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Taxonomic monograph of the genus *Taeniolella s. lat*. (*Ascomycota*)

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Abstract: A taxonomic monograph of the ascomycete genus *Taeniolella* (asexual dematiaceous hyphomycetes, sexual morphs unknown) is provided. Recent phylogenetic analyses demonstrated the polyphyly of this genus. The type species of *Taeniolella* pertains to the *Kirschsteiniotheliaceae* within *Dothideomycetes*, while other saprobic species clustered far away within *Sordariomycetes*, *Savoryellaceae s. lat.*, and *Lindgomycetaceae*, whereas lichenicolous species belong to a monophyletic clade that represents the order *Asterotexiales*, but for most species assigned to *Taeniolella* sequence data and phylogenetic analyses are not yet available. The main focus of the present taxonomic study was on a revision of the lichenicolous *Taeniolella* species. Since the currently available phylogenetic analyses do not allow final taxonomic conclusions at generic rank, the exclusion of lichenicolous species from *Taeniolella s. lat*. has been postponed pending a broader sampling and more phylogenetic data of allied ascomycete genera within the order *Asterotexiales*. For the interim, *Taeniolella s. lat*., including lichenicolous and saprobic species, is maintained. The taxonomic background, history, generic description and discrimination from morphologically confusable genera, phylogeny, biology, host range and distribution, and species concept of *Taeniolella* species are briefly outlined and discussed. Keys to the species of *Taeniolella* divided by ecological groups (lichenicolous taxa, saprobic taxa) are provided, supplemented by a tabular key to lichenicolous species based on host (lichen) families and genera. Twenty-nine lichenicolous species and a *Taeniolella* sp. (putative asexual morph of *Sphaerellothecium thamnoliae*) as well as 16 saprobic species are described in detail and illustrated by drawings, macroscopic photographs, light microscopic and SEM micrographs, including six new lichenicolous species (*T. arctoparmeliae* on *Arctoparmelia separata, T. lecanoricola* on *Lecanora rupicola, T. thelotrematis* on *Thelotrema, T. umbilicariae* and *T. umbilicariicola* on *Umbilicaria*, *T. weberi* on *Thelotrema weberi*), three new saprobic species (*T. filamentosa* on *Salix, T. ravenelii* on *Quercus, T. stilbosporoides* on *Salix caprea*), and one new combination, *T. arthoniae*.

Most saprobic *Taeniolella* species are wood-inhabiting (on bark, decorticated trunks and twigs, rotten wood), whereas lichenicolous species grow on thalli and fruiting bodies (mostly apothecia) of lichens, mostly without causing any evident damage, but they are nevertheless confined to their host lichens, or they are obviously pathogenic and cause either disease of the thalli (*e.g.*, *Taeniolella chrysothricis* and *T. delicata*) or at least thallus discolorations or necroses (*e.g.*, *T. christiansenii*, *T. chrysothricis*, *T. cladinicola*, *T. pseudocyphellariae*, and *T. strictae*). *Taeniolella atricerebrina* and *T. rolfii* induce the formation of distinct galls. The range of micro-morphological traits for taxonomic purposes is limited in *Taeniolella* species, but size, shape and septation of conidiophores and conidia, including surface ornamentation, provided basic characters. Mycelium, stromata and arrangement of conidiophores are less important for the differentiation of species. Lichenicolous species are widespread on a wide range of lichens, with a focus in the northern hemisphere, mainly in northern temperate regions, including arctic-subartic habitats (18 species, *i.e.*, 62 % of the lichenicolous species). Eleven lichenicolous species, *e.g.*, *T. pseudocyphellariae*, *T. santessonii*, *T. thelotrematis, T. umbilicariae*, are also known from collections in non-temperate Asia, Australia and South America (38 % of the species). Most collections deposited in herbaria are from northern temperate to arctic-subarctic regions, which may reflect activities of lichenologists and mycologist dealing with lichenicolous fungi in general and *Taeniolella* in particular. Most lichenicolous *Taeniolella* species are confined to hosts of a single lichen genus or few closely allied genera (26 species, *i.e.*, 97 % of the lichenicolous species), but only three species, *T. delicata*, *T. punctata*, and *T. verrucosa*, have wider hosts ranges.

Excluded, doubtful and insufficiently known species assigned to *Taeniolella* are listed at the end, discussed, described and in some cases illustrated, including *Talpapellis beschiana* comb. nov. (≡ *Taeniolella beschiana*), *Corynespora laevistipitata* (≡ *Taeniolella laevistipitata*), *Stanjehughesia lignicola* comb. nov. (≡ *Taeniolella lignicola*), *Sterigmatobotrys rudis* (≡ *Taeniolella rudis*), and *Taeniolina scripta* (≡ *Taeniolella scripta*).

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Keys

INTRODUCTION

Asexual fungal morphs (anamorphs) with pigmented conidiophores formed singly, in fascicles, synnemata or sporodochia, *i.e.*, without complex conidiomata like acervuli, pycnidia or stromatic conidiomata, are usually classified as dematiaceous hyphomycetes and belong to *Ascomycota*. Ellis (1971, 1997) impressively demonstrated the wide range of morphological types and structures within dematiaceous hyphomycetes. Genera based on asexual morphs were previously usually introduced in virtue of morphological similarities of conidiophores and conidia, *i.e.*, without any phylogenetic background. Over the years the number of species of many hyphomycete genera increased strongly, but new species were frequently even arbitrarily assigned to the genera concerned, which mostly led to wide heterogeneous generic concepts and circumscriptions. *Taeniolella* is a case in point, at first introduced for a few saprobic dematiaceous hyphomycetes, including *T. exilis*, the type species of the genus (Hughes 1958), but later widened by allocations and descriptions of lichenicolous species (Hawksworth 1979). Years ago, the examination of the lichenicolous *Cladosporium arthoniae*, a species not fitting in *Cladosporium* and rather taeniolelloid, in the course of monographic studies on *Cladosporium* spp., led to a comprehensive revision of *Taeniolella*, at first covering lichenicolous species, and later extended to *T. exilis* and all other saprobic species of this genus. The little knowledge about distribution and taxonomy of the species of this genus, the notorious confusions with similar genera, *e.g.*, with *Trimmatostroma*, and the absence of any reliable phylogenetic data were the main reasons behind the decision to revise the genus *Taeniolella*. Despite the broader concept of this revision covering the whole genus, lichenicolous species remained the focus of our studies.

Symbiotic associations between fungi and algae or cyanobacteria, *i.e.*, the phenomenon of lichenisation, represent a common, widespread life strategy occurring in all kinds of habitats and ecological niches almost worldwide. Lichenised fungi (lichens), currently comprising about 20 000 species (www.ucmp.berkley.edu/fungi/lichens/lichensy.html), are a biological success story (Ahmadjian & Hale 1973). The large number of lichens provide a wide range of ecological niches for mycophilic fungi, comprising a multitude of ascomycetes and basidiomycetes (Hawksworth 1979, 1983, Clauzade *et al*. 1989, Diederich 1996, 2011, Lawrey & Diederich 2003, etc.). Fungi associated with lichens are called lichenicolous. There are various definitions of the latter term, *e.g.*, the characterisation of “lichenicolous” introduced by Hawksworth (1982) implying in short that lichenicolous fungi form obligate associations with lichens either as saprotrophs dwelling on died off thalli or as parasites. However, “lichenicolous” just means “dwelling on lichens” and should be used in this broad and general sense since the phenomenon “lichenicolous habit or life strategy” covers a much wider range and continuum between commensalism and parasitism, and may even include parasymbioses, *i.e.*, fungi living as secondary symbionts associated with already existing symbioses between fungi and algae. A detailed review of and discussion on lichenicolous fungi, including all aspects of the biology of the associations of lichens and lichen-inhabiting fungi, was published by Lawrey & Diederich (2003). Currently about 1 750 obligate parasites, parasymbionts and/or saprobic fungi associated with lichens and/or their photobionts are known (Rambold & Triebel 1992, Lawrey & Diederich 2003, 2017), but a much larger number of lichenicolous species is to be expected, and between 5 000 and 7 500 species have been estimated (Werth *et al*. 2013, Lawrey & Diederich 2017). There is a wide range of symptoms indicating parasitism of fungi dwelling on lichens, ranging from more or less evident discolorations of the lichen thalli, via gall formation (lichen cecidia) to devastating fungi damaging to destroying host thalli. On the other hand, numerous lichenicolous fungi are little or not harmful, do not cause any visible symptoms, and in most cases the biology is little known, quite unclear, and mostly not examined in detail, so that clear allocations of the fungi concerned to these life strategies are often difficult and not possible with certainty. Feeding structures as indicators of parasitism, *e.g.*, haustoria, often found in plant pathogenic fungi, are mostly unknown and barely examined, *i.e.*, nutritional strategies and details are often quite unclear and unknown. Lichenicolous species of the genus *Taeniolella* are a striking example, covering the discussed whole range of habits, including gall induction and discolorations, but most species do not cause obvious symptoms, and details of the nutrition of species belonging to the latter group are largely unknown.

Conclusions of first basic phylogenetic analyses of *Taeniolella* spp. have recently been published (Ertz *et al*. 2016) and confirmed the putative polyphyly of this genus. There are only few fossil finds of taeniolelloid fungi. Kalgutkar (1997) described the fossil taxon *Diporicellaesporites taeniolelloides* with taeniolella-like, catenate, coarsely rough-walled conidia, and Kettunen *et al*. (2016, 2017) published first records of taeniolella-like fossils embedded in Bitterfeld and Baltic Paleogene amber. The results of the comprehensive taxonomic revision of lichenicolous and saprobic *Taeniolella* species are presented here.

Historical overview

Hughes (1958) introduced the new genus *Taeniolella* for an assemblage of saprobic dematiaceous hyphomycetes characterised by having little differentiated (semi-macronematous), mostly unbranched conidiophores with integrated, terminal, monoblastic, non-cicatrized conidiogenous cells, and pigmented, 1- to pluriseptate conidia formed in mostly long acropetal, not easily disarticulating chains. The species reallocated to *Taeniolella* by Hughes (1958) were originally assigned to the hyphomycete genera *Dendryphion*, *Hormiscium*, *Septonema*, and *Torula*. In his influential treatment of dematiaceous hyphomycetes, Ellis (1971) took up Hughes's concept of *Taeniolella*, provided a more detailed generic circumscription, brief descriptions of species, and instructive illustrations. In his second book, Ellis (1976) added the new combination *Taeniolella pulvillus*, and described the new genus *Taeniolina* for superficially similar species with usually much branched conidia. The number of *Taeniolella* species increased over the years to about 53, accompanied by a gradual widening of the morphological concept and circumscription of this genus, inter alia, by the inclusion of aquatic and lichenicolous species. The latter drastic extension of the genus goes back to Hawksworth's (1979) treatment of lichenicolous hyphomycetes in which several morphologically similar lichen-inhabiting species were assigned to *Taeniolella*. To this day, the number of lichenicolous *Taeniolella* species has increased rapidly. The lichenicolous species roughly fit with saprobic *Taeniolella* species in terms of morphology, although most of the saprobic species are characterised by having pluriseptate conidia versus amero- to phragmosporous conidia in lichenicolous taxa. These differences are, however, only gradual and barely significant to justify the establishment of a separate genus for the lichenicolous species just based on morphology. The striking morphological diversification and wide range of ecological niches within the broad concept of *Taeniolella* raised the question whether the current morphological circumscription of this genus may withstand phylogenetic approaches. Minter & Holubová-Jechová (1981) recorded a *Taeniolella* asexual morph for the ascomycete *Mytilinidion gemmigenum*, which led to an assignment of *Taeniolella* to *Glyphium* as its asexual morph and its allocation to the family *Mytilinidiaceae* (Kirk *et al*. 2008, Hyde *et al*. 2013), but these conclusions were not phylogenetically verified. Among ascomycete genera typified by asexual morphs, there are two opposed tendencies. For some genera, traditional morphological concepts have been confirmed by molecular methods and this has led to the recognition of larger monophyletic core genera, such as *Alternaria* (Woudenberg *et al.* 2013) and *Cladosporium* (Bensch *et al.* 2012). Other genera such as *Sporidesmium* (Shenoy *et al.* 2006) proved to be totally polyphyletic. Ertz *et al.* (2016) demonstrated the strong genetic heterogeneity of lichenicolous fungi exemplified by former *Polycoccum* species (sexual morphs) and lichenicolous *Phoma* species (asexual morphs) which phylogenetically belong to the genus *Didymocyrtis* (*Phaeosphaeriaceae*). In order to get a first insight into the phylogenetic affinity of *Taeniolella* species, Ertz *et al.* (2016) performed first phylogenetic analyses of saprobic and lichenicolous species based on a larger sampling, including two cultures of the type species of this genus, with some expected and some surprising results (see Ertz *et al*. 2016). However, a taxonomic monograph of the whole genus *Taeniolella* covering saprobic and lichenicolous species has never been elaborated and published, which was the starting point for the present comprehensive revision of the genus.

Phylogeny of *Taeniolella*

Right from the beginning of our taxonomic studies of *Taeniolella*, attempts had been made to clarify the phylogeny of this genus, but we were faced with two basic problems. Genera are nomenclaturally and taxonomically ruled by their type species, *i.e.*, the true phylogenetic affinity of a genus can only be identified by phylogenetic analyses based on data retrieved from its type species. Thus, it was necessary to get a verified culture of *T. exilis*, the type species of *Taeniolella*. Furthermore, we needed sequence data obtained from lichenicolous *Taeniolella* species, which were the focus and main target of this study. The whole process to achieve corresponding cultures and data took much time, and first attempts to culture lichenicolous *Taeniolella* species with standard lab methods failed. Alternative approaches to get sequence data directly from *Taeniolella* conidiophores removed from the surface of host lichens, without culture, failed as well and led to undesirable results, since the obtained sequences referred to endophytic fungi and common saprobes of the phyllosphere. But only a new collaboration with the working group of D. Ertz in Belgium, experienced in culturing slow-growing lichenicolous fungi and specialised in phylogenetic analyses of them, finally constituted a breakthrough and resulted in a recent publication on phylogenetic aspects of *Taeniolella s. lat.* (Ertz *et al.* 2016). Several lichenicolous *Taeniolella* species and other fungal species associated with lichens were successfully cultured, and mtSSU (mitochondrial small subunit rRNA gene) and nuLSU (nuclear large subunit ribosomal DNA gene) sequence data were obtained and analysed. Sequence data retrieved from two confirmed cultures of *T. exilis*, type species of *Taeniolella*, were included in these analyses together with all available sequences of other saprobic species assigned to *Taeniolella* (details in Ertz *et al.* 2016).

The previous hypothesis that saprobic and lichenicolous *Taeniolella* species are phylogenetically not closely allied with each other and thus actually not congeneric has been confirmed. *Taeniolella s. lat.* proved to be completely polyphyletic. *Taeniolella s. str.*, based on its type species *T. exilis*, pertains to the *Kirschsteiniotheliaceae* within *Dothideomycetes* (adjacent to the order *Mytilinidiales*, see Boonmee *et al.* 2012, and recently accommodated in the order *Kirschsteiniotheliales*, see Hernández-Restrepo *et al.* 2017). It is the hitherto only sequenced species of *Taeniolella* that clusters in this clade, but the circumscription with some species assigned to the genus *Kirschsteiniothelia* (*e.g.*, *K. thujina*) needs clarification. Analysed sequences retrieved from all other saprobic species previously assigned to *Taeniolella* clustered far away from *T. exilis* within *Sordariomycetes* and were either shown to be unreliable and based on misidentified cultures probably attributable to contaminants, or the species concerned turned out to be placed in *Taeniolella* merely due to superficial similarities of conidiophores and conidia, *i.e.*, they are neither morphologically nor phylogenetically congeneric with *Taeniolella s. str.* In one case, it was possible to clarify the true affinity and to draw taxonomic consequences, *viz*., *Taeniolella rudis* (*Savoryellaceae s. lat.*) was transferred to *Sterigmatobotrys*, as *S. rudis*. *Taeniolella typhoides*, an aquatic hyphomycete, was shown to be a species of the *Lindgomycetaceae*, but its true generic affinity remains unclear. *Taeniolella sabalicola*, recently introduced for a saprobic species isolated from a petiole of a dead leaf of *Sabal palmetto* in south Florida, USA (Delgado & Miller 2017), belongs to *Sordariomycetes incertae sedis* and is phylogenetically as well as morphologically quite distinct from *T. exilis*, the type species, and all other saprobic core species of *Taeniolella*.

Sequences obtained from lichenicolous species of *Taeniolella s. lat.* clustered within *Dothideomycetes*, as in the case of *T. exilis*, but in another family, unrelated to *Kirschsteiniotheliaceae*. Together with sequences obtained from several other lichenicolous ascomycetes, including species of the genera *Buelliella s. lat*., *Karschia*, *Labrocarpon*, *Melaspilea s. lat*. and *Stictographa*, they clustered in a monophyletic clade that represents the order *Asterotexiales* (Guatimosim *et al.* 2015), but not as a monophyletic group. The sequences representing the five analysed lichenicolous *Taeniolella* spp. were intermixed with sequences of species of the genera *Buelliella s. lat*., *Karschia*, *Labrocarpon*, *Melaspilea s. lat*. and *Stictographa*. The phylogenetic affiliation of lichenicolous *Taeniolella* species to *Asterotexiales* has been elucidated and confirmed, but the sampling for the phylogenetic analyses in the whole context was not yet sufficient for final conclusions and taxonomic consequences on generic level. Asexual-sexual relations between lichenicolous *Taeniolella* species and the involved sexual-typified ascomycete genera remain unclear. Additional examinations based on a broader sampling, including sequences of additional species of *Buelliella s. lat*., *Karschia*, *Labrocarpon*, *Melaspilea s. lat*. and *Stictographa*, are urgently required. Lichenicolous *Taeniolella* species are allied and belong, as far as known, to one order of *Ascomycota*, but are not monophyletic. It cannot be excluded that new genera are needed for these species, but they might also pertain in one or several of the lichenicolous ascomycete genera involved. The currently available data are not sufficient for final conclusions and taxonomic consequences for lichenicolous *Taeniolella* species. Hence, we prefer to retain the species concerned in *Taeniolella s. lat.*, at least tentatively until additional data based on a broader sampling and trees with better resolutions will be available.

Generic concept and circumscription of *Taeniolella*

Taeniolella is an ascomycetous genus (*Ascomycota*) comprising dematiaceous hyphomycetes (asexual morphs) with little differentiated conidiophores, holoblastic conidiogenous cells and aseptate to pluriseptate conidia formed in acropetal chains. The genus currently encompasses a wide range of species with different ecological preferences and habitats, ranging from saprobes to lichenicolous taxa. There are gradual morphological differences between saprobic species of this genus, which are usually characterised by having pluriseptate conidia in long chains, and lichenicolous species, which have rather amero- to phragmosporous conidia, often in short, easily disarticulating conidial chains, although long, firm chains are also formed in some lichenicolous species. However, these differences are only gradual, difficult to circumscribe, and thus barely applicable to establish several genera just based on different host/substrate ranges. Therefore, phylogenetic analyses have recently been performed to clarify relations between saprobic and lichenicolous *Taeniolella* species (see Ertz *et al.* 2016). However, the sampling in these studies was rather limited and not yet sufficient for final conclusions. Moreover, it is likely that some lichenicolous species might belong to other orders (outside of *Asterotexiales*) because lichenicolous species appear to be morphologically heterogeneous, notably species differing from the currently sequenced lichenicolous taxa by developing external hyphae (*e.g.*, *T. chrysothricis*). Therefore, a splitting of *Taeniolella* into smaller generic units has been postponed (see Ertz *et al.* 2016), *i.e.*, this genus is tentatively maintained in its currently broad polyphyletic sense comprising saprobic and lichenicolous species.

Taeniolella S. Hughes, *Canad. J. Bot*. **36**: 816. 1958.

Type species: *Taeniolella exilis* (P. Karst.) S. Hughes (≡ *Septonema exile* P. Karst.).

Ascomycota. Asexual morphs, saprobic and lichenicolous dematiaceous hyphomycetes. *Colonies in vivo* effuse, loose to dense, sometimes punctiform, rarely sporodochial or inducing galls (on lichens), medium to dark brown or even blackish. *Mycelium* internal and external; *hyphae* branched, septate, subhyaline to pigmented, usually thin-walled, smooth to rough-walled, sometimes with constrictions at the septa, forming swollen hyphal cells, rarely almost monilioid-toruloid, occasionally forming small aggregations of swollen hyphal cells or in some species even distinct stromata. *Conidiophores* mostly semi-macronematous, simple or sometimes branched, arising from internal or external hyphae, swollen hyphal cells or stromata, sometimes breaking off at the base and functioning as diaspores, erect, mostly little differentiated, sometimes almost micronematous, differentiation between conidiophores and developing conidial chains often difficult, supporting hyphae sometimes gradually developing into conidiophores and conidiogenous cells, making the distinction between hyphae and conidiophores difficult, conidiophores aseptate (conidiophores reduced to conidiogenous cells) to pluriseptate, longer conidiophores occasionally with enteroblastic rejuvenations (proliferations) leaving conspicuous annellations (sheath-like wall remnants visible as irregular collar), pigmented, mostly brown to dark brown, wall thin to thickened, smooth or almost so to distinctly ornamented (verruculose, verrucose, rugose, rimulose, rhagadiose-squamulose, squamose), cell plasma sometimes reduced, with a distinct central vacuole-like cavity; *conidiogenous cells* integrated, terminal, little differentiated, conidiogenesis holoblastic to holothallic, unilocal, rarely multilocal (with two conidiogenous loci), determinate or percurrently proliferating, leaving distinct annellations (terminal annellations connected with the formation of conidial chains from terminal conidiogenous cells), proliferation rarely sympodial, conidiogenous loci truncate to somewhat convex, undifferentiated (neither thickened nor darkened), mostly broad and little attenuated. *Conidia* in short to long acropetal chains, rarely solitary, chains simple, occasionally branched, easily disarticulating or firm, persistent (not easily disintegrating), little to strongly constricted between individual conidia of the chain, shape diverse, ellipsoid, ovoid, doliiform, subcylindrical, vermiform, clavate or obclavate, aseptate to pluriseptate, euseptate, rarely distoseptate, wall thin to thick, thick walls sometimes distinctly two-layered, rarely multi-layered, pale to dark brown, rarely subhyaline to pale brown, cell plasma in some species reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick walls composed of several layers, base truncate, mostly little attenuated, *i.e.*, with a broad hilum, apex rounded in solitary or primary conidia or truncate, similar to the conidial base, hila undifferentiated, *i.e.*, neither thickened nor darkened-refractive; conidial secession schizolytic, conidia occasionally with microcyclic conidiogenesis.

Morphologically similar and confusable genera

There are a few morphologically similar hyphomycete genera confusable with *Taeniolella*, first and foremost the genus *Trimmatostroma* which differs from *Taeniolella* in forming characteristically polymorphous conidia in basipetal chains and perpendicular to oblique conidial septa. Saprobic species tend to be sporodochial. Lichenicolous *Trimmatostroma* species are probably not congeneric with the type species of this genus and are only tentatively maintained in this genus until phylogenetic data will be available (Diederich *et al.* 2010). *Trimmatostroma lichenicola* (Hawksworth 1979) was the first lichenicolous species assigned to this genus. Hawksworth & Cole (2002) revised and reassessed *Trimmatostroma lichenicola* and similar lichenicolous hyphomycetes and introduced the new genus *Intralichen*, mainly differentiated from *Trimmatostroma* by its lichenicolous habit, an immersed mycelium, entirely immersed micronematous conidiophores, and pale, smooth-walled conidia with few septa.

Ellis (1976) introduced the genus *Taeniolina* for the saprobic type species *T. centaurii* (≡ *Torula centaurii*) characterised by semi-macronematous conidiophores producing much branched, septate conidia. The branched conidial chains in *Taeniolina* species often break off at the base and function as propagules. Conidiophores or conidial chains of some lichenicolous *Taeniolella* species (*e.g.*, *T. arthoniae* and *T. caespitosa*) are occasionally branched, but never as frequently as in *Taeniolina* and the new species *Taeniolella filamentosa*. The phylogeny of *Taeniolina* and its relationship to *Taeniolella* are still unclear and unconfirmed. In the interim, we prefer to maintain *Taeniolina* as a separate genus. The placement of the new species *T. filamentosa* in the genus *Taeniolella*, based on morphological features, is also tentative until molecular data will be available.

Talpapellis (Alstrup & Cole 1998) is an additional genus confusable with lichenicolous *Taeniolella* species. This genus has recently been revised, re-circumscribed and emended by Heuchert *et al.* (2014). Zhurbenko *et al.* (2015) added a new species and provided an updated key to the species of this genus. Diederich *et al.* (2017b) recently introduced a new species (*Talpapellis mahensis*) based on material from Seychelles. *Talpapellis* is characterised by forming terminal conidiogenous cells via percurrent proliferation leaving distinct annellations. The conidiogenous cells give rise to acropetal conidial chains. In *Talpapellis peltigerae*, the type species of the genus, the conidiogenous cells are polyblastic, whereas in *T. peltigerae* var. *rossica* and *T. solorinae* they are mostly unilocal. Most species of *Taeniolella* are easily distinguishable from *Talpapellis*, but a few *Taeniolella* species with terminal annellations and easily disarticulating conidial chains, *e.g.*, *Taeniolella pseudocyphellariae*, are very similar and confusable, but differ in forming terminal conidial chains without preceded formations of conidiogenous cells via percurrent proliferation, *i.e.*, the annellations are directly associated with the conidial formation. The question arises whether these differences are sufficient for the discrimination of *Talpapellis* and similar lichenicolous *Taeniolella* species, which can only be verified in the context of a comprehensive generic revision of the whole *Taeniolella* complex based on phylogenetic analyses. It can currently not be excluded with certainty that some lichenicolous *Taeniolella* species with frequently formed terminal annellations pertain to *Talpapellis*.

Cladosporium (Bensch *et al.* 2012) includes two lichen-inhabiting species, the lichenicolous *C. licheniphilum*, and *C. antarcticum*, isolated from a lichen thallus. *Cladosporium* species are barely confusable with *Taeniolella* species and readily distinguishable by having quite distinct, very characteristic conidiogenous loci and conidial hila which are both coronate, *i.e.*, composed of a raised rim around a convex central dome, and they are darkened-refractive. The loci and hila are much smaller in relation to the conidial width. Bensch *et al.* (2012) excluded *Cladosporium arthoniae* from *Cladosporium s. str.* and classified it as taeniolella-like. In the present work, this species is reallocated to *Taeniolella*. The lichenicolous genus *Verrucocladosporium* (Crous *et al.* 2007a) belongs together with *Cladosporium* in the family *Cladosporiaceae*, and the distinctly verruculose-rugose conidia, irregular in outline in the type species, and narrow, distinctly darkened-refractive loci and hila are rather cladosporioid, but differ in being non-coronate and barely or only slightly thickened.

Some saprobic *Taeniolella* species (*e.g.*, *T. breviuscula*, *T. multiplex* and even the type species, *T. exilis*) were previously associated with the genus *Septonema* (Hughes 1958). However, genuine species of *Septonema* are readily distinguishable from *Taeniolella* species by having unbranched or branched macronematous conidiophores arising from superficial hyphae. The terminal and intercalary conidiogenous cells are monoblastic or occasionally polyblastic with subdenticulate conidiogenous loci, the conidia are formed in long, often branched, acropetal chains, and ramoconidia are usually present (Ellis 1971, Seifert *et al*. 2011).

Heteroconium, introduced in 1949, and *Taeniolella*, described in 1958, are two morphologically very similar and confusable genera. Carmichael *et al.* (1980) [see also Seifert *et al*. 2011] suggested that *Taeniolella* might be a heterotypic synonym of *Heteroconium*. The morphological distinction between these genera is, indeed, rather vague. Hughes (2007) distinguished *Taeniolella* from *Heteroconium* by having hyphae mostly immersed in wood and bark, and broader, darker conidia with thicker walls. In a "Key to *Heteroconium* and its related genera" provided by Ma *et al*. (2012), *Taeniolella* was characterised by having micronematous or only semi-macronematous conidiophores and conidia that only secede with difficulty, whereas *Heteroconium* was keyed out under genera with macronematous conidiophores and easily seceding conidia. However, in this key *Taeniolella* belongs together with *Parapleurotheciopsis* and *Xenoheteroconium* in a group of genera keyed out via "conidia frequently in branched chains" whereas *Heteroconium*, *Pirozyskiella* and other genera are in contrast characterised by forming "conidia frequently in unbranched chains", which is totally misleading and not tenable for saprobic as well as lichenicolous *Taeniolella* species. Twenty-four species have been assigned to the undoubtedly heterogeneous genus *Heteroconium*. According to Cheewangkoon *et al*. (2012) only three of them are congeneric with *H. citharexyli*, the type species of the genus, namely the Indian *H. asiaticum*, the Californian *H. glutinosum*, and the Hawaiian *H. neriifoliae.* Numerous other species previously assigned to *Heteroconium* have been excluded and reallocated to other genera, *e.g.*, *H. eucalypti* (≡ *Alysidiella eucalypti*), *H. kleinziense* (≡ *Alysidiella kleinziensis*), *H. solaninum* (≡ *Pirozynskiella solaninum*), *H. tetracoilum* (≡ *Lylea tetracoila*) (Holubovà-Jechovà 1978, Hughes 2007, Cheewangkoon *et al*. 2012). Recently, several new Chinese species assigned to *Heteroconium* have been described, *e.g.*, *H. schimae*, *H. annesleae* (Ren *et al*. 2012), *H. bannaense* (Xia *et al*. 2012), *H. fici*, and *H. tsoongiodendronis* (Ma *et al*. 2012), but the affinities of these species to *Heteroconium* remain doubtful and need to be verified on the basis of phylogenetic methods. Hence, the differentiation between *Heteroconium* and *Taeniolella* has to be based on the type species of these genera and genuinely congeneric taxa and can be summarised as follows: In species of *Heteroconium s. str*., considered to be sooty moulds, the usually macronematous conidiophores arise from well-developed superficial hyphae and often proliferate percurrently. The proliferations are obviously associated with the conidiogenesis. Conidia secede easily. In contrast, saprobic as well as lichenicolous species of *Taeniolella* are characterised by having mostly immersed hyphae, rarely superficial, giving rise to micronematous or semi-macronematous conidiophores, percurrent proliferations associated with conidiogenesis are lacking, but rejuvenations via enteroblastically proliferating conidiophores with obvious sheath-like wall remnants visible as irregular fringe may occasionally occur, and conidial chains are often rather firm and do not easily disintegrate, although exceptions are known. Seifert *et al.* (2011) mentioned for *Heteroconium* in addition to monoblastic also tretic conidiogenesis, which is, however, very doubtful. Hughes (2007) described in detail the conidium transseptation in species of *Heteroconium* and *Pirozynskiella* and separated the two genera by differences in the sequence of conidium septation, which are basifugal and centrifugal, respectively, and stated that the basifugal sequence found in *Heteroconium* was also observed in unbranched chains of *Taeniolella exilis* and in *T. alta*. However, peculiarities of the transseptation of conidia are little examined. The value of this character is unclear, and it is very difficult or often even impossible to comprehend it *in vivo*, *i.e.*, examination of the conidial development *in vitro* is necessary. Seifert (2011) listed, according to Müller *et al*. (1987), *Heteroconium* as asexual morph of *Capronia* (*Herpotrichiellaceae*), but this record is incorrect and was based on a postulated connection between *Capronia pilosella* and *Heteroconium chaetospira*, two non-type species. Based on LSU sequence data, the phylogenetic position of *H. chaetospira* was later clarified by Crous *et al*. (2007b) who reallocated this species to *Cladophialophora* (≡ *C. chaetospira*). Fortunately, Cheewangkoon *et al.* (2012) managed the isolation of DNA from the type specimen of *H. citharexyli*, the type species of *Heteroconium*. The phylogenetic analysis of a LSU sequence showed a clear affinity of *H. citharexyli* to the *Capnodiaceae* within the order *Capnodiales*, including sooty moulds with bitunicate asci that tend to live in complex communities, often with multiple fungal parasites, inhabiting a common sooty mass (Chomnunti *et al*. 2011). Thus, *Heteroconium s. str*. and *Taeniolella s. str*. are phylogenetically definitely separated since *Taeniolella exilis*, the type species of *Taeniolella*, clusters in the present phylogenetic analyses (combined ITS, LSU and SSU sequence analysis) as sister to a clade including *Kirschsteiniothelia aethiops*, the type species of *Kirschsteiniothelia* (Boonmee *et al*. 2012, Ertz *et al.* 2016). The new family *Kirschsteiniotheliaceae* was introduced for *Kirschsteiniothelia* in Boonmee *et al*. (2012), and the new order *Kirschsteiniotheliales* by Hernández-Restrepo *et al.* (2017), with a placement between the *Capnodiales* and *Mytilinidiales*. The marine species *Kirschsteiniothelia maritima*, which clustered within the *Mytilinidiales*, was excluded and assigned to the new genus *Halokirschsteiniothelia*. The genus *Kirschsteiniothelia* was originally placed in the *Pleosporaceae* (Hawksworth 1985). The affiliation of *Kirschsteiniotheliaceae* and *Taeniolella* to an appropriate order is not yet finally confirmed and requires further molecular studies, but there is undoubtedly no affinity to the *Capnodiales*. Hence, *Heteroconium s. str.* and *Taeniolella s. str.* are morphologically and phylogenetically obviously differentiated. This applies to lichenicolous *Taeniolella* species as well, which are, as far as known, phylogenetically restricted to *Asterotexiales* within *Dothideomycetes* (Ertz *et al*. 2016).

