5 µm.

**Herbarium specimens examined:** Syntype material preserved in several collections (same location and host as lectotype): Herb. Saccardo (PAD) [perithecia half-submerged, compact, flattened, ascospores 2-celled, brown, thus unlike *Niesslia*; drawn perithecia, spines, and ascospores corresponding with description]. – De Thümen, Mycotheca universalis 1357 (L) [*Niesslia*-like perithecia sparse, no ascospores]. – De Thümen, Mycotheca universalis 1357 (K) [no *Niesslia* seen]. – Saccardo, Mycotheca Veneta 1360 [no *Niesslia* seen; perithecia in dense clusters in fissures of stem]. – De Thümen,

Mycotheca universalis 1357 (BR) [spines as in holotype, no ascospores]. Herb. Mycol. M.C. Cooke (K) [ascospores 8–8.5 × 2.5 µm, spines dark brown, 60 µm long]. – France, Toulouse, Haute Garonne, ‘sur les sarments desséchés sur pied du *Vitis vinifera*’, A. Roumeguère, autumn 1887, Roumeguère, Fungi sel. Exsiccati 4767 (K) [no *Niesslia* seen]. Same collection, 4767 (BR 5020096941389) [spines ca. 40 µm long, asci 40–45 × 5–5.5 µm, ascospores up to 1.5 µm, with pointed ends, not necessarily *N. spegazziniana*].

**Comments:** *Niesslia spegazziniana* was recognised as belonging to *Niesslia* by Sivanesan (1977), but he did not see any ascospores. The species must be compared with *Venturia missionum* (= *Niesslia exigua*).

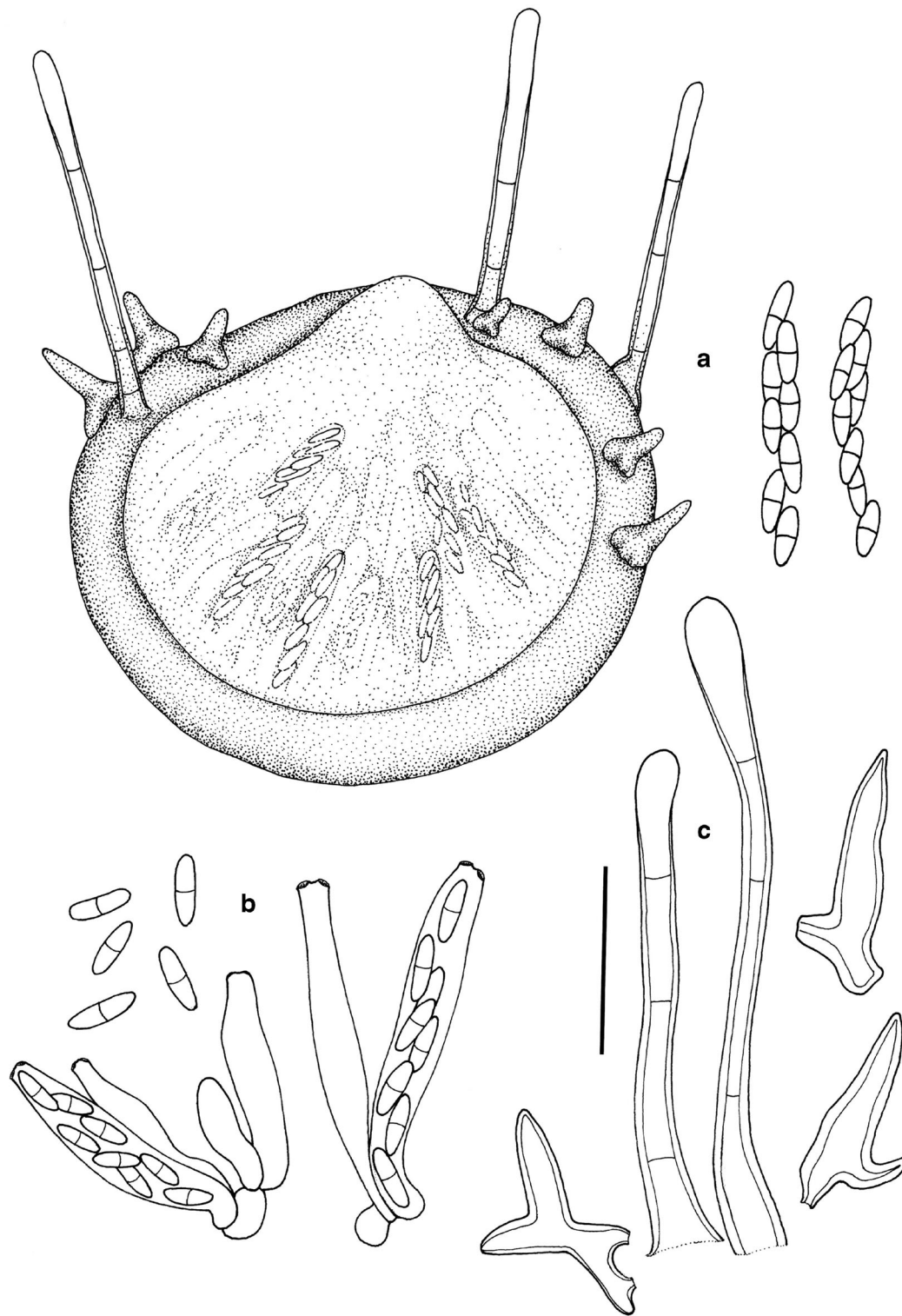
*Niesslia stictarum* (Nannf. & R. Sant.) R. Sant. & Tretiach, in Tretiach, Nova Hedwigia 75: 364. 2002. Fig. 26a–c  
Mycobank MB 373711.

≡ *Nitschkiopsis stictarum* Nannf. & R. Sant., apud Nannfeldt, Svensk bot. Tidskr. 69: 322. 1975.

**Holotype:** Kenya, Central Prov., Nanyuki Distr., Mt. Kenya, W. slope, National Park Road (Naro Moru Track), in bamboo zone, on *Sticta ambavillaria* on *Arundinaria alpina*; ca. 2700–3100 m. alt., R. Santesson 22144f, 23 Jan. 1970 (UPS:BOT:L-112114).

**Description from protologue:** Perithecia superficial at maturity, scattered, globose, cup-shaped when dry, dark brown, 90–120 µm diam, covered by up to 25 spines and 6 hairs, papilla slightly pronounced and paler than body, ca. 25–30 µm diam. Spines 1-celled, thick-walled, dark brown to black, 12–20 µm, 3–5 µm wide, basally abruptly widening to 6–12 µm, pointed at apex. Hairs 2–5-celled, thin-walled, hyaline, 55–85 µm long, 3.5–4 µm wide, apical and basal part slightly enlarged. Perithecial wall membranaceous, pseudoparenchymous, in thin sections rather pale brown, 10–15 µm thick. Asci clavate, with apical ring, 8-spored, 30–40 × 5–6 µm. Ascospores uni- or biseriate, 1-septate, fusiform-ellipsoidal, hyaline, thin-walled, 6–7 × 1.5–2 µm.