Key to *Taeniolella* and morphologically confusable genera

1 Mycelium immersed; conidiophores micronematous, immersed in lichen thalli, not erumpent; conidia eventually superficial, pale, smooth, with few septa .... ***Intralichen***
Mycelium internal or external; conidiophores micronematous, semi-macronematous or macronematous, but always clearly visible, *i.e.*, not immersed, either erumpent or arising from superficial hyphae 2

2 (1) Conidiogenous loci much narrower than the conidiogenous cells, conspicuously thickened and darkened, often somewhat protuberant, either distinctly coronate (*i.e.*, composed of a raised rim around a convex central dome) or non-coronate, but then conidia coarsely verrucose-rugose, shape of the conidia somewhat irregular 3

Conidiogenous loci truncate, neither thickened nor darkened, non-coronate, rather broad or subdenticulate when narrow 4

3 (2) Conidiogenous loci and conidial hila coronate, *i.e.*, composed of a raised rim around a convex central dome, and darkened-refractive; conidial shape regular .... ***Cladosporium***
Conidiogenous loci and conidial hila thickened and darkened, but non-coronate; conidia often somewhat irregular in shape, coarsely verrucose-rugose .... ***Verrucocladosporium***

4 (2) Conidiophores usually simple, little differentiated; conidia polymorphous, formed in basipetal chains, septa transverse, longitudinal and oblique, often forming multicellular aggregations of conidial cells .... ***Trimmatostroma***
Conidiophores micronematous, semi-macronematous or macronematous; conidia in acropetal chains, septa usually transverse, multicellular aggregations not developed 5

5 (4) Conidiophores producing much-branched, septate conidia, formed in branched conidial chains often breaking off at the base, functioning as propagules .... ***Taeniolina***
Conidia unbranched or at most occasionally branched, but not much-branched 6

6 (5) Conidiophores usually macronematous, arising from well-developed superficial hyphae 7
Conidiophores usually micronematous or semi-macronematous; hyphae usually immersed, rarely with few superficial hyphae 8

7 (6) Conidiophores usually unbranched, conidiogenous cells monoblastic, determinate or often percurrently proliferating (with annellations), proliferations obviously associated with the conidiogenesis; conidia usually in simple chains, ramoconidia lacking .... ***Heteroconium***
Conidiophores often branched, conidiogenous cells mono- to usually polyblastic, proliferation sympodial (without annellations); conidia in branched chains, ramoconidia present .... ***Septonema***

8 (6) Terminal conidiogenous cells formed via percurrent proliferation leaving distinct flaring annellations, *i.e.*, the annellations are directly associated with the conidiogenesis; lichenicolous .... ***Talpapellis***
Percurrent proliferations associated with conidiogenesis are lacking, but rejuvenations via enteroblastically proliferating conidiophores with obvious sheath-like wall remnants visible as irregular fringe may occasionally occur; saprobic or lichenicolous .... ***Taeniolella***

Morphological traits of *Taeniolella* species

Mycelium, hyphae, stromata

Taeniolella species are ascomycetes with an ordinary, mostly little differentiated mycelium. Hyphae are usually branched, septate, thin-walled, occasionally somewhat thickened, smooth to rough-walled, subhyaline to usually distinctly pigmented, ranging from pale olivaceous to medium brown or even darker brown. Constrictions at the hyphal septa are often lacking, but they may occur in some species, in a few species they are even very evident and connected with swollen hyphal cells leading to the formation of monilioid-toruloid hyphae, as for instance in *T. christiansenii* and *T. verrucosa*. The mycelium of saprobic species is often external, or both internal and external, *e.g.*, in *T. alta*, *T. breviuscula*, *T. plantaginis*, and *T. stilbosporoides*. Other saprobic species have an exclusively internal mycelium, *e.g.*, *T. faginea*, *T. multiplex*, *T. muricata*, *T. subsessilis*, and *T. vermicularis*. Most lichenicolous species are characterised by having an exclusively internal mycelium, but external hyphae may be developed in some species, including *T. christiansenii*, *T. chrysothricis*, *T. delicata*, *T. friesii*, *T. serusiauxii*, *T. verrucosa*, and *T. weberi*. Some species form small, loose aggregations of swollen hyphal cells, sometimes giving raise to conidiophores, which cannot yet be classified as true stromata. True stromata are lacking in almost all saprobic *Taeniolella* species, except for *T. exilis* (type species of *Taeniolella*), and in almost all lichenicolous species, except for *T. arctoparmeliae*, *T. caespitosa*, and *T. weberi*, which develop loose stromatic hyphal aggregations below conidiophores.

Conidiophores

Conidiophores of *Taeniolella* species range from being micronematous (little differentiated and barely distinguishable from hyphal cells) to semi-macronematous (different from vegetative hyphae and conspicuous but nevertheless little differentiated). The vegetative hyphae may develop into conidiophores gradually, which means that the discrimination between hyphae and conidiophores may be difficult. Conidiophores may arise from internal or external hyphae, swollen hyphal cells or stromatic hyphal aggregations, either formed singly or sometimes in tufts, rarely aggregated in sporodochioid conidiomata (*e.g.*, *T. weberi*). They are erect to decumbent, straight to curved-sinuous or irregularly shaped, with swellings and constrictions, simple or branched in a few species, aseptate (conidiophores reduced to conidiogenous cells) to pluriseptate, thin- to thick-walled, wall sometimes composed of two or more conspicuous layers, smooth to distinctly ornamented (verruculose, verrucose, rugose, rimulose to rhagadiose-squamulose or squamose), pigmented, pale to dark brown, cell lumen sometimes reduced, with a small central vacuole-like cavity, imitating very thick walls. Conidiophores may rejuvenate via enteroblastic, percurrent proliferation leaving conspicuous annellations formed by sheath-like wall remnants. Conidiophores may occasionally disintegrate in fragments of different sizes or they break off as a whole, and the fragments or broken off conidiophores may possibly function as diaspores.

Conidiogenous cells and conidiogenesis

Conidiogenous cells of *Taeniolella* species are integrated, terminal or sometimes separate, *i.e.*, conidiophores are reduced to conidiogenous cells. They are little differentiated, short cylindrical, doliiform to oblong, usually with a single simple terminal conidiogenous locus (unilocal), determinate to percurrently proliferating, with a single to several distinct annellations, rarely sympodial, with two loci, conidiogenous loci truncate to slightly convex, undifferentiated, neither thickened nor darkened-refractive. The conidiogenesis is holoblastic (conidial initials budding, narrower than the conidiogenous cells) to holothallic (conidial initials not or barely narrower than the conidiogenous cells).

Conidia

Conidia of *Taeniolella* species are formed in simple or occasionally branched, firm (not easily disarticulating) or easily disintegrating acropetal chains. Conidia are always pigmented (usually pale to dark brown), but shape, size and septation are diverse. Saprobic species tend to have larger, pluriseptate conidia, whereas lichenicolous species are rather characterised by having amero- to phragmosporous conidia, often only 0–1-septate. Conidia are almost exclusively euseptate, rarely distoseptate. The conidial shape may range from being ellipsoid, ovoid, obovoid, doliiform, subcylindrical, short to long cylindrical to vermiform or sometimes somewhat irregular. The conidial wall may be thin to thick, one-layered or distinctly two- or rarely three-layered, smooth or almost so to distinctly ornamented, usually agreeing with the ornamentation of the conidiophores, ranging from verruculose, verrucose, rugose, rimulose to rhagadiose-squamulose or even squamose. The cell lumen is sometimes reduced, with a small central vacuole-like cavity, imitating a very thick wall. Solitary or primary conidia are apically rounded, catenate; secondary conidia are truncate or subtruncate at the apex, and the more or less truncate basal hilum is undifferentiated, neither thickened nor darkened-refractive.

Species concept

The descriptions and delimitations of species in this taxonomic monograph are mainly based on qualitative and quantitative morphological characters *in vivo*, supplemented by host range data for lichenicolous taxa. The focus on morphology *in vivo* results from the limited availability of cultures and phylogenetic data. The geographical distribution of particular species is often insufficiently known. Some *Taeniolella* species are widespread, others are characterised by having disjunct ranges.

The following morphological and biometrical characters proved to be diagnostic and taxonomically relevant:

- Ramification of the conidiophores (if present).
- Conidial formation, conidial chains (long, short, firm or easily disarticulating).
- Conidial shape and size, septation (number, eu- or in a few cases distoseptate), wall thickness and number of conspicuous layers.
- Wall ornamentation of conidiophores and conidia (from smooth to rhagadiose-squamose).
- Colony characters [effuse (most species), “punctiform”, *i.e.*, in dense tufts or densely caespitose, forming small clearly delimited aggregations of conidiophores but without supporting stromatic base (*e.g.*, *T. punctata*), sporodochial, *i.e.*, conidiophores in large dense aggregations, arising from a stromatic base (*e.g.*, *T. weberi*)] and biological differences in lichenicolous species (invaded thallus unchanged or obviously pathogenic, causing discolorations or even gall inducing).

The following morphological and biometrical characters are only applicable and diagnostic in combination with other traits:

- Shape, size, and septation of conidiophores, rejuvenation of conidiophores leaving distinct annellations.
- Shape and size of conidiogenous cells (number of conidiogenous loci relevant when more than a single locus (sympodial proliferation).
- Formation of stromata and arrangement of conidiophores.

The following morphological and biometrical characters are either rather uniform or very variable and barely applicable for the discrimination of species:

- Mycelium and hyphae, except for a few cases of species with special hyphal formations, *e.g.*, with monilioid-toruloid hyphae (*e.g.*, *T. christiansenii*, *T. toruloides*, and *T. verrucosa*) or abundant superficial mycelium.
- Structure of conidiogenous loci and conidial hila (uniformly truncate to slightly convex, unthickened and not darkened).
- Degree of pigmentation (either rather uniform or variable, often depending on the age of the collections).

Biology, ecology and distribution

The genus *Taeniolella* is currently purposely very broadly circumscribed and includes saprobic and lichenicolous species, which are undoubtedly not congeneric in terms of a phylogenetic approach. The generic affinity of a few aquatic species previously assigned to *Taeniolella* remains unclear and doubtful because the type collections or any other samples were not available, or have been excluded due to morphological peculiarities and/or their phylogenetic affinities since they belong elsewhere, *e.g.*, *Taeniolella rudis* is reallocated to the genus *Sterigmatobotrys* (Ertz *et al.* 2016); *T. typhoides* was shown to be a species of the *Lindgomycetaceae* (Shearer *et al.* 2009) vs. *T. exilis* (type species of *Taeniolella*) pertaining to the *Kirschsteiniotheliaceae* within *Dothideomycetes*. Almost all saprobic species, including *T. exilis*, are wood-inhabiting (xylophilous). They usually occur on living or mostly dead, sometimes decaying twigs and trunks, often on bark, sometimes on decorticated twigs and stems. *Taeniolella plantaginis* is an exceptional species occurring on senescent leaves of *Plantago* species. Other records of saprobic *Taeniolella* species from unusual sources, such as isolations from soil, litter and humans, are doubtful or have been excluded as far as material was available (*e.g.*, *Taeniolella boppii*, isolated from human, was reallocated to the genus *Cladophialophora* (de Hoog *et al.* 1995); *T. phialophora*, isolated from strawberry rhizosphere soil, was included in the *Sordariales* (Liang *et al*. 2011). Lichenicolous species occur on a wide range of lichens. They grow on thalli and fruiting bodies (mostly apothecia), mostly without causing any evident damages, but they are nevertheless confined to their host lichens, or they are obviously pathogenic and cause either distinct damages of the thalli (*e.g.*, *Taeniolella chrysothricis* and *T. delicata*) or at least thallus discolorations or necroses (*e.g.*, *T. christiansenii*, *T. chrysothricis*, *T. cladinicola*, *T. pseudocyphellariae*, and *T. strictae*). *Taeniolella atricerebrina* and *T. rolfii* induce the formation of distinct galls.

The distribution of most saprobic species of the genus *Taeniolella* is little known. Voucher specimens are underrepresented in herbaria worldwide. Collections of saprobic species are largely confined to the northern hemisphere, with a focus on Europe and North America, but occasionally also collected in Africa, Asia, and South America. Lichenicolous species are widespread in Africa, Asia, Australia, Europe, North and South America, but also with a focus on the northern hemisphere, which might, however, reflect the residences and collecting activities of lichenologists and mycologists interested in lichenicolous fungi in general and *Taeniolella* species in particular.

MATERIAL AND METHODS

Morphology

Dried specimens of the species examined are deposited at BR, BP, C, CANL, E, FH, GLM, GZU, H, HAL, IMI, K, K(M), L, LE, LG, M, MAF, MIN, NSW, NY, NYS, PREM, PRM, SBBG, TU, UPS, WA (abbreviations according to Holmgren *et al.* 1990), and in the private collections of F. Berger, W. v. Brackel, R. Cezanne & M. Eichler, P. Diederich, P. A. Earland-Bennett, J. Etayo, and A. Tsurykau. Microscopic examinations (including all microscopic measurements) were carried out using handmade sections mounted in distilled water and an Olympus BX50 microscope at a magnification of ×1000, without any staining, since all structures examined are darkly pigmented. In one case, the fungal hyphae were stained with Lactophenol Blue Solution (Merck, Darmstadt). Permanent slides were prepared by sealing the cover-glasses with Canada balsam (SERVA, Heidelberg) and dried for 24 h. Measurements of twenty conidiophores, conidia and other structures were made for each collection and the 95 % confidential intervals determined (values are rounded to the nearest half micrometre, except for wall thickness; extreme values in parentheses). All drawings, with the exception of Fig. 26 (prepared by U. Braun), were carried out free hand by B. Heuchert. All digital micrographs were taken by B. Heuchert with a ZEISS Axioskop 2 equipped with ZEISS AxioCam HR and occasionally optimised with the software ZEISS AxioVision. Macroscopic photographs of lichenicolous species, most of them taken by Paul Diederich, were prepared using a Canon 40D camera with a Nikon BD Plan 5× or 10× microscope objective, StackShot (Cognisys) and Helicon Focus (HeliconSoft) for increasing the depth of field. ESEM examinations, conducted at the Interdisciplinary Centre of Materials Science (CMAT) of Martin Luther University Halle-Wittenberg, were carried out to identify details of conidiophores and conidial surface ornamentations. Specimens were excised from the host and attached to aluminium pin stubs. Observations and micrographs were made with a Philips XL30 ESEM-FEG environmental electron microscope with digital camera, at 1.2 Torr and 3.0 kV acceleration voltages. The specimens were not coated.

Cultures and molecular methods

Methodological details in connection with phylogenetic analyses and cultures used for these studies have been described in detail in Ertz *et al.* (2016).

Abbreviations

cf. = confer (compare), comb. nov. = new combination, *del*. = *delineati* (depicted), diam = diameter, *et al*. = *et alii* (and others), *e.g.* = *exempli gratia* (for example), f. = forma, fig. = figure, herb. = herbarium, ill. = illustration, *i.e.* = *id est* (that is), incl. = inclusive, *ined*. = *ineditus* (not published), *l.c.* = *locus citatus*, lit. = literature, reference, LM = light microscopy, *nom. nud.* = *nomen nudum* (name without any description or diagnosis), pl. = plate, *s. lat.* = *sensu lato* (in a wide sense), *s. str.* = *sensu stricto* (in a narrow sense), ESEM = environmental scanning electron microscope, *s. n.* = *sine numero* (without number), sp. nov. = species nova (new species), sp. = species, spp. = plural of sp., ssp. = subspecies, *viz.* = *videlicet* (namely), vs. = versus (against).

Key to lichenicolous *Taeniolella* species, *Talpapellis* species and *Taeniolina scripta*

The abbreviation "*T.*" stands for *Taeniolella* (all other generic names are not abbreviated). *Taeniolina scripta* (saprobic species occasionally found on lichens) and *Talpapellis beschiana* are treated under "Excluded, doubtful and insufficiently known species".

1 Conidial chains and conidia strongly branched from base to top, chains not easily disintegrating, adhering for a long time,
often breaking off at the base and functioning as propagules; conidiophores poorly developed,
often micronematous, (1.7–)5–7(–12.5) × (1.7–)3–5 µm, aseptate [saprobic species, occasionally found on lichen thalli]
.... ***Taeniolina scripta***
Conidial chains and conidia unbranched or only occasionally branched, but not strongly branched and
not forming multibranched propagules; conidiophores mostly semi-macronematous, longer 2

2 (1) Conidiophores with enteroblastic proliferations in the upper part, leaving coarse annellations, conidiogenous cells formed
at the apex of conidiophores as result of enteroblastic proliferation, but conidiogenesis holoblastic [*Talpapellis*]
.... 3
Conidiophores without any enteroblastic proliferations, annellations lacking or in a few species only occasionally
with sparse rejuvenations leaving annellations, which are, however, not connected with the formation of
conidiogenous cells [*Taeniolella*] 7
3 (2) Conidiophores arising from internal and external hyphae, erect, outline irregular, with swellings and constrictions,
walls irregularly thickened and pigmented, with thicker and darker wall portions, to 1.5 µm wide; conidia catenate,

5–14 × 3–6 µm, 0–1-septate, walls not uniformly pigmented, with thicker and darker portions; on an unidentified crustose lichen, Seychelles .... ***Talpapellis mahensis***
Conidiophores and conidia more or less regular, width and pigmentation regular 4

4 (3) Conidiophores relatively short, 8–40 × 3–5(–6) µm, sometimes branched; conidia 0–1(–2)-septate [on *Solorina crocea*] .... ***Talpapellis solorinae***
Conidiophores longer, 11–70(–80) × 3–6 µm, usually unbranched; conidia usually aseptate; on *Cladonia* spp. and *Peltigera venosa* 5

5 (4) Conidiogenous cells with coarse, often flaring annellations [on *Cladonia* spp.] .... ***Talpapellis beschiana***
Annellations not or barely flaring [on *Peltigera venosa*] 6

6 (5) Conidiogenous cells with a single or up to four conidiogenous loci; ramoconidia present, 9–10.5 × 3–3.5 µm; conidia (3–)5.5–7(–8) × (2–)2.5–4(–4.5) µm, width on average < 4 µm .... ***Talpapellis peltigerae*** var. ***peltigerae***
Conidiogenous cells with a single or occasionally two conidiogenous loci; ramoconidia lacking; conidia aseptate, (4–)5.5–9.5(–13) × (3–)4–5.5(–6) µm, width on average > 4 µm .... ***Talpapellis peltigerae*** var. ***rossica***

7 (2) Conidiophores in sporodochial conidiomata, to 100 µm diam, base with stromatic hyphal aggregations; conidiophores 12–70 × 5–8 µm; conidia small, 6–16 × 5–7 µm, 0–3-septate, conidial septa conspicuously darkened, thickened and multilayered [on *Thelotrema weberi*] .... ***T. weberi***
Sporodochia or sporodochioid aggregations of conidiophores not formed or, when formed, without stromatic hyphal base and/or much smaller; conidial septa not conspicuously darkened, thickened and multilayered 8

8 (7) Conidiophores and conidial chains frequently branched; conidiogenous cells with a single or often two conidiogenous loci; conidiophores 8–80 × 2.5–6.5(–8) µm; conidia 4–15 × 3–6.5(–7) µm, smooth or verruculose to rugose [on thalli of *Arthoniales*] .... ***T. arthoniae***
Conidiophores and conidial chains either usually unbranched or conidiogenous cells at least consistently unilocal 9

9 (8) Conidia consistently solitary or mostly solitary, only occasionally in short chains, solitary conidia with rounded apex 10
Conidia usually catenate, primary conidia with rounded apex, the majority of other conidia with truncate apex 15

10 (9) Loose to dense stromata developed; conidiophores (7–)8–11(–12) µm wide; conidial wall thick, 1–2.5(–3) µm [on *Umbilicaria* spp.] .... ***T. umbilicariae***
Stromata lacking; conidiophores either narrower, (1.5–)3–8(–9) µm, and/or conidial wall thinner, 0.25–1.5 µm wide 11

11 (10) Conidia 6–20 × 3–6 µm, 1–5-septate, thin-walled, 0.25–0.5 µm, at first smooth, finally verruculose or with net-like cracks; conidiophores 4–32 µm long, 1–5-septate [on *Thamnolia* spp.] ....***Taeniolella*** sp. (treated in the list of lichenicolous *Taeniolella* spp.)
Conidial wall thicker, 0.5–1.5 µm, conidia either wider, 6–9 µm, or conidiophores much shorter, 3–12(–15) µm, aseptate 12

12 (11) Conidiophores very short and aseptate, 3–12(–15) × (1.5–)3–5 µm; conidia 3–12 × 3–5 µm, smooth to verruculose-rimulose [on *Strigula stigmatella*] .... ***T. friesii***
Conidiophores longer and/or wider, 7–55 × 4–10 µm; conidia 7–31 × 5.5–9 µm 13

13 (12) Conidiophores and conidia rather pale, pale brown to greyish brown; conidia smooth or only rugose to somewhat squamulose with age [on *Ionaspis odora*] .... ***T. ionaspisicola***
Conidiophores and conidia darker, medium to dark brown; conidia verruculose, rimulose or squamulose 14

14 (13) Conidiophores 7–29 µm long, 0–4-septate, without percurrent proliferations and annellations; conidiogenous loci and conidial hila not distinctly attenuated, truncate, broad, 3–5 µm wide [on *Arctoparmelia* spp.] .... ***T. arctoparmeliae***
Conidiophores 14–55 µm long, 0–9-septate, with 1–4 percurrent proliferations leaving distinct annellations; conidiogenous loci and conidial hila distinctly attenuated, 2.5–4 µm [on *Trapeliopsis* spp.] .... ***T. trapeliopseos***

15 (9) Conidia smooth (light microscopy) [at most with some irregularly spread verrucae] 16
Conidia sometimes smooth or almost so when young, but soon verruculose, verrucose, rimulose to squamulose throughout (light microscopy) 25

16 (15) Conidiophores mostly branched, usually at the base, sometimes with an additional branch in the upper part, 9–65 × 4–7 µm, 1–9-septate; conidia 5–20 × 4–6(–7) µm, 0–2(–3)-septate [on *Thelotrema* spp.] .... ***T. thelotrematis***
Conidiophores usually unbranched 17

17 (16) Conidia in long, firm (persistent), toruloid chains (with numerous distinct constrictions), to 100 µm long [on *Thelotrema* spp.] .... ***T. toruloides***
Conidia not in toruloid chains 18

18 (17) Pathogenic, usually destroying infected apothecia and thalli which are also discoloured; conidiophores 8–56(–90) × 3.5–7 µm; conidia 4–17 × 3–8 µm, (0–)1–2(–3)-septate, smooth, finally becoming irregularly verruculose, pale brown to brown [on a wide range of lichens] .... ***T. delicata***
Not destroying infected apothecia and thalli, conidia darker brown, or on *Chrysothrix* spp. thalli that are sometimes damaged and somewhat discoloured, but conidia much paler, subhyaline to pale brown 19

19 (18) Conidiophores and conidia, 2–6 µm wide [on *Chrysothrix* spp.] .... ***T. chrysothricis***
Conidiophores and conidia broader, (4–)5–13 µm 20

20 (19) Conidiophores very long and broad, (18–)20–216 × 7–13 µm; conidia 9–11 µm wide [on *Phaeophyscia* spp.] .... ***T. phaeophysciae***
Conidiophores shorter and narrower, 5–71(–85) × 4–8(–9) µm; conidia 3–9 µm wide 21

21 (20) Conidiophores short, 8–15(–20) µm, often in tufts, wall smooth, 0.5 µm wide; conidia in long, firm chains, not easily disintegrating, 5–13 × 4–5.5 µm, (0–)1–2(–3)-septate, smooth to irregularly verrucose [on *Phaeographis* spp.] .... ***T. hawskworthiana***
Conidiophores longer, 7–95 µm, wall thicker, 0.5–1.5 µm 22

22 (21) With conspicuously torulose external hyphae (stereomicroscope); conidia 4–16 × 3–6.5(–7.5) µm, almost smooth to verruculose-striate [on *Arthonia* and *Stereocaulon*] .... ***T. christiansenii***
External torulose hyphae not formed; conidia 5–9 µm wide 23

23 (21) Tips of conidiophores and/or the adhering terminal conidium somewhat swollen; conidia smooth, becoming irregularly rugose or wall occasionally squamulose with age [on *Ionaspis odora*] .... ***T. ionaspisicola***
Tips of conidiophores and/or the adhering terminal conidium sometimes somewhat swollen; conidial wall not squamulose, also not with age 24

24 (23) Mycelium dimorphic [hyphae penetrating the host thallus: flexuous to tortuous, branched, 1.5–3 µm wide (4–6 µm wide on rock), septate, slightly constricted at the septa, smooth, walls thickened, pale brown; hyphae entering the underlying cortex cells, densely aggregated, 3–10 µm wide, septate, constricted at the septa, irregularly shaped, subhyaline to pale brown, unthickened, granulate (such hyphae are only developed around the base of conidiophores)]; conidia smooth, sometimes somewhat irregularly rough [on *Pertusaria* spp.] .... ***T. caespitosa***
Mycelium not dimorphic, uniform; conidia smooth, occasionally slightly rugose or verruculose [on lichens of various genera, most often on *Graphis scripta s. lat.* and associated taxa] .... ***T. punctata***

25 (15) Inducing the formation of distinct galls, or conidiophores at least in distinct sporodochium-like aggregations, subglobose-oval, planate-convex, up to 0.75 mm diam 26
Galls or distinct sporodochioid aggregations of conidiophores not formed 28

26 (25) Colonies effuse to sporodochioid, sporodochium-like aggregations of conidiophores to 0.75 mm diam; conidiophores 5–7 µm wide, wall squamulose, squamules 1–7 µm diam [on *Roccellina cerebriformis*] .... ***T. santessonii***
Inducing the formation of distinct galls, 0.2–4 mm diam; conidiophores either somewhat narrower, 4–6.5 µm wide, or wider, 5–10(–12) µm, with swollen base, 6–12 µm diam, and smaller squamules, 1–4 µm diam 27

27 (26) Galls 0.5–4 mm diam; conidiophores 15–47 × 5–10(–12) µm, base swollen, 6–12 µm wide, squamules of the wall 1–4 µm diam [on *Tephromela atra*] .... ***T. atrocerebrina***
Galls 0.2–1(–1.5) mm diam; conidiophores longer and narrower, 12–122 × 4–6 µm, not distinctly swollen at the base, squamules of the wall 1–8 µm diam. [on *Cetraria* spp.] .... ***T. rolfii***

28 (25) Conidiophores poorly developed, barely distinguishable from conidial chains, 3–7 µm long and broad, aseptate, *i.e.*, reduced to conidiogenous cells [on *Pyrenula* spp.] .... ***T. pyrenulae***

Conidiophores well-developed, usually much longer, when short then much narrower (not as wide as long), not consistently aseptate 29

29 (28) Pathogenic, causing damages of thalli or at least distinct discolorations 30
Non-pathogenic, without any thallus damages and discolorations 35

30 (29) Usually destroying infected apothecia and thalli which become discoloured; conidiophores 8–56(–90) µm long, (0–)1–15-septate; conidia 4–17 × 3–8 µm, smooth to irregularly verruculose [on hosts of various genera] .... ***T. delicata***
Apothecia and thalli not destroyed, but causing thallus discoloration [on *Arthonia*, *Chrysothrix* and *Stereocaulon* spp.] or becoming necrotic [on *Cladonia*, *Nephroma* and *Pseudocyphellaria* spp.], but then conidiophores and conidia often becoming rimulose or conidiophores annellate 31

31 (30) Thallus discolorations brown; forming superficial hyphae with constrictions at the septa (with monilioid cells) 32
Either thallus discoloration reddish to purplish brown, or thallus becoming necrotic, dark brown to black; superficial hyphae with monilioid cells not formed 34

32 (31) Conidiophores 3–5 µm wide [on *Chrysothrix* spp.] .... ***T. chrysothricis***
Conidiophores 4–7(–9) µm wide 33

33 (32) Conidiophores 5.5–27.5(–50) µm long, (0–)1–5-septate; conidial chains disintegrating into fragments, 0–5-septate, wall verruculose and with fine net-like cracks [confined to *Cladonia stricta*] .... ***T. strictae***
Conidiophores 5–55 µm long, 0–7-septate; conidia in easily disintegrating chains, 0–2(–3)-septate, wall almost smooth, finally somewhat verruculose-striate [on *Arthonia* and *Stereocaulon* spp.] .... ***T. christiansenii***

34 (31) Thallus discoloration reddish to purplish brown [on various *Cladonia* spp.] .... ***T. cladinicola***
Thallus becoming necrotic, dark brown to black [on *Nephroma* and *Pseudocyphellaria* spp.] .... ***T. pseudocyphellariae***

35 (29) Conidia solitary or in short easily disintegrating chains, smooth, finally irregularly rugose, rarely squamulose [on *Ionaspis odora*] .... ***T. ionaspisicola***
Conidia catenate, wall distinctly sculptured, even in younger conidia 36

36 (35) Conidiophores short, 8–15(–29) × 5–6 µm, 0–3(–4)-septate, smooth; conidia in long, firm chains, 5–13 × 4–5.5 µm, smooth to verrucose [on *Phaeographis* spp.] .... ***T. hawksworthiana***
Conidiophores longer, 5–104 µm, not smooth; conidia either wider, 4–10 µm, or wall coarsely rhagadiose-squamulose 37

37 (36) Conidia coarsely rhagadiose-squamulose, 5–22 × 3.5–6.5 µm, often with long subhyaline germ tubes; conidiophores 2.5–5(–5.5) µm wide [on *Dendrographa* and *Tylophoron* spp., and on unidentified crustose lichens with *Trentepohlia*] .... ***T. serusiauxii***
Conidia verruculose, rimulose to delicately rhagadiose-squamulose, 5–10 µm wide, without germ tubes; conidiophores 4.5–10 µm wide 38
38 (37) Colonies on the thallus punctiform 39
Colonies effuse, caespitose, not distinctly punctiform 40

39 (38) Conidiophores 10–32(–68) µm long, 0–5(–9)-septate; conidia rugose, verrucose, rimulose-squamose [on *Placopsis* spp.] .... ***T. diederichiana***
Conidiophores 14–83(–95) µm long, 2–25-septate; conidia smooth, later slightly verruculose-rugose .... ***T. punctata***

40 (38) Forming torulose hyphae; conidiophores very long, 9–104 µm, 1–12-septate; conidia 6–19 × 6–10 µm, 0–1(–3)-septate [on thalli of lichens of different genera] .... ***T. verrucosa***
Torulose hyphae not formed; conidiophores shorter, about 6–50 µm; conidia (0–)1–4-septate 41

41 (40) Conidiophores 7–13 µm wide, wall to 2 µm thick, multilayered; conidia solitary or catenate, 10–25 × 7–10 µm, hila 5–7(–8) µm wide [on *Lecanora* spp.] .... ***T. lecanoricola***
Conidiophores 5–7(–8) µm wide; conidia 4–8 µm wide, hila 2.5–6(–7) µm wide 42

42 (41) Conidiophores with a relatively thin wall, 0.5–1 µm, one-layered, frequently with enteroblastic-percurrent proliferations leaving distinct annellations [on thalli of lichens of various genera, excluding *Umbilicaria* spp.] .... ***T. pertusariicola***
Conidiophores with a thick wall, to 2 µm, distinctly multilayered, enteroblastic-percurrent proliferations leaving distinct annellations usually lacking [on *Umbilicaria* spp.] .... ***T. umbilicariicola***

Tabular key to lichenicolous *Taeniolella* species, *Talpapellis* species and *Taeniolina scripta* based on host families and genera

Host genera of lichenicolous *Taeniolella* species, *Talpapellis* species and *Taeniolina scripta* (saprobic species occasionally found on lichens) are listed according to their affiliations to families, and the lichenicolous species occurring on hosts of the particular families are listed or keyed out when two or more species are involved. Collections and records on unidentified crustose lichens are excluded and not listed.

Amandinea – **Caliciaceae**; *Arctoparmelia* – **Parmeliaceae**; *Arthonia* – **Arthoniaceae**; *Arthothelium* – **Arthoniaceae**; *Aspicilia* – **Hymeneliaceae**; *Bilimbia* – **Porpidiaceae**; *Caloplaca s. lat.* – **Teloschistaceae**; *Candelariella* – **Candelariaceae**; *Cetraria* – **Parmeliaceae**; *Cetrariella* – **Parmeliaceae**; *Chrysothrix* – **Chrysothricaceae**; *Cladina* = *Cladonia* – **Cladoniaceae**; *Cladonia* – **Cladoniaceae**; *Dendrographa* – **Roccellaceae**; *Enterographa* – **Roccellaceae**; *Fissurina* – **Graphidaceae**; *Fuscidea* – **Fuscideaceae**; *Graphis* – **Graphidaceae**; *Hyperphyscia* – **Physciaceae**; *Hypocenomyce* – **Lecideaceae**; *Hypogymnia* – **Parmeliaceae**; *Ionaspis* – **Hymeneliaceae**; *Lecanactis* – **Roccellaceae**; *Lecania* – **Ramalinaceae**; *Lecanographa* – **Lecanographaceae**; *Lecanora* – **Lecanoraceae**; *Lecidella* – **Lecanoraceae**; *Lepra* – **Pertusariaceae**; *Loxospora* – **Loxosporaceae**; *Micarea* – **Micareaceae**; *Myriolecis* – **Lecanoraceae**; *Nephroma* – **Nephromataceae**; *Ocellomma* – **Roccellaceae**; *Ochrolechia* – **Pertusariaceae**; *Opegrapha* – **Opegraphaceae**; *Ophioparma* – **Ophioparmaceae**; *Parmelia* – **Parmeliaceae**; *Pectenia* – **Pannariaceae**; *Peltigera* – ***Peltigeraceae;*** *Pertusaria* – **Pertusariaceae**; *Phaeographis* – **Graphidaceae**; *Phaeophyscia* – **Physciaceae**; *Phlyctis* – **Phlyctidaceae**; *Physcia* – **Physciaceae**; *Physconia* – **Physciaceae**; *Placopsis* – **Agyriaceae**; *Porpidia* – **Porpidiaceae**; *Protoparmeliopsis* – **Lecanoraceae**; *Pseudocyphellaria* – **Lobariaceae**; *Psilolechia* – **Micareaceae**; *Pyrenula* – **Pyrenulaceae**; *Ramalina* – **Ramalinaceae**; *Rhizocarpon* – **Rhizocarpaceae**; *Roccellina* – **Roccellaceae**; *Ropalospora* – **Fuscideaceae**; *Solorina* – **Peltigeraceae**; *Stereocaulon* – **Stereocaulaceae**; *Strigula* – **Strigulaceae**; *Tephromela* – **Ramalinaceae**; *Thamnolia* – **Icmadophilaceae**; *Thelotrema* – **Thelotremataceae**; *Trapeliopsis* – **Agyriaceae**; *Tylophoron* – **Arthoniaceae**; *Umbilicaria* – **Umbilicariaceae**; *Varicellaria* – **Pertusariaceae**.

Amandinea – *T. delicata*; ***Arctoparmelia*** – *T. arctoparmeliae*; ***Arthonia*** – *T. arthoniae*, *T. christiansenii*, *T. delicata*, *T. punctata*, *T. verrucosa*; ***Arthothelium*** – *T. punctata*; ***Aspicilia*** – *T. verrucosa*; ***Bilimbia*** – *T. delicata*; ***Caloplaca*** *s. lat.* – *T. delicata*; ***Candelariella*** – *T. delicata*; ***Cetraria*** – *T. rolfii*; ***Cetrariella*** – *T. rolfii*; ***Chrysothrix*** – *T. chrysothricis*; ***Cladonia*** – *T. cladinicola*, *T. strictae*, *Talpapellis beschiana*; ***Dendrographa*** – *T. arthoniae*, *T. serusiauxii*; ***Enterographa*** – *T. delicata*; ***Fissurina*** – *T.* cf. *punctata*; ***Fuscidea*** – *T. delicata;* ***Graphis*** – *T. delicata*, *T. punctata*; ***Hyperphyscia*** – *T. delicata*, *T. phaeophysciae*; ***Hypocenomyce*** – *T. delicata*; ***Hypogymnia*** – *T. delicata*; ***Ionaspis*** – *T. ionaspisicola*; ***Lecanactis*** – *T. arthoniae*, *T. delicata*; ***Lecania*** – *T. delicata*; ***Lecanographa*** – *T. arthoniae*; ***Lecanora*** – *T. delicata, T. lecanoricola, T. pertusariicola*; ***Lecidella*** – *T. delicata*; ***Lepra*** – *T. delicata*, *Taeniolina scripta*; ***Loxospora*** – *T. delicata*; ***Micarea*** – *T. delicata*; *T. verrucosa*; ***Myriolecis*** – *T. delicata*; ***Nephroma*** – *T. pseudocyphellariae*; ***Ocellomma*** – *T. delicata*; ***Ochrolechia*** – *T. pertusariicola*; ***Opegrapha*** – *T. delicata*; ***Ophioparma*** – *T. pertusariicola*; ***Parmelia*** – *T. delicata*; ***Pectenia*** – *T. delicata*, *T. phaeophysciae*; ***Peltigera*** – *Talpapellis peltigerae*; ***Pertusaria*** – *T. caespitosa*, *T. delicata*, *T. pertusariicola*, *T. phaeophysciae*, *T. punctata*; ***Phaeographis*** – *T. delicata*, *T. hawksworthiana*, *T. punctata*; ***Phaeophyscia*** – *T. phaeophysciae*, *Taeniolina scripta*; ***Phlyctis*** – *T. delicata*; ***Physcia*** – *T. delicata*, *T. phaeophysciae*; ***Physconia*** – *T. delicata*, *T. phaeophysciae*; ***Placopsis*** – *T. diederichiana*; ***Porpidia*** – *T. delicata*; ***Protoparmeliopsis*** – *T. delicata*; ***Pseudocyphellaria*** – *T. pseudocyphellariae*; ***Psilolechia*** – *T. delicata*; ***Pyrenula*** – *T. pyrenulae*; ***Ramalina*** – *T. delicata*; ***Rhizocarpon*** – *T. verrucosa*; ***Roccellina*** – *T. santessonii*; ***Ropalospora*** – *T. delicata*; ***Solorina*** – *Talpapellis peltigerae*; ***Stereocaulon*** – *T. christiansenii*; ***Strigula*** – *T. friesii*. ***Tephromela*** – *T. atricerebrina*; ***Thamnolia*** – *Taeniolella* sp. (putative asexual morph of *Sphaerellothecium thamnoliae*); ***Thelotrema*** – *T. thelotrematis*, *T. toruloides*, *T. weberi*; ***Trapeliopsis*** – *T. trapeliopseos*; ***Tylophoron*** – *T. serusiauxii*; ***Umbilicaria*** – *T. umbilicariae*, *T. umbilicariicola*; ***Varicellaria*** – *V. pertusariicola*.

Agyriaceae (*Placopsis*, *Trapeliopsis*)

1 Conidiogenous cells short cylindrical, not obconically narrowed, 5−12 µm long, conidiogenous loci 4.5−6 µm diam; conidia catenate in unbranched chains, doliiform, subcylindrical, ellipsoid, 0–1(–2)-septate, 7–17(–21) × 5–7.5 µm, wall irregularly rugose, verrucose to rimulose, later squamulose, squamules 0.5–3 µm wide [on *Placopsis*] .... ***T. diederichiana***

Conidiogenous cells subcylindrical, conspicuously obconically narrowed (from 8 to 4 µm), 9−13 × 4−7 µm, loci 2.5−3.5 µm diam; conidia solitary, broad ellipsoid, subcylindrical, pyriform, 0–4-septate, 9–24 × 5.5–8 µm, outer wall irregularly verrucose, becoming rimulose with deep cracks, later squamulose, squamules 0.5−1.5 µm wide [on *Trapeliopsis*] .... ***T. trapeliopseos***

Arthoniaceae (*Arthonia*, *Arthothelium*, *Tylophoron*)

1 Conidiophores forming a densely branched sporogenous complex, 7–9(–10) µm wide .... ***T. verrucosa***

Conidiophores not in densely branched sporogenous complex, narrower 2

2 (1) Tips of the conidiophores and/or the adhering terminal conidium occasionally swollen up to 9 µm wide [on *Arthothelium*] .... ***T. punctata***

Tips of the conidiophores and/or the adhering terminal conidium not swollen 3

3 (2) Conidiophores rarely unbranched, mostly variously branched, wall irregularly verruculose to verrucose, rarely smooth .... ***T. arthoniae***
Conidiophores mostly unbranched or occasionally branched 4

4 (3) Wall of conidiophores smooth, especially in young conidiophores, in older ones often irregularly verruculose, slightly rimulose to rhagadiose, conidiogenous cells sometimes narrowed to the tip, loci (1–)1.5–4(–5) µm diam .... ***T. delicata***
Walls of conidiophores verruculose to verrucose or verruculose-striate with longitudinal splits 5

5 (4) Walls of conidiophores verruculose to verrucose; conidia 0−1(−2)-septate, 5–22 × 3.5–6.5 µm, pale brown to brown, wall irregularly rough-walled, soon becoming rimulose to strongly sculptured, rhagadiose-squamulose to squamose, coarse ornamentation above all very evident in older conidia, squamules 0.5–5 µm wide, irregularly shaped, squamules firm, not detached, with a granular inner pigmentation, conidia often germinating, germ tubes subhyaline, up to 50 × 1.5–2 µm, smooth, unthickened [on *Tylophoron*] .... ***T. serusiauxii***
Wall of conidiophores verruculose-striate with longitudinal splits; conidia 0–2(–3)-septate, 4–16(–24) × 3–6.5(–8) µm, brown to dark brown, small conidia smooth, outermost wall layer longitudinally splitting, verruculose-striate, without squamules and long, subhyaline germ tubes .... ***T. christiansenii***

Caliciaceae

On *Amandinea* .... ***T. delicata***

Candelariaceae

On *Candelariella* .... ***T. delicata***

Chrysothricaceae

On *Chrysothrix* .... ***T. chrysothricis***

Cladoniaceae (*Cladonia*)

1 Mycelium only immersed and intracellular in host hyphae, infection causes reddish or purplish brown discolorations of infected host thallus .... ***T. cladinicola***
Mycelium immersed and superficial, superficial mycelium composed of subglobose or globose, monilioid cells with irregularly rough walls, usually with fine net-like cracks or with squamules, up to 2 µm wide, infection causes brownish discolorations of infected host thallus .... ***T. strictae***

Fuscideaceae

On *Fuscidea* or *Ropalospora* .... ***T. delicata***

Graphidaceae (*Fissurina*, *Graphis*, *Phaeographis*)

1 Tips of conidiophores and/or the adhering terminal conidium occasionally swollen, up to 9 µm wide .... ***T. punctata***
Tips of conidiophores and/or the adhering terminal conidium not swollen, sometimes narrowed 2

2 (1) Conidia ellipsoid, ovoid or subcylindrical, (0–)1–2(–3)-septate, 5–13 × 4–5.5 µm; infected thalli not destroyed and without any discoloration [on *Phaeographis*] .... ***T. hawksworthiana***
Conidia ellipsoid, doliiform, pyriform, limoniform or subcylindrical, (0-)1–2(–3)-septate, 4–17 × 3–8 µm; infected thalli usually destroyed and apothecia become discoloured, grey or dark brown to black .... ***T. delicata***

Hymeneliaceae (*Aspicilia*, *Ionaspis*)

1 Conidiophores aggregated in small tufts, loosely caespitose, forming a densely branched sporogenous complex; conidia catenate in unbranched chains, doliiform, subcylindrical, obovoid, 0–1(–3)-septate, 6–19 × 6–7 µm [on *Aspicilia*] .... ***T. verrucosa***
Conidiophores solitary or in small groups, sometimes densely aggregated, mostly unbranched, rarely with a single branch at the base, not forming a branched sporogenous complex; conidia solitary or in short easily disintegrating chains, broad subcylindrical, pyriform, clavate, 0–3-septate, 7−31 × 6−9 µm [on *Ionaspis*] .... ***T. ionaspisicola***

Icmadophilaceae

On *Thamnolia* .... ***Taeniolella* sp. (putative asexual morph of *Sphaerellothecium thamnoliae*)**

Lecanoraceae (*Lecanora*, *Lecidella*, *Myriolecis, Protoparmeliopsis*)

1 Conidiophores 20–52 × 7–11 µm; conidia 1–3-septate, broad subcylindrical, 7–10 µm wide .... ***T. lecanoricola***
Conidiophores and conidia narrower 2

2 (1) Conidiophores 7–50(–60) × 5–7(–8) µm, wall irregularly rugose, verrucose to rimulose, later squamulose, squamules 1–5 µm wide, irregularly shaped, firm, not detached or only slightly so; conidia broad ellipsoid, doliiform or subcylindrical, conidia (0–)1–3-septate, 4–8 µm wide .... ***T. pertusariicola***
Conidiophores 8–56(–90) × 3.5–7 µm, wall smooth, especially in young conidiophores, in older ones often irregularly verruculose, slightly rimulose to rhagadiose; conidia subcylindrical, doliiform, pyriform, ellipsoid, limoniform, (0–)1–2(–3)-septate, 3–8 µm wide .... ***T. delicata***

Lecanographaceae

On *Lecanographa* .... ***T. arthoniae***

Lecideaceae

On *Hypocenomyce* .... ***T. delicata***

Lobariaceae

On *Pseudocyphellaria* .... ***T. pseudocyphellariae***

Loxosporaceae

On *Loxospora* .... ***T. delicata***

Micareaceae (*Micarea*, *Psilolechia*)

1 Conidiophores forming densely branched sporogenous complexes, 7–9(–10) µm wide .... ***T. verrucosa***
Conidiophores not forming densely branched sporogenous complexes, narrower, 3.5–7 µm .... ***T. delicata***

Nephromataceae

On *Nephroma* .... ***T. pseudocyphellariae***

Ophioparmaceae

On *Ophioparma* .... ***T. pertusariicola***

Pannariaceae (*Pectenia*)

1 Conidiophores up to 216 µm long and 7–13 µm wide .... ***T. phaeophysciae***
Conidiophores shorter and narrower, 8–56(–90) × 3.5–7 µm .... ***T. delicata***

Parmeliaceae (*Arctoparmelia*, *Cetraria*, *Cetrariella, Hypogymnia*, *Parmelia*)

1 Conidia solitary, doliiform, broad subcylindrical, broad ellipsoid, obovoid, 0–2-septate, 10–20 × 6–8 µm, wall irregularly verrucose, soon becoming rimulose, with fissures and squamules, squamules (patches) up to 4 µm diam, irregularly shaped to subglobose or square [on *Arctoparmelia*] .... ***T. arctoparmeliae***
Conidia catenate, mostly in unbranched, sometimes in branched chains 2

2 (1) Conidiophores aggregated in delimited, gall-like swellings, 0.2–1(–1.5) mm diam, greenish brown, olive brown to dark brown, sometimes grey-brown, woolly to caespitose; conidia 0–2(–3)-septate, 5–22 × 3.5–6(–7) µm, rarely almost smooth, but usually conspicuously rough, rugose or irregularly verrucose, rhagadiose-squamulose to squamose, squamules irregularly shaped, 1–8 µm wide, often detached [on *Cetraria* and *Cetrariella*] .... ***T. rolfii***

Conidiophores not aggregated in gall-like swellings, colonies effuse, brown to dark brown or almost black, slightly shiny, scattered over the infected tissue of the host and on the apothecia, rarely in small tufts, usually loosely to densely caespitose, sometimes velvety or floccose; conidia (0–)1–2(–3)-septate, 4–17 × 3–8 µm, mostly smooth to irregularly verruculose, rarely slightly rhagadiose, not squamulose to squamose [on *Hypogymnia* and *Parmelia*] .... ***T. delicata***

Pertusariaceae (*Lepra*, *Ochrolechia*, *Pertusaria*)

1 Conidiophores (18–)20–216 × 7–13 µm [on *P. pertusa*] .... ***T. phaeophysciae***
Conidiophores shorter and narrower 2

2 (1) Wall of conidiophores irregularly rugose, verrucose to rimulose, later squamulose, squamules 1–5 µm wide [on *Ochrolechia* and *Pertusaria* spp.] .... ***T. pertusariicola***
Wall of conidiophores usually smooth, sometimes somewhat irregularly rough or irregularly verruculose, slightly rimulose to rhagadiose 3

3 (2) Tips of conidiophores and/or the adhering terminal conidium not swollen, sometimes narrowed [on *Lepra albescens*] .... ***T. delicata***
Tips of conidiophores and/or the adhering terminal conidium occasionally swollen up to 9 µm wide 4

4 (3) Dimorphic mycelium composed of pale brown, flexuous to tortuous, 1.5–3 µm wide, smooth and thick-walled hyphae that penetrate the host thallus, and of subhyaline to pale brown, densely aggregated, 3–10 µm wide, irregularly shaped, thin-walled hyphae with a granular surface entering the underlying cortex cells [on *Pertusaria* spp.] .... ***T. caespitosa***
Without dimorphic mycelium [on *Pertusaria leioplaca*] .... ***T. punctata***

Phlyctidaceae

On *Phlyctis* .... ***T. delicata***

Physciaceae (*Hyperphyscia*, *Phaeophyscia*, *Physcia*, *Physconia*)

1 Conidiophores (18–)20–216 × 7–13 µm [on hosts of various genera including *Phaeophyscia*] .... ***T. phaeophysciae***
Conidiophores shorter and narrower, 8–56(–90) × 3.5–7 µm [on *Physcia* and *Physconia* spp.; not known on *Phaeophyscia*] .... ***T. delicata***

Porpidiaceae

On *Bilimbia* .... ***T. delicata***
On *Porpidia* .... ***T. delicata***

Pyrenulaceae

On *Pyrenula* .... ***T. pyrenulae***

Ramalinaceae (*Lecania*, *Ramalina*, *Tephromela*)

1 Infections inducing the formation of galls; wall of conidiophores and conidia irregularly verrucose, later becoming rimulose with deep longitudinal to irregular cracks, rhagadiose-squamulose to squamous, squamules 1–4 µm wide, wall thickened, 0.75–2 µm [on *Tephromela*] .... ***T. atricerebrina***
Infections not inducing the formation of galls; wall of conidiophores and conidia smooth to irregularly verruculose, slightly rimulose to rhagadiose, walls thickened, up to 1 µm [on *Lecania* and *Ramalina*] .... ***T. delicata***

Rhizocarpaceae

On *Rhizocarpon* .... ***T. verrucosa***

Roccellaceae (*Dendrographa*, *Enterographa*, *Lecanactis*, *Ocellomma*, *Opegrapha*, *Roccellina*)

1 Conidiophores in sporodochial colonies, 5–38 × 5–7 µm; conidia 0–3-septate, 7–21 × 5–7.5 µm [on *Roccellina*] .... ***T. santessonii***
Conidiophores not in sporodochial colonies 2

2 (1) Conidiophores rarely unbranched, mostly variously branched, wall irregularly verruculose to verrucose, rarely smooth [on *Dendrographa* and *Lecanactis*] ..... ***T. arthoniae***
Conidiophores mostly unbranched or occasionally branched 3

3 (2) Walls of conidiophores verruculose to verrucose; wall of conidia irregularly rough-walled, soon becoming rimulose to strongly sculptured, rhagadiose-squamulose to squamose, coarse ornamentation above all very evident in older conidia, squamules 0.5–5 µm wide, irregularly shaped, squamules firm, not detached, with a granular inner pigmentation, conidia often germinating, germ tubes subhyaline, up to 50 × 1.5–2 µm, smooth, unthickened [on *Dendrographa*] ..... ***T. serusiauxii***
Wall of conidiophores smooth, especially in young conidiophores, in older ones often irregularly verruculose, slightly rimulose to rhagadiose; wall of conidia mostly smooth to irregularly verruculose, rarely slightly rhagadiose, without squamules and long, subhyaline germ tubes [on *Enterographa*, *Lecanactis*, *Ocellomma* and *Opegrapha*] ..... ***T. delicata***

Stereocaulaceae

On *Stereocaulon* ..... ***T. christiansenii***

Strigulaceae

On *Strigula* ..... ***T. friesii***

Teloschistaceae

On *Caloplaca s. lat.* ..... ***T. delicata***

Thelotremataceae (*Thelotrema*)

1 Conidiophores densely fasciculate, in sporodochial conidiomata, up to 100 µm diam ..... ***T. weberi***
Conidiophores not aggregated in sporodochial conidiomata 2

2 (1) Conidiophores short, 6–34 µm, usually unbranched; conidia in firm not easily disarticulating chains up to 100 µm long, with distinct constrictions (torula-like) ..... ***T. toruloides***
Conidiophores much longer, up to 65 µm, frequently branched; conidia in non-torulose, easily disarticulating chains ..... ***T. thelotrematis***

Umbilicariaceae (*Umbilicaria*)

1 Conidiophores and conidia (7–)8–11(–12) µm wide ..... ***T. umbilicariae***
Conidiophores and conidia narrower, 5–7(–8) µm ..... ***T. umbilicariicola***

Key to saprobic *Taeniolella* species

1 On leaves of *Plantago* spp.; conidia simple or branched, in long chains, 15–230 × 7–10(–13) µm, not easily disintegrating, at first smooth, later verruculose ..... ***T. plantaginis***
On woody plants (bark and wood) 2

2 (1) Conidia branched or in branched chains, forming branched complexes (propagules), usually strongly curved to sigmoid ..... ***T. curvata***
Conidia consistently unbranched or branched, but straight or occasionally only slightly curved 3

3 (2) Conidia frequently branched or in branched chains, branched at the base or with lateral branches 4
Conidia unbranched or only rarely branched 8

4 (3) Conidia frequently branched, with lateral branches 5
Conidia usually branched at the base [conidiophores poorly developed, micronematous, very short and usually micronematous] 7

5 (4) With long, filiform aerial hyphae, mostly simple; conidia in long, often branched, not easily disintegrating chains, to 245 µm long; conidia 10–41 × 7–10(–11) µm, 0–6-septate, sometimes with 1–2 distosepta ..... ***T. filamentosa***
Long, filiform aerial hyphae not formed; conidia either longer and/or distosepta lacking 6

6 (5) Conidia 21–95(–162) × 4.5–6(–7.5) µm, with (1–)4–25(–39) septa .... see ***Taeniolina scripta***
Conidia wider, 13–285 × 6–10(–12) µm, with up to 40 septa .... ***T. vermicularis***

7 (4) Conidia catenate, chains firm, not easily disintegrating, forming branched complexes (propagules), 25–160 µm long, to 40-septate, disintegrated conidia 10–43 × 6–10 µm, 1–6-septate, smooth to irregularly verruculose or rimulose .... ***T. stilbospora***
Conidia solitary or only occasionally in short chains, 15–70 × 8–10 µm, 2–11-septate .... ***T. stilbosporoides***

8 (3) Conidia smooth or almost so 9
Conidial surface sculptured, verruculose to verrucose, sometimes with cracks 16

9 (8) Conidia with eu- and distosepta 10
Conidia only euseptate 11

10 (9) Hyphae sometimes aggregated, forming stromata, 150–320 × 30–60 µm; conidia in unbranched, not easily disintegrating chains, 19–108(–180) × 8–14(–17) µm, (0–)1–7(–13)-euseptate, sometimes also with 1–2 intermixed distosepta .... ***T. exilis***
Stromata lacking; conidia usually narrower and with more septa, 35–135(–215) × 5–8(–9) µm, 6–26(–40)-septate .... ***T. multiplex***

11 (9) Synanamorph present, characterised by forming metulae in verticillate heads; conidia often characteristically fusiform, in persistent chains; conidiophores distinct, (8–)10–13 µm wide .... see ***Sterigmatobotrys rudis***
Synanamorph not formed; conidia usually not fusiform; conidiophores either barely discernable or narrower when distinct, 5–10 µm 12

12 (11) Conidia 2–40-septate, (12–)25–277 × 7–13 µm; conidiophores short, 5–14 × 4–7 µm, 0–1-septate .... ***T. stricta***
Conidia to 12-septate, to 120 µm long; conidiophores longer, 8–120 µm 13

13 (12) Conidial chains not easily disintegrating, firm; conidia 8–15 µm wide 14
Conidial chains easily disintegrating; conidia usually not wider than 10 µm 15

14 (13) Conidia 14–32 × 8–13 µm, 1–3(–5)-septate; conidiophores barely discernable (conidiophores gradually developing into conidial chains) .... ***T. breviuscula***
Conidia 9–107(–120) × 7–15 µm, 0–12-septate; conidiophores conspicuous, easily discernible, 8–30 × 5–10 µm, 0–2-septate .... ***T. alta***

15 (13) Conidiophores 32–99 × 5–8 µm, 3–14-septate, often branched, basal cells enlarged, 8–12 × 8–16 µm; conidia subcylindrical to ellipsoid-doliiform, smooth to irregularly verrucose .... ***T. pulvillus***
Conidiophores shorter, 8–28 × 6–8 µm, 0–2-septate, unbranched, base not enlarged; conidia obclavate, subcylindrical, obovoid, consistently smooth .... ***T. subsessilis***

16 (8) Conidia 15–118 × 7–11 µm, with (0–)1–3 eusepta and 1–20 distosepta, coarsely verrucose .... ***T. muricata***
Conidia euseptate, distosepta lacking 17

17 (16) Conidiophores poorly developed, 6–17 µm long; conidia in simple, not easily disintegrating chains, 55–170 × 7–14 µm, 4–22-septate, individual conidia 10–21 × 7–11 µm, 0–1-septate .... ***T. ravenelii***
Conidiophores well-developed, much longer, (5–)15–99 µm; conidia in more easily disintegrating chains, shorter, 7–50 µm, 0–4(–5)-septate 18

18 (17) Conidiophores 32–99 µm long, frequently proliferating, leaving distinct annellations, base of the conidiophores often swollen, 8–12 × 8–16 µm; conidia 10–50 µm long, (0–)1–4(–5)-septate, smooth to sometimes verruculose .... ***T. pulvillus***
Conidiophores (5–)15–57 × 4–7(–9) µm, not proliferating, without annellations, base not swollen; conidia 7–20 × 6–9(–10) µm, 0–2(–3)-septate, verrucose, sometimes with cracks .... ***T. faginea***

Species of *Taeniolella*

The present work provides a comprehensive treatment of all *Taeniolella* species known to date. Lichenicolous and saprobic species, currently maintained in *Taeniolella* in a broader sense (*s. lat.*) until more comprehensive phylogenetic data will be available, as well as doubtful, excluded and insufficiently known species of this genus are separately listed and annotated.

Names are arranged in alphabetic order. The treatment of each species contains the scientific name with bibliographic reference (not repeated under "Literature"), synonyms, the type specimen (examined collections highlighted with an exclamation mark), relevant literature references (Lit.) without those that contain only distribution information, published illustrations (Ill.), exsiccatae (Exs.), a comprehensive description, host range and geographic distribution, additional specimens examined and notes. The treatments are supplemented by macro- and micrographs as well as drawings (the specimens that were used as the basis for the illustrations are listed in the respective legends). Most photos were taken by B. Heuchert, exceptions, including macrophotos taken by P. Diederich, are noted in square brackets. Author abbreviations conform to those in Brummitt & Powell (1992), while journal abbreviations follow Bridson (2004). Herbarium names have been abbreviated according to Holmgren *et al*. (1990). Abbreviations of exsiccatae correspond to those used in Triebel & Scholz (2001–2013).

Host range and distribution data indicate the known distribution and hosts or substrates obtained from examined herbarium specimens, checklists and databases. All relevant references are listed in chronological order for each country. Taxonomy and nomenclature of the lichens are based on 'indexfungorum' (http://www.indexfungorum.org/) and 'MycoBank' (http://www.mycobank.org/). The taxonomy of plant species, used in this and other chapters, is based on the databases Tropicos (http://www.Tropicos.org/) and The Plant List (http://www.theplantlist.org).

Lichenicolous Taeniolella species

Taeniolella arctoparmeliae Heuchert & Zhurb., ***sp. nov***. MycoBank MB819300. Figs 1–2.

Etymology: Species named after the genus of the type host, *Arctoparmelia*.

Diagnosis: Morphologically close to *Taeniolella umbilicariae*, but conidiophores and conidia distinctly narrower (6–8 µm wide vs. (7–)8–11(–12) µm wide in *T. umbilicariae*) with obviously less thickened walls (0.5–1.2 µm vs. 1–2.5(–3) µm in *T. umbilicariae*).

Description: *Colonies* dispersed over the host thallus, forming blackish grey, velvety-rough colonies, punctiform, circular with crenate margin, up to 1 mm diam, confluent or on faded to necrotic basal parts, forming black colonies, effuse, loosely caespitose, crumbly. *Mycelium* immersed; hyphae inconspicuously branched, 2.5–4 µm wide, septate, sometimes constricted at the septa, pale brown to brown, smooth, wall slightly thickened, up to 0.5 µm wide. Some cells swollen, subglobose, 4–7 µm diam, forming stromatic aggregations, brown to dark brown, wall thickened, 0.5–0.75 µm, smooth to verrucose or rimulose. *Conidiophores* solitary or in small

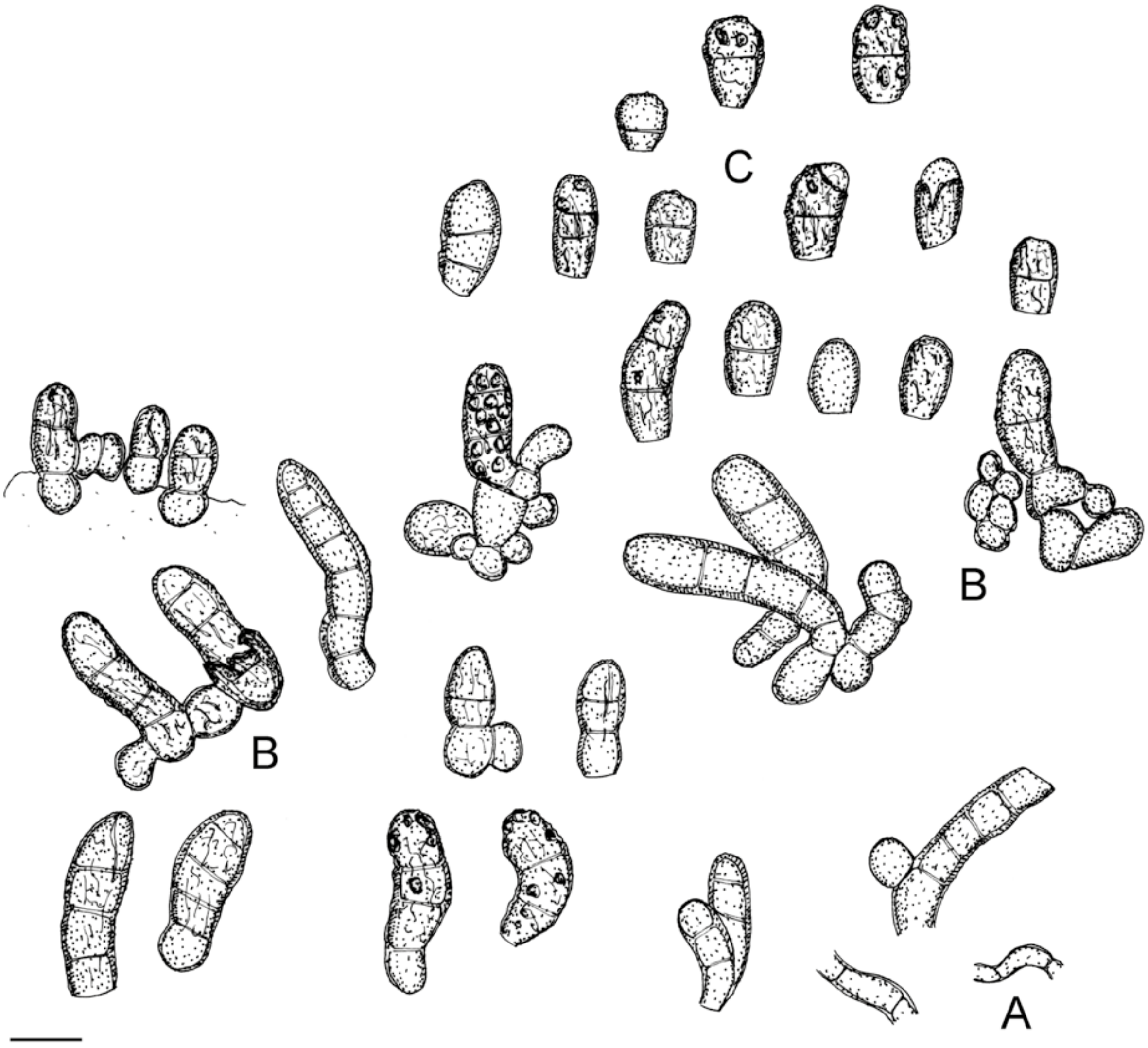

Fig. 1. *Taeniolella arctoparmeliae* [holotype]. **A.** Hyphae. **B.** Conidiophores arising from hyphae or from stromatically aggregated cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

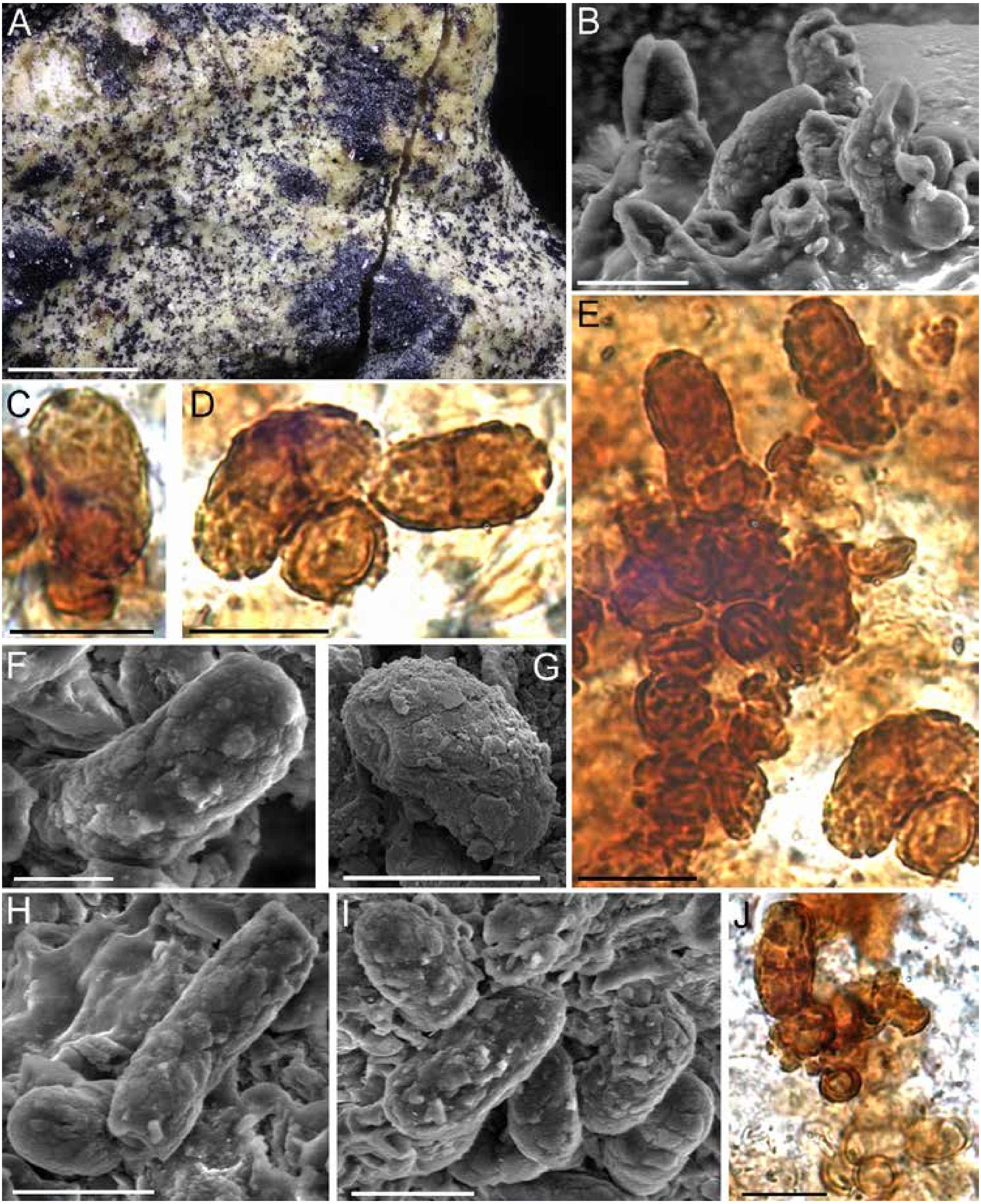

Fig. 2. *Taeniolella arctoparmeliae* [holotype]. **A.** Macroscopic overview of colonies. **B, E, F, H–J.** Conidiophores arising from hyphae or from stromatically aggregated cells. **C, D, G.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 10 µm (C–E, J), 9 µm (B, G–I), 4 µm (F).

groups, arising from hyphae or swollen hyphal cells, semi-macronematous, mononematous, erect to decumbent, mostly straight, sometimes flexuous, mostly unbranched or occasionally once branched in the lower part, subcylindrical, doliiform, broad ellipsoid, obovoid, conidiophores with adhering conidia 7–29 × 6–8 µm, 0–4-septate, rarely and only slightly constricted at the septa, dark brown, wall irregularly verrucose, soon becoming rimulose, with fissures and squamules, squamules (patches) up to 4 µm diam, irregularly shaped to subglobose or square, wall thickened, 0.5–1.5 µm, rarely enteroblastically proliferating. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, doliiform, up to 7 µm long, conidiogenous loci truncate to slightly convex, unthickened, 3 µm diam. *Conidia* solitary straight, doliiform, broad subcylindrical, broad ellipsoid, obovoid, aseptate conidia 10–12 × 6–7 µm, 1-septate ones 10–13 × 6–8 µm, 2-septate ones 14–20 × 6–8 µm, conidiophores sometimes breaking off at the base and functioning as diaspores, not or only slightly constricted at the septa, dark brown, ornamentation of the wall as in conidiophores, wall thickened, 0.5–1.25 µm, apex rounded, base truncate, hila truncate to somewhat convex, unthickened, not darkened, 3–5 µm diam.