**Herbarium specimens examined:** All on *Sticta ambavillaria*. Kenya, Nanyuki Distr., Mt. Aberdare, along Wandera’s Track, ca. 3300 m alt., on trunk of *Stoebe kilimandscharica*, I. & H. Hedberg, No. 5024 L, 15 Jul. 1971, det. R. Santesson (UPS:BOT:F-521846). – Tanzania, Arusha Prov., Mt. Meru, E. slope, ca. 2 km N of Kitoto Camp, in high and dense ericaceous bushland (montane forest belt), 2450 m alt., on trunk of *Stoebe kilimandscharica*, R. Santesson, No. 22960, 7 Jan. 1971 (UPS:BOT:F-521850). – In high and dense ericaceous bushland (montane forest belt), 2450 m alt., on *Hypericum lanceolatum*, R. Santesson, No. 22969, 7 Jan. 1971 (UPS:BOT:F-521848). – Tanzania, Kilimanjaro Prov., Mt. Kilimanjaro, W slope, E of Lemosho Glades, ericaceous belt, 2800–2900 m alt., on various high shrubs, R. Santesson, No. 21297a, 14 Jan. 1970 (UPS:BOT:F-521851). – Tanzania, Arusha Prov., Mt. Meru,



**Fig. 26** *Niesslia stictarum*. **a** Perithecium with short spines and sterile, monocillium-like conidiophores, and ascospores. **b** Asci and ascospores. **c** Monocillium-like conidiophores from perithecia and perithecial spines (all from holotype UPS L-112114). Scale bar, 20  $\mu\text{m}$ ; for perithecium in **a**, 40  $\mu\text{m}$

E slope, road to the crater, ca. 1900 m alt., on the upper branches of a big tree in a montane forest, R. Santesson, No. 23073b, 7 Jan. 1971 (UPS:BOT:F-521849). – Peru, Dept.

Puno, near Sachapata, on *Sticta tomentosa*, leg. W. Lechler, Plantae peruviana No. 3124, Sep. 1854, det. R. Santesson (UPS:BOT:F-521852). – Papua New Guinea, Simbu Prov.,

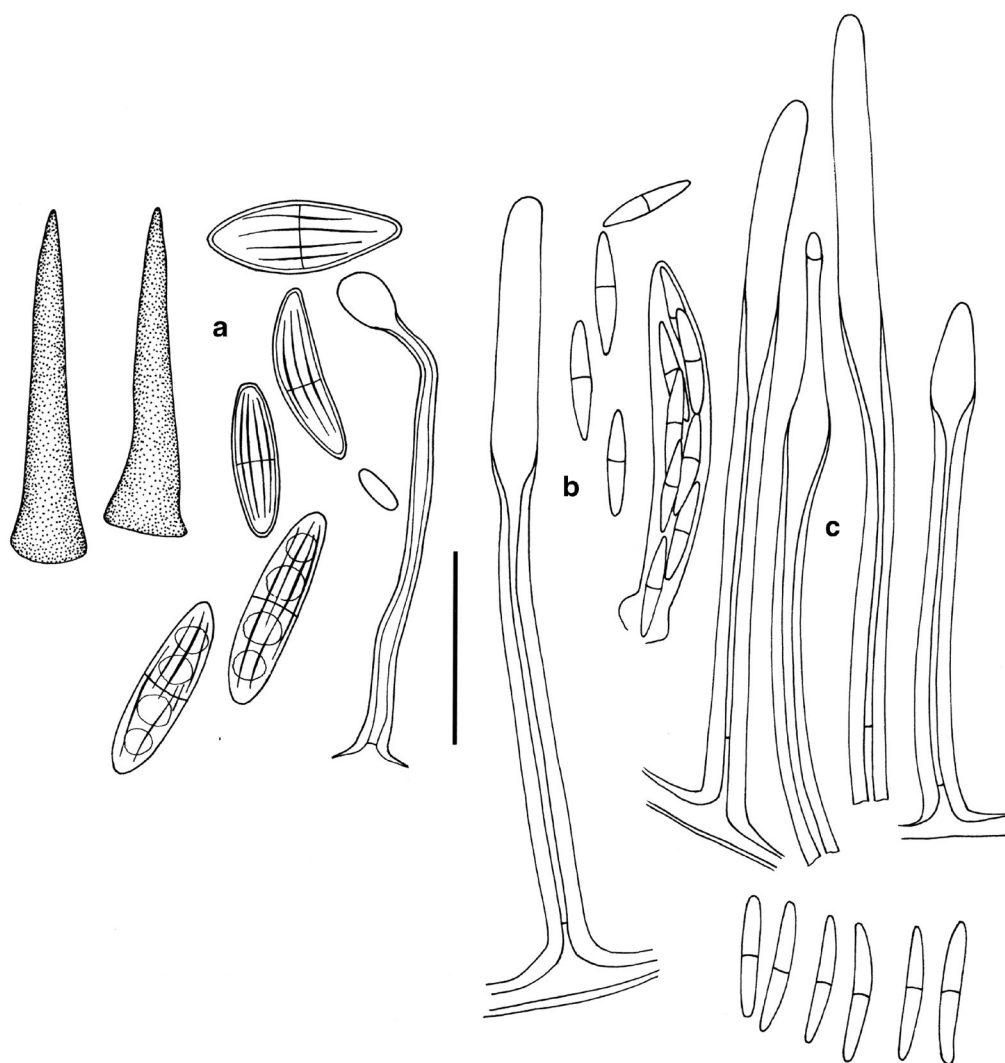
Mount Wilhelm area, Bundi Gap, on road Keglsugl-Bundi, 2800 m alt., on *Peletigera rufescentiformis*, P. Diederich, 4 Aug. 1992 (Herb. P. Diederich 11020, as *Niesslia* sp.).

**Comments:** This is the type and only species of the genus *Nitschkiopsis*. The authors list material in collections originating from Eastern Africa and Peru and Brazil in South America. They compared it to the other members of the Nitschkiaceae (Coronophorales) and distinguished it especially because of the lichenicolous habit, but did not compare it to *Niesslia*. The occurrence of both dark and pale spines and hyaline conidiophores on perithecia is comparable to the phialide-like vesiculate structure seen in *N. antarctica*. The paler spines, however, were often 3-septate and up to 75  $\mu\text{m}$  long. Typical 50–75  $\mu\text{m}$  long monocillium-like aculeate phialides were observed in

Hedberg 5024 L. It could not be ascertained whether a group of subglobose conidia belonged to this fungus. The only argument to place the present species apart from *Niesslia* is the slightly more pronounced apical ring in the asci.

Samuels and Barr (1997) regarded *Nitschkiopsis* as a synonym of *Niesslia*. Etayo (2002) followed them and regretted the absence of the correct recombination, without validly introducing it. Subsequently, a few more lichenicolous *Niesslia* species were described, and are included in this revision. The distinct apical ring in the asci and the two kinds of spines are unique features of *N. strictarum*.

*Niesslia striatispora* W. Gams, spec. nov. Fig. 27a  
Mycobank MB 827322.



**Fig. 27** *Niesslia striatispora*. **a** Perithecial spines, striate ascospores, conidium, and monocillium-like conidiophore (U 178544B). *Niesslia sydowii*. **b** Monocillium-like conidiophore, ascus and ascospores (Fungi

exotici exsiccati No. 806, isotype in B). **c** Monocillium-like conidiophore and ascospores (holotype in BR). Scale bar, 20  $\mu\text{m}$ ; for perithecial spines in a, 50  $\mu\text{m}$

**Holotype:** Indonesia, Java, Bogor, on dead culm of bamboo, leg. Sri Sabani, Feb. 1956, ex Herb. K.B. Boedijn (U 178544B).