Holotype: **Russia**, Krasnoyarsk Territory: Taimyr Peninsula, Byrranga Mts., S of Levinson-Lessing Lake, boulders in arctic tundra, 74°24' N, 98°46' E, alt. 50 m, on *Arctoparmelia separata*, 31 Jul. 1995, *M. Zhurbenko 95385* (HAL 3139 F**!**). *Isotype*: LE 309437.

Host range and distribution: On *Arctoparmelia separata*; Russia (Siberia, Taimyr Peninsula), known only from the type collection.

Notes: The single collection on *Arctoparmelia separata* is comparable with *Taeniolella umbilicariae*, but differs in having narrower conidiophores and conidia (6–8 µm wide vs. (7–)8–11(–12) µm wide in *T. umbilicariae*) with obviously less thickened walls (0.5–1.25 µm vs. 1–2.5(–3) µm in *T. umbilicariae*).

Taeniolella arthoniae (M.S. Christ. & D. Hawksw.) Heuchert & U. Braun, ***comb. nov***. MycoBank MB819301. Figs 3–4.
Basionym: *Cladosporium arthoniae* M.S. Christ. & D. Hawksw., *Bull. Brit. Mus.* (*Nat. Hist*.), *Bot*. **6**: 210. 1979.

Literature: Clauzade *et al.* (1989: 120, as *Cl. arthoniae*), Diederich (1989: 239, as *Cl. arthoniae*), Heuchert *et al.* (2005: 58, as *Cl. arthoniae*).

Illustration: Hawksworth (1979: 211, fig. 10).

Description: *Colonies* on lichen thalli and ascomata, dark to blackish brown, forming speckles or effuse, rarely somewhat floccose. *Mycelium* immersed; hyphae branched, septate, 2–6 µm wide, subhyaline to pale brownish or olivaceous brown, thin-walled or slightly thickened, smooth to verruculose. *Stromata* lacking, hyphal cells rarely aggregated. *Conidiophores* macronematous, mononematous, solitary or in small, loose aggregations, occasionally in pairs, arising from hyphal cells, erect to decumbent, straight to slightly flexuous, subcylindrical, often somewhat irregular in shape, unbranched to variously branched, repeatedly branching towards the apex, but occasionally also branched below, rarely branched at the very base, 8–80 × 2.5–6.5(–8) µm, 0-13-septate, often constricted at the septa, medium brown to medium dark brown, sometimes paler towards the apex, irregularly verruculose to verrucose, rarely smooth, walls somewhat thickened, 0.5–2 µm, lumen reduced, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* and conidia little differentiated, integrated, terminal, occasionally intercalary, monoblastic or polyblastic, *i.e.*, with a single or two conidiogenous loci, subcylindrical, somewhat conic to doliiform-ampulliform, 3–12 µm long, loci truncate to slightly convex, unthickened, not darkened, 1.5–3 µm diam. *Conidia* catenate, in simple or branched chains, disarticulating or often adhering in chains or chain fragments often persistent (confusable with pluriseptate conidia), conidia broad ellipsoid-ovoid, doliiform, short subcylindrical, 0–1(–2)-septate, aseptate conidia 4–10 × 3–6 µm, 1-septate ones 6–15 × 3–6.5(–7.5) µm, 2-septate ones 6–15 × 5–6 µm, not or only slight constricted at the septa, pale to medium dark brown, smooth to irregularly verruculose, verrucose to rugose, wall somewhat thickened, 0.5–1 µm, lumen reduced, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate to slightly convex, often attenuated, hila truncate, unthickened, not darkened, 1–3 µm diam, conidial germination and microcyclic conidiogenesis occasionally observed.

Holotype: **Sweden**, Skåne, Genarp, Häckeberga, on apothecia of *Pachnolepia pruinata* (= *Arthonia impolita*) growing on *Quercus*, 24 Apr. 1946, *M.S. Christiansen 12.967a* (C, herb. Christiansen 570**!**).

Host range and distribution: On *Dendrographa decolorans*, *Lecanactis abietina*, *Lecanographa lyncea*, *Pachnolepia pruinata*; Denmark (first report, see specimens examined), France (Roux *et al*. 2001), Luxembourg (Clauzade *et al.* 1989; Diederich 1989, 1990a; Diederich *et al.* 1991; 2017a), the Netherlands (first report, see specimens examined), Spain (Llop & Gómez-Bolea 2006), Sweden (Hawksworth 1979; Santesson 1993).

Additional specimens examined: **Denmark**, Langeland, Tranekær, on *Pachnolepia pruinata*, on the trunk of an old oak in the park around the lake "Borgsö", near the castel Trankær Slot, 7 Oct. 1981, *M.S. Christiansen 81.195* (C, herb. Christiansen 1678); Zealand, Vejlö, the island Gavnö south of Næstved, Lönned skov, on *P. pruinata*, at the base of the trunk of an old oak at the edge of the wood, 3 Jun. 1981, *M.S. Christiansen 81.061* (C, herb. Christiansen 1479); on *P. pruinata*, at the base of the trunk of an old ash-tree (*Fraxinus*) at the edge of the wood, 3 Jun. 1981, *M.S. Christiansen 81.059* (C, herb. Christiansen 1474, 1475). **France**, Seine-et-Marne, Forêt de Fontainebleau, près de la tour Denécourt, on *Dendrographa decolorans*, on *Quercus*, 15 Mar. 1991, *P. Diederich 9470* (herb. Diederich). **Luxembourg**, Berdorf, Binzeltschloeff, on *D. decolorans*, 11 Jun. 1984, *P. Diederich 8964 & Sérusiaux 6502b* (LG, herb. Diederich); E Schieren, Kieselbaach, on *D. decolorans*, 11 Sep. 1986, *P. Diederich 8363* (herb. Diederich); N Medernach, Schmuelschenterkopp, on *D. decolorans*, 20 Sep. 1986, *P. Diederich 8962* (herb. Diederich); NEE Haller, Halerbaach, on *D. decolorans*, 22 Sep. 1986, *P. Diederich 8965* (herb. Diederich); SEE Beaufort, Halerbaach, on *D. decolorans*, 23 Sep. 1986, *P. Diederich 8966* (herb. Diederich); NE Boevange-sur-Attert, Viichtbaach, on *D. decolorans*, 12 Aug. 1986, *P. Diederich 8961* (herb. Diederich); Vogelsmühle, Halerbaach, on *Lecanactis abietina*, on *Quercus*, 12 Apr. 2000, *P. Diederich 14031* (herb. Diederich); SEE Beaufort, Halerbaach, on *Lecanographa lyncea*, on *Quercus*, 23 Sep. 1986, *P. Diederich 8983* (herb. Diederich). **The Netherlands**, Friesland, Oudkerk, along road in the village, on *D. decolorans*, 16 Jul. 2002, *A. Aptroot 54755* (HAL 3155 F, BR).

Notes: Hawksworth (1979) placed this species in *Cladosporium s. lat.* In that time this genus was still very heterogeneous,

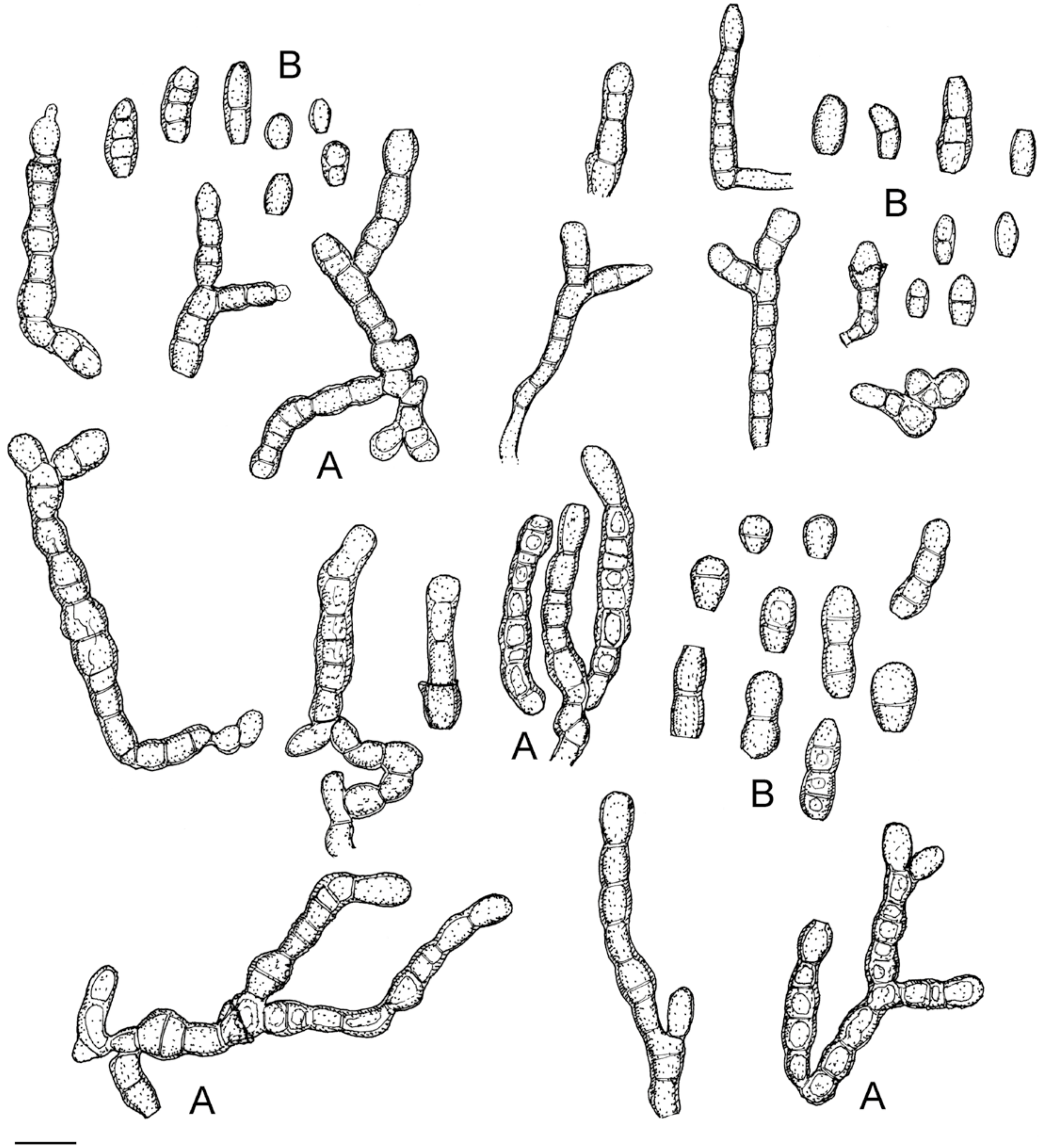

Fig. 3. *Taeniolella arthoniae* [C, herb. Christiansen 1479]. **A.** Branched conidiophores with adhering conidia. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

comprising all kinds of dematiaceous hyphomycetes with polyblastic, sympodial conidiogenous cells and conidia formed in simple or branched acropetal chains. However, true *Cladosporium* species (*s. str.*), congeneric with the type species *Cladosporium herbarum*, are well-characterised by having coronate conidiogenous loci and conidial hila, *i.e.*, these structures are protuberant, darkened, composed of a central convex dome, surrounded by a raised periclinal rim (David 1997, Schubert *et al.* 2007). The conidiogenous loci and conidium initials are much narrower than the conidiogenous cells. As far as known, true *Cladosporium* species are anamorphs of mycosphaerella-like ascomycetes (*Cladosporiaceae*), for which the new generic name *Davidiella* (*Davidiellaceae*, *Capnodiales*) has been introduced (Braun *et al.* 2003, emend. in Schubert *et al*. 2007). Based on the new Code (ICN), the latter genus is a heterotypic synonym of *Cladosporium*, which has been proposed as recognised holomorph name (Rossman *et al*. 2015).

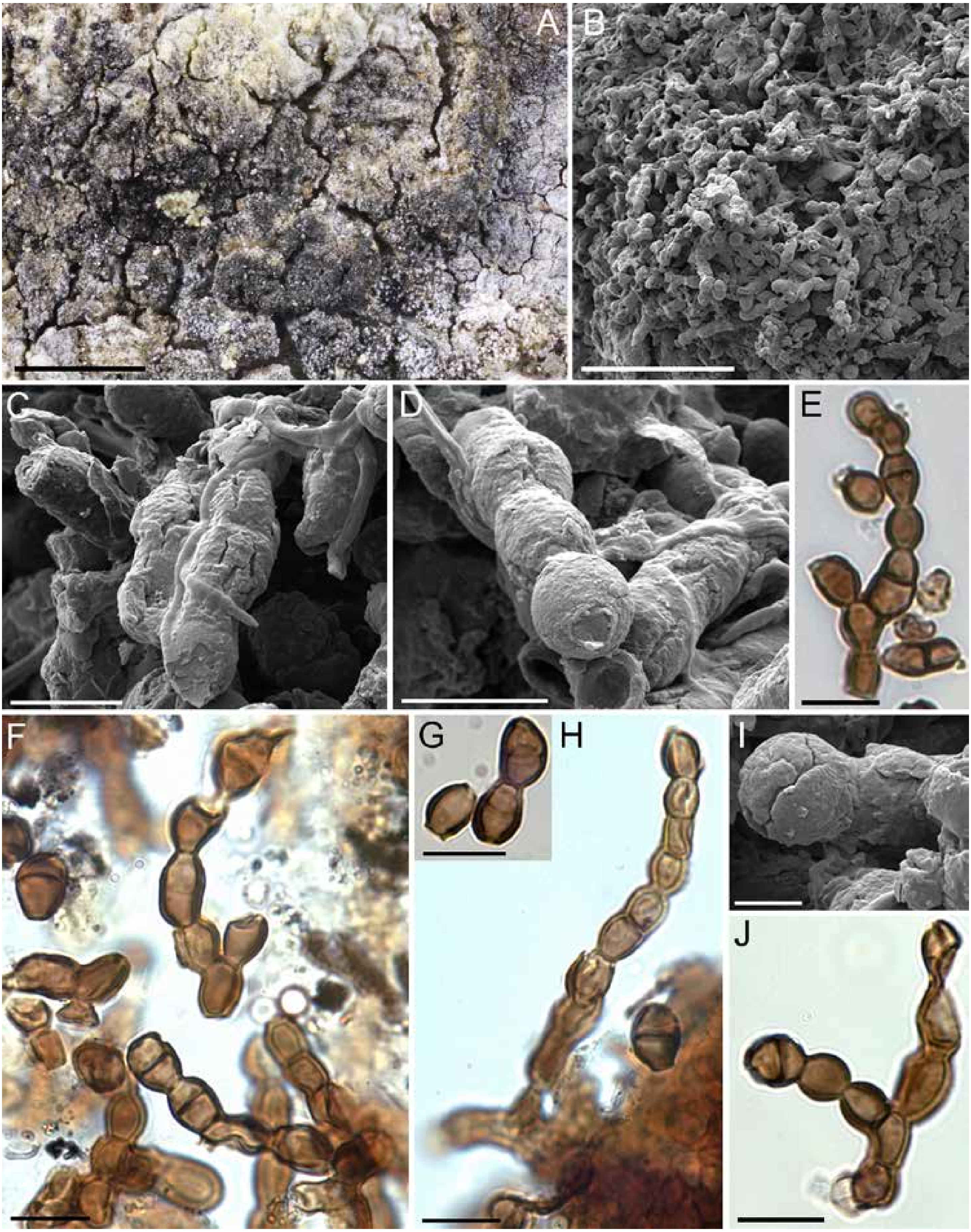

Fig. 4. *Taeniolella arthoniae* [A: Aptroot 54755; B–J: C, herb. Christiansen 1479]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, D, G.** Conidia. **E–F, H, J.** Conidiophores with adhering conidia. **I.** Tip of conidial chain with verrucose to rugose surface ornamentation. Bars: 1 mm (A) [photo taken by Paul Diederich], 60 µm (B), 10 µm (E–H, J), 7 µm (C, D).

Cladosporium arthoniae, occurring on lichenized *Arthoniales*, is quite distinct from *Cladosporium s. str.* The conidiogenous loci are subtruncate, non-protuberant, unthickened, not darkened, without any dome and raised rim (Heuchert *et al.* 2005). The conidiogenous loci and conidial hila are rather broad and not distinctly narrower than the conidiogenous cells.

Ecology, general habit, conidiogenesis, structure of the conidiogenous loci and the conidial shape are, however, strongly reminiscent of lichenicolous *Taeniolella* species. *Cladosporium arthoniae* differs from the original concept of *Taeniolella* as follows: (1) conidiogenous cells integrated, terminal and occasionally intercalary (vs. integrated, terminal in *Taeniolella*), (2) conidiogenous cells unilocal to multilocal, sympodial, *i.e.*, with a single or two loci (vs. unilocal, monopodial or determinate in *Taeniolella*), (3) conidia often in branched chains (vs. conidia usually in simple chains in *Taeniolella*). It has to be discussed if these differences are sufficient to keep *C. arthoniae* apart of *Taeniolella*. The conidiogenous cells of *Taeniolella* species are usually integrated, terminal, unilocal, monopodial or determinate, but there are some exceptions. In other *Taeniolella* species, conidiogenous cells with two loci may also be observed, *e.g.*, in *T. verrucosa* (Hawksworth 1979, fig. 38), *T. rolfii* and *T. chrysothricis.* Intercalary conidiogenous cells have been depicted by Diederich (1990b, fig. 13) for *Taeniolella chrysothricis* and Diederich & Zhurbenko (1997, fig. 3) for *T. rolfii*.

In any case, *C. arthoniae* has to be excluded from *Cladosporium*. The phylogenetic affinity of *C. arthoniae* is unknown and *Taeniolella s. lat.* as currently circumscribed proved to be phylogenetically heterogeneous. Currently available data of molecular sequence analyses are not yet sufficient to assign lichenicolous *Taeniolella* species to phylogenetically circumscribed genera. Comprehensive phylogenetic studies based on a much broader sampling are necessary. For the interim, we have decided to keep *Taeniolella s. lat*., including lichenicolous species, to which *C. arthoniae* can be reallocated, at least tentatively.

Taeniolella arthoniae is well-characterised by having frequently branched conidiophores and conidial chains (Diederich 1989, as *C. arthoniae*). Branched conidiophores are, however, not unusual in *Taeniolella* species, *e.g.*, in *T. christiansenii*, *T. chrysothricis*, *T. punctata*, *T. serusiauxii* and *T. atricerebrina*. Branched conidial chains are also known in several lichenicolous *Taeniolella* species, *e.g.*, in *T. christiansenii, T. chrysothricis* and *T serusiauxii*. Hence, the differences discussed do not constitute any sound basis for a separation of *Cladosporium arthoniae* and other lichenicolous *Taeniolella* species. Conidiogenous cells intercalary/terminal, unilocal/multilocal, determinate/percurrent/sympodial and conidia in simple/branched chains proved to be untenable for generic delimitations in various other groups of dematiaceous hyphomycetes, *e.g.*, in cercosporoid fungi (Crous *et al.* 2001, Crous & Braun 2003) and fusicladioid asexual morphs of *Venturia* (Schubert *et al.* 2003).

Some *Taeniolella* species are similar to *T. arthoniae*, *e.g.*, *T. serusiauxii*, *T. chrysothricis*, *T. christiansenii* and *T. verrucosa. T. serusiauxii* is also known from *Dendrographa decolorans*, but distinguishable from the latter by having narrower (9–61(–80) × 2.5–5(–5.5) µm), mostly unbranched conidiophores and usually rimulose to squamulose conidia. The usually smooth-walled, often branched conidiophores of *T. chrysothricis* are mostly narrower than in *T. arthoniae*. *T. christiansenii* and *T. arthoniae* are two very similar species, but they are easily differentiated by their surface structures, *viz. T. christiansenii* with a smooth to rimulose, verruculose-striate surface and *T. arthoniae* with an irregularly verruculose to verrucose, rarely smooth surface. Furthermore, *T. arthoniae* is well-characterised by having frequently branched conidiophores and conidial chains. *T. verrucosa* is also known on *Pachnolepia pruinata*, but distinguishable from *T. arthoniae* by having usually wider conidiophores (9–104 × 7–9(–10) µm in *T. verrucosa*) and in the development of sporogenous complexes.

The examined collection on *Dirina massiliensis* (= *Dirina stenhammarii*) from the Ukraine [Crimean Peninsula, Bakhchysarai, Mashino, limestone cliff 500 m NW of the village, 44°42'04" N, 33°54'26" E, c. 350 m alt.; on base of the cliff, on limestone in overhangs, 10 Jun. 2006, *J. Vondrák (4613) & J. Šoun*, Hafellner: Lichenicolous Biota 81 (GZU)] (Hafellner 2010), originally assigned to *Cladosporium arthoniae* proved to be misidentified. Due to a combination of certain features (sporodochia absent, conidia variable in shape and size, 8–32 × 8–35 µm, lobed, walls unevenly thick and pigmented) this collection can be allocated to *Milospium graphideorum*.

The report of *T. arthoniae* on leaves of *Buxus sempervirens* in Spain [Girona] (Llop & Gómez-Bolea 2006) is very doubtful, since this species seems to be confined to lichens.

Taeniolella atricerebrina Hafellner, *Biblioth. Lichenol*. **96**: 115. 2007. Figs 5–6.

Illustrations: Hafellner (2007: 117, figs 5–8), Muggia & Grube (2010: 463, fig. 1D).

Exsiccatae: Hafellner, Lichenicolous Biota 9 (isotypes). Hafellner, Lichenicolous Biota 20 (duplicates of paratype).

Description: *Infections* inducing the formation of galls. *Galls* black, mostly arising from flanks of areoles, on severely infested thalli gall initials also on apothecial discs, strongly convex, proliferating, finally with wrinkled surface, exposed portions glossy, more protected portions matted, giving the impression of a coverage by a dark brown ‘pruina’; in section internal parts nearly hyaline, the outermost layer bluish black; young galls 0.5–1.2 mm diam, older ones up to 4 mm diam (Hafellner 2007). *Colonies* on the entire surface of galls, dark brown, effuse, caespitose, but rather inconspicuous. *Mycelium* immersed; hyphae flexuous and toruloid, contorted, branched, 4–10 µm wide, septate, with constrictions at the septa, brown to dark brown, irregularly rough-walled, verrucose or slightly rimulose, wall 0.5–1 µm wide. *Stromata* lacking, hyphal cells among conidiophores swollen, subglobose, 9–13 µm diam, wall thickened, 0.5–1 µm wide, rimulose to squamulose, dark brown. *Conidiophores* solitary or loosely aggregated, arising from hyphae or swollen hyphal cells, semi-macronematous, mononematous, erect, mostly straight, sometimes flexuous, mostly unbranched, rarely once branched in the lower part, subcylindrical, conidiophores with adhering conidia 15–47 × 5–10(–12) µm, base swollen, 6–12 µm wide, apex narrower, 5–7 µm, 2–9-septate, not or only slightly constricted at the septa, dark brown, enteroblastically proliferating with obvious sheath-like wall remnants, visible as irregular fringe, wall irregularly verrucose, later becoming rimulose with deep longitudinal to irregular cracks, rhagadiose-squamulose to squamous, squamules 1–4 µm wide, wall thickened, 0.75–2 µm, distinctly multi-layered. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, subcylindrical, doliiform, 6–8 µm

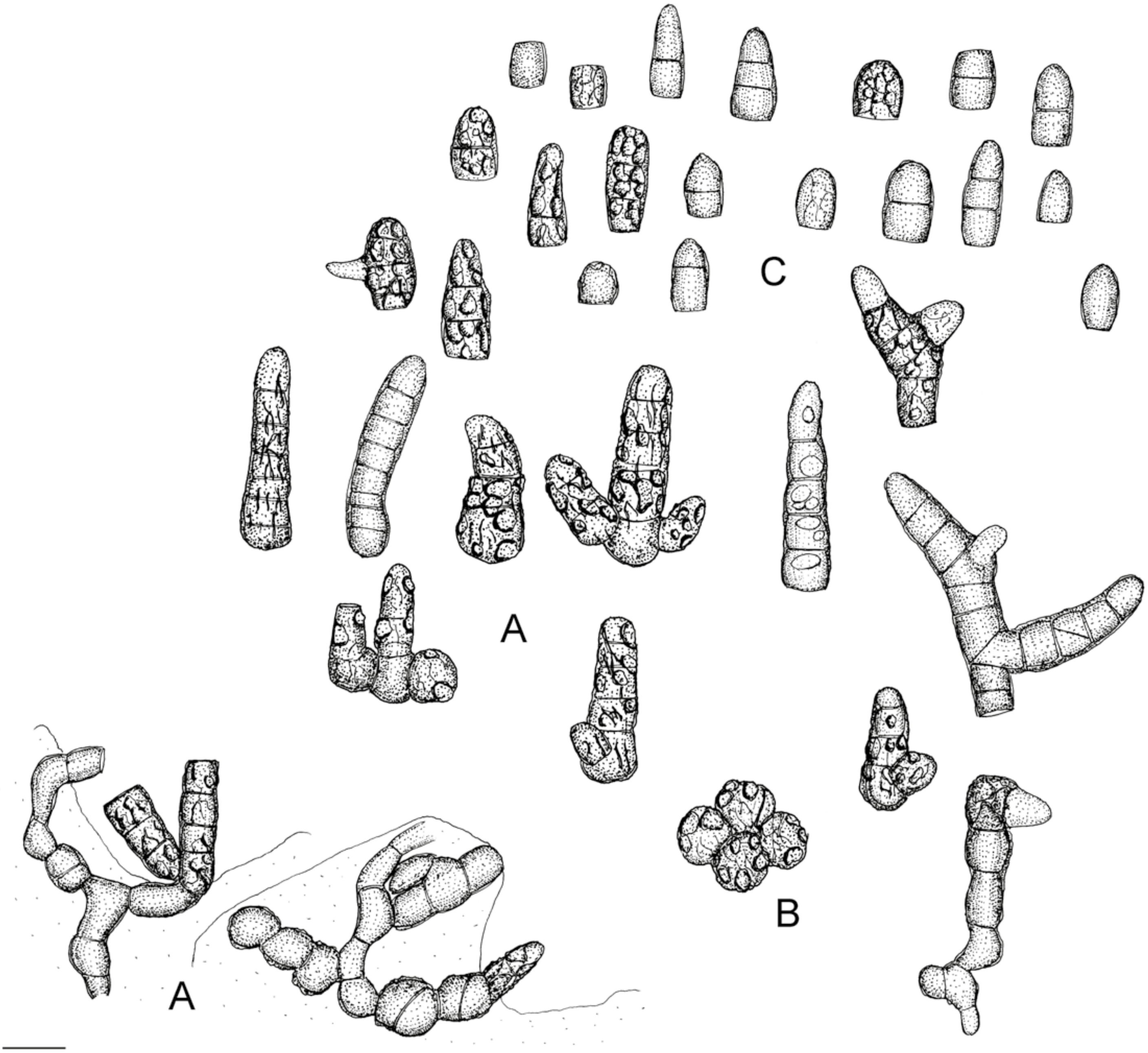

Fig. 5. *Taeniolella atricerebrina* [holotype]. **A.** Conidiophores arising from hyphae or swollen hyphal cells. **B.** Aggregated swollen hyphal cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

long, loci truncate, 3–5 µm wide, unthickened. *Conidia* solitary or catenate, in persistent unbranched, short chains, straight, doliiform, subcylindrical, ellipsoid, 0–2(–3)-septate, aseptate conidia 7–13 × 5–8 µm, 1-septate ones 9–18 × 5–8 µm, 2- and 3-septate ones 14–20 × 6–8 µm, not or only slightly constricted at the septa, brown to dark brown, ornamentation of the wall as in the conidiophores, squamules up to 3 µm wide, wall thickened, up to 1 µm, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, hila truncate, unthickened, not darkened, 3–6 µm diam.

Holotype: **Austria**, Styria, Eastern Alps, Niedere Tauern, Triebener Tauern, Griesmoar Kogel SW von Wald am Schoberpaß, am N-Rücken halbwegs zwischen dem Sattel zum Himmeleck und dem Gipfel, 47°25'15" N, 14°36'10" E, alt. ca. 1950 m, GF 8553/4, niedere Ausbisse aus Glimmerschiefer, stellenweise mit Ca-Spuren, in alpinen Matten, auf Neigungsflächen, on thallus of *Tephromela atra*, 20 Aug. 2002, *J. Hafellner 59165 & J. Miadlikowska* (GZU**!**). *Isotypes*: Hafellner, Lichenicolous Biota 9 (BR, CANB, GZU**!**, NY, UPS, E).

Host range and distribution: On *Tephromela atra*; Austria (Hafellner 2007, 2008), Poland (Kukwa & Flakus 2009).

Additional specimens examined [all on *Tephromela atra*]: **Austria**, Styria, Eastern Alps, Niedere Tauern, Seckauer Tauern, Hämmerkogel N von Seckau, S-Abhänge oder der Goldlacke, 47°20'30" N, 14°45'05" E), alt. ca. 2100 m, GF8654/4, niedere Schrofen in alpinen Rasen, an Neigungsflächen von Silikatschrofen, 20 Oct. 2001, *J. Hafellner 64099* [distributed as Lichenicolous Biota no. 20] (BR, CANB, GZU**!**, NY, UPS); Steierisches Randgebirge, Koralpe, Weinofen, alt. 155 km WNW von Deutschlandsberg, kurz S über dem Pass Weinebene, 46°50'10" N 15°01'00" E, alt. ca. 1720 m, GF 9156/3; niedere Ausbisse und Blöcke eines mürben Silikatschiefers an der aktuellen Waldgrenze, auf Neigungsflächen, 15 Sep. 2007,

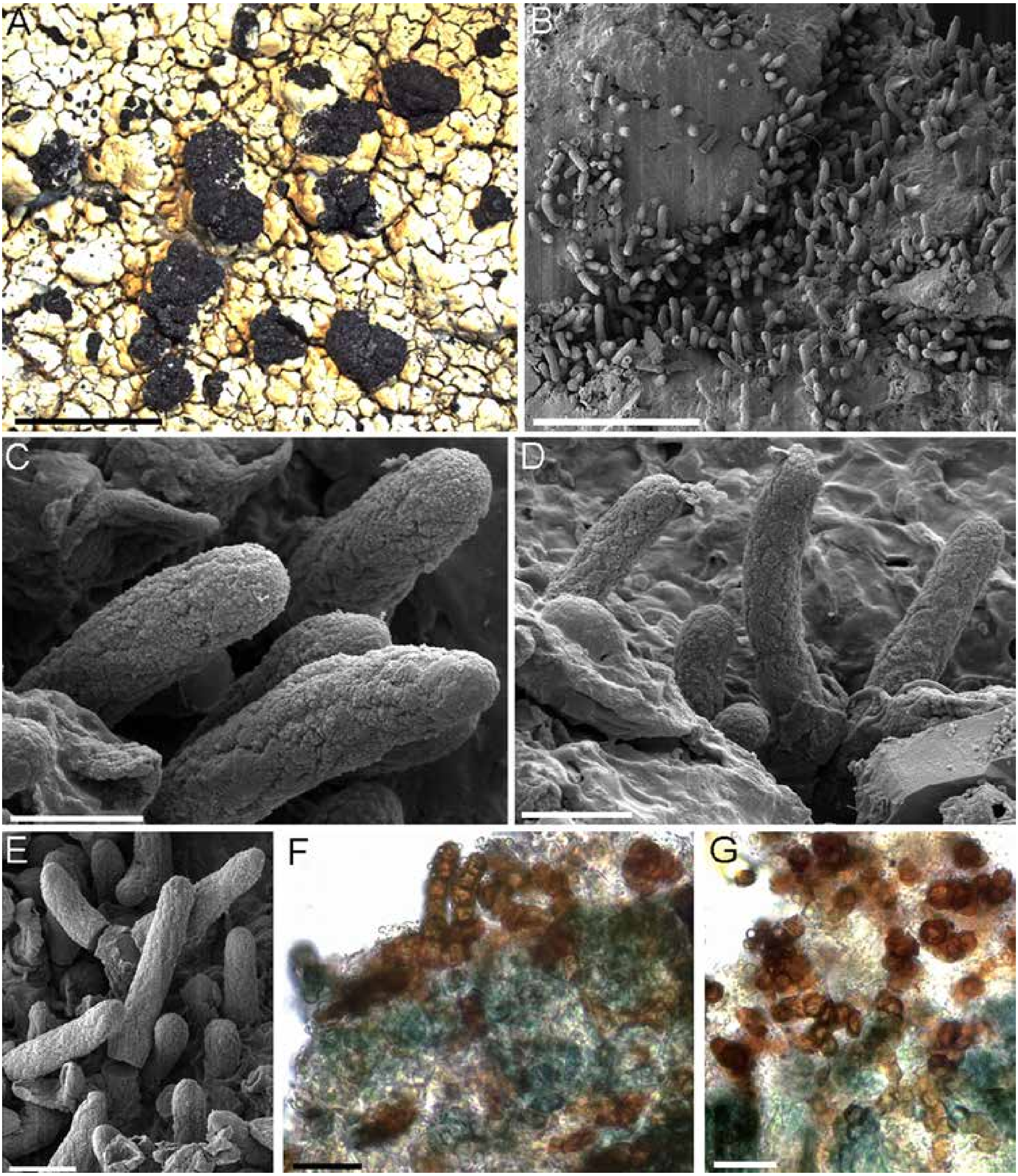

Fig. 6. *Taeniolella atricerebrina* [holotype]. **A.** Infection inducing the formation of blackish galls on *Tephromela atra*. **B.** SEM overview of a colony. **C–F.** Conidiophores with adhering conidia. **G.** Brown hyphae penetrating the galls. Bars: 5 mm (A), 100 µm (B), 20 µm (F), 10 µm (C–E, G).