**Etymology:** The epithet *striatispora* refers to the longitudinally striate ascospores.

**Description:** Perithecia dark brown, glossy, globose, collapsing cup-like when dry. Spines numerous, black, 80–95 µm long, tapering from 20 to 22 µm at base towards pointed apex. Asci cylindrical with slightly truncate apex, 8-spored. Ascospores ellipsoidal–fusiform, some slightly curved, two-celled, thick-walled, longitudinally striate with 8–10 lines of unequal length, 16–21 × 4.5–7.7 µm, l/w 2.7–4.1. A few thick-walled, about 0.8 µm, monocillium-like phialides, 50–60 µm long, ending in a sterile vesicle, were seen on the type material.

*Niesslia sukauensis* Matsushima, Matsushima Mycol. Mem. 10: 122. 2003. No. 1370.

Mycobank MB 376127.

**Holotype:** Malaysia, Sabah, Sukau, on a leathery dicotyledonous leaf, T. Matsushima, Nov. 1999. MFC-21043, not seen.

**Description from protologue:** Perithecia black, 120–160 µm diam, spines 6–13 on each ascoma, (40–)60–120 µm long. Paraphyses torulose, disappearing at maturity. Asci 8-spored. Ascospores cylindrical–fusiform, often slightly inequilateral, verruculose, hyaline, 12–19 × 2.0–2.5 µm. Vegetative hyphae 1.5–4 µm wide. Sporulation nematogenous or plectonematogenous. Monocillium-like anamorph. Phialides 32–80 µm long, thick-walled base 1.2–1.5 µm wide, then widening to 2–3.5 µm, and tapering again to 1 µm in a 7.5–12.5 µm long, somewhat undulate apical part. Conidia cylindrical–ellipsoidal, (4.5–)5–6.5(–7.5) × 1.5–2.0 µm.

*Niesslia sydowii* W. Gams, spec. nov. Fig. 27b, c  
Mycobank MB 827321.

**Holotype:** Venezuela, near Colonia Tovar, on dead leaves of *Podocarpus coriaceus*, ‘saepe in consortio aliorum fungorum’, H. Sydow, 19 Jan. 1928, Sydow, Fungi exotici exsiccati No. 806, as *Niesslia exilis* (BR 5020075759028); isotype in B.

**Etymology:** The species is named to honour the memory of Hans Sydow, Berlin, who collected the cited specimen.

**Description:** Perithecia sitting on a white subiculum, dark brown, glossy, globose, collapsing cup-like when dry, 135–150 µm diam. Spines numerous, dark brown, about 40 µm long, tapering from up to 7 µm at base towards pointed apex, or paler and longer, ending in a vesicular extension like phialides. Asci cylindrical with slightly truncate apex, 8-spored, about 30–40 × 5–6 µm. Ascospores obliquely biseriate, sharply fusiform, straight or slightly bent, two-celled, thin- and smooth-walled, 11–14.5 × 1.7–2.0 µm, l/w 5.5–8.2. Numerous monocillium-like phialides, thick-walled (1–1.8 µm), 4–4.5 µm wide near base, mostly ending in a

thin-walled, 4–5 µm wide, elongate, sterile vesicle, altogether up to more than 90 µm long. Conidia not seen.

**Comments:** *Niesslia sydowii* differs from *N. exilis* by the well-developed subiculum and thick-walled phialides. It is thus morphologically similar to *N. subiculosus*, which has ascospores with broadly rounded ends.

*Niesslia taiwanensis* Sivan. & W.H. Hsieh, Mycol. Res. 93: 342. 1989.

Mycobank MB 136314.

≡ *Ornatisora taiwanensis* (Sivan. & W.H. Hsieh) K.D. Hyde, Goh, Joanne E. Taylor & J. Fröhl., Mycol. Res. 103: 1438. 1999.

**Holotype:** Taiwan, Nantou, on sheath of *Chrysalidocarpus lutescens*, A. Sivanesan, 30 Dec. 1987 (IMI 323932, not seen).

**Description from protologue:** Perithecia brown-black, subglobose, compressed cup-shaped when dry, 100–215 µm diam. Spines septate, 130–165 µm long, 7–10 µm wide at base, often variously bent. Ascoma wall 7–15 µm thick. Paraphyses filiform, septate. Asci 80–110 × 11–14 µm, with biseriate spores. Ascospores narrowly ellipsoidal, slightly curved, sometimes slightly constricted at septum, 16–27.5 × 4–8 µm, mostly 4-guttulate, finely verruculose under oil immersion. Numerous phialides of monocillium-like anamorph scattered over the substrate.

**Comments:** Because of the very fine spore ornamentation and the presence of a monocillium-like anamorph, the transfer to *Ornatispora* does not seem justified. In spite of several attempts, the author did not succeed in growing this species in culture (Sivanesan and Hsieh 1989). This species was also described in Whitton et al. (2012).

*Niesslia tatjanae* (S.Y. Kondr.) Etayo, in Etayo & Sancho, Biblioth. Lichenol. 98: 149. 2008.

Mycobank MB 536936.

≡ *Wentomyces tatjanae* S.Y. Kondratyuk, Muelleria 9: 96 (1996).

**Holotype:** Tasmania, Florentine Valley, by track 7, about 55 miles (88 km) WNW of Hobart, in high forest of *Nothofagus cunninghamii* in moderate shade with numerous mosses, growing on fallen logs, on *Pseudocyphellaria coronata* (Müll. Arg.) Malme thalli, R. Melville, J.H. Willis, W.M. Curtis & D. Paton 2339, 13 Dec 1952 (BM, not seen).

**Description from protologue:** Perithecia (80–)120–180 µm diam. Spines numerous, 18–36 × 2.5–5.5 µm. Asci (40–)54–63 × 5.5–6.5(–7) µm. Ascospores ellipsoidal, 6–11(–12) × (1.5–)2–3.5(–4) µm.

**Herbarium specimens examined:** Canada, Brit. Columbia, Wells Grey Provincial Park, Trophy Mountain, close to Trophy Meadows, 1740 m alt., on *Peltigera aphthosa* on the ground, P. Diederich & D. Ertz, 24 Jul 2008 (Herb. P. Diederich No. 17287, as *N. peltigericola*) [perithecia 110 µm diam; spines

dense, 30–50  $\mu\text{m}$  long; ascospores more fusiform, 8.5–10  $\times$  2.2–2.7  $\mu\text{m}$ , possibly representing this species]. – Canada, Brit. Columbia, Wells Grey Provincial Park, Helmeken Falls, alt. 750 m, on *Peltigera leucophlebia*, P. Diederich & D. Ertz, 23 Jul 2008 (Herb. P. Diederich No. 17297, as *N. peltigericola*) [perithecia 150  $\mu\text{m}$  diam, ascospores ellipsoidal, 7.5–9  $\times$  2.0–2.5  $\mu\text{m}$ , possibly representing this species].

**Comments:** A similar specimen encountered by Etayo and Sancho (2008) on *Pseudocyphellaria granulata* in Chile is reminiscent of *N. tatjanae* with perithecia having numerous spines, 20–49(–60)  $\mu\text{m}$  long and 6–11  $\mu\text{m}$  wide at the bulbous base, clavate, biseriate asci, 29–33  $\times$  5–6  $\mu\text{m}$ , and ellipsoidal to subcylindrical, slightly curved ascospores, 8–10.5  $\times$  2.0–2.5  $\mu\text{m}$ .

*Niesslia vaginata* Whitton, K.D. Hyde & McKenzie, *Fungi associated with Pandanaceae*, Springer, Fungal Divers. Res. Ser. 21: 84. 2012.

Index Fungorum number IF 563772.

**Holotype:** Vanuatu, Efate, near Eton, on decaying leaves of *Pandanus tectorius*, E.H.C. McKenzie, 27 Oct 1996 (IFRD8998, not seen).

**Description from protologue:** Perithecia 60–98  $\mu\text{m}$  diam, sitting on a hyaline hyphal subiculum containing conidiophores of the monocillium-like anamorph. Spines 5–20 per perithecium, 30–64  $\mu\text{m}$  long, 8.5–16  $\mu\text{m}$  wide at base. Asci narrowly clavate, 32–44  $\times$  6.2–7.5  $\mu\text{m}$ , 8-spored, irregularly biseriate. Ascospores cylindrical, finely verrucose, surrounded by a hyaline gelatinous sheath, 9.5–13  $\times$  2–3  $\mu\text{m}$ . Monocillium-like phialides 34–100  $\mu\text{m}$  long, 1.5–3  $\mu\text{m}$  wide at thick-walled base, often with spatulate end. Conidia cylindrical, 6.5–8.5  $\times$  1.5–2  $\mu\text{m}$ .

*Niesslia yaganae* Etayo, in Etayo & Sancho, *Biblioth. Lichenol.* 98: 152. 2008.

Mycobank MB 536937.

**Holotype:** Chile, Navarino, camino desde Lago Róbalo a Puerto Williams, 425 m alt., on *Nephroma antarcticum* on *Nothofagus* sp., J. Etayo et al., 20 Jan. 2005 (MAF, not seen).

**Description from protologue:** Perithecia 170–250  $\mu\text{m}$  diam, wall about 15  $\mu\text{m}$  thick. Spines 35–95  $\times$  4–7  $\mu\text{m}$ , interspersed with hyaline hairs. Asci clavate, ca. 40  $\times$  6  $\mu\text{m}$ . Ascospores ellipsoidal to fusiform, slightly curved, (10–)12–15(–17)  $\times$  3–4.5  $\mu\text{m}$ . **Observations by WG:** Perithecia 250–350  $\mu\text{m}$  diam. Spines pale to dark brown, 40–65(–80)  $\mu\text{m}$  long, base 6.5  $\mu\text{m}$  wide. Ascospores ellipsoidal, somewhat fusiform tapering, minimally curved, 10.5–14.5  $\times$  2.5–3  $\mu\text{m}$ , l/w 3.8–5.

**Herbarium specimen examined:** Chile, Navarino, subida al Cerro Bandera, desde la base hasta el mirador, bosque de lengas Viejo con muchos troncos caídos, 80–300 m alt., on *Nephroma antarcticum* on *Nothofagus pumilio*, J. Etayo et al.,

9 Jan. 2005, Herb. Etayo 22173.

#### Species of uncertain identity or to be excluded from *Niesslia*.

*Acanthonitschkea argentinensis* Speg., *Anal. Mus. Nac. Buenos Aires* III 10: 116. 1908. Not a *Niesslia*, spines in mycelium.

Mycobank MB 233150.

*Acanthonitschkea macrobarbata* Fitzpatrick, *Mycologia* 15: 63. 1923. Not *Niesslia*, has spines in mycelium.

Mycobank MB 270129.

*Niesslia albosubiculosa* W. Gams, Gräfenhan & Schroers, *spec. nov.* Fig. 28a

Mycobank MB 827323.

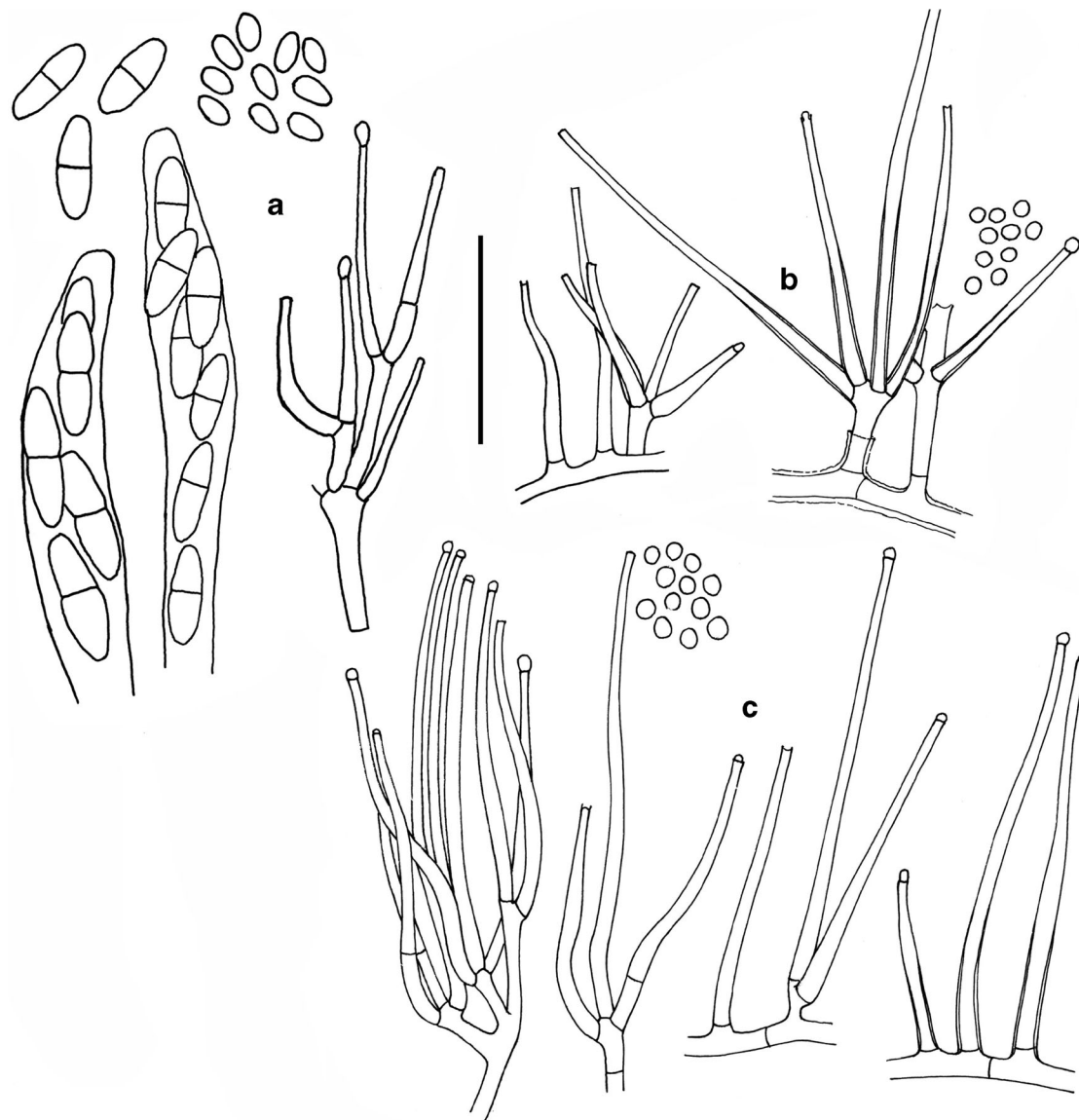
**Holotype:** Japan, Nagano Pref., Kakuma Valley, on deciduous wood, leg. W. Gams and Y. Degawa, 1997 (CBS 100348, alive, metabolically inactive deposit).

**Etymology:** In reference to its similarity to *N. subiculosa* and the white hyphal subiculum supporting perithecia on natural substrate.