J. Hafellner 70353 (GZU); Steierisches Randgebirge, Stubalpe, Größenberg S von Zeltweg, NW-Rücken gegen Eppenstein, etwa halbwegs zwischen Wetterkopf und dem Gipfel, 47°05'15" N. 14°47'35" E, alt. ca. 2020 m, GF 8954/2; niedere Gneisausbisse in Zwergstrauchheiden, 15 Aug. 2006, *J. Hafellner 66587* (GZU); Steierisches Randgebirge, Stubalpe, W von Köflach, Peterer Riegel, im obersten Teil des N-Rückens, alt. ca. 1920 m, 47°02'25" N, 14°50'30" E, GF 8955/3, niedere Schrofen und große Blöcke aus Granatglimmerschiefer in Zwergstrauchheiden, 20 Jul. 2002, *J. Hafellner 59732* (GZU).

Notes: *Taeniolella rolfii*, described by Diederich & Zhurbenko (1997), is another cecidogenous *Taeniolella* species, widespread

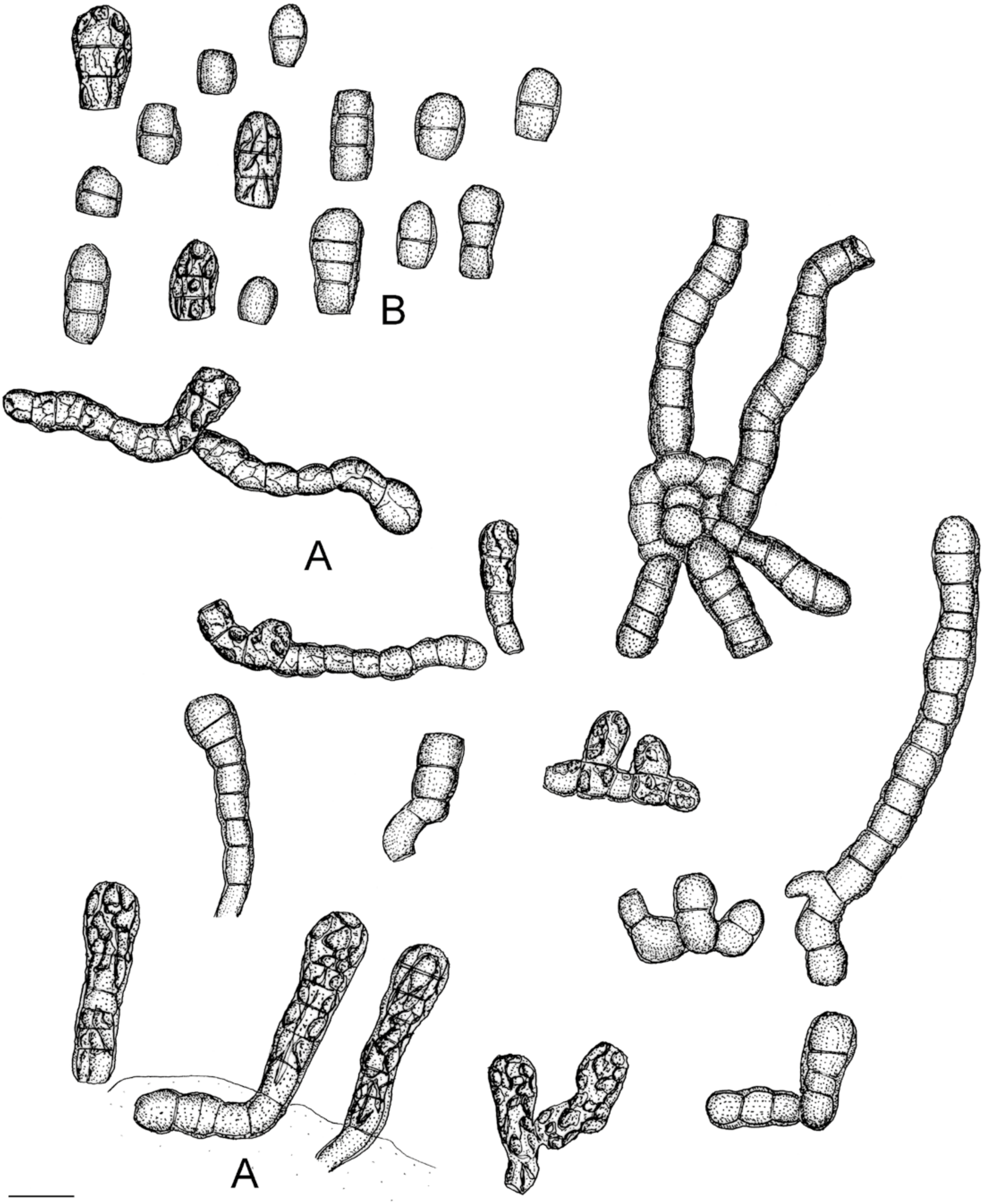

Fig. 7. *Taeniolella* cf. *atricerebrina*. [M-0043804]. **A.** Conidiophores arising from hyphae or stromatically aggregated swollen hyphal cells. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

in north Europe and Canada on various species of *Cetraria*, which forms gall-like swellings, 0.2–1(–1.5) mm wide, but differs from *T. atricerebrina* in having longer conidiophores (12–122 × 4–6.5 µm) and usually narrower conidia, 3.5–6(–7) µm wide. The hyphae of *T. atricerebrina*, penetrating the galls, are 4–10 µm wide, brown to dark brown, irregularly rough-walled, verrucose to slightly rimulose, wall 0.5–1 µm thick. They are easily distinguishable from those of the host mycelium.

Colonies of the South American *Taeniolella santessonii* (Etayo 2010) are rather variable, ranging from distinctly sporodochioid, convex to effuse and confluent. They are up to 0.75 mm diam and thus smaller than the galls of *T. atricerebrina*. Furthermore, the squamules of the outer wall in *T. santessonii* are somewhat wider (1–4 × 2–7 µm, up to 1.5 µm thick), and the conidiophores are narrower, 5–7 µm (vs. 5–9 µm, up to 12 µm at the very base in *T. atricerebrina*).

Conidiophores and conidia with a splitting outer wall layer are also known in some other *Taeniolella* species that do not induce any galls or gall-like swellings. The conidia of *T. atricerebrina* are mostly 0–1-septate, but in contrast to the original description, 2–3-septate conidia have also been observed.

Muggia & Grube (2010) included the lichen *Tephromela atra* in their investigations and added an illustration of *T. atricerebrina* on this host. Furthermore, the lichen *Tephromela atra*, infected by *T. atricerebrina*, is included in the investigations of Fleischhacker *et al*. (2015) on community analyses of lichenicolous fungi in Alpine habitats by single-strand conformation polymorphism (SSCP).

A specimen on *Tephromela* sp. from Italy (M-0043804) is very similar to *T. atricerebrina*, but colonies are loosely caespitose, scattered over the thallus or marginally formed on apothecia. Galls are lacking, the mycelium is mostly superficial, subglobose hyphal cells form stromata, and conidiophores are often apically widened, *i.e.*, clavate. Other features are within the range of variation of *T. atricerebrina*. Because of the absence of galls, this specimen is provisionally classified as *T.* cf. *atricerebrina*: **Italy**: *Prov. di Livorno*: Isola d´Elba, 1 km SW of Rio nell´Elba, Le Panche, NW-facing slopes of Cima del Monte Mountain near the walking trail to the summit, boulders in Macchia heath, 42°48' N, 10°24' E, alt. ca. 380 m, on *Tephromela* sp., 22 Apr. 1998, *D. Triebel & G. Rambold 6191* (M-0043804) (see Fig. 7). This collection is characterised as follows: *Colonies* on lichen thalli or marginal on apothecia, scattered, loosely caespitose, dark brown to black. *Mycelium* mostly superficial and partly immersed, immersed hyphae inconspicuous, superficial hyphae easily visible with low magnification, flexuous, branched, 4–7 µm wide, septate, with constrictions at the septa, pale brown to brown, smooth to irregularly rough-walled, slightly rimulose, wall thickened, 0.25–1 µm wide, hyphal cells below conidiophores stromatically aggregated, stromata subglobose 10–35 µm diam, cells subglobose, 4–7 µm diam, wall thickened, up to 1 µm wide, smooth, slightly rough-walled, ornamentation coarser in older conidia, brown. *Conidiophores* solitary or loosely aggregated in small tufts, up to 6, arising from hyphae or stroma cells, macronematous, mononematous, erect, sometimes decumbent, mostly flexuous, sometimes straight, mostly unbranched, rarely once branched in the lower part, subcylindrical to clavate, conidiophores with adhering conidia 9–40(–80) × 4–9 µm, 4–7 µm wide at the base, apex sometimes swollen, 6–9 µm, 2–15-septate, often constricted at the septa, dark brown, wall irregularly verrucose, later becoming rimulose with deep longitudinal to irregular cracks, rhagadiose-squamulose to squamous, squamules 1–4 µm wide, wall thickened, 1.5–2.25 µm, distinctly multi-layered. *Conidiogenous cells* integrated, terminal, monoblastic to thalloblastic, monopodial, subcylindrical, doliiform, 3–5 µm long, loci truncate, 4.5 µm diam, unthickened. *Conidia* solitary or catenate, in unbranched, not easily disintegrating chains, straight, subcylindrical, ellipsoid, broad ellipsoid, clavate, 0–2(–3)-septate, aseptate conidia 6–6.5 × 6 µm, 1-septate ones 7–10 × 5.5–7 µm, 2- and 3-septate ones 11–16 × 5.5–7 µm, slightly or not constricted at the septa, dark brown, ornamentation of the wall as in the conidiophores, wall thickened, 1–2 µm wide, apex rounded in primary conidia, truncate in secondary ones, base slightly obconically truncate, hila truncate, unthickened, not darkened, 3–5.5 µm diam.

Taeniolella caespitosa M.S. Cole & D. Hawksw., *Mycotaxon* **77**: 332. 2001. Figs 8–9.

Illustration: Cole & Hawksworth (2001: 333, fig. 9).

Description: *Colonies* scattered over the whole thallus, effuse, punctate, in small tufts or larger groups, rounded, up to 0.5 mm diam, or elongated, up to 1 mm long, confluent, densely caespitose, dark brown to black, occasionally spread into the adjacent cortex, without any discolorations of the lichen thallus. *Mycelium* immersed, dimorphic; 1) hyphae penetrating the host thallus: flexuous to tortuous, branched, 1.5–3 µm wide (4–6 µm wide on rock), septate, slightly constricted at the septa, smooth, walls thickened, pale brown, 2) hyphae entering the underlying bark cells, densely aggregated, 3–10 µm wide, septate, constricted at the septa, irregularly shaped, subhyaline to pale brown, unthickened, granulate (such hyphae are only developed around the base of conidiophores). True stromata lacking, but with stromatically aggregated cells below the conidiophores, cells subglobose, 4–9 µm diam or square, 3–6 × 2–5 µm, brown to dark brown, smooth, walls thickened, up to 0.5 µm. *Conidiophores* macronematous, mononematous, in small caespitose tufts or solitary, arising from procumbent hyphae or from stromatically aggregated cells, erect, ascending, straight to slightly flexuous, subcylindrical, apically swollen, clavate, unbranched or sometimes branched at the base or in the upper part, conidiophores with adhering conidia 7–71(–85) × (4–)5–8 µm, 1–13(–19)-septate, not or slightly constricted at the septa, dark brown, paler towards the apex, tips of conidiophores and/or the adhering terminal conidium sometimes somewhat swollen, *i.e.*, either entire terminal conidium or only conidial tip swollen, up to 9 µm wide, wall predominantly smooth, sometimes somewhat irregularly rough, without cracks and squamules, tips often verrucose, rarely with small cracks when swollen, outer wall thickened, 0.75–1.25 µm, cell plasma sometimes reduced, with a central vacuole-like cavity, frequently enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic, subcylindrical or doliiform, 3–7 µm, loci truncate, unthickened, 2–4 µm diam. *Conidia* solitary or catenate, in unbranched chains, straight, rarely slightly curved, subcylindrical, ellipsoid, doliiform, clavate, conidiophores occasionally breaking off and acting as diaspores, than up to 40 µm long, conidia (0–)1–3(–4)-septate, aseptate conidia 6–12 × 5–7 µm, 1-septate ones 7–16 × 5–7(–9) µm, 2-septate ones 10–21 × 5–8 µm, 3- and 4-septate ones 14–23 × 5.5–8 µm, not or slightly constricted at the septa, brown to dark brown, predominantly smooth, sometimes somewhat irregularly rough, without cracks and squamules, wall thickened, 0.5–1 µm, apex rounded in primary conidia, frequently somewhat swollen, truncate in secondary ones, base truncate, rarely slightly obconically truncate, hila truncate, sometimes slightly convex, unthickened, not darkened, 2–3.5(–5) µm diam.

Lectotype [designated here, MBT380026]: **Canada**, Quebec, Stoneham, Mont Wright, Parc de Conservation Municipale,

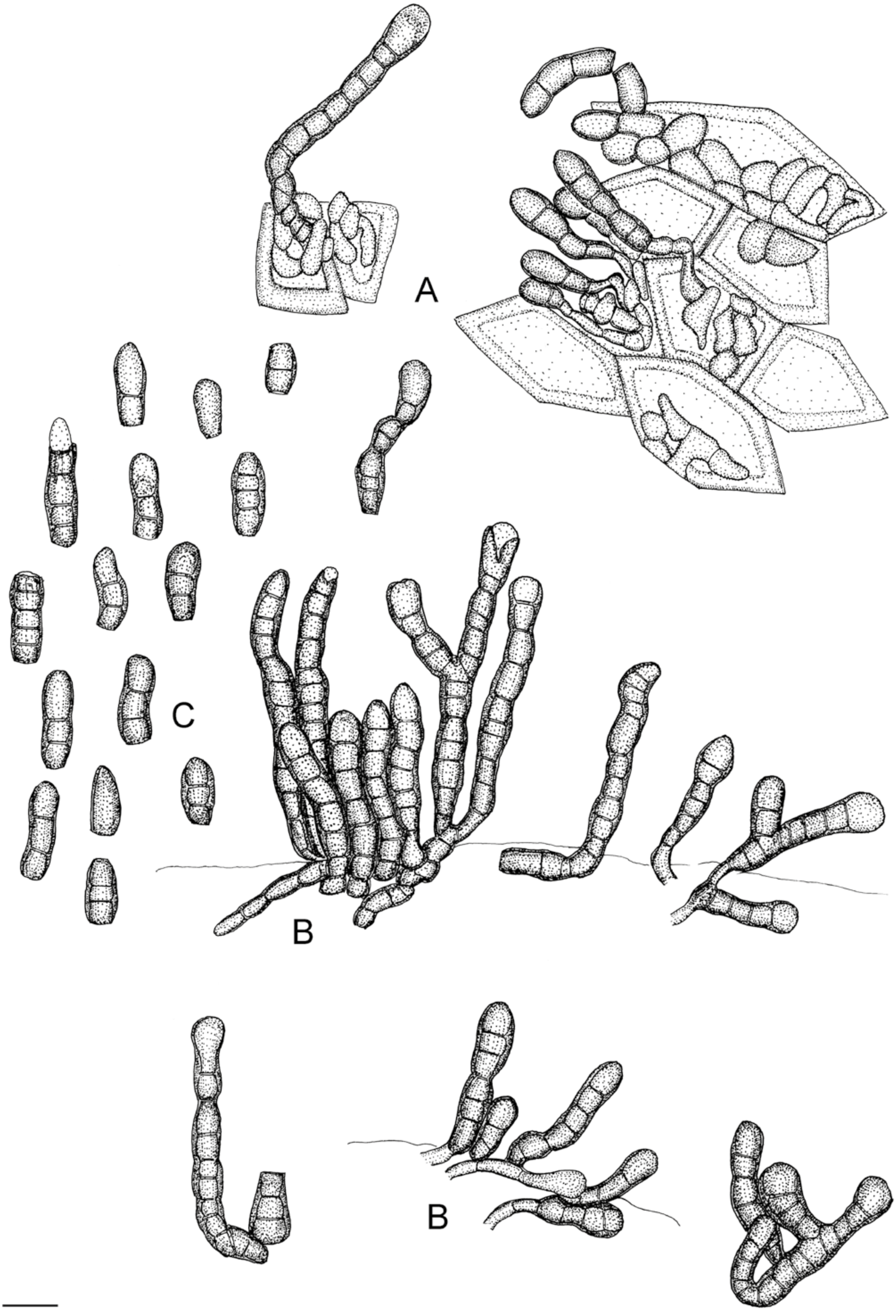

Fig. 8. *Taeniolella caespitosa* [Diederich 13599]. **A.** Conidiophores arising from hyphae entering the underlying bark cells. **B.** Conidiophores arising from hyphae or from stromatically aggregated cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

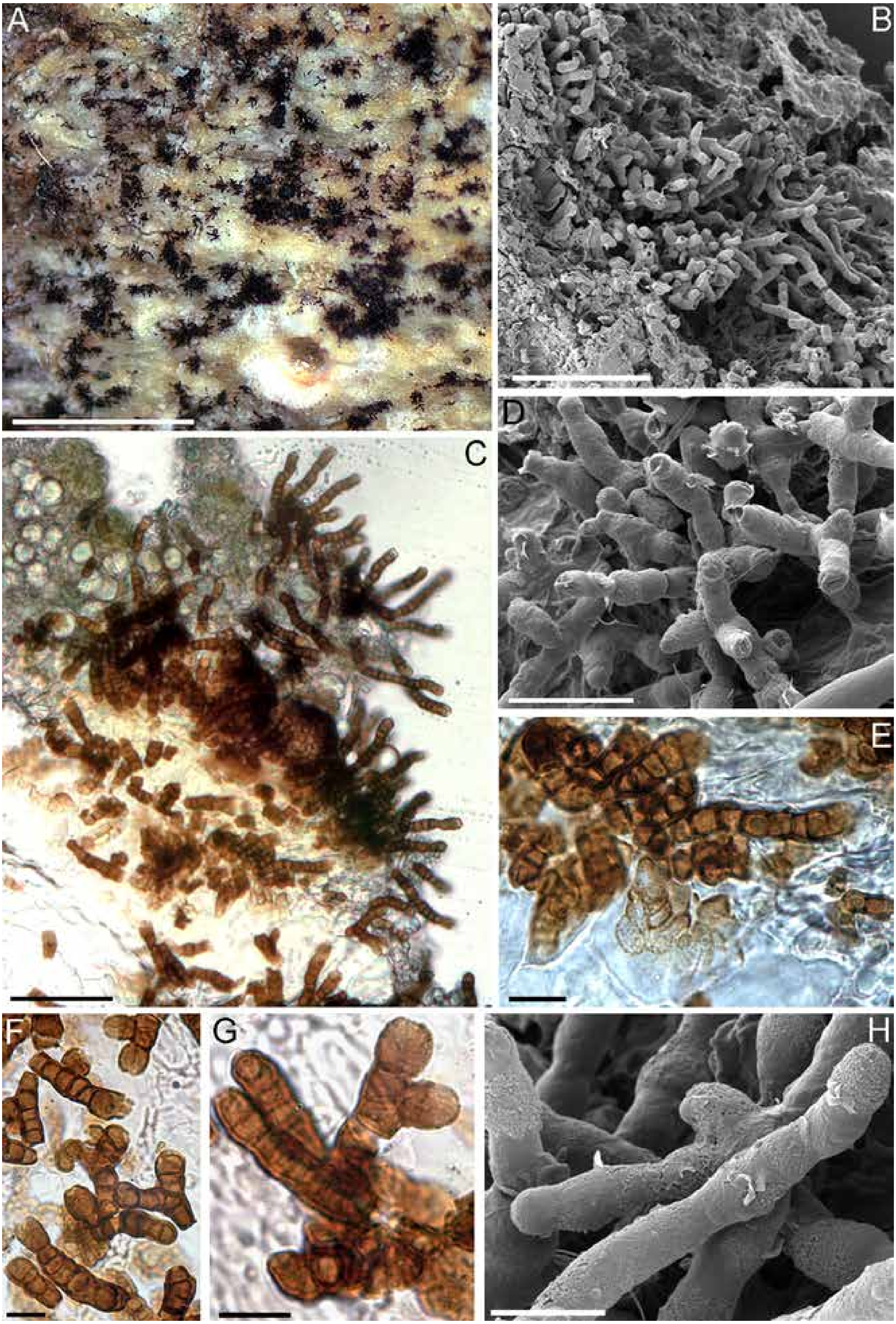

Fig. 9. *Taeniolella caespitosa* [A, B, D, H: holotype; C, E–G: Diederich 13599]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C, D, F.** Conidiophores. **E.** Conidiophores arising from hyphae entering the underlying bark cells. **G, H.** Tips of conidiophores with verrucose surface ornamentation. Bars: 1 mm (A), 70 µm (B), 50 µm (C), 20 µm (D), 10 µm (E–G), 9 µm (H).

47°00'42" N, 71°20'45" W, alt. 230 m, on *Acer saccharum*, on *Pertusaria* sp., 7 Aug. 1997, *M.S. Cole & I.M. Brodo 7038* (MIN 870333**!**) [confined to the *Taeniolella* element, excluding *Ellisembia lichenicola* Heuchert & U. Braun found in the holotype collection].

Host range and distribution: On *Pertusaria leioplaca*, *P. pertusa*, *Pertusaria* sp.; Canada (Quebec) (Cole & Hawksworth 2001; Esslinger 2016, 2018), Denmark, Germany, Luxembourg, Poland, Sweden (first report, see specimens examined), USA (Diederich 2003).

Additional specimens examined: **Denmark**, Bornholm, Østerlarsker, on *Pertusaria leioplaca*, on *Carpinus betulus* in the wood along the river Kobbeåen, between Stavehøl and the sea, 27 Jun. 1970, *M.S. Christiansen* (C, herb. Christiansen 6283). **Germany**, Hessen, Rhein-Main-Tiefland, Messeler Hügelland, TK 6118-114, Eichen-Hainbuchenwald, Oppermanns-Wiesen-Schneise, alt. 165 m, on *P. leioplaca*, 9 Sep. 2007, *R. Cezanne & M. Eichler 7385* (herb. Cezanne-Eichler). **Luxembourg**, Entre Berdorf et Mullerthal, versant droit de l'Ernz Noire, Schnellert, on *P. leioplaca*, 7 Mai 1998, *P. Diederich 13599* (herb. Diederich); S Capellen, Jongeboesch, on *P. leioplaca*, on *Carpinus*, 26 Mar. 2005, *P. Diederich 16042* (herb. Diederich); Vogelsmühle, vallon du Halerbaach, rive gauche, sur *Fagus*, dans une chênaie-hêtraie, on *P. leioplaca*, 9 Dec. 2007, *P. Diederich 16719* (herb. Diederich); Naturwaldreservat "Laangmuer" NO von Luxemburg, Südwestrand, alt. 44 m, on *P. pertusa*, 16 Apr. 2008, *R. Cezanne & M. Eichler 7503* (herb. Cezanne-Eichler). **Poland**, Rówinia Bielska, Białowieża Primeval Forest, Białowieski National Park, forest section no 256, plot D11, *Tilio-Carpinetum*, ATPOL grid square Cg-56, on *P. pertusa*, on *C. betulus*, 16 Aug. 2014, *M. Kukwa 17201*, *A. Łubek*, ex UGDA L (HAL 3148F). **Sweden**, Härjedalen, Tännäs par., Tjölen (Kölen), W of the road between Funäsdalen and Mittådalen, ca. 9 km SSW of Mittådalen, alt. 810 m, 62°37' N, 12°37' E, on *Pertusaria* sp., on a rock, 10 Aug. 1987, *R. Santesson 31944* (UPS).

Notes: Type material of *Taeniolella caespitosa* has been examined and proved to be heterogeneous, *i.e.*, composed of two different elements, *viz.* conidia and conidiophores of the *Taeniolella* and a second hyphomycete that was described as *Ellisembia lichenicola* (Heuchert & Braun 2006).

The mycelium of *T. caespitosa* is immersed in the upper layer of the cortex (Cole & Hawksworth 2001), and in addition, as special distinguishing feature, dimorphic hyphae are formed (see description). *Fagus*, *Carpinus* and rock are known to be substrates of the host lichens. In corticolous populations, granulate, subhyaline to pale brown and unthickened hyphae entering the underlying bark cells are usually present, but they were not observed in the examined collection from Sweden (UPS) on rock, but hyphae within the lichen thallus in this specimen are wider (4–6 µm wide) compared with those from collections on wood. On the label of the examined sample from Denmark (C, herb. Christiansen 6283, deposited as *Taeniolella* sp.), M.S. Christiansen noted that the *Taeniolella* is possibly a bark-inhabiting fungus that is breaking through the thallus of *Pertusaria leioplaca*. In several collections of this species, the colonies are occasionally scattered on the adjacent bark.

Taeniolella caespitosa is very similar to, but clearly different from *T. punctata* (see comments under the latter species). *T. pertusariicola*, another species known to inhabit *Pertusaria* spp., is easily distinguishable from *T. caespitosa* by having consistently verrucose to rimulose, later squamulose outer walls of conidiophores and conidia, discernable by light as well as scanning electron microscopy (Alstrup & Hawksworth 1990). The outer walls of conidiophores and conidia of *T. caespitosa* are usually smooth, sometimes somewhat irregularly rough or at the tips verrucose, but always without cracks.

Taeniolella christiansenii Alstrup & D. Hawksw., *Meddel. Grønland, Biosci*. **31**: 67. 1990. Figs 10–12.

Literature: Zhurbenko (2010: 30).

Illustrations: Alstrup & Hawksworth (1990: 68–69, figs 40–41).

Description: *Colonies* on the surface of thalli and apothecia, spreading widely over the surface as chains of torulose hyphae with brown, subglobose cells mainly 5–8 × 4–6 µm, walls sometimes verrucose-striate, invaded part of the thallus becoming grey, colonies effuse, loosely caespitose, dark brown to black. *Mycelium* immersed, partly superficial; hyphae flexuous, tortuous branched, 2–7 µm wide, septate, with constrictions at the septa, cells ellipsoid to irregularly shaped, subhyaline to pale brown, between the conidiophores brown, walls slightly to distinctly thickened, 0.25–0.5(–1) µm, smooth, brown hyphae sometimes verrucose-striate, more deeply immersed hyphae subhyaline, 3–4 µm wide, walls unthickened, smooth. *Stromata* lacking, swollen hyphal cells rarely aggregated. *Conidiophores* semi-macronematous, mononematous, solitary or in small fascicles, arising from hyphae, lateral and terminal, erect, differentiated from hyphal cells by being darker brown, straight to slightly flexuous, doliiform, subcylindrical or broad ellipsoid, mostly unbranched, occasionally branched, conidiophores with adhering conidia 5–55 × 4–7(–9) µm, 0–7-septate, often constricted at the septa, brown to dark brown, paler towards the apex, thick-walled, 0.5–1.5 µm, often thin-walled near the tips, smooth to rimulose, verruculose-striate, enteroblastically proliferating with up to 2 conspicuous sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic or thalloblastic, occasionally polyblastic, monopodial, short cylindrical, 4–10 µm long, conidiogenous loci truncate to slightly convex, unthickened, 2.5–5.5 µm diam. *Conidia* catenate, mostly in unbranched, rarely in branched chains, easily disarticulating, straight, rarely slightly curved, doliiform, subcylindrical, ellipsoid, 0–2(–3)-septate, aseptate conidia 4–12 × 3–6.5(–7) µm, 1-septate ones 8–16 × 4–6.5(–8) µm, 2-septate ones 11–14(–24) × 4–6(–7.5) µm, 3-septate ones 13–16 × 4.5–5 µm, mostly constricted at the septa, brown to dark brown, wall thickened, 0.5–1 µm, often thin-walled and pale brown near the apex, small conidia smooth, outermost wall layer longitudinally splitting, verruculose-striate, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate to slightly convex, hila truncate, unthickened, not darkened, (1–)1.5–5 µm diam, in one case possibly with microcyclic conidiogenesis.

Holotype: **Denmark**, West Greenland, Itivdlinquad, midway in Sørde Strømfjord (Kangerdlugssuaq), at the northern shore of the fjord, on the ground, 66°30' N, alt. 50–150 m, parasitic on ascomata of *Arthonia nephromiaria*, on the surface of phyllocladia of *Stereocaulon alpinum*, 24 Jul. 1946, *M.S. Christiansen* (C, herb. Christiansen 5568**!**).

Host range and distribution: On *Stereocaulon alpestre*, *S. alpinum*, *S. botryosum*, *S. depressum*, *S. glareosum, S. groenlandicum*, *S. intermedium*, *S. rivulorum*, *S. subcoralloides*, *S. symphycheilum*;

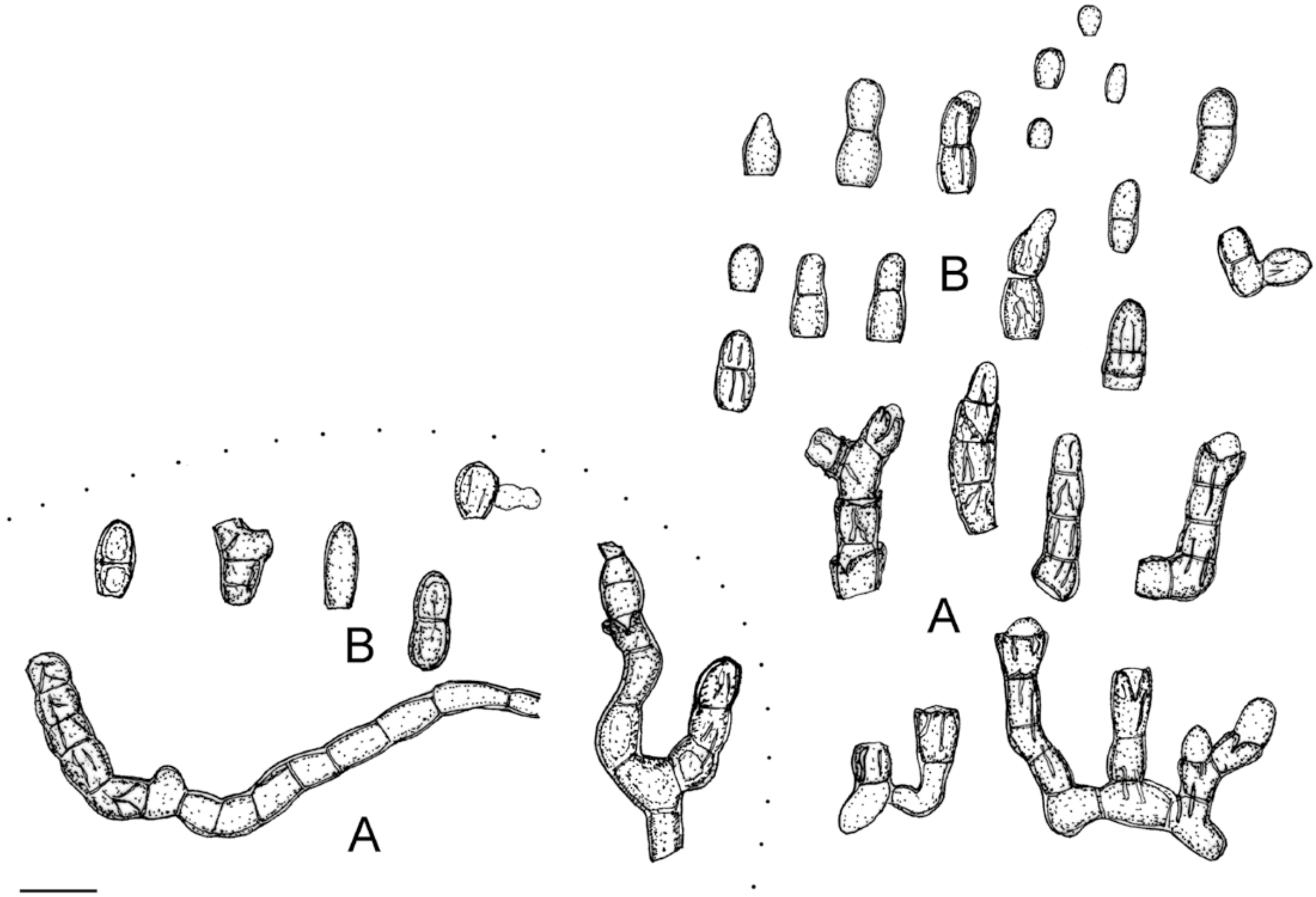

Fig. 10. *Taeniolella christiansenii* [holotype, bottom left; Zhurbenko 9678, right]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