**Description:** Perithecia formed on decaying deciduous wood on a conspicuous white hyphal subiculum, dark brown to black, hardly glossy, globose, collapsing cup-like when dry. No spines. Asci clavate, 8-spored, ca. 55  $\mu\text{m}$  long. Ascospores ellipsoidal, straight or slightly curved, two-celled, smooth- and rather thick-walled, or faintly striate, 9–13  $\times$  3–3.5  $\mu\text{m}$ , l/w 2.4–3.9. Colonies slow-growing, reaching 18 mm diam in 10 days at 20 °C on OA, on MEA in 20 days finely powdery, orange, reverse similarly coloured. Vegetative hyphae hyaline, thin-walled, 1.0–2.0(–2.5)  $\mu\text{m}$  wide, partly cyanophilic. No crystals present. Sporulation scanty or absent, on OA or PCA, after 1 month on CMA orange-red sporodochia formed with branched conidiophores. Phialides hardly thick-walled, aculeate, 14–20  $\mu\text{m}$  long, tapering from 1.3–2.0  $\mu\text{m}$  to less than 1.0  $\mu\text{m}$ . Conidia short-ellipsoidal, symmetrically rounded or tapering at base, one-celled, smooth- and rather thick-walled, 3.5–4  $\times$  1.5–2  $\mu\text{m}$ , l/w 1.8–2.6. Chlamydospores absent.

**Comments:** The species differs from *N. subiculosa* by larger, ellipsoidal ascospores. A comparable collection, PDD 32574 (= G.J.S. 73–249, as *N. subiculosa*, New Zealand, on rachis of *Cyathea medullaris*, Auckland Prov., Waitemata County, Waitakere Ranges, Cascade Kauri Park, G.J. Samuels, 8 Nov. 1973), has thick-walled ascospores, 13.5–15  $\times$  4–5  $\mu\text{m}$ ; its conidia are cylindrical, have slightly tapering ends, and measure 5–7  $\times$  0.8–1.2  $\mu\text{m}$ . Preliminary phylogenetic analyses (not shown) suggest that *N. albosubiculosa* represents a currently undescribed hypocrealean genus. *Niesslia albosubiculosa* lacks typical *Niesslia* perithecial spines. The absence of perithecial spines and rather thin-walled, aculeate phialides indicate the eventual exclusion of this species from *Niesslia*.





**Fig. 28** *Niesslia albosubiculosa*. **a** Asci and ascospores from natural substrate, part of branched conidiophore from orange sporodochium and conidia (CMA, 40 days) (CBS 100348). *Niesslia minutispora*. **b**, **c**

Monocillium-like conidiophores and conidia (**b**, OA, CBS 394.82; **c** MEA, 28 days, CBS 612.82). Scale bar, 20  $\mu$ m

*Niesslia anacardii* P.G. Sathe & K.M. Mogarkar, Maharashtra Vidnyan Mandir Patrika 10: 13. 1975 (as ‘*anacardiae*’).

Mycobank MB 318652.

**Comments:** Type not seen. Described on dried stems of *Anacardium occidentale*, with bitunicate asci and ascomata with few, blunt roughened spines. Thus, this species is misclassified in *Niesslia*.

*Niesslia barbicincta* (Ellis & Everh.) M.E. Barr apud Bigelow & Barr, Rhodora 65: 305. 1963.

Mycobank MB 335160.

≡ *Byssosphaeria barbicincta* Ellis & Everh., J. Mycol. 4: 63. 1888.

≡ *Herpotrichia barbicincta* (Ellis & Everh.) Ellis & Everh., N-Amer. Pyrenom.: 158. 1892.

**Holotype:** USA, New Jersey, Newfield, on old *Diatrype tremellophora* and adjacent bark of *Magnolia*, Oct. 1887 (NY).

**Comments:** Conspicuous paraphyses seen; spines arising from subiculum. This taxon has a *Codinaea* anamorph and is now classified as *Chaetosphaeria barbicincta* (Ellis & Everh.) M.E. Barr 1993.

*Niesslia crucipila* (Höhn.) E. Müller, apud Müller & v. Arx, Didymosp. Pyrenom.: 577. 1962.

Mycobank MB 335161.

≡ *Valetoniella crucipila* Höhn., Sber. K. Akad. Wiss. Wien, math.-nat. Kl. 118(1): 1499. 1909.

**Holotype:** Indonesia, Bogor, botanical garden, on bark of? *Albizia* sp., 1907 (FH, Höhnel prep. 3484).

**Comments:** This species has branched spines on the perithecia, ribbed ascospores, and no monocillium-like anamorph. This species is the type of the genus *Valetoniella* distinct from *Niesslia*.

*Niesslia echinoides* Etayo, Flakus & Kukwa, Lichenologist 45: 21. 2013.

Mycobank MB 800218.

**Holotype:** Bolivia, Dep. La Paz, Prov. Nor Yungas, PNANMI Cotapata, montane cloud forest, 3437 m alt., on *Erioderma barbellatum* (Pannariaceae), 23 Dec. 2009 (KRAM-L-65981).

**Description:** Described as similar to *N. schizospora* but differing by larger and more setose ascospores, with usually simple setae, and larger and wider ascospores, 13–15 × 3.0–3.5 µm. Perithecia 120–170(–190) µm diam, richly setose, with either dark spines, 10–24 µm long and basally 3–6 µm wide, or hyaline setae, 10–35 µm long and basally 2 µm wide, sometimes twisted. Ascospores biserial, ellipsoidal to fusiform, within ascus breaking into part-spores, often 4-guttulate. In type material short spines, often provided with a short laterally extending projection. Part-ascospores ellipsoidal with one end truncate and other slightly pointed, 6–7 × 2.5–3.0 µm. Monocillium-like phialides about 40 µm long.

**Comments:** The fragmenting ascospores are unusual for *Niesslia* and make this species reminiscent of *N. schizospora*. Because a monocillium-like anamorph is associated with its perithecia, *N. echinoides* could be correctly classified in *Niesslia*. Phylogenetic analyses based on ascospore isolates, unavailable at the moment, are required.

*Niesslia globispora* Etayo (as ‘*globospora*’), Biblioth. Lichenol. 84: 81. 2002.

Mycobank MB 373064.

**Holotype:** Colombia, Nariño, Serrania de Morasurco, 3000–3500 m alt., on thallus of *Dictyonema glabratum*, J. Etayo, 25 July 1998 (COL, isotype in herb. Etayo, not seen).

**Description from protologue:** Perithecia 60–100 µm diam. Spines 32–65 µm × 4–5 µm. Asci cylindrical, uniseriate, 33–42 × 4–5 µm. Ascospores ornamented, 3–4 µm diam. **Observations by WG:** Perithecia 100–125 µm diam; spines 35–75 µm long, base 4 µm wide. Asci cylindrical, 33–42 × 6–7 µm, 4-spored with spores early separating in ascus. Part-spores subglobose, 3–3.5 × 2.5–2.7 µm, rather firm-walled but appearing smooth. A few aculeate phialides seen.

**Herbarium specimen examined:** Ecuador, Tulcán, Páramo El Ángel, de Tufiño a Maldonado ca. km 10, zona de las Lagunas Verdes, páramo con frailejones, suolo, 4000 m

alt., on *Dictyonema*, J. Etayo & Z. Palice, 3 March 2003 (Herb. Etayo 26977).

**Comments:** Ascospores described by Etayo (2002) as unicellular and verrucose. Provided illustration suggests that asci are 4-spored, with part-spores readily separating.

*Niesslia horridula* (Wallr.) Kirschst., Ann. Mycol. 37: 91. 1939.

Mycobank MB 267347.

≡ *Sphaeria horridula* Wallr., Fl. crypt. 2: 796. 1833.

≡ *Eriosphaeria horridula* (Wallr.) Sacc., Syll. Fung. 1: 599. 1882.

**Comments:** Müller (1953) classified the species in the distinct genus *Eriosphaeria*. Material in STR is probably lost. Secondary material examined in ZTH was not a *Niesslia*.

*Niesslia kununguakii* Alstrup & E.S. Hansen, Graphis scripta 12: 44. 2001.

Mycobank MB 484126.

**Description from protologue:** Perithecia up to 200 µm diam. Spines 45–50 µm long, at base 3.5–4 µm wide. Paraphyses present. Asci bitunicate, ascospores 1–3-septate, growing on lichen thallus of *Arthrographis alpina*, Greenland. Thus obviously not a *Niesslia*.

*Niesslia minutispora* W. Gams, Gräfenhan & Schroers, spec. nov. Fig. 28b, c

Mycobank MB 827324.

**Holotype:** Netherlands, from agricultural soil, isolated by H. Nielander 377 (CBS H-1649); ex-type culture, CBS 246.82.

**Etymology:** In reference to the small conidia formed by this species.

**Description:** Colonies slow-growing, reaching 8 mm diam in 10 days at 20 °C on OA, finely granular, pinkish; reverse reddish grey. Vegetative hyphae hyaline, thin-walled. Crystals absent. Sporulation abundant, phalacrogenous, with conidia adhering in slimy droplets, often coalescent. Phialides often aggregated in whorls on 4–9 µm long stalk cells, slightly thick-walled throughout, aculeate, 15–45 µm long and 1.2–2.0 µm wide at base, tapering to 0.7–1.0 µm at tip. Conidia subglobose, with hardly differentiated base, one-celled, smooth- and thin-walled, 1.5–2.0 × 1.2–1.5 µm, l/w 1.1–1.4. Chlamydoconidia absent.

**Living culture:** Netherlands, all from agricultural soil, all isolated by H. Nielander (CBS 394.82 and 612.82).

**Comments:** This anamorphic species is most similar to *Acremonium*, particularly *A. psammosporum* (Gams 1971). It is distinguished by the thicker phialide walls and intense pink colour of the colonies. Morphologically it is somewhat similar to *N. mucida*, but the colonies grow much slower and the conidia are significantly smaller. The sporodochial

conidiomata and conidiophores with terminal whorls of relatively long phialides are unusual for *Niesslia*. Preliminary phylogenetic analyses (not shown) suggest that *N. minutispora* represents an undescribed genus with hypocrealean affinities.

*Niesslia rubi-idaei* Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 123: 98. 1914.

Mycobank MB 149256.

**Comments:** Described as associated with and as a teleomorph of *Pyrenochaeta rubi-idaei* Cavara (Funghi parassiti delle piante coltivate od utili No. 90) and as having numerous paraphyses. It is unlikely to be correctly classified in *Niesslia*.

*Niesslia schizospora* Etayo, Biblioth. Lichenol. 48: 82. 2002 (as '*schyzospora*') MycoBank MB 373065.

**Holotype:** Colombia, Nariño, Pasto, Reserva Natural Tunguragua, on lichen *Hypotrachyna* sp., X. Etayo 15773.

**Description from protologue:** Perithecia globose, brown, darkening in KOH, 100–130 µm diam. Spines brown, often with short lateral projections. Ascospores ellipsoidal-fusiform, hyaline, smooth-walled, 5–8 × 1.5–2 µm, separating into part-spores already in the ascus.

**Herbarium specimens examined:** Ecuador, prov. Cuenca, Parque Nacional Cajas, Laguna Toreadora, turberas y roquedos, 3950–4000 m alt., on *Dichosporidium* sp., J. Etayo & Z. Palice, 2 Aug 1999 (Herb. Etayo 26409) [no *Niesslia* found]. – Ecuador, prov. Cuenca, Parque Nat. Cajas, Laguna Toreadora, 3950–4000 m alt., on bark of *Polylepis*, J. Etayo & Z. Palice, 2 Aug. 1999 (Herb. Etayo 26405 in *Lichenes et lichenicoli fungi advenientes, América tropical*, 8) [no perithecia seen].

**Comments:** The branched spines as well as the fragmenting ascospores exclude the species from *Niesslia* and suggest *Valetoniella*.

*Niesslia tetrahedrospora* Etayo, Biblioth. Lichenol. 84: 85. 2002.

Mycobank MB 373068.

**Holotype:** Colombia, Nariño, Pasto, Reserv. Nat. Tunguragua, 2700 m alt., on *Dichosporidium nigrocinctum*, S. Churchill & J. Etayo et al., 27 July 1998 (COL, Etayo 18049; isotype in herb. Etayo; not seen).

**Description from protologue:** Perithecia (50–)100–120 µm diam, globose, with 10–20 slender brown, somewhat curved spines. Spines (20)58–92 µm long, 3–4 µm wide at base. Asci cylindrical, '16-spored' because of 8 biseriate disintegrating part-spores, 42–50 × 5–6 µm. Part-ascospores stellate, tetrahedral, hyaline, 4–5 µm diam.

**Herbarium specimens examined:** Colombia, Nariño, Pasto, Reserva Natural Tunguragua, 2700 m alt., lichenicolous on *Dichosporidium nigrocinctum*, S. Churchill, J. Etayo et al., 29 July 1998. – Chile,

Navarino, 16 Jan 2005 (herb. Etayo 22583) [no *Niesslia* corresponding to the description found]. – Ecuador, prov. Tungurahua, entre Pondo y Tungurahua, bosque nublado, 2400–3800 m alt., J. Etayo & Z. Palice, 29 July 1999 (herb. Etayo 25924) [no *Niesslia* corresponding to the description found].

**Comments:** This species has early fragmenting, angular ascospores, so that the part-spores give a tetrahedral impression. Because of the fragmenting ascospores, the fungus is tentatively excluded from *Niesslia*. Phylogenetic analyses based on ascospore isolates, unavailable at the moment, are required. Etayo and Sancho (2008) found a similar fungus with slightly smaller part-spores, 3–4 µm, and smaller spines, (20–)58–92 × 3–4 µm, on *Pseudocyphellara obvoluta* in Chile.

*Niesslia tirolensis* (Kirschst.) Zhilina, Vestn. Leningr. Univ. 3, Ser. Biol. 1: 142. 1963.

Mycobank MB 335163.

≡ *Coleroa tirolensis* Kirschst., Ann. Mycol. 33: 207. 1935.

**Holotype:** Austria, Unteres Verwalltal bei St. Anton a.A., on dried leaves of *Vaccinium vitis-idaea*, W. Kirschstein, 14 Jul. 1931 (B).

**Comments:** This species is better classified in *Coleroa* or as *Protoventuria maculosa* (Ellis) M.E. Barr (≡ *Antennularia maculosa* (Ellis) M.E. Barr, *Meliola maculosa* Ellis).

*Niesslia vermicularia* (Nees: Fr.) Kirschst., Ann. Mycol. 37: 91. 1939.

Mycobank MB 281529.

≡ *Sphaeria vermicularia* Nees, Syst.: 311, Fig. 347. 1816: Fries, Syst. mycol. 2: 451. 1822.

≡ *Trichosphaeria vermicularia* (Nees: Fr.) Fuckel, Symb. mycol.: 145. 1870.

≡ *Eriosphaeria vermicularia* (Nees: Fr.) Sacc., Syll. Fung. 1: 597. 1882.