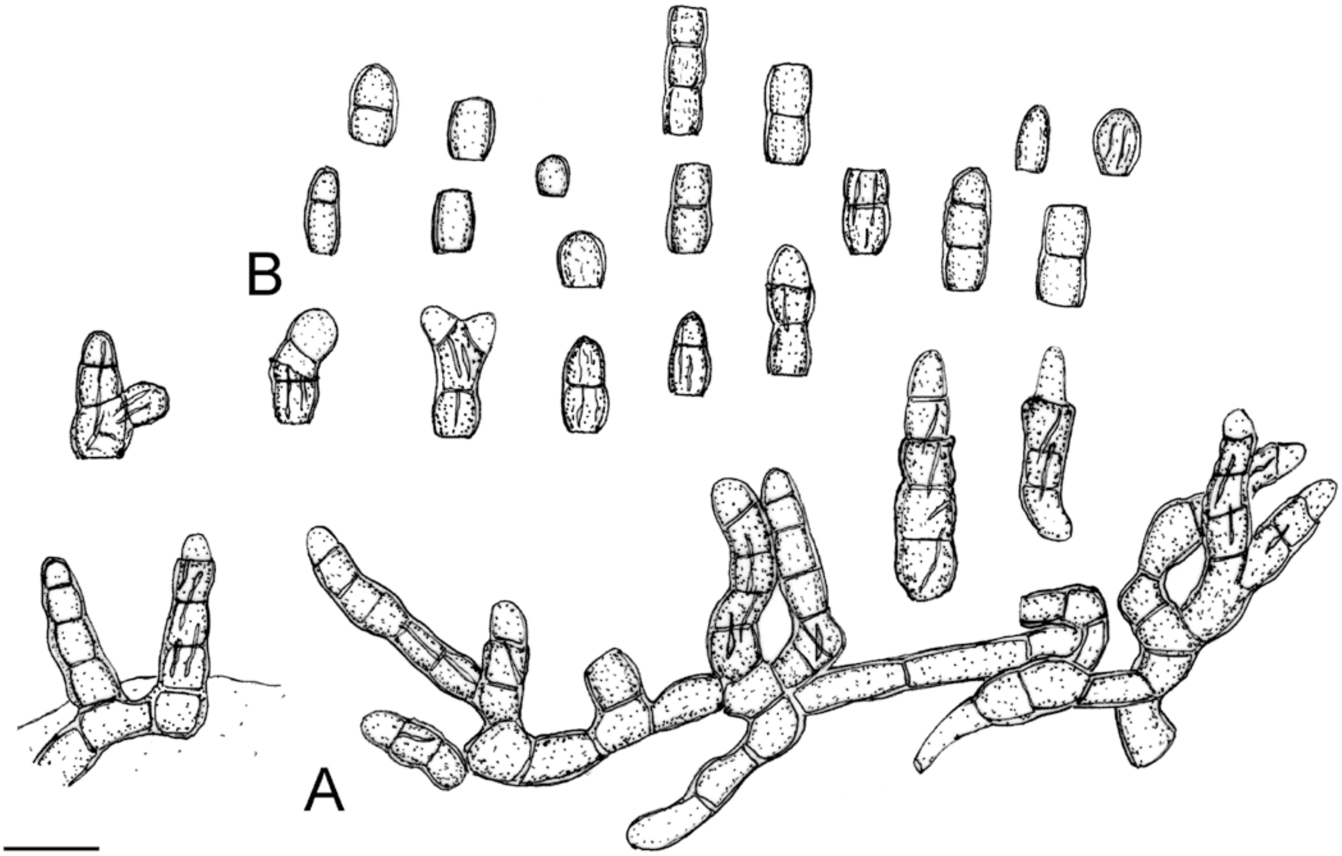

Fig. 11. *Taeniolella christiansenii* [LE 207693a]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

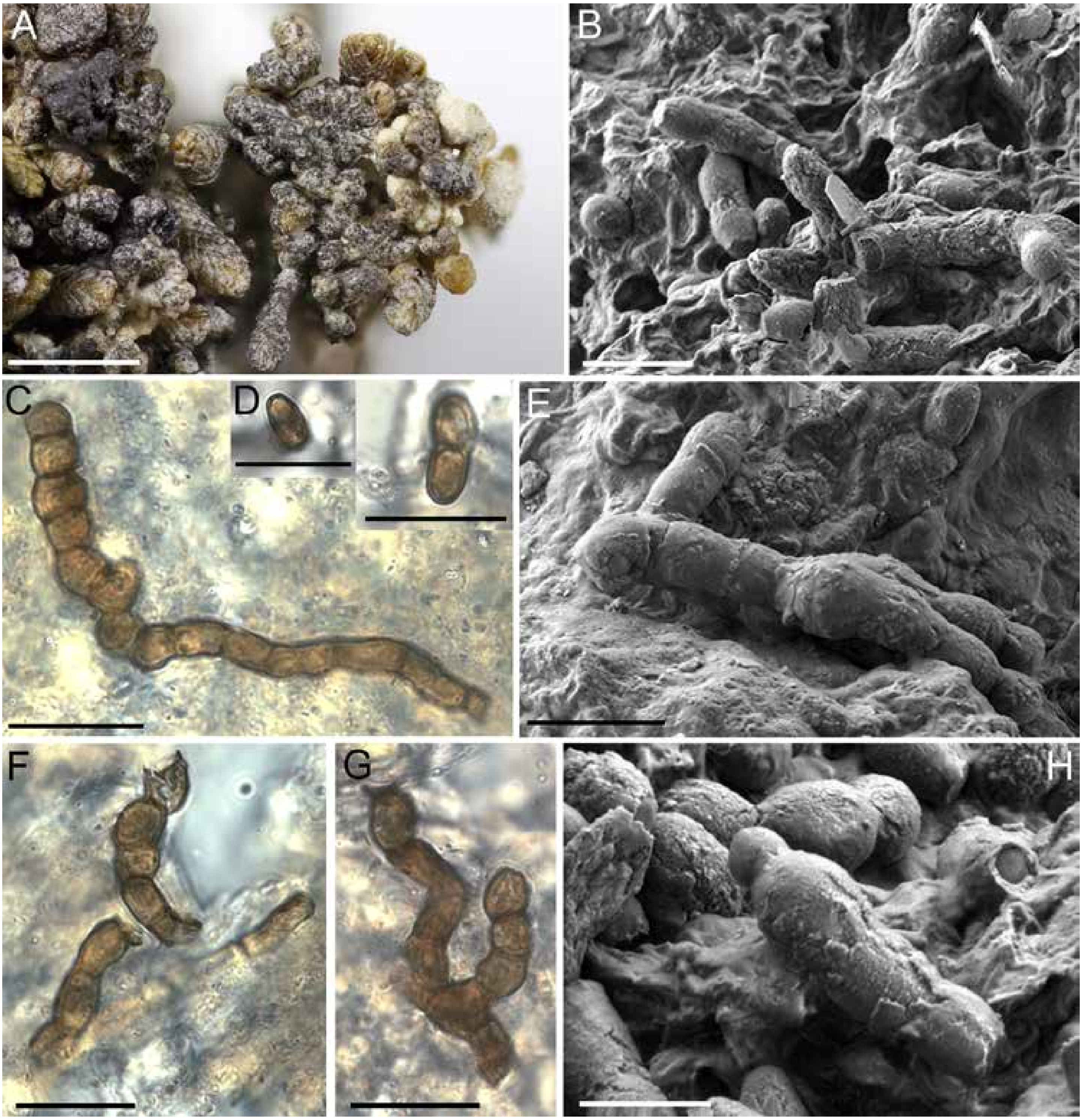

Fig. 12. *Taeniolella christiansenii* [A, B, E, H: Zhurbenko 9678; C, D, F, G: holotype]. **A.** Macroscopic overview of colonies. **B, C, E–G.** Conidiophores arising from hyphae. **D, H.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 10 µm (B–G), 6 µm (H).

also on lichenicolous *Arthonia nephromiaria* and *A. stereocaulina* over *Stereocaulon*; British Columbia (Zhurbenko 2010), Canadian Arctic [Ellesmere] (Zhurbenko & Daniëls 2003; Kristinsson *et al*. 2006; Esslinger 2016, 2018), Greenland (Alstrup & Hawksworth 1990; Alstrup 2005; Kristinsson *et al*. 2006), Norway (first report, see specimens examined), Russia [Chukotka East, Krasnoyarsk Territory, Severnaya Zemlya, Sakha-Yakutiya Republic, Taimyr Peninsula, Putorana Plateau, mainland Yakutiya, New Siberian Islands and Wrangel Island] (Andreev *et al*. 1996, Karatygin *et al*. 1999; Kristinsson *et al*. 2006, 2010; Zhurbenko 2010), USA (Zhurbenko 2010).

Additional specimens examined: **Norway**, Sör Trödelag, Opdal, Kongsvoll. Dovrefjell, on gravelly soil, alt. ca. 1150 m, on *Stereocaulon glareosum*, 7 Jul. 1948, *M.S. Christiansen 13.458* (C, herb. Christiansen 1636). **Russia**, Taimyr Pen., coast of Enesei Gulf, mouth of Ragozinka River, in tundra, 72°48' N, 80°53' E, alt. 50 m, on *Stereocaulon alpinum*, 18 Jul. 1990, *M.P. Zhurbenko 90370: a* (LE 207693: a) [note: associated with *Taeniolella rolfii* on *Cetraria odontella* (lobe tips) (*M.P. Zhurbenko 90370*: b, LE 207693: b)]; Krasnoyarsk Territory, Severnaya Zemlya Archipelago, NW extremity of Bol'shevik Is., near Ostraya Mountain at the northern boundary of Mushketova Glacier, moist to mesic terrace slope along the glacier with alternating patches of stones and silt with gravel, in sparse bryophyte-lichen vegetation, 79°11' N, 102°09' E, alt. 200 m, on *S.* cf. *alpinum* (thallus), 11 Jul. 1996, *M.P. Zhurbenko 9678* [note: species in early stage of development]; Chukotka, Tanyurer River, 64°50' N, 174°30' E, on *S. alpinum* (stem, phyllocladia), 5 Sep. 1943, *M.N. Avramchik 76: a* (LE 207579); Chukotka, Chukchi Pen., near Baran'e Lake, mountain foot, 66°54' N, 175°15' E, on *S. groenlandicum*, on stones (LE 207580: a) and *S. subcoralloides* (LE 207580: b), growing together, 22 Jul. 1980, *I.I. Makarova* (LE 207580 a, b); Sakha-Yakutiya Republic, New Siberian Islands, Bennett Is., coastal rocks, 76°40' N, 149°00' E, alt. 140 m, on *S. groenlandicum*, 9 Sep. 1989, *M.P. Zhurbenko 8972* (LE 207677) [note: associated with *Cercidospora stereocaulorum* (Arnold) Hafellner].

Notes: When viewed under a stereo microscope, there are portions of the thallus infested by *T. christiansenii* but devoid of any conidiophores, in any case however readily discernible by the presence of torulose hyphae. Such thallus portions are unchanged, *i.e.*, without any discolorations, whereas affected portions of the thalli with developed conidiophores turn grey, suggesting that this species might be pathogenic and that caused discolorations are probably associated with the formation of the asexual morph. Zhurbenko (2010) considered this species as a moderate pathogen, since the infected host tissues become darker.

In a single case, a possible microcyclic conidiogenesis has been observed. Two conidia were laterally formed from a two-celled fragment, which can possibly be classified as secondary conidia.

Taeniolella christiansenii and *T. arthoniae* are two very similar species, which can mainly be differentiated on the basis of their surface structures of conidiophores and conidia: *T. christiansenii* with smooth to rimulose, verruculose-striate surface, and *T. arthoniae* with an irregularly verruculose to verrucose, rarely smooth surface. Furthermore, *T. arthoniae* is well-characterised by having frequently branched conidiophores and conidial chains. *T. christiansenii* is also comparable with *T. pseudocyphellariae* (see under the latter species).

Zhurbenko (2010) listed several new *Stereocaulon* species as hosts of *T. christiansenii* and supposed that this species is a true stereocaulicolous species, able to overgrow ascomata of *Arthonia* species lichenicolous on *Stereocaulon*.

Taeniolella chrysothricis Diederich, *Mycotaxon* **37**: 323. 1990. Figs 13–15.

Literature: Clauzade *et al*. (1989: 120).

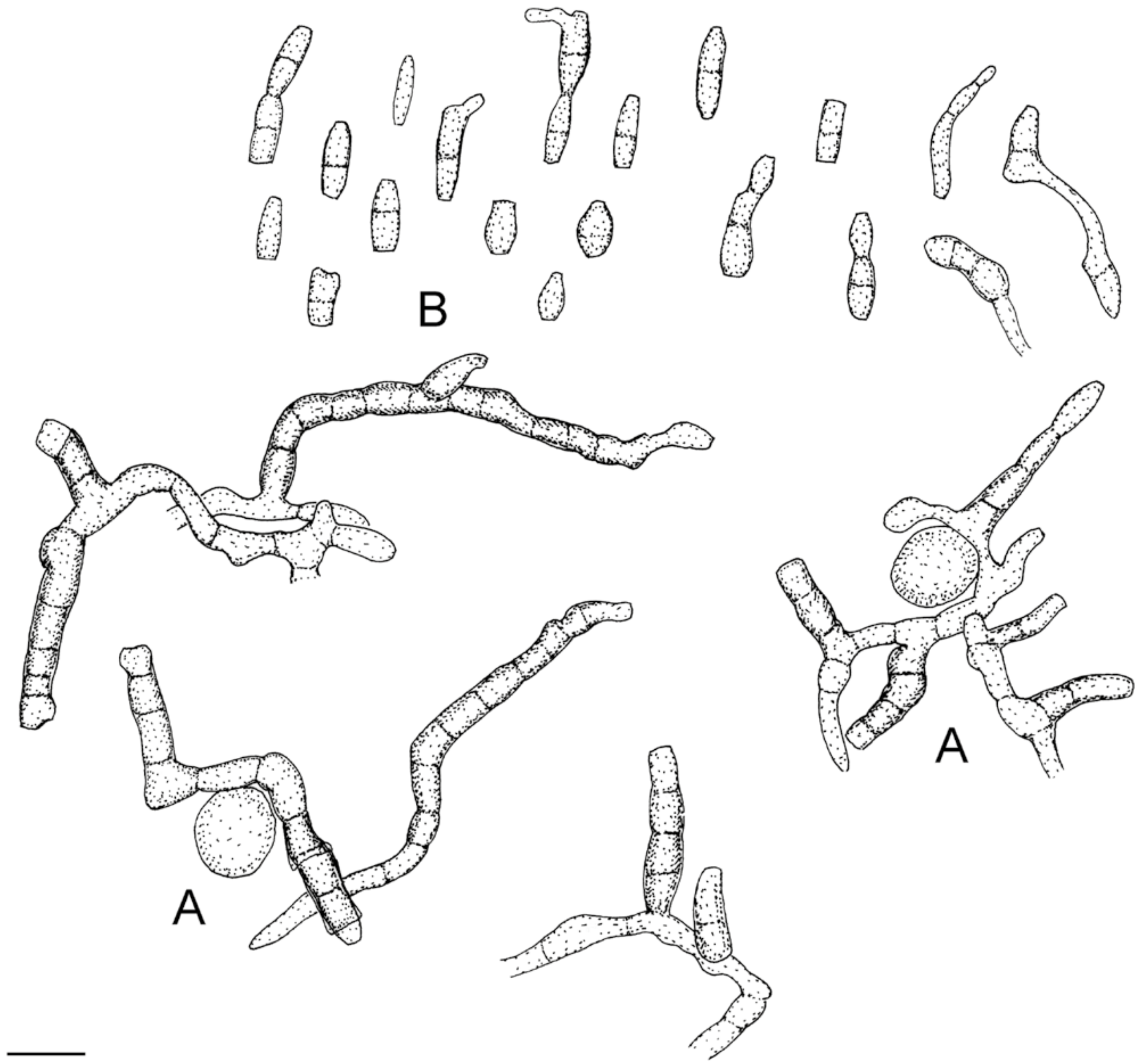

Fig. 13. *Taeniolella chrysothricis* [isotype]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

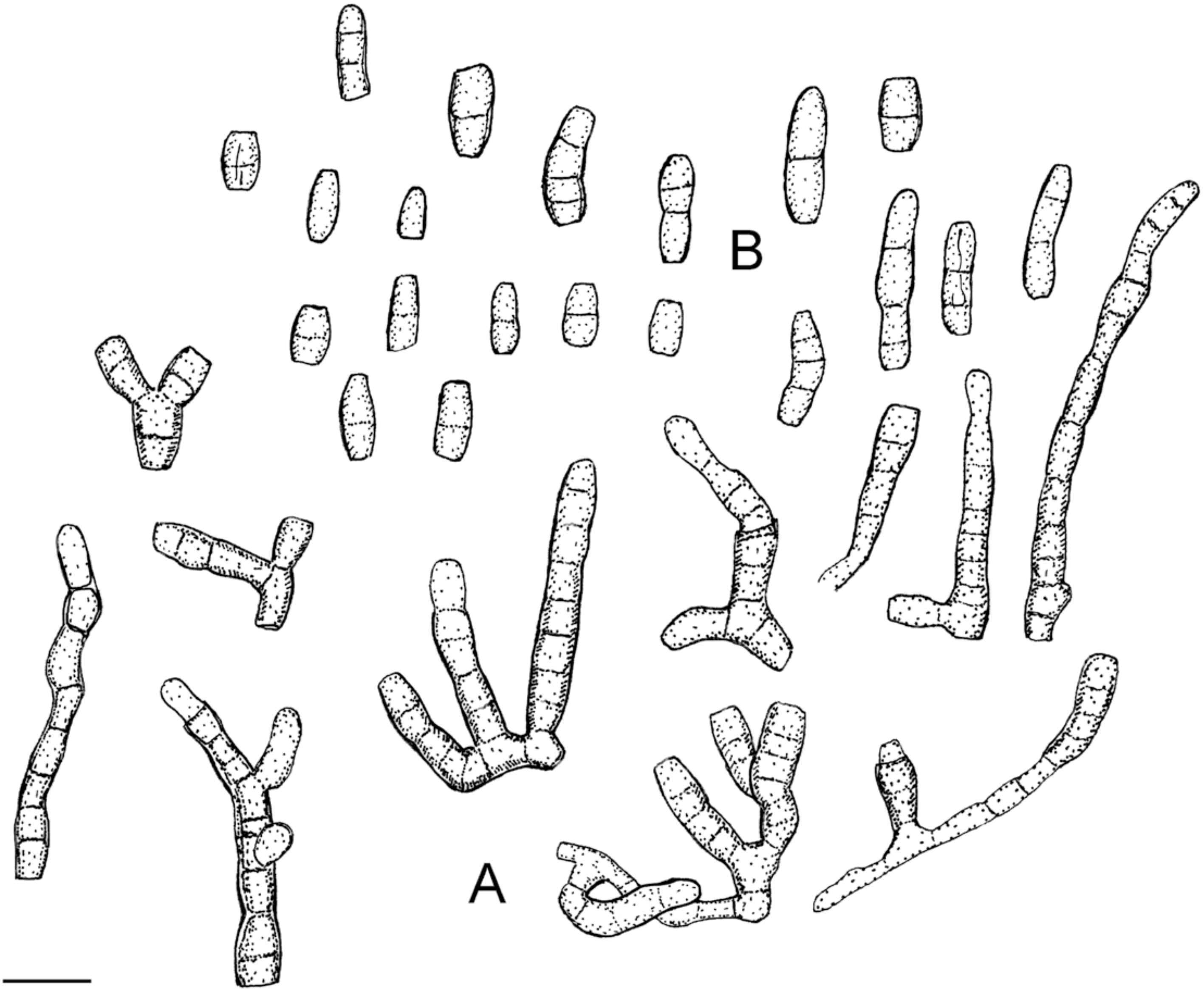

Fig. 14. *Taeniolella chrysothricis* [Diederich 16059]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Illustrations: Diederich (1990b: 324–325, figs 13–14, Diederich *et al*. 2017a).

Description: *Colonies* effuse, pale brown to olivaceous brown, caespitose to floccose, invaded part of the thallus turning brownish, sometimes damaged. *Mycelium* superficial and immersed; hyphae growing around soredia, composed of flexuous and tortuous hyphae, branched, 1.5–5 µm wide, septate, constricted at the septa, subhyaline to pale brown, smooth, walls unthickened or slightly thickened. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, solitary or mostly in loose tufts, arising from hyphae, lateral and terminal, erect to decumbent, plagiotropous, mostly flexuous, partly straight, mostly unbranched, occasionally branched, mostly in the lower part, subcylindrical, 9–53(–70) × 3–5 µm, 1–12-septate, often constricted at the septa, pale brown to brown, paler towards the apex, smooth, sometimes verruculose to verrucose, wall somewhat thickened, 0.5–1 µm, often thinner near the tips, with distinctly differentiated cell-plasma, occasionally enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, occasionally intercalary, doliiform or subcylindrical, mostly monoblastic, rarely polyblastic, with two loci, mostly monopodial, rarely sympodial, 3–8 µm wide, loci truncate, unthickened, 1.5–3 µm diam. *Conidia* catenate, mostly in unbranched, rarely in branched chains, easily disintegrating, straight, rarely slightly curved, ellipsoid, subcylindrical, 0–2(–3)-septate, aseptate conidia 5.5–10 × 2–4.5 µm, 1-septate ones 6–15 × (2.5–)3–5 µm, 2- and 3-septate ones 10–20 × 4–4.5 µm, slightly or not constricted at the septa, subhyaline to pale brown, smooth or verruculose to rugose (according to the original description, wall finally spitting and breaking up into patches and stripes of 1–3 µm diam), wall thickened, 0.25–0.75 µm, apex rounded to attenuated in primary conidia, truncate in secondary ones, base somewhat obconically truncate, hila truncate, unthickened, not darkened, 1–3 µm diam.

Host range and distribution: On *Chrysothrix candelaris*; Chile (first report, see specimens examined), Germany (John 1990), Luxembourg (Diederich 1990a, b; Diederich *et al*. 2017a).

Holotype: **Luxembourg**, E Carelshaff (Ettelbruck), 10 Sep. 1986, on *Chrysothrix candelaris*, on *Quercus*, *P. Diederich 7490* (K(M) IMI 335014). *Isotypes*: LG**!**, herb. Diederich**!**

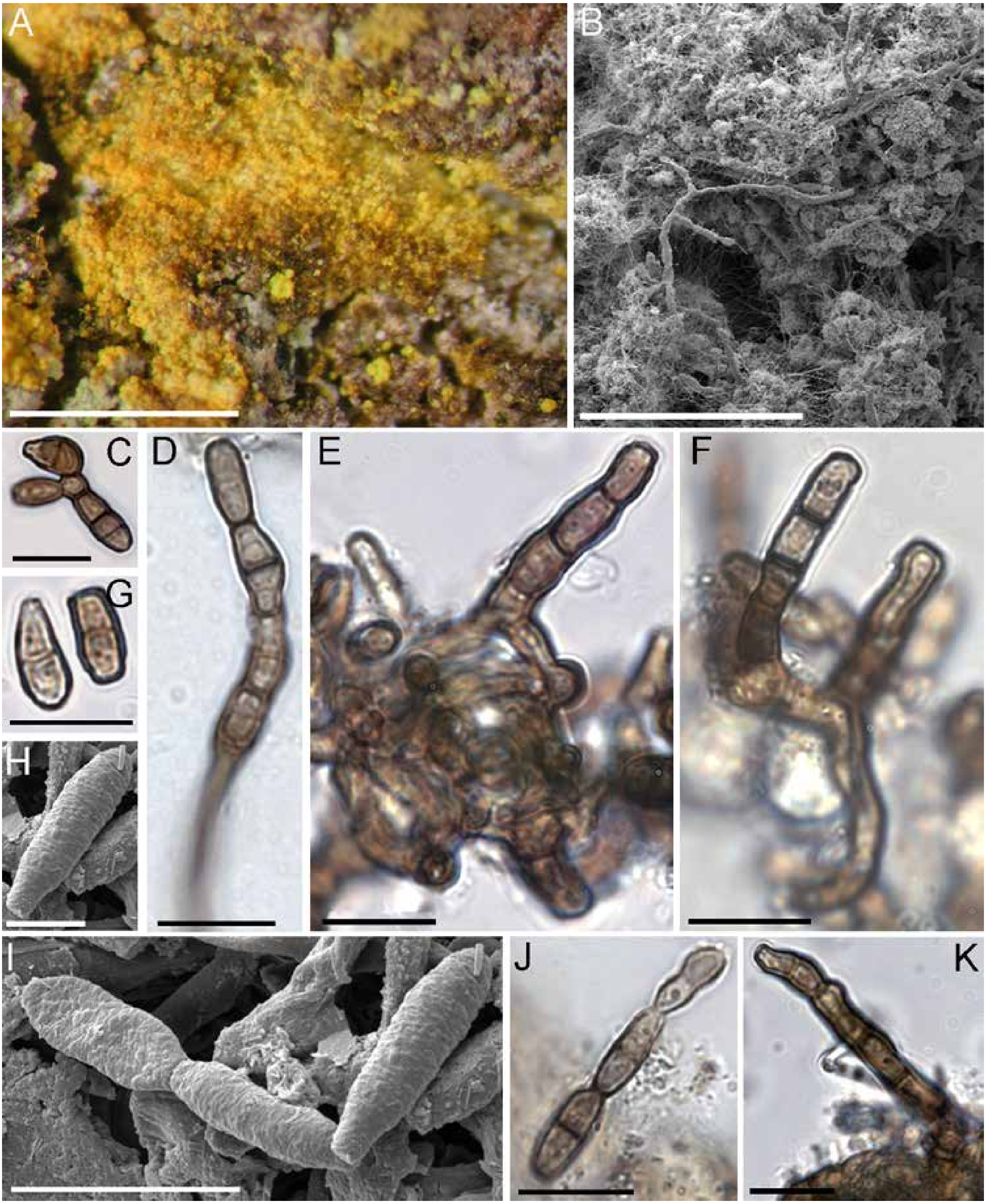

Fig. 15. *Taeniolella chrysothricis* [A: Diederich 15750; B–K: isotype]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C, G–J.** Conidia. **D–F, K.** Conidiophores arising from hyphae. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (B), 10 µm (C–G, J, K), 9 µm (I), 4 µm (H).

Additional specimens examined: **Chile**, Navarino, Puerto Eugenia, carretera Pto. Williams al E, bosque de lengas y coigües, entrada del terreno militar, 54°54'49.1" S, 67°50'51.8" W, 10 m, on *C. candelaris*, on *Nothofagus pumilio*, 11 Jan. 2005, *J. Etayo 22717, Gómez & Rancho* (herb. Etayo). **Luxembourg**, Berdorf, à 1 km au S de Vogelsmühle, rive droite de l'Ernz Noire, on *C. candelaris*, on *Populus*, 13 Sep. 2003, *P.*

Diederich 15750 (herb. Diederich); ibid. on *C. candelaris*, 13 Apr. 2005, *P. Diederich 16059* (herb. Diederich).

Notes: The disintegration of the outer wall of conidia, described by Diederich (1990b), has not been observed. The conidia are mostly smooth to slightly rough. Although the conidia are usually 1-septate, aseptate and 2–3-septate ones have also been found.

The conidiogenous cells of *Taeniolella* species are usually integrated, terminal, unilocal, determinate or percurrently proliferating, but there are some exceptions. *T. chrysothricis* is one of the deviating *Taeniolella* species, in which conidiogenous cells with two loci may also be formed (other examples are *T. arthoniae*, *T. christiansenii*, *T. rolfii* and *T. verrucosa*). Intercalary conidiogenous cells were also found in *T. rolfii* and have been depicted by Diederich & Zhurbenko (1997: fig. 3). The conidiophores and conidia of *T. arthoniae*, *T. christiansenii* and *T. verrucosa* are usually wider than in *T*. *chrysothricis*. The verrucose-striate ornamentation of conidiophores and conidia in *T. christiansenii* and the striking surface structure (outer wall mostly transversely splitting and breaking off into pieces) in *T. rolfii* clearly differentiate these species from *T*. *chrysothricis.*

Taeniolella delicata is similar to *T. chrysothricis*, but the conidiophores and conidia in this common *Taeniolella* species are usually wider (3–7(–8) µm vs. 2–5 µm in T. *chrysothricis*), and conidiophores of *T. delicata* are always erect, in comparison to the frequently plagiotropous conidiophores of *T. chrysothricis*. *Taeniolella friesii* is another species with narrow conidia, but this species is clearly distinguished from *T. chrysothricis* by having micronematous to semi-macronematous, short, subcylindrical-conical and always unbranched conidiophores (4–12(–15) × 2–4.5 µm), which are reduced to conidiogenous cells.

The conidia in *Talpapellis beschiana* (formerly *Taeniolella beschiana*) are also delicate, narrow and pale, but the conspicuous annellations connected with the formation of conidiogenous cells and the conidiogenesis are striking characters in favour of *Talpapellis* and not characteristic for *Taeniolella chrysothricis*. Annellations may occur in the latter species, but they are rather a result of spontaneous rejuvenations, distantly formed and not connected with the formation of conidiogenous cells and conidiation.

Based on the formation of a superficial mycelium with solitary conidiophores, sometimes with more than one conidiogenous locus and the rather small conidia, this species is atypical for *Taeniolella* and reminiscent of species of the *Fusicladium* (*Venturia*)/*Pseudocladosporium* complex (*Venturiaceae*). However, the true generic affinity of *T. chrysothricis* can only be clarified by means of cultures and analyses of molecular sequence data. For the interim, we prefer to maintain this species in *Taeniolella s. lat*.

Taeniolella cladinicola Alstrup, *Graphis Scripta* **5**: 61. 1993. Figs 16–18.

Literature: Kocourková (2000: 127), Suija (2005: 360).

Illustration: Alstrup (1993a: 62, fig. 2).

Exsiccatum: Hansen & Christensen, Lich. Dan. Exs. 57.

Description: *Colonies* on podetia of the host thallus, effuse, loose to rarely densely caespitose, sometimes conidiophores solitary, dark brown, in the first stage of infection without initiated formation of conidiophores the infected parts of the thallus turn reddish or purplish brown, later the host surface becomes dark brown by the beginning conidial formation. *Mycelium* immersed, usually developing inside host hyphae; hyphae clearly visible in lactophenol blue, branched, 2–5 µm wide, rarely swollen below the conidiophores, up to 7 µm, septate, mostly constricted at the septa, subhyaline to pale brown, slightly thickened, to 0.5 µm. *Stromata* lacking, *Conidiophores* macronematous, mononematous, mostly solitary, rarely in small tufts, arising from hyphae, often erumpent through the wall of host hyphae, erect or decumbent, straight or slightly flexuous, unbranched, subcylindrical, 14–72(–103) × 4.5–7 µm, narrowed at the apex, 1–8(–13)-septate, not or only slightly constricted at the septa, brown to dark brown, paler towards the apex, irregularly rugose, slightly rimulose, but not squamulose, often smooth at the apex, walls thickened, 1–1.5(–2) µm, cell plasma often reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, less thickened toward the apex, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, subcylindrical, doliiform, usually narrowed towards the tip, 6–17 µm long, little differentiated, loci truncate, slightly convex, unthickened, 2–3 µm diam. *Conidia* catenate, usually in unbranched, rarely in branched chains, easily disintegrating, straight, subcylindrical, ellipsoid, subglobose, obovoid, pyriform, 0–1(–2)-septate, aseptate conidia 3–13 × 3–6 µm, 1-septate ones 9–19 × 4–6 µm, 2-septate ones 20–25 × 5 µm, not or slightly constricted at the septa, brown to dark brown, wall rarely smooth, young conidia verrucose, older conidia becoming irregularly rough, rimulose, walls thickened, 0.25–1 µm, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed, hila truncate, slightly convex, unthickened, 1–2.5 µm diam.

Holotype: **Denmark**, Northeast Zealand, Frederiksværk Kommune, Asserbo Plantage, Stængehus, on *Cladonia arbuscula*, Nov. 1991, *U. Søchting* (C**!**).

Host range and distribution: On *Cladonia arbuscula*, *C. arbuscula* ssp. *squarrosa*, *C. mitis*, *C. portentosa*, *C. rangiferina*, *C. uncialis*, *C. uncialis* ssp. *biuncialis*, *C. zopfii*; Austria (Hafellner *et al*. 2004), Czech Republik (Kocourková 2000), Denmark (Alstrup 1993a, b), Estonia (Suija 2005), Finland (first report, see specimens examined), France (first report, see specimens examined), Italy (Brackel 2013), Lithuania (Montijūnaitė 2015), Poland (first report, see specimens examined).

Additional specimens examined: **Denmark**, NE-Jutland, Nordøstjylland, Bunken Strand between Frederikshavn and Skagen, in sanddune, on old *Cladonia arbuscula*, 25 May 1992, *V. Alstrup* (C, herb. Christiansen 605, 606); Vendsyssel, Skagen, Tornbakke Rimme near Hulsing, on the ground in a pine plantation, on *C. arbuscula* ssp. *squarrosa*, 5 Oct. 1968, *M.S. Christiansen 7303* (C, herb. Christiansen 5651); Bornholm, Dueodde, on dune slope in *Pinus* plantation, on *C. mitis*, 30 Oct. 1982, *S.N. Christensen* (C); Jylland, Thy, Hanstedreservatet, in dune heath, on *C. portentosa*, 12 Sep. 1992, *V. Alstrup* [Hansen & Christensen, Lich. Dan. Exs. 57] (H); Thy, Hanstedreservatet, between Hanstholm and Klitmøller, on dune sand, on *C. uncialis*, 2 Dec. 1992, *V. Alstrup 7292* (C, herb. Christiansen 5647); Hanstedreservatet, on *C. uncialis*, 2 Dec. 1992, *V. Alstrup* (C); Hanstedreservatet, on *C. zopfii*, 2 Dec. 1992, *V. Alstrup* (C); N-Sylland, Simon Skrivens Klit, on *Cladonia* sp., 16 May 1992, *V. Alstrup*

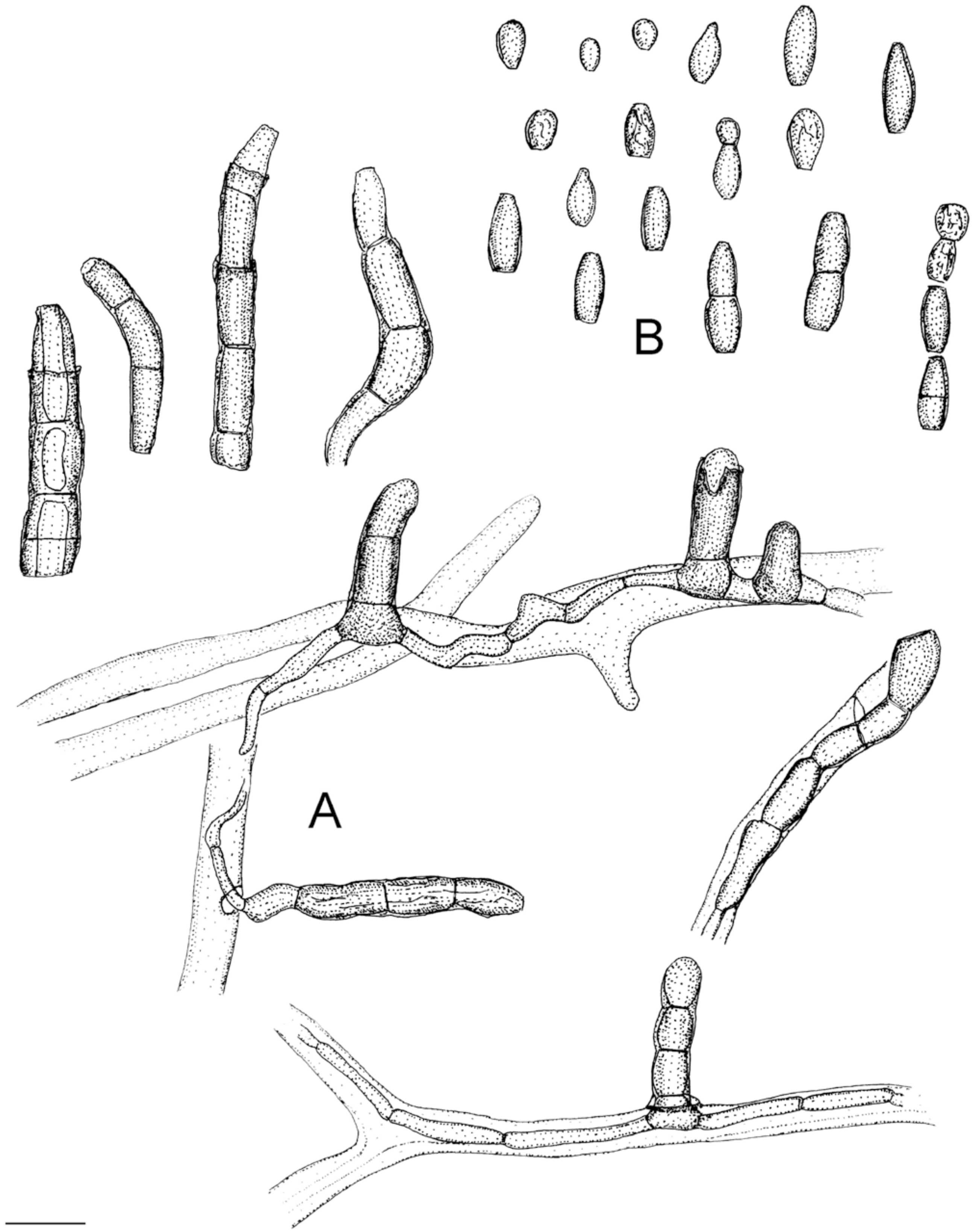

Fig. 16. *Taeniolella cladinicola* [holotype]. **A.** Conidiophores arising from hyphae usually developing inside host hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

(C). **Finland**, Uusimaa, Sipoo, south of Sipoonkpi National Park, *Pinus sylvestris* woodland, on granitic rock, on *C. uncialis*, 13 Nov. 2014, *R. Pino Bodas* (H 6060106); Uusimaa, Sipoo, Luukkaa Recreation Area, *P. sylvestris* woodland, on granitic rock, on *C. arbuscula*, 90 m alt., 19 Sep. 2014, *R. Pino Bodas* (H 6060154). **France**, Moselle, A 12 km à l´Ede Bitche, Grosser Hundskopf [Réserve Naturelle des Rochers et Tourbières du Pay de Bitche: rocher 20], sur un rocher en grès bigarré, on *C. uncialis* ssp. *biuncialis*, 25 Jul. 2001, *P. Diederich 14916 & J. Signoret* (herb. Diederich). **Poland**, Półwysep Helski, E of Hel town, Jastarnia forest division, forest section no. 285, 54°36'21" N, 18°49'04" E, scrub vegetation with *Pinus mugo* and young *P. silvestris*, on *C. uncialis*, 8 Feb. 2007, *M. Kukwa 5499* (ex UGDA-L-14197, dupl. herb. Diederich).