**Comments:** A specimen exists at PAD. This is the type species of *Eriosphaeria* in the Trichosphaeriaceae.

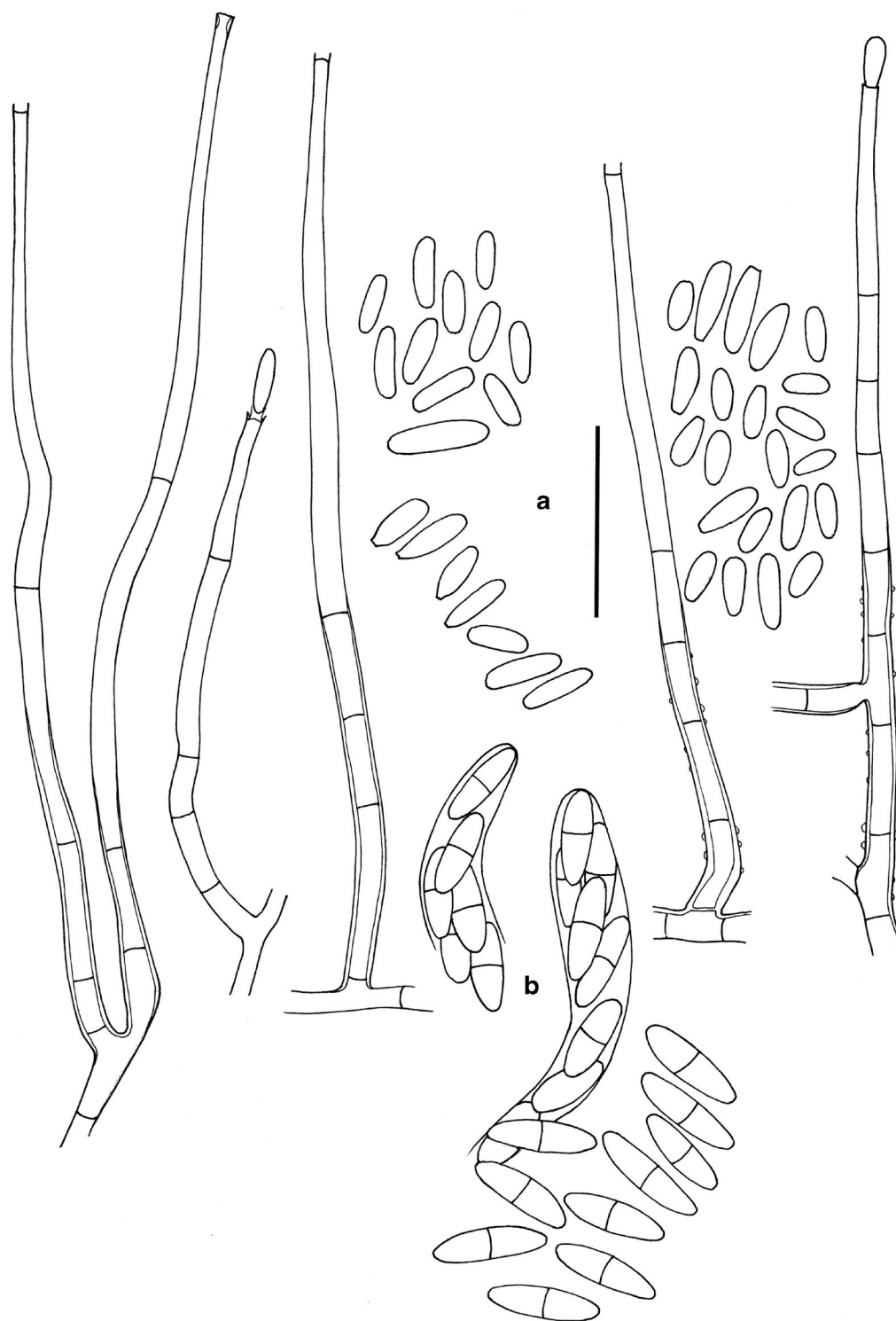
*Niesslia waitemataensis* W. Gams, Samuels, Gräfenhan & Schroers, spec. nov. Fig. 29a, b

Mycobank MB 827325.

**Holotype:** New Zealand, Auckland Prov., Waitemata, Waitakere Ranges, Whatipu, on stem of *Lupinus arboreus*, G.J. Samuels & C.S. Samuels, 3 Sep 1976 (PDD 35972); ex-type culture, CBS 324.77, G.J.S. 76–162).

**Etymology:** In reference to Waitemata, where this species was encountered by and where Gary J. Samuels and his colleagues collected a tremendous number of ascomycetes.

**Description:** Perithecia formed on stem of a lupin in vitro, dark brown, glossy, globose, collapsing cup-like when dry, 200–240(–300) µm diam, lacking spines. Asci cylindrical-



**Fig. 29** *Niesslia waitemataensis*. **a** Monocillium-like conidiophores and conidia (left, MEA, 2–4 weeks.; right, OA 4 weeks) (CBS 324.77). **b** Asci and ascospores from natural substrate (PDD 35972). Scale bar, 20  $\mu\text{m}$

clavate, (30–)60–70  $\times$  7–8  $\mu\text{m}$ . Ascospores ellipsoidal, straight or slightly curved, two-celled, 4-guttulate, smooth- and firm-walled, 10–13  $\times$  3.0–3.5  $\mu\text{m}$ , l/w 3.1–4.1. Colonies slow-growing, reaching 20 mm diam in 14 days at 20  $^{\circ}\text{C}$  on CMD, finely powdery, white to cream-coloured. Vegetative

hyphae 1–3  $\mu\text{m}$  wide, hyaline, thin-walled, cyanophilic. No crystals present. Sporulation abundant, phalacrogenous-plectonematous, with conidia adhering in slimy droplets, often coalescent. Conidiophores 65–100  $\mu\text{m}$  long, often 2–3-septate in lower part, rarely branching in lower part, thick-walled (up

to 0.5 µm) basal portion 2.5–3 µm wide and somewhat warted, tapering gradually to 1.2–1.5 µm at tip of integrated, thin-walled, 40–60 µm long phialide. Conidia ellipsoidal, symmetrically rounded, one-celled, smooth-walled, 4.5–9(–13) × (1.7–)2–2.5(–3) µm, l/w (1.8–)2.6–3.2(–4.2). Chlamydospores absent.

**Comments:** The species is reminiscent of *N. coloradensis*, but the ascospores are considerably longer. The anamorph is unusual for *Niesslia* by having septate, roughened, and apically relatively wide conidiophores. Preliminary phylogenetic inferences (not shown) revealed that *N. waitemataensis* is closely related to *Ochronectria thailandica* Q.J. Shang, D.Q. Dai & K.D. Hyde (Li et al. 2016) probably representing a new genus having 1-septate ascospores and dark brown to black perithecia (similar to *Niesslia* but without spines). *Ochronectria* Rossman & Samuels sensu stricto is based on *O. calami* characterised by multi-septate ascospores and yellow-orange peritythecia with fleshy, relatively thick perithecial walls. *Ochronectria calami* also produces yellowish orange oily droplets between cells of the perithecial wall (Samuels et al. 1990; Rossman et al. 1999). For the time being, we prefer to classify the new species in *Niesslia* until type material of *O. thailandica* becomes available for further studies.

*Monocillium exsolum* Batista & Heine, Publ. Inst. Micol. Univ. Recife 457: 3. 1965.

Mycobank MB 334440.

**Comments:** The ex-type isolate CBS 431.64 (= IMI 164266), is *Metarhizium anisopliae* (Metschn.) Sorokin var. *anisopliae*.

*Monocillium humicola* G.L. Barron, Canad. J. Bot. 39: 1575. 1961.

Mycobank MB 334441.

**Comments:** This taxon is recognised as a synonym of *Torulomyces lagenae* Delitsch (Barron 1967). Two varieties distinguished by Christensen and Backus (1964) were recognised as distinct species of *Torulomyces* (Ando et al. 1998; Visagie et al. 2016); both were transferred to *Penicillium* by Houbraken and Samson (2011).

*Monocillium humicola* var. *brunneum* M. Chr. & Backus, Mycologia 56(4): 498. 1964.

Mycobank MB 353642.

≡ *Torulomyces brunneus* (M. Chr. & Backus) K. Ando, in Ando, Nawawi, Manoch & Pitt, Mycoscience 39: 314 (1998).

≡ *Penicillium porphyreum* Houbraken & Samson, Stud. Mycol. 70: 48 (2011).

*Rosasphaeria moravica* (Petr.) Jakl. & Voglm., Fungal Divers. 52: 93. 2012.

Mycobank MB 561140.

≡ *Stigmataea moravica* Petrak, Ann. Mycol. 12: 473. 1914.

**Comments:** This taxon was described as a member of the Niessliaceae, but has not been associated with a monocillium-like anamorph.

*Valetoniellopsis laxa* Samuels & M.E. Barr, Can. J. Bot. 75: 2175 (1998) [1997].

Mycobank MB 443175.

**Comments:** The ex-type strain is CBS 191.97. The genus is distinct from *Niesslia*, but phylogenetically closely related.

*Venturia chartae* Vouaux, Bull. Soc. Bot. Fr. 59: 15. 1912. Saccardo, Syll. Fung. 24: 899. Type not in PC.

Mycobank MB 199367.

*Venturia corralensis* Speg., Revta Fac. Agron. Vet. La Plata 6: 51, Fungi Chil. No. 83. 1910.

Mycobank MB 154397.

**Comments:** The species was described from Chile, Bahía de Corral, Jan. 1909 on the basis of perithecia scattered on dead leaves of *Uncinia erinacea* but Spegazzini did not find asci or ascospores. According to the description, this species is similar to *V. microspora* and *V. bellotae*.

*Venturia pezizoidea* Sacc. & Ellis, Michelia 2: 567. 1882.

Mycobank MB 176665.

**Holotype:** USA, New Jersey, Newfield, on leaves of *Andromeda ?racemosa*, Ellis No. 3256 (PAD 3399 and in L).

**Description from protologue:** Perithecia globose, loosely aggregated on lower surface of leaves. Spines dark, 40–60 × 5 µm. Asci clavate, 35 × 8 µm. Ascospores immature, almost straight, 1-celled, 8–10 × 2 µm. This is not a *Niesslia*.

**Acknowledgements** The manuscript was originally conceived and initiated by the main author, Dr. (Konrad) Walter Gams, who passed away on April 9, 2017, at the age of 82 in his second home in Italy. All species descriptions, dichotomous keys, pencil drawings of examined fungal isolates and most of the text originated from WG's studies of specimens collected by himself and other mycologists around the globe. The foundation of a taxonomic revision of the ascomycete genus *Niesslia* and its monocillium-like anamorphs was established in his renowned book on 'Cephalosporium'-like hyphomycetes published in 1971. In subsequent decades, Walter Gams published two new *Niesslia/Monocillium* species as he continued to collect, isolate and examine fresh material in preparation of a comprehensive monograph. More specifically, WG contemplated the idea of a taxonomic revision during the hyphomycete course held in Sugadaira, Japan, in August 1997. HJS and TG vividly recall conversations with the main author about his intention to concentrate on new collections of *Niesslia* specimens including its anamorph, formerly known as *Monocillium*. His plans later culminated in a draft manuscript on new and revised taxa of *Niesslia* that was coauthored by Margaret E. Barr and Gary J. Samuels but in the end was never published. After his retirement and departure from the Centraalbureau voor Schimmelcultures in 2008, WG dedicated more of his time to a compilation of available data and knowledge on this and other groups of hypocrealean ascomycetes. With the support of BS and the Westerdijk Fungal Biodiversity Institute, preserved cultures were re-examined and barcoded based on DNA sequences of phylogenetic marker genes. Preliminary results of the taxonomic studies on *Niesslia* were summarised on a scientific poster

presented at the 10th International Mycological Congress held in Bangkok, Thailand, in 2014. With ailments and progressing age, the status of WG's taxonomic studies did not change significantly after 2015, which represents the most recent information captured here. For decades, a taxonomic revision of the genus *Niesslia* was a matter close to WG's heart. Without doubt, other mycologists contributed material, data and information to his studies of these inconspicuous, often minute representatives of the Hypocreales. Of course, many of them deserve co-authorship as much as any of those listed on the paper. As former students, HJS and TG took on a commitment of reviewing and compiling scientific material from WG's estate, including original versions of species descriptions, DNA analyses, literature references and other more or less complete parts of the text. HJS inventoried pencil drawings and notes of the *Niesslia* material examined by WG, and a considerable proportion of drawings already were inked by an unknown artist. The coauthors tried to preserve as much of the original text and information as technically possible without deviating from WG drafts. However, they edited and elaborated on the taxonomic concepts conceived by WG, and responded to concerns by peer reviewers. BS facilitated most of the exchange between Walter Gams and the culture collection of the Westerdijk Fungal Biodiversity Institute. From the WFBI collection, BS also extracted the DNA and generated DNA barcodes of the fungal cultures studied. We thank Arien van Iperen and Trix Merckx at WFBI for checking specimens and specimen numbers in the herbarium of the WFBI. HJS and TG gratefully acknowledge the assistance of curators Ann Bogaerts (Botanic Garden Meise, Belgium, herbarium BR), Begoña Aguirre-Hudson (Royal Botanic Gardens, UK England, Kew, K), Jorge A. Chayle (Museo de La Plata Herbarium, Universidad Nacional de La Plata Herbario, La Plata, Argentina, LPS), Cony Decock (Université Catholique de Louvain, Belgium, MUCL), Lorinda Leonardi (New York State Museum, USA New York, Albany, NYS), Rossella Marcucciz (Erbario dell'Università di Padova, Italy, PAD), and Jordan K. Teisher (Academy of Natural Sciences, USA Pennsylvania, Philadelphia, PH). Curators of these herbaria and others including Botanischer Garten und Botanisches Museum Berlin-Dahlem, Germany, Berlin (B), The Natural History Museum, UK, England, London (BM), U.S. National Fungus Collections, USDA-ARS, USA Maryland, Beltsville (BPI), Agriculture and Agri-Food Canada, Canada, Ontario, Ottawa (DAOM), CABI Bioscience UK Centre, UK England, Egham (IMI), Naturalis, Netherlands, Leiden (L/U), Botanische Staatssammlung München, Germany, München (M), The New York Botanical Garden, USA, NY, Bronx (NY), Muséum National d'Histoire Naturelle, France, Paris (PC), Manaaki Whenua Landcare Research, New Zealand, Auckland (PDD), Swedish Museum of Natural History, Sweden, Stockholm (S), Università di Siena, Italy, Siena (SIENA), Museum of Evolution, Sweden, Uppsala (UPS), and Naturhistorisches Museum Wien, Austria (W) made specimens and data available to WG. Data related to certain specimens cited here were also downloaded from the Global Biodiversity Information Facility (GBIF 2018). Finally yet importantly, we would like to thank Amy Y. Rossman (Department of Botany and Plant Pathology, Oregon State University, USA) and Keith A. Seifert (Ottawa Research and Development Centre, Agriculture and Agri-Food Canada) for numerous comments, suggestions and corrections that significantly improved the quality of the text.

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