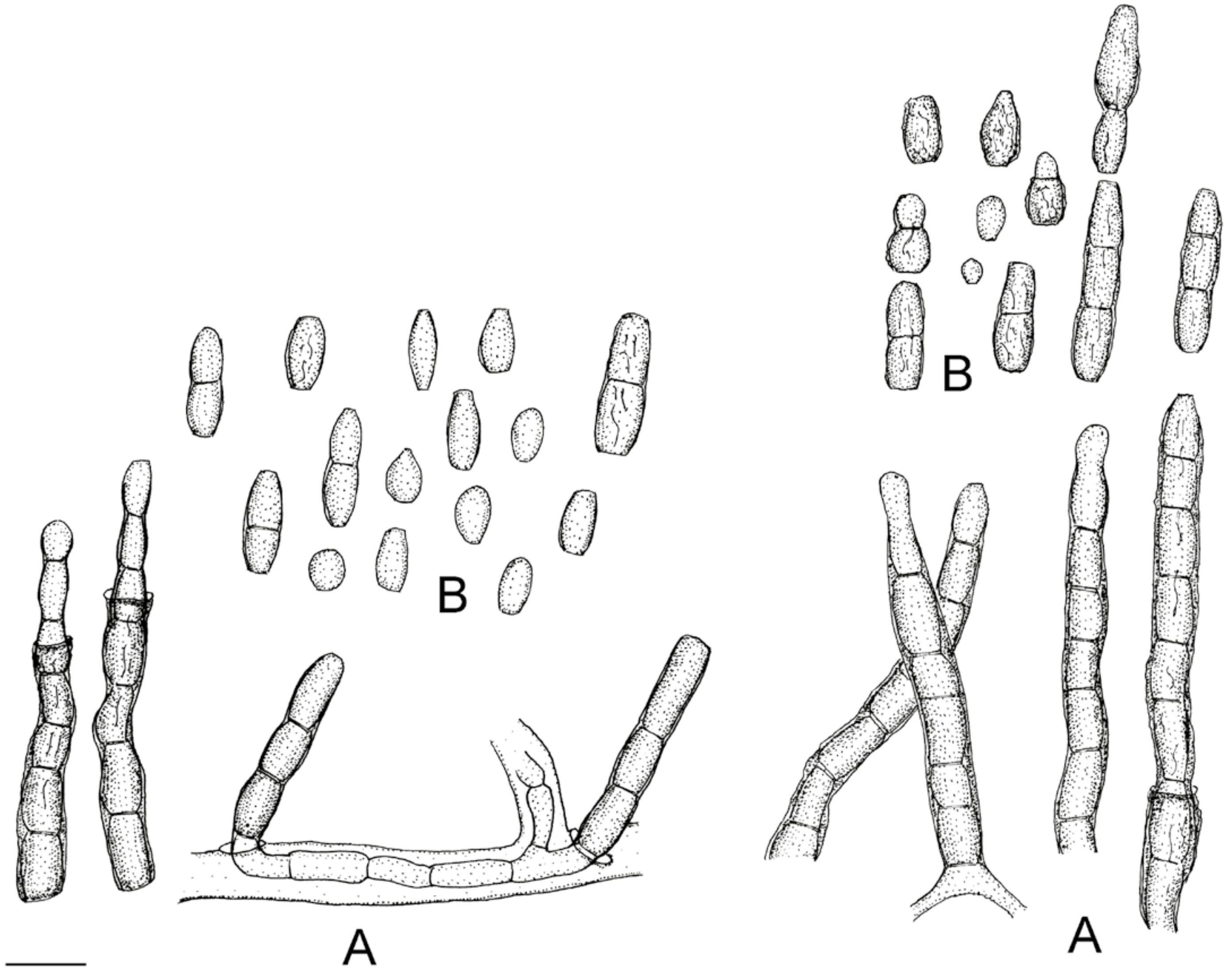

Fig. 17. *Taeniolella cladinicola* [C, herb. Christiansen 606, right; C, herb. Christiansen 5651, left]. **A.** Conidiophores arising from hyphae usually developing inside host hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Notes: *Taeniolella cladinicola* is one of the few obviously parasitic *Taeniolella* species. It is the only *Taeniolella* species with hyphae of the immersed mycelium that usually develop inside host hyphae. Particularly noticeable is that in the first infection stadium the host thallus turns reddish or purplish brown, and later becomes dark brown caused by the beginning conidial formation. Suija (2005) also observed that infections are macroscopically visible because the infected part turns purplish brown before conidia appear.

Reddish brown or brownish discolorations are also caused by *T. umbilicariae*, known on *Umbilicaria virginis* from Sweden and Peru, as well as *T. chrysothricis*, known on *Chrysothrix candelaris* and C. *chlorina* from Austria, Germany, Luxembourg and Chile. In addition to their hosts and distribution, both species are clearly distinguished from *T. cladinicola* by some morphological features (dimensions of conidiophores and conidia). The thallus of *Umbilicaria* sp. in a Peruvian collection infested by *T. umbilicariicola* is occasionally discoloured and becomes grey. Conidia are usually larger (*e.g.*, aseptate conidia 5–9(–12) × 5–6(–7) µm in *T. umbilicariicola* vs. 3–13 × 3–6 µm in *T. cladinicola*), the conidial shape is distinct, and in *T. cladinicola* 3- and 4-septate conidia have not been observed. Furthermore, thalli invaded by *T. christiansenii* commonly become grey. In this species, flexuous and tortuous hyphae are immersed and also superficial, spreading over the surface, but they are not formed within host hyphae. Thallus areas with torulose hyphae but without conidiophores do not show any grey discolorations. The conidial stage of this species seems to be parasitic and may damage the host.

Taeniolella cladinicola has to be compared with the cladoniicolous species *Talpapellis beschiana*. Both species are morphologically very similar (Kocourková 2000). For a detailed comparison, see under *Talpapellis beschiana*. *Taeniolella cladinicola* is also similar to *Taeniolella delicata*, which has never been found on *Cladonia* species. The dimensions of conidia and conidiophores are similar in both species, but *T. delicata* has mostly smooth to irregularly verruculose, rarely slightly rhagadiose conidia. The tip of the conidiogenous cells and the base of the conidia are conspicuously narrowed in *T. cladinicola*, which is not the case in *T. delicata*, or at least less evidently. The loci are 2–3 µm diam vs. 1–4(–5) µm diam in *T. delicata*.

Taeniolella strictae, known only from the type collection on *Cladonia stricta*, is easily distinguishable from *T. cladinicola* by forming superficial hyphae, composed of subglobose or globose, monilioid cells with irregularly rough walls, usually with fine net-like cracks or with squamules that are up to 2 µm wide.

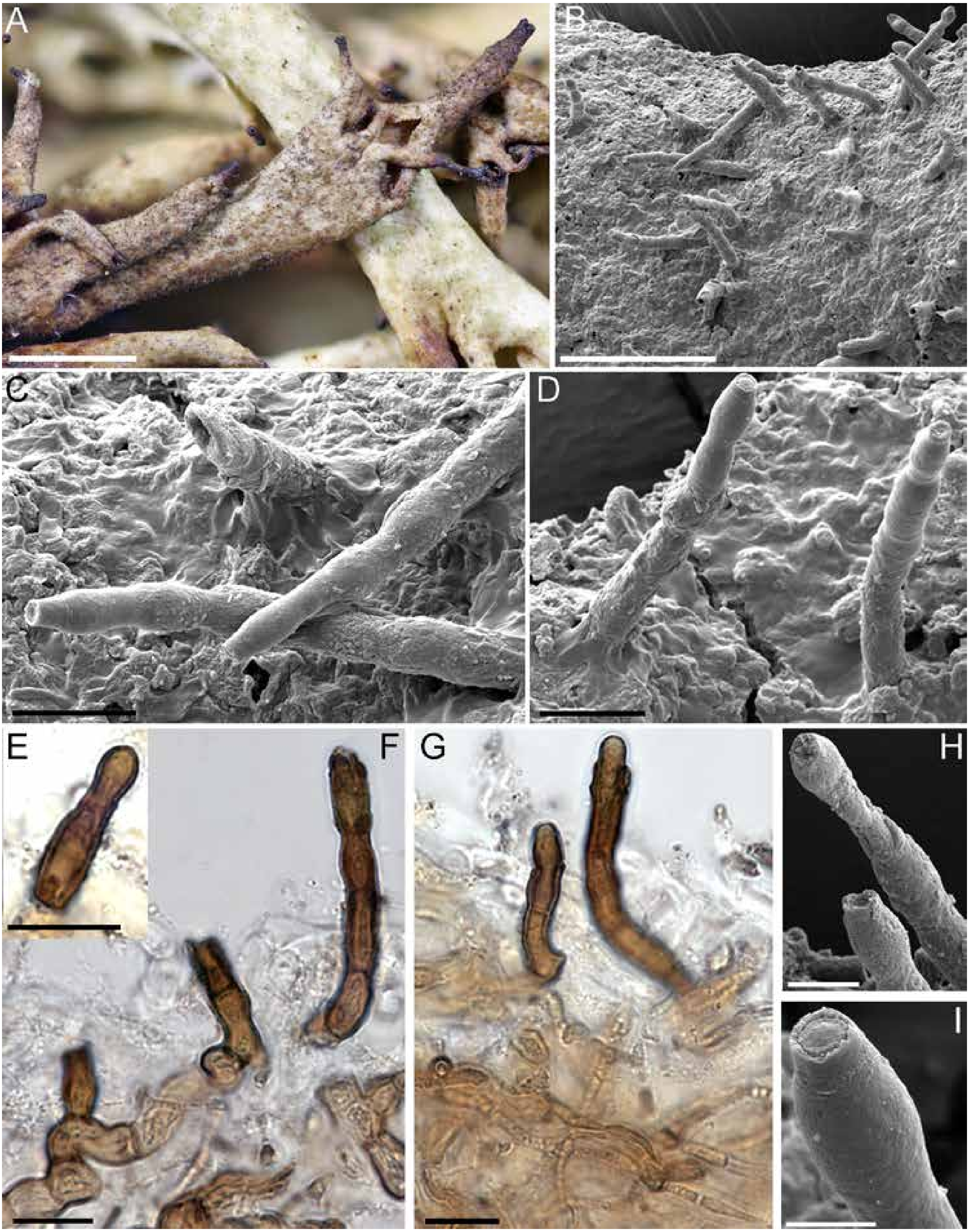

Fig. 18. *Taeniolella cladinicola* [A: Kukwa 5499; B–D, H, I: C, herb. Christiansen 606; E–G: C, Alstrup, on *Cladonia zopfii*]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C, D, F, G.** Conidiophores. **E.** Conidia. **H.** Tip of conidiophores with adhering conidia. **I.** Hila. Bars: 1 mm (A) [photo taken by Paul Diederich], 50 µm (B), 10 µm (C–G), 7 µm (H), 3 µm (I).

During the re-examination of the material assigned to *T. cladinicola*, a new lichenicolous hyphomycete species has repeatedly been found on *Cladonia stygia* (Alstrup *et al*. 2004) and *C. portentosa* [V. Alstrup, Hansen & Christensen, Lich. Dan. Exs. 57 (H), mixed with *T. cladinicola*] and was eventually described as *Ramichloridium cladoniicola* (Braun *et al*. 2009).

Taeniolella delicata M.S. Christ. & D. Hawksw., *Bull. Brit. Mus.* (*Nat. Hist*.), *Bot*. **6**: 253. 1979. Figs 19–21.

Literature: Clauzade *et al.* (1989: 121), Diederich (1989: 252), Boqueras (2000: 462), Suija & Jüriado (2002: 41), Tsurykau (2017: 156).

Illustrations: Hawksworth (1979: 254, fig. 35), Boqueras (2000: 459, fig. 79g).

Exsiccatae: Santesson, Fungi Lichenicoli Exs. 74. Vězda, Lichenes Selecti Exsiccati 1898, 1900.

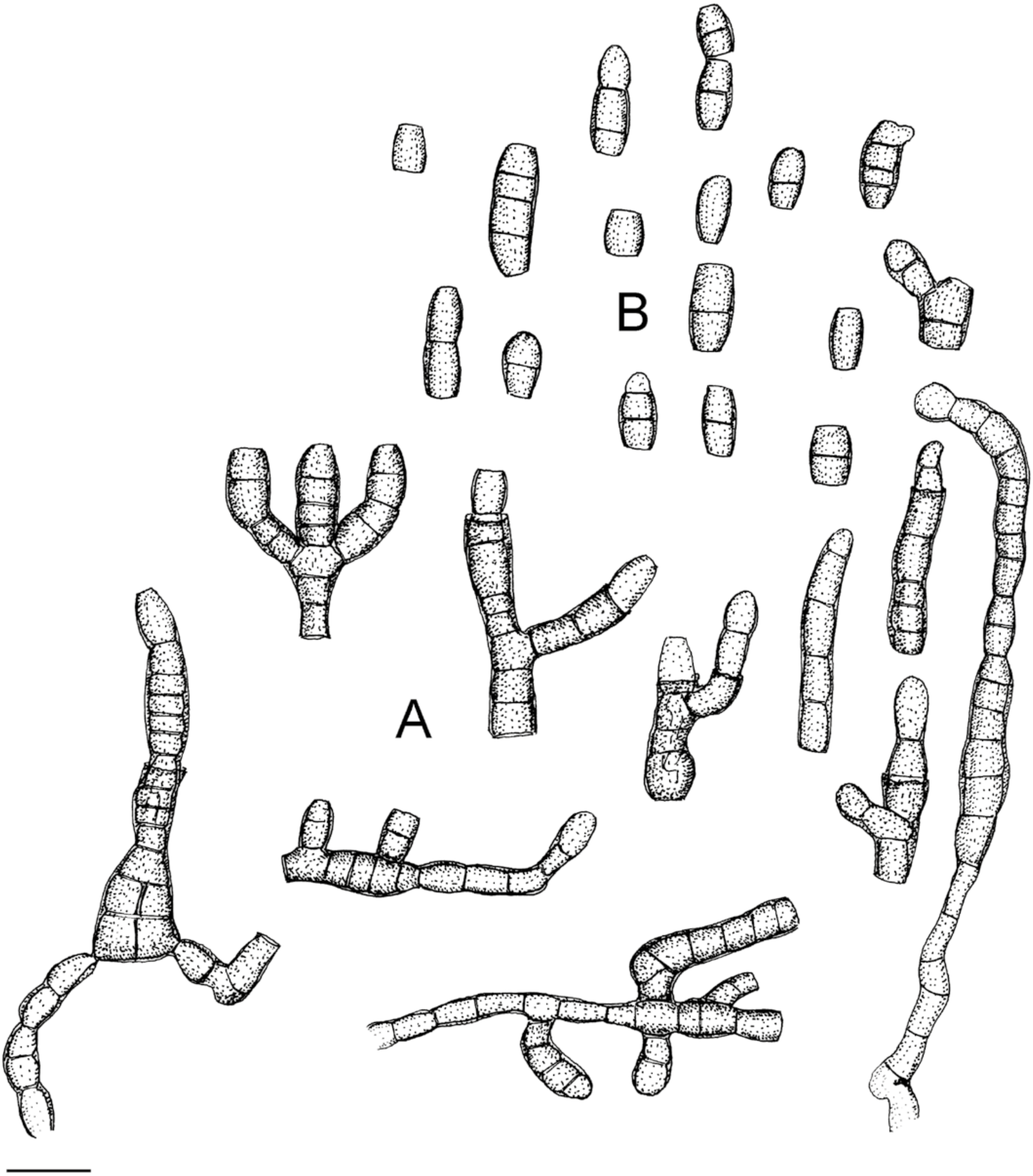

Fig. 19. *Taeniolella delicata* [holotype]. **A.** Conidiophores with adhering conidia. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

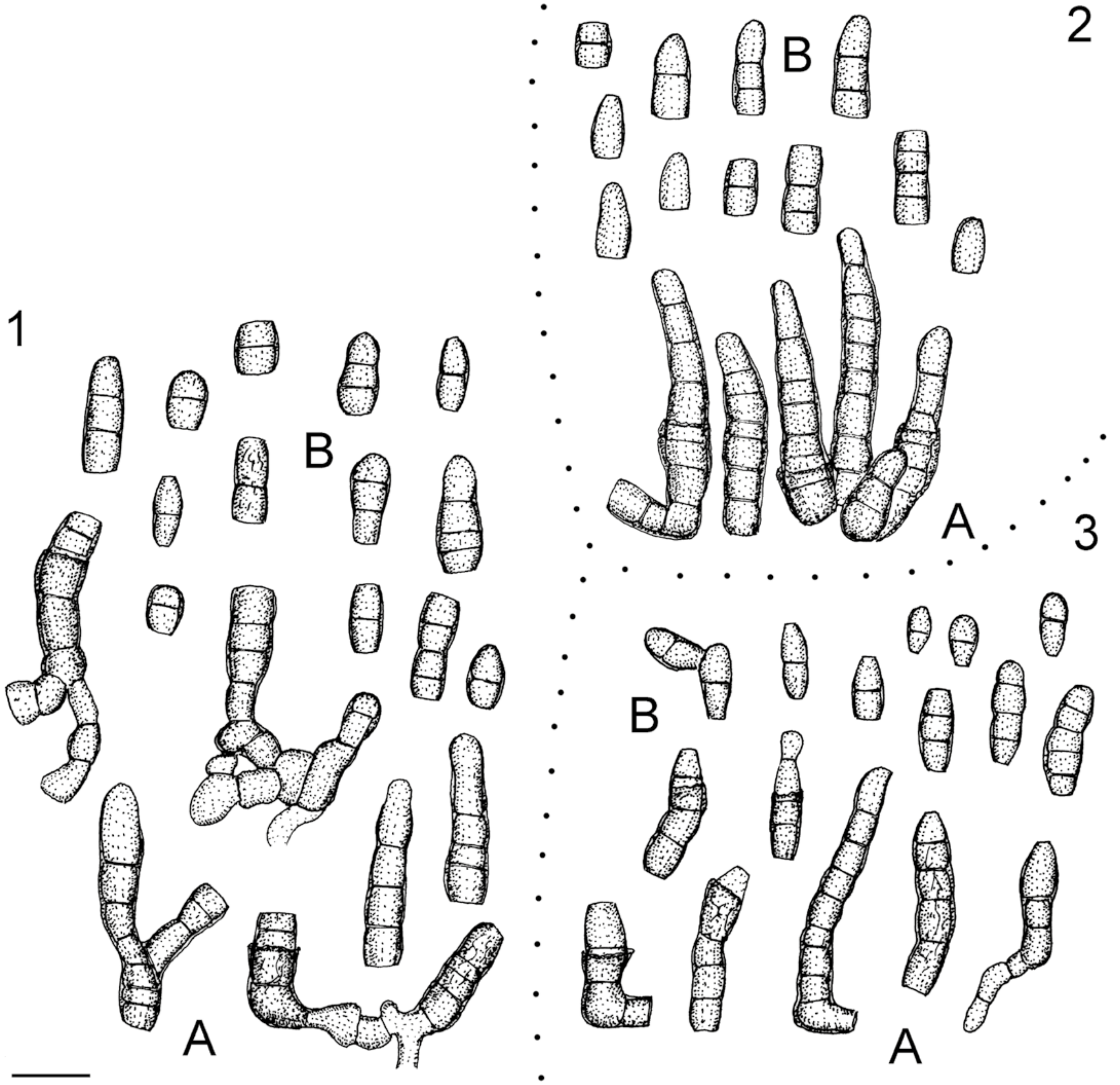

Fig. 20. *Taeniolella delicata* [1: C, herb. Christiansen 6373; 2: C, herb. Christiansen 5641; 3: Diederich 15720]. **A.** Conidiophores with adhering conidia. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Description: *Colonies* effuse, brown to dark brown or almost black, slightly shiny, scattered over the infected tissue of the host and on the apothecia, rarely in small tufts, usually loosely to densely caespitose, sometimes velvety or floccose, confluent, 1–10 mm diam, occasionally thallus completely overgrown, obviously pathogenic, usually destroying infected thalli and apothecia which become discoloured, grey or dark brown to black. *Mycelium* rather sparsely developed; hyphae immersed and superficial, flexuous, branched, (1–)2–6 µm wide, septate, mostly constricted at the septa, pale brown to brown, smooth, walls slightly thickened. *Stromata* lacking, hyphal cells below the conidiophores loosely aggregated, swollen, subglobose to irregularly formed, 3–9 µm diam, smooth, wall up to 0.5 µm thick. *Conidiophores* semi-macronematous, mononematous, solitary or usually in caespitose tufts, arising from hyphae, lateral and terminal, or arising from aggregated swollen hyphal cells, erect to decumbent, straight to slightly flexuous, mostly unbranched or occasionally branched, mostly in the lower part, subcylindrical, conidiophores (without adhering conidia) 8–56(–90) × 3.5–7 µm, (0–)1–15-septate, often slightly constricted at the septa, sometimes yellowish brown, but usually brown to dark brown, paler towards the apex, wall smooth, especially in young conidiophores, in older ones often irregularly verruculose, slightly rimulose to rhagadiose, walls thickened, up to 1 µm, apically slightly thickened, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* little differentiated, integrated, terminal, monoblastic, monopodial, subcylindrical, sometimes narrowed to the tip, (1.5–)3–9 µm wide, loci truncate, unthickened, (1–)1.5–4(–5) µm diam. *Conidia* catenate, mostly in unbranched,

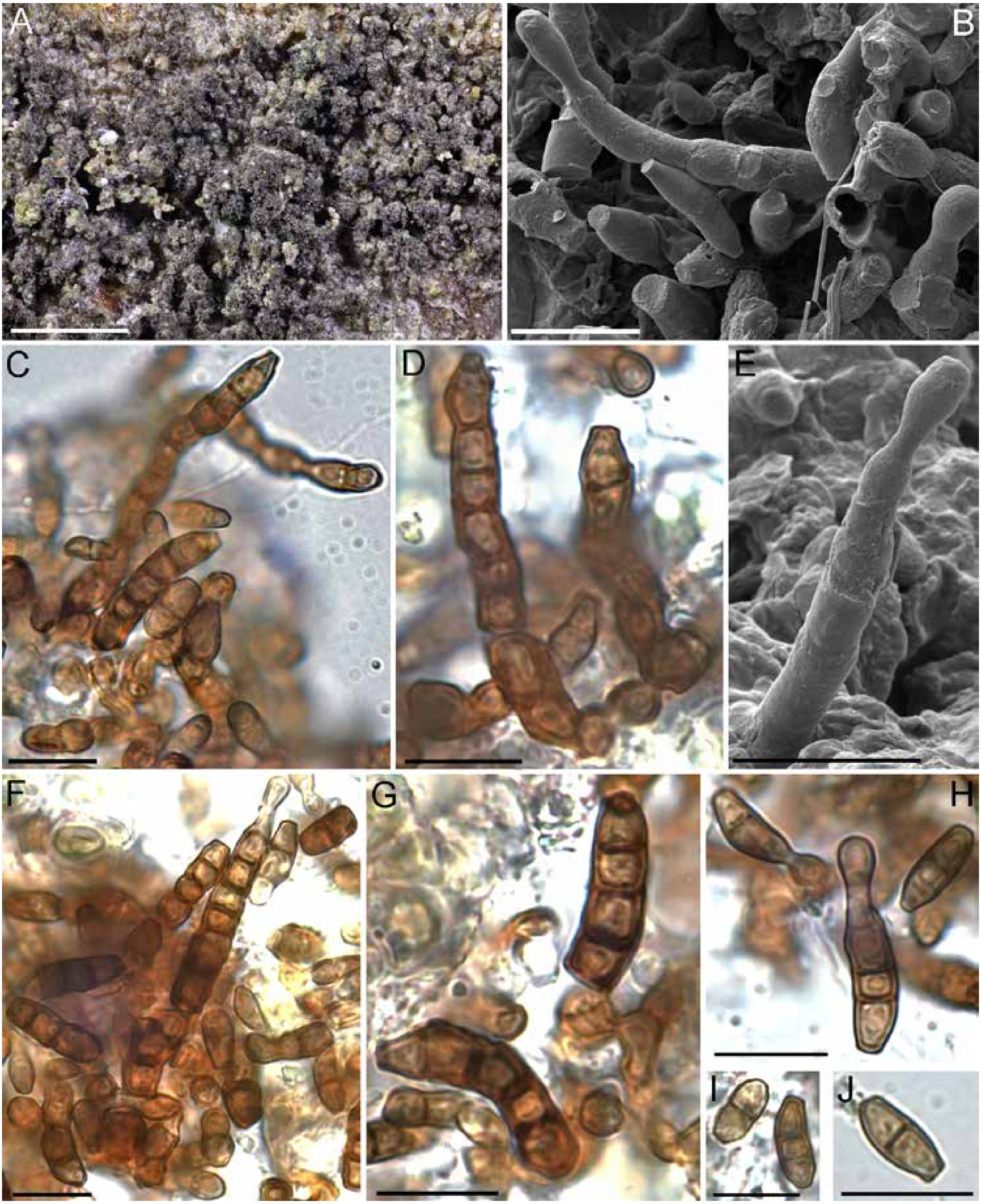

Fig. 21. *Taeniolella delicata* [Diederich 15720]. **A.** Macroscopic overview of colony. **B–G.** Conidiophores with adhering conidia. **H–J.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 10 µm (C, D, F–J), 9 µm (B, E).

rarely in branched chains, not easily disintegrating, often constricted at the septa which separate the conidia from the conidiogenous cells, straight, subcylindrical, doliiform, pyriform, ellipsoid, limoniform, (0–)1–2(–3)-septate, aseptate conidia

4–11 × 3–7 µm, 1-septate ones 5–15 × 3–7 µm, 2-septate ones 8–14 × 4–6 µm, 3-septate ones 10–17 × 4–8 µm, non-constricted or slightly constricted at the septa, pale brown to brown, sometimes slightly yellowish brown, mostly smooth to irregularly verruculose, rarely slightly rhagadiose, wall 0.25–1 µm thick, apex rounded to attenuated in primary conidia, truncate and sometimes narrowed in secondary ones, base truncate, sometimes narrowed, hila truncate, unthickened, not darkened, 1–4.5 µm diam.

Holotype: **UK**, Buckinghamshire, Waddesdon Manor, on *Fraxinus*, on *Lecanora* cf. *chlarotera*, 20 Apr. 1977, *D.L. Hawksworth 4457* (K(M) IMI 214396**!**).

Host range and distribution: On *Amandinea punctata*, *Bilimbia sabuletorum*, *Caloplaca obscurella*, *Candelariella vitellina*, *C. xanthostigma*, *Enterographa crassa*, *E. zonata*, *Fuscidea lygaea*, *Graphis scripta*, *Hyperphyscia adglutinata*, *Hypocenomyce scalaris*, *Hypogymnia physodes*, *Lecanactis abietina*, *Lecania cyrtella*, *Lecania* sp., *Lecanora albella*, *L. argentata*, *L. campestris* ssp. *campestris*, *L. carpinea*, *L. chlarotera*, *L. helicopis*, *L. intumescensL. polytropa* f. *polytropa*, *L. pulicaris*, *L. saligna*, *L. saligna* var. *sarcopis*, *Lecanora* sp., *Lecidella elaeochroma* f. *elaeochroma*, *L. euphorea*, *Lepra albescens*, *Loxospora elatina*, *Micarea denigrata*, *Myriolecis crenulata*, *M. dispersa* agg., *M. hagenii*, *Ocellomma picconianum*, *Opegrapha vermicellifera*, *O. vulgata* var. *vulgata*, *Pachnolepia pruinata*, *Parmelia sulcata*, *Pectenia plumbea*, *Pertusaria leioplaca*, *Phaeographis inconspicua*, *Phlyctis ludoviciensis*, *Physcia adscendens*, *P. stellaris*, *P. tenella* ssp. *tenella*, *Physconia distorta* (= *P. pulverulenta*), *Porpidia cinereoatra*, *Porpidia* sp., *Protoparmeliopsis muralis* (≡ *Lecanora muralis*), *Psilolechia lucida*, *Ramalina pollinaria, Ropalospora viridis*, sterile crustose lichen with a whitish thallus; Austria (Hawksworth 1979, Wittmann & Türk 1990, Petutschnig 1992, Türk & Poelt 1993, van den Boom *et al.* 1996, Hafellner 2003), Belarus (Tsurykau 2017), Belgium (van den Boom *et al.* 1998, Diederich & Sérusiaux 2000, Diederich *et al*. 2017a), Czech Republic (Kocourková 2000, Malíček & Palice 2013), Denmark (Hawksworth 1979, Alstrup *et al.* 2004), Estonia (Suija & Jüriado 2002, Suija 2005), France (Roux *et al.* 2001, 2006, 2011, Roux *et al*. 2017), Germany (John 1990, Scholz 2000, Brackel 2007, 2010a, Brackel & Feuerer 2007, Wirth *et al.* 2010, Cezanne & Eichler 2015), Greenland (Alstrup & Hawksworth 1990, Alstrup 2005, Alstrup *et al.* 2005, Kristinsson *et al.* 2006, 2010), Ireland (Fox 2001), Italy (first report, see specimens examined), Luxembourg (Diederich 1986, 1989, 1990a, van den Boom *et al.* 1998, Diederich & Sérusiaux 2000, Diederich *et al.* 2004, 2017a), the Netherlands (Aptroot *et al.* 1999, Aptroot *et al.* 2004, www.verspreidingsatlas.nl), Papua New Guinea (Aptroot *et al.* 1997, Aptroot 2009), Poland (Kukwa *et al.* 2008, Matwiejuk & Bohdan 2011), Russia (Zhurbenko 2007, Zhurbenko & Kobzeva 2014), Spain (Etayo 1989, 2006, 2008, Giralt 1991, 1996, Giralt & Gómez-Bolea 1991, Boqueras 1993, 2000, Navarro-Rosinés *et al.* 1994, Llimona & Hladun 2001, Hladun & Llimona 2002–2007, Zamora *et al*. 2014), Sweden (Hawksworth 1979, Santesson 1993, Santesson *et al.* 2004, Nordin *et al.* 2010), Ukraine (Kondratyuk & Kolomiets 1997), UK (Hawksworth 1979, 2003), USA (Diederich 2003, Esslinger 2016, 2018).

Additional specimens examined: **Belarus**, Gomel region, Gomel district, Chenki recreation area, 52°20' N, 30°57' E, on *Ramalina pollinaria*, growing on oak, 14 Jul. 2015, *A. Tsurykau* (GSU-2193). **Belgium**, De Panne, De Westhoek, NE border of nature reserve, in a dune, on *Lecania cyrtella*, on *Sambucus*, 4 Jan. 2008, *P. Diederich 16726* (herb. Diederich); Prov. Luxembourg, W of Bouillon, 1 km W of Poupehan, E side of Rau du Moulin, small strong sloping wood with *Acer*, *Carpinus* and *Quercus*, alt. 240 m, 4°59.1' E, 49°48.7' N, on *Ropalospora viridis*, 2 Apr. 1999, *van den Boom 21881* (herb. Diederich); au nord de Gérouville, vallée de la Soûye à l'est de la route vers Bellefontaine, on *R. viridis*, on *Carpinus*, 6 Sep. 2003, *P. Diederich 15720* (herb. Diederich). **Denmark**, E-Jutland, Falling, E of Horsens, Amstrup, on *Amandinea punctata*, on the north side of the trunk on an old poplar along the road S of the village, alt. 10–20 m, 2 Sep. 1984, *M.S. Christiansen 84.158* (C, herb. Christiansen 4451); Djursland, Nörager, on *A. punctata*, on *Ulmus* along the road from Nielstrup, alt. 20–25 m, 22 Aug. 1982, *M.S. Christiansen 82.155* (C, herb. Christiansen 2281); Falster, Vaalse, on *A. punctata*, on the trunk of *Acer campestre* at the southern border of the wood Resle Skov, near the sea-shore, alt. 0–5 m, 12 Aug. 1980, *M.S. Christiansen 80.159e* (C, herb. Christiansen 1255); Fyn, Romsø, on *A. punctata*, on *Quercus* near farm, with *Intralichenum lichenum*, 29 Oct. 1994, *V. Alstrup* (C, herb. Christiansen 669); Langeland, Snöde, on the trunk of pollarded poplars in a boundary between fields, SE of Store Snöde, alt. 10–20 m, on *A. punctata*, 5 Oct. 1981, *M.S. Christiansen 81.163* (C, herb. Christiansen 1581, M-0043797, distributed in Santesson, Fungi Lichenicoli Exsiccati 74, C, herb. Christiansen 1582); Snöde, ad septentriones et orientem versus a Stora Snöde, alt. 10–20 m, ad truncum Populi sp., on *A. punctata*, 12 Oct. 1982, *M.S. Christisansen 82.357* (M-0043795, H, distributed in Vězda, Lichenes Selecti Exsiccati 1900); Stoense, on *Ulmus glabra* in the avenue to the farm Steensgaard, alt. ca. 20 m, on *A. punctata*, 5 Oct. 1981, *M.S. Christiansen 81.182* (C, herb. Christiansen 1667); Tranekær, in the avenue to the castel Tranekær Slot, on *A. punctata* on *Tilia*, 7 Oct. 1981, *M.S. Christiansen 81.209* (C, herb. Christiansen 1692); Zealand, Tiköb. Nyrup, along the road in the village, on *A. punctata* on *Ulmus*, 19 Aug. 1965, *M.S. Christiansen 65.207a* (C, herb. Christiansen 2115); S-Zealand, Stevens Klint, at Højerup old church, on *A. punctata* on *Sambucus*, 1 Oct. 1994, *V. Alstrup* (C, herb. Christiansen 1284); SE-Zealand, Jungshoved, SE of Præstø, along a secondary road, on *A. punctata* on *Populus canadensis* 12 Aug. 1966, on *A. punctata* on *P. canadensis* (C, herb. Christiansen 6373); East Jutland, Gylling, E of Horsens, Gyllingnæs, at the fringes of the wood Kalsehoved, near the sea-shore, alt. 0–5 m, on *Enterographa crassa*, at the base of the trunk of *Ulmus glabra*, 11 Jul. 1985, *M.S. Christiansen 85.043* (C, herb. Christiansen 4711); Funen, Horne, W of Fåborg. Horne Land, on vertical surface of siliceous boulder in a stone fence between Bøjden and Horne, northern exposure, alt. 45 m, on *Enterographa zonata*, 30 Oct. 1970, *M.S. Christiansen 70.758a* (C, herb. Christiansen 6524); East Jutland, Helgenæs, on *Candelariella vitellina*, 10 Oct. 1976, *M.S. Christiansen 76.814a* (C, herb. Christiansen 555); the shore of Begtrup Vig, on boulder in littoral meadow, on *C. vitellina*, 10 Oct. 1976, *M.S. Christiansen 419* (C, herb. Christiansen 5641); Falster, Vaeggerlöse, loco dicto "Bötö Plantage", alt. 0–2 m, ad truncum arboris (*Pinus silvestris*), on *Hypocenomyce scalaris*, 12 Oct. 1982, *M.S. Christiansen 82.357* (H 7038077, M-0043796, distributed in Vězda, Lichenes Selecti Exsiccati 1898); Folkeuniversitetskursus i Kliim Nordøstjylland, Kliim Bjerg, on *Lecania cyrtella*, on *Sambucus*, 15 May 1988, *V. Alstrup* (C); Nordisk Lichenologisk Forening´s ekskursion på Bornholm: Christianso, on *Lecanora carpinea*, on *Fraxinus*, 2 Jul. 1987, *V. Alstrup* (C); Lolland, Vigsæs, N of Sakskôbing, on granitic boulder at the sea-shore near Vestermark, on *Lecanora helicopis*, 19 Jul. 1984, *M.S. Christiansen 84.070* (C, herb. Christiansen 4296, 4300); Zealand, Hornsherred, Kirke Hyllinge, Vellerup Vig, on granitic boulder at the seashore, on *Protoparmeliopsis muralis* (≡ *Lecanora muralis*), 15 Oct. 1950, *M.S. Christiansen 14.369a* (C, herb. Christiansen 4210); W Zealand, Aarby, Asnæs, the protected common "Dyrehaven" W of Asnæsgaard, on the top surface of a boulder of sandstone, 10–20 cm above the surface of the soil, 0–10 m, on *Lecanora polytropa* f. *polytropa*, 2 Sep. 1983, *M.S. Christiansen 83.191* (C, herb. Christiansen 4260); East Jutland, Halling, SE of Odder, churchyard, on *Lecidella elaeochroma* f. *elaeochroma*, on the trunk of old *Fraxinus*, associated with *Bispora christiansenii*, alt. 10–20 m, 22 Jul. 1987, *M.S. Christiansen 87.025* (C, herb. Christiansen 5266); N-Jutland, Himmerland, Vokslev, SE of Nibe, along the road through the village, on *L. elaeochroma* f. *elaeochroma*, on old *Fraxinus excelsior*, 28 May 1990, *M.S. Christiansen 90.080* (C, herb. Christiansen 6009); Zealand, Greve, Mosede Strand, on wood of a wicked to a garage, near the ground, on *Micarea denigrate*, 16 Aug. 1980, *M.S. Christiansen 80.160a* (C, herb. Christiansen 1245) (deposited as *T. verrucosa*); East Jutland, Djursland, Nörager, along the road from Nielstrup, alt. 20–25 m, on *Myriolecis hagenii*, on *Ulmus*, 22 Aug. 1982, *M.S. Christiansen 82.156* (C, herb. Christiansen 2282); the island Alrö in Horsens Fjörd, Alhale, on a fence post of oakwood along the see-shore E of the dam to Amstrup, on *M. hagenii*, 2 Sep. 1984, *M.S. Christiansen 84.161* (C, herb. Christiansen 4454); Samsö, Nordby, churchyard, alt. 20–40 m, on *M. hagenii* and on the thallus of *Amandinea punctata*, on the trunk of an old *Fraxinus* 23 Jul. 1987, *M.S. Christiansen 87.070a* (C, herb. Christiansen 5304); Møn, Damsholte, Hjelms Mark, on the overanging side of old pollarded poplars in a boundary between fields, on *Opegrapha vulgata* var. *vulgata*, 10 Sep. 1966, *M.S. Christiansen 66.719a* (C, herb. Christiansen 5716); Zealand, Kildebrønde, along a road, on *Physconia distorta* (= *P. pulverulenta*), on *Fraxinus*, 22 Sep. 1940, *M.S. Christiansen 5797* (C, herb. Christiansen 593); Vallö, in the avenue to the castel "Vallö Kloster", on *P. distorta*, on *Tilia*, 31 May 1942, *M.S. Christiansen 8084* (C, herb. Christiansen 609); Lolland, Vigsnæs, N of Sakskōbing, in the wood Hildesvig Skov, on an unidentifiable crustaceous lichen thallus on the trunk of an old oak, 12 Aug. 1984, *M.S. Christiansen 84.050* (C, herb. Christiansen 4259); East Jutland, Gylling, E of Horsens, Gyllingnæs, at the fringes of the wood Kalsehoved, near the sea-shore, alt. 0–5 m, on decayed lichen thallus (i.a. *Lepraria incana*) converted into a finely granular, white substance, which recrystallize in lactophenol at the base of the trunk of *Ulmus glabra*, 11 Jul. 1985, *M.S. Christiansen 85.050* (C, herb. Christiansen 4718). **France**, Dep. Eure, les Andelys, in the outskirts of the town along the road to Val-St.-Martin, alt. 20–30 m, on pebbles among grasses on the ground, on *Fuscidea lygaea*, 7 May 1977, *M.S. Christiansen 77.085* (C, herb. Christiansen 556); Pyrénées-Atlantiques, au sud de St Jean-Pied-de-Port, Forêt d´Iraty, à 0,5 km au sud de Chalet Pedro, alt. 1000m, on *Lecidella elaeochroma* f. *elaeochroma*, on *Fagus*, dans une hêtraie, 27 Jul. 1990, *P. Diederich 9203* (herb. Diederich). **Germany**, *Bavaria*: Oberbayern, München, Riem, alte Tribüne, Moosrasen auf Steinplatte, 7836/3, alt. 530 m, on *Bilimbia sambuletorum*, 24 Nov. 2006, *W. v. Backel* (herb. Brackel 4212); Oberbayern, Kreis München, Kloster Schäflarn, an der Straße zur Isar, on *Lepra albescens*, on *Tilia*, alt. 545 m, 12 Jun. 2008, *W. v. Brackel* (herb. Brackel 4852); Oberbayern, Stadt München, Lochhausen, Moor am Küchenmeisterbach, alt. 506 m, on dead branches of old *Sambucus*, on *Physcia adscendens*, 17 Jul. 2006, *W. v. Brackel* (herb. Brackel); Kreis Neustadt a.d. Aisch, Bad Windsheim, E Weigenheim S Marbacher See, Mittelwald, alt. 360 m, on *Physcia stellaris*, on *Quercus robur*, 9 Jan. 2008, *W. v. Brackel* (herb. Brackel 4575). **Italy**: Tuscany, Prov. Siena, Siena, Bot. Garden, alt. 330 m, on *Physcia tenella* ssp. *tenella*, on *Olea europaea*, 13 Sep. 2007, *W. v. Brackel* (herb. Brackel 5811). **Luxembourg**, S Beiler, on *Candelariella xanthostigma*, on *Populus*, 21 Aug. 1986, *P. Diederich 8969* (herb. Diederich); E Emerange, berge de la Gander, on *Lecanora carpinea*, *L. saligna* & *Lecidella elaeochroma* f. *elaeochroma*, on *Salix*, 31 Aug. 1987, *P. Diederich 8616* (herb. Diederich); Berdorf, Vugelsmillen, bord du chemin vers Berdorf, on *Opegrapha vermicellifera*, on *Quercus*, 2 May 1987, *P. Diederich 8967* (herb. Diederich). **The Netherlands**, Heemskerk, in dune area N of Kruisberg, on *Caloplaca obscurella*, on *Populus tremula*, 1 Jun. 1986, *A. Aptroot 16015* (herb. Diederich). **Papua New Guinea**, Madang province, Big pig island near Madang, alt. 1 m, 5°10' S, 145°50' E, secondary forest on coral island, on a sterile crustose lichen with a whitish thallus on *Cocos*, 16 Aug. 1992, *A. Aptroot 31870* (herb. Diederich). **Poland**, in Puszcza Bialowieska E of Hajnówka, ca 1 km S of Budy, most old forest with *Fraxinus* and *Carpinus*, on *Lecidella euphorea*, 28 Jun 1993, *V. Alstrup 9452D* (C); Rówinia Bielska, Białowieża Primeval Forest, Białowieski National Park, forest section no 256, plot L07, *Tilio-Carpinetum*, ATPOL grid square Cg-61, on *Ropalospora viridis*, on *Alnus glutinosa*, 29 Sep. 2015, *M. Kukwa 17548, A. Łubek*, ex UGDA L (HAL 3145 F); plot A11, *Circaeo-Alnetum*, ATPOL grid square Cg-57, on *R. viridis*, on *Alnus glutinosa*, Aug. 2014, *M. Kukwa 13342, A. Łubek*, ex UGDA L (HAL 3146 F); plot C07, *Carici elongatae-Alnetum*, ATPOL grid square Cg-58, on *R. viridis*, on *Alnus glutinosa*, Aug. 2014, *M. Kukwa 13889, A. Łubek*, ex UGDA L (HAL 3147 F); plot E08, *Carici elongatae-Alnetum*, ATPOL grid square Cg-59, on *R. viridis*, on *Alnus glutinosa*, 18 Aug. 2015, *M. Kukwa 17250, A. Łubek*, ex UGDA L (HAL 3149 F); plot D05, *Pino-Quercetum*, ATPOL grid square Cg-62, on *R. viridis*, on *Carpinus betulus*, 17 Aug. 2014, *M. Kukwa 17229, A. Łubek*, ex UGDA L (HAL 3151 F); plot K07, *Querco-Piveetum*, ATPOL grid square Cg-60, on *R. viridis*, 22 Aug. 2015, *M. Kukwa 17378, A. Łubek*, ex UGDA L (HAL 3152 F). **Spain**, Navarra, Leiza, Leizalarrea, robledal en ladera, alt. ca. 600 m, on *Pectenia plumbea*, 24 Mar. 1996, *J. Etayo 24392* (herb. Etayo); Guipúzcoa, Peñas de Aia, Hirumugarrieta por castello del inglés, alt. 870 m, 43°17' N, 1°47' W, roquedo, on sterile *Porpidia* (?), 18 Aug. 2008, J. *Etayo 24764* (herb. Etayo); *Canary Islands*, Tenerife, Monte de la Orotava, Aguamansa, on the trunk of *Ilex canariensis* on the fringes of the pine forest, alt. ca. 100 m, on *Lecanora* aff. *chlarotera*, 3 Dec. 1980, *M.S. Christiansen 80.372* (C, herb. Christiansen 1303). **Sweden**, Småland, Aneboda, on *Amandinea punctata*, 19 Oct. 1990, *V. Alstrup* (C); Skåne, Brunnby k:n, Kullen, along the road E of Mölle, on *Parmelia sulcata*, on the trunk of old elms, 21 Aug. 1969, *M.S. Christiansen 69.221* (C, herb. Christiansen 5873); Skåne, Genarp, Häckeberga, on *Pachnolepia pruinata*, on *Quercus*, 24 Apr. 1946, *M.S. Christiansen 12.967* p.p. (C, herb. Christiansen 569); Skåne, Brunnby k:n, Kullen, on the trunk of old elms along the road E of Mölle, on *Physconia distorta*, 21 Aug. 1969, *M.S. Christiansen 69.230* (C, herb. Christiansen 5883, 5882). **UK**, S end of Loch Lomond, Gartocharn, Claddochside, alt. ca. 30 m, on *Myriolecis dispersa* agg., on old *Acer pseudoplatanus*, 3 Mar. 1980, *B.J. Coppins 4624* (E). **USA**, Florida, Hillsborough Co., Hillsborough River State Park, Florida Trail, 28°08.90' N, 82°14.01' W, on *Phaeographis inconspicua*, 26 Oct. 2011, *R. Common 9244F* (herb. Diederich); Gilchrist County, Waccasassa Flats, along Co. Rd. 232, ca. 3 mi E of US 129, ca. 7.5 mi due N of Trenton, 29°44' N, 82°48' W, shrubby *Taxodium* samp carpeted with *Sphagnum macrophyllum*, on *Phlyctis ludoviciensis*, on *Taxodium*, 5 Dec. 1993, *W.R. Buck 24414* (herb. Diederich); Levy County, black point Swamp, along Co. Rd. 326, 1,1 mi W of Co. Rd. 347, 29°13' N, 83°02' W, hardwood-*Taxodium* swamp forest, on a sterile lichen thallus with *Trentepohlia* on *Nyssa*, 30 Nov. 1992, *R.C. Harris 29381* (herb. Diederich).

Notes: *Taeniolella delicata* is able to infect numerous lichen species of various unrelated genera and is one of the most common *Taeniolella* species. The holotype of *T. verrucosa* (on *Pachnolepia pruinata*) is a mixed collection co-inhabited by *T. delicata*, but both species are easily distinguishable. The conidiophores of *T. verrucosa* form a densely branched sporogenous complex with usually wider conidiophores [7–9(–10) µm broad, vs. 3.5–7 µm in *T. delicata*]. Conidia are also wider, *e.g.*, 1-sepate conidia are 6–10 µm broad, vs. 3–7 µm in *T. delicata*. Walls of conidiophores and conidia are obviously verruculose to rimulose and split up. Infections do not cause any discolorations of the thalli as in the similar *T. arthoniae* that also occurs on *Pachnolepia pruinata*. However, in *T. arthoniae*, the wall of the usually variously branched conidiophores is rarely smooth, but usually irregularly verruculose to verrucose and up to 2 µm thick (vs. up to 1 µm thick in *T. delicata*). In comparison to *T. delicata*, chains of conidia in *T. arthoniae* are often branched.

Taeniolella delicata is one of the obviously pathogenic *Taeniolella* species. The colonies are scattered over the host thallus, grow on apothecia, inhibit asci and ascospores (Suija & Jüriado 2002), and finally infections by *T. delicata* culminate in obvious damages of the host thallus. The host thallus becomes discoloured, ranging from grey or dark brown to black. The infestation by *T. christiansenii* also causes discolorations of the host thallus. This fungus is possibly parasitic and may damage the host, as invaded parts become grey. Inhabited portions of the thalli without conidiophores, but with torulose hyphae are usually not discoloured. The dimensions of conidiophores and conidia are similar to those of *T. delicata*. Walls of conidiophores and conidia are verruculose-striate with longitudinal splits. *T. christiansenii* occurs on different *Stereocaulon* species, which are not known as hosts for *T. delicata*.

In *T. trapeliopseos* and *T. chrysothricis* the invaded parts of the thallus turn brownish. Both species are easily distinguishable from *T. delicata*. The wall of conidiophores and conidia in *T. trapeliopseos* is characterised by having deep cracks, becoming squamulose with age. The conidia are usually wider and longer, *e.g.*, 1-septate conidia 10–23 × 6–8 µm, vs. 5–15 × 3–7 µm in *T. delicata*. In *T. chrysothricis*, confined to *Chrysothrix candelaris* and *C. chlorina* as hosts, the conidiophores are occasionally pale brown to brown, the conidiogenous cells are sometimes polyblastic, the mycelium is usually superficial and grows around the soredia, and the conidia are usually narrower, *e.g.*, 1-sepate conidia (2.5–)3–5 µm vs. 3–7 µm in *T. delicata*.

Taeniolella cladinicola and *T. delicata* share similar dimensions of conidia and conidiophores. Infestations by *T. cladinicola*, confined to different *Cladonia* species, cause reddish or purplish brown, finally dark brown discolorations. The mycelium is immersed and the hyphae are usually developing inside host hyphae. The tips of the conidiogenous cells and the bases of the conidia are conspicuously narrowed, more distinctly than in *T. delicata*, and the conidiogenous loci are 2–3 µm diam vs. 1–4(–5) µm diam in *T. delicata*.

Clauzade *et al.* (1989) include *T. delicata* in a key to lichenicolous fungi. The given dimensions of conidia fall within the variability of this species. The maximum length of conidiophores (up to 90 µm) was observed in collections from Luxembourg collected by Diederich (1989) who also observed not easily disintegrating catenate conidia constricted at the septa which separate individual conidia. Boqueras (2000) provided a detailed morphological description. Several authors, *e.g.*, Hawksworth (1979), Diederich (1989) and Diederich & Sérusiaux (2000), presumed that collections deposited under the name *T. delicata* are most probably heterogeneous, but these authors emphasized that the differences between different collections of this species are too low for a separation into several species, which could be confirmed in the course of re-examinations of a large number of collections.

Aptroot *et al.* (1997) supposed that his material collected in Papua New Guinea might belong to different taxa. A re-examination of the material concerned confirmed this presumption. Specimen Aptroot 31870 is *T. delicata*, but the morphological features of the sample *Aptroot 33033* [Papua New Guinea (Madang Province), Gogol valley, ca. 30 km W of Madang, Tgubi logging site, 5°8' S, 145°28' E, 2 km, alt. 125 m, floodplain forest along Gogol river, on a sterile corticolous, whitish, crustose lichen, 13 Aug. 1992, *A. Aptroot 33033* (herb. Diederich)] turned out to be a member of the genus *Sporidesmium s. lat*. or of a related genus.

Taeniolella diederichiana Etayo & Calat., *Lichenologist* **37**: 303. 2005. Figs 22–23.

Literature: Brackel & Berger (2010: 203).

Illustration: Etayo & Calatayud (2005: 304, fig. 1).

Description: *Colonies* on the surface of thalli and margin of apothecia, punctiform, aggregated in tufts or loose groups, but not confluent, 30–50(–70) µm diam, hemispherical, convex, black. *Mycelium* immersed; hyphae branched, 2–4 µm wide, septate, with constrictions at the septa, cells ellipsoid, pale brown, not easily distinguishable from the cortex of the host, walls slightly thickened, up to 0.5 µm, smooth. *Stromata* lacking, but with solitary swollen brown hyphal cells, aggregated below conidiophores, subglobose or isodiametric, 4–8 µm diam. *Conidiophores* semi-macronematous, mononematous, aggregated in small tufts, arising from basal hyphal cells, densely caespitose, erect to decumbent, straight to flexuous, subcylindrical or broad ellipsoid, mostly unbranched, occasionally branched in the lower part, conidiophores with adhering conidia 10–32(–68) × 4.5–8 µm, 0–5(–9)-septate, mostly constricted at the septa, brown to dark brown, sometimes paler towards the apex, wall irregularly rugose, verrucose to rimulose, later squamulose, squamules 0.5–3 µm wide, irregularly shaped, firm, not detached or only slightly so, wall thickened, 0.5–1 µm, often less thickened towards the apex, usually with 1–2 enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic or thalloblastic, monopodial, short cylindrical, 5–12 µm long, conidiogenous loci truncate to slightly convex, unthickened, 4.5–6 µm diam. *Conidia* catenate in unbranched chains, not easily disintegrating, forming larger fragments, chains of adhering conidia up to 60 µm long, straight, rarely slightly curved, doliiform, subcylindrical, ellipsoid, 0–1(–2)-septate, aseptate conidia 7–11 × 5–7.5 µm, 1-septate ones 7–17 × 5–7 µm, 2-septate ones 21 × 5.5 µm, slightly constricted at the septa, brown to dark brown, ornamentation of the outer wall similar as in conidiophores, wall thickened, 0.5–1 µm, apex rounded in primary conidia, truncate in secondary ones, base truncate to slightly convex, hila truncate, unthickened, not darkened, thick outer wall forming a small rim, 4–6 µm diam.

Holotype: **Peru**, Prov. Huaraz, Cuzco, road Huaraz–Laguna Llaca, 15–20 km NE of Huaraz, on *Placopsis* sp., 9°26' S, 77°30' W, alt. ca. 3800 m, 28 Feb. 1981, *R. Santesson & R. Moberg P61:5* (UPS**!**).

Host range and distribution: On *Placopsis gelida*, *Placopsis* sp.; Canary Islands (Etayo & Calatayud 2005; Hafellner 2008b), Columbia (Etayo & Calatayud 2005), French Southern Territories (Ile Amsterdam) (Aptroot *et al*. 2011), Iceland (Brackel 2010c), Peru (Etayo & Calatayud 2005, Etayo 2010), Russia (Zhurbenko 2009).

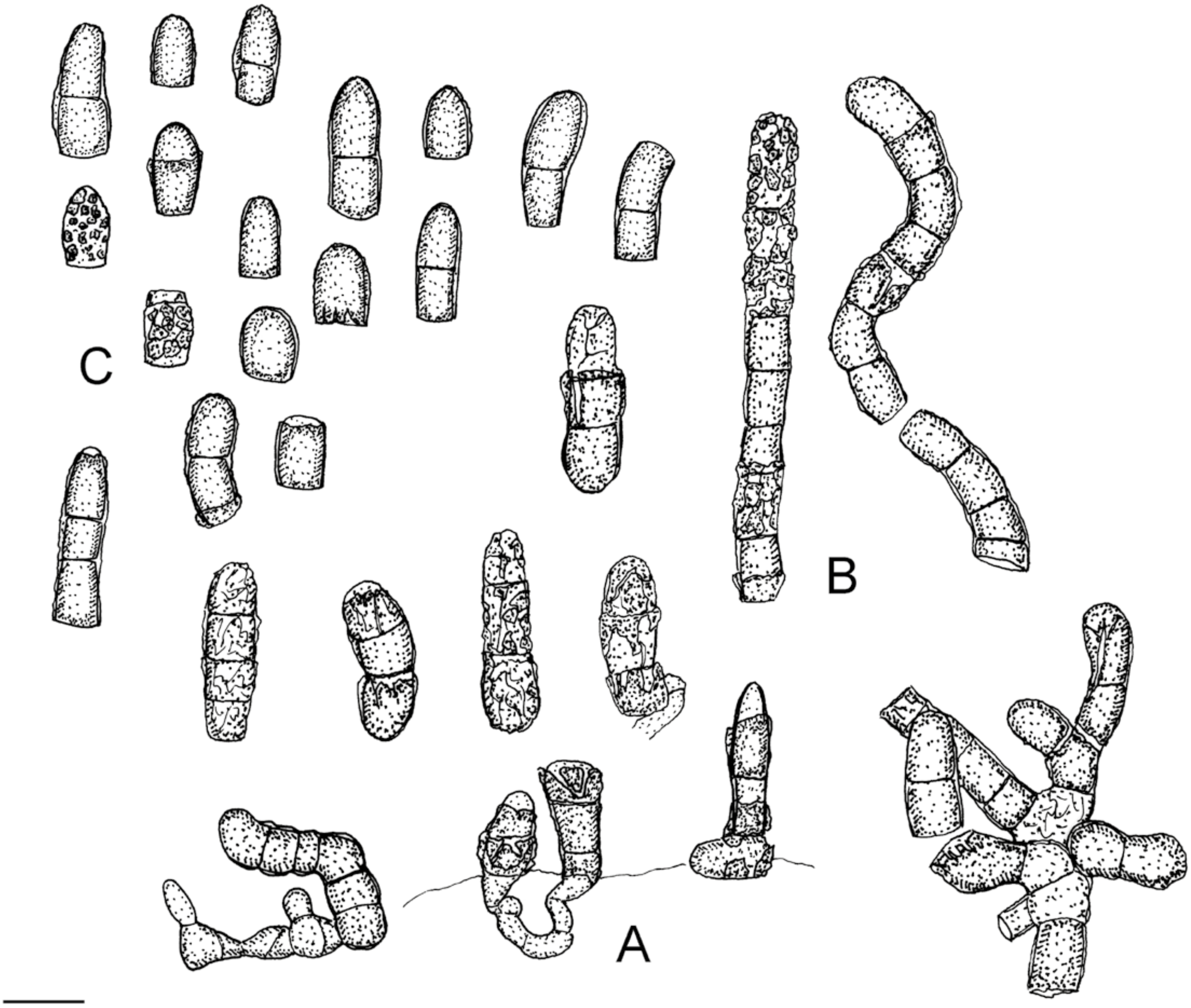

Fig. 22. *Taeniolella diederichiana* [holotype]. **A.** Conidiophores arising from basal hyphal cells. **B.** Conidial chain. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Additional specimens examined: **Iceland**, W of Reyðarfjörður, lake Lagarfljót, SW of Hallormsstaður, Atlavík cove, W of Atlavík camping, siliceous rock outcrops in native *Betula* forest, on *Placopsis gelida*, 4 Aug. 2013, *P. Diederich 17512* (herb. Diederich). **Peru**, Prov. Urubamba, valley of Rio Piri, 30 km from NW of Ollantaytambo, 13°5' S, 72°22' W, alt. 3700 m, on *Placopsis* sp., 1981, *R. Santesson, A. Tehler & G. Thor P89:28* (UPS).

Notes: *T. diederichiana* is the only *Taeniolella* species known on and confined to *Placopsis*. A key to the lichenicolous fungi currently known on *Placopsis*, including *T. diederichiana*, was published by Brackel & Berger (2010). Conidiophores of *T. diederichiana* are aggregated in small groups, arising from subglobose or isodiametric, stromatically aggregated hyphal cells, resembling those of *T. punctata*, which are also formed in punctiform aggregations. However, conidiophores with adhering conidia in *T. punctata* are mostly longer, 14–83(–95) × 5–8 µm, and the outer wall of conidiophores and conidia is rugose to verrucose, but neither rimulose nor squamulose. The preferred host of *T. punctata* is *Graphis scripta*, but this species is also known on numerous other lichens.

Taeniolella pertusariicola, widespread in Northern Europe, inhabits various hosts, *e.g.*, *Lecanora rupicola*, *Pertusaria bryontha* and *P. carneopallida*. Conidiophores of this species, usually arising from hyphae, may also be aggregated in small tufts, but stromatically aggregated swollen hyphal cells are not formed. With regard to size and ornamentation of the outer wall of conidiophores and conidia, *T. diederichiana* and *T. pertusariicola* are morphologically very similar.

Taeniolella toruloides and *T. arctoparmeliae* are two additional morphologically similar species. In *T. toruloides*, known from France, Luxembourg, Poland, Spain and the Azores on *Thelotrema antoninii* and *T. lepadinum*, conidia are formed in adhering, not easily disarticulating, long chains, up to 100 µm, which frequently contain oil-like droplets. The wall of conidiophores and young conidia is smooth, *i.e.*, never rimulose to squamulose. *T. arctoparmeliae* is known from a single collection on *Arctoparmelia separata* in Arctic Russia on faded

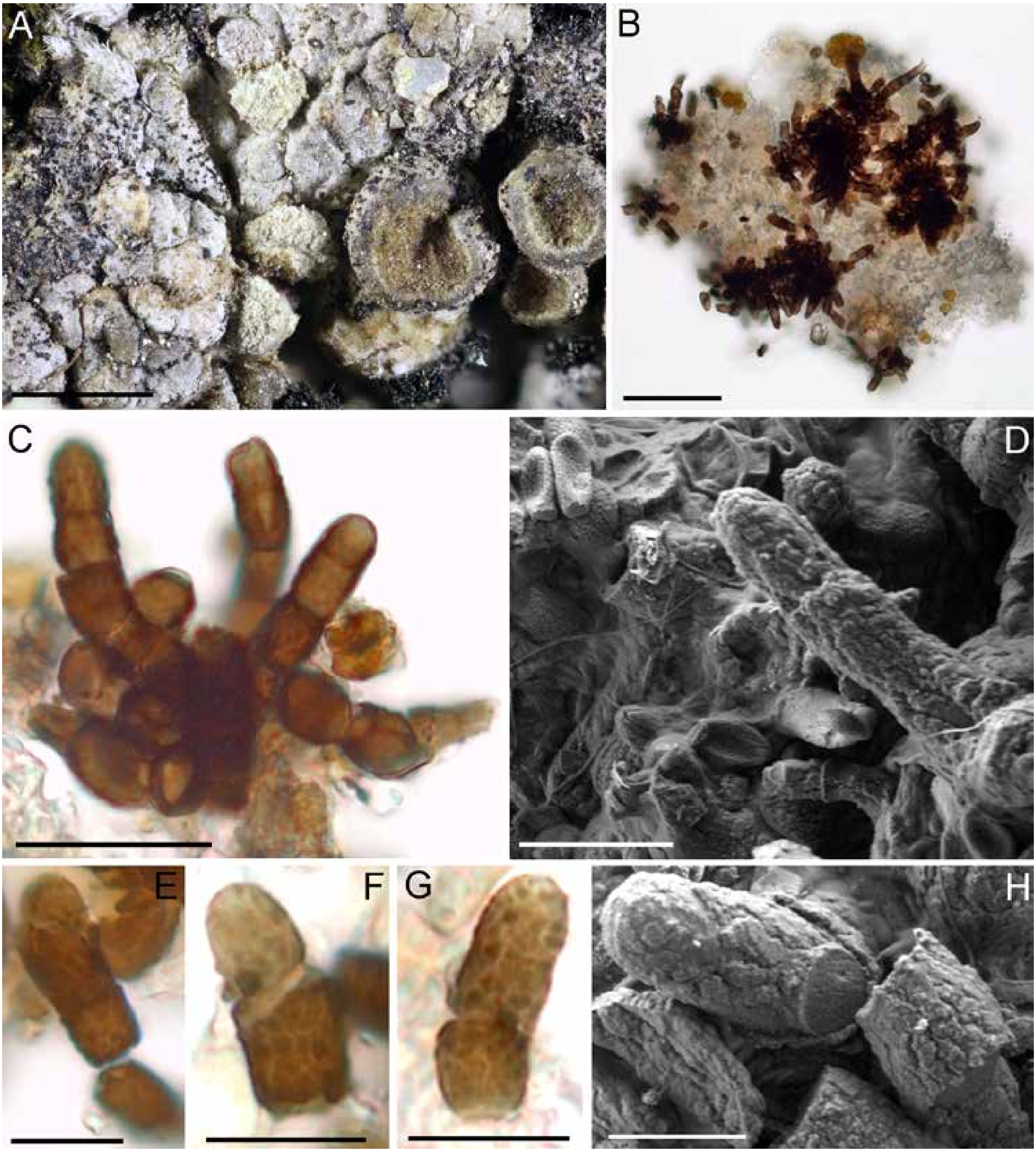

Fig. 23. *Taeniolella diederichiana* [A: Santesson P89:28; B–H: holotype]. **A.** Macroscopic overview of colonies. **B–D.** Conidiophores aggregated in small tufts. **E–H.** Conidia with conspicuous squamulose wall ornamentation. Bars: 1 mm (A), 50 µm (B), 20 µm (C), 10 µm (E–G), 9 µm (D), 6 µm (H) [A–C, E–G: photos taken by Paul Diederich].

to necrotic basal parts of the host. The conidia are usually wider (up to 8 µm) and broad subcylindrical, ellipsoid to obovoid.

Taeniolella friesii (Hepp) Hafellner, *Herzogia* **13**: 140. 1998. Figs 24–25.
Basionym: *Abrothallus friesii* Hepp, *Die Flechten Europas*: no. 464. 1857 [as *Abrothallus* (?) *Frisii*; without location, "parasitisch auf der Kruste von *Pyrenula muscorum* (Fries)" (type material not preserved)].

Literature: Arnold (1874: 102, as *A. friesii*); Vouaux (1913: 471, as *A. friesii*); Keissler (1930: 217, as *A. friesii*).

Illustration: Hafellner (1998: 141, fig. 1, 143, fig. 2).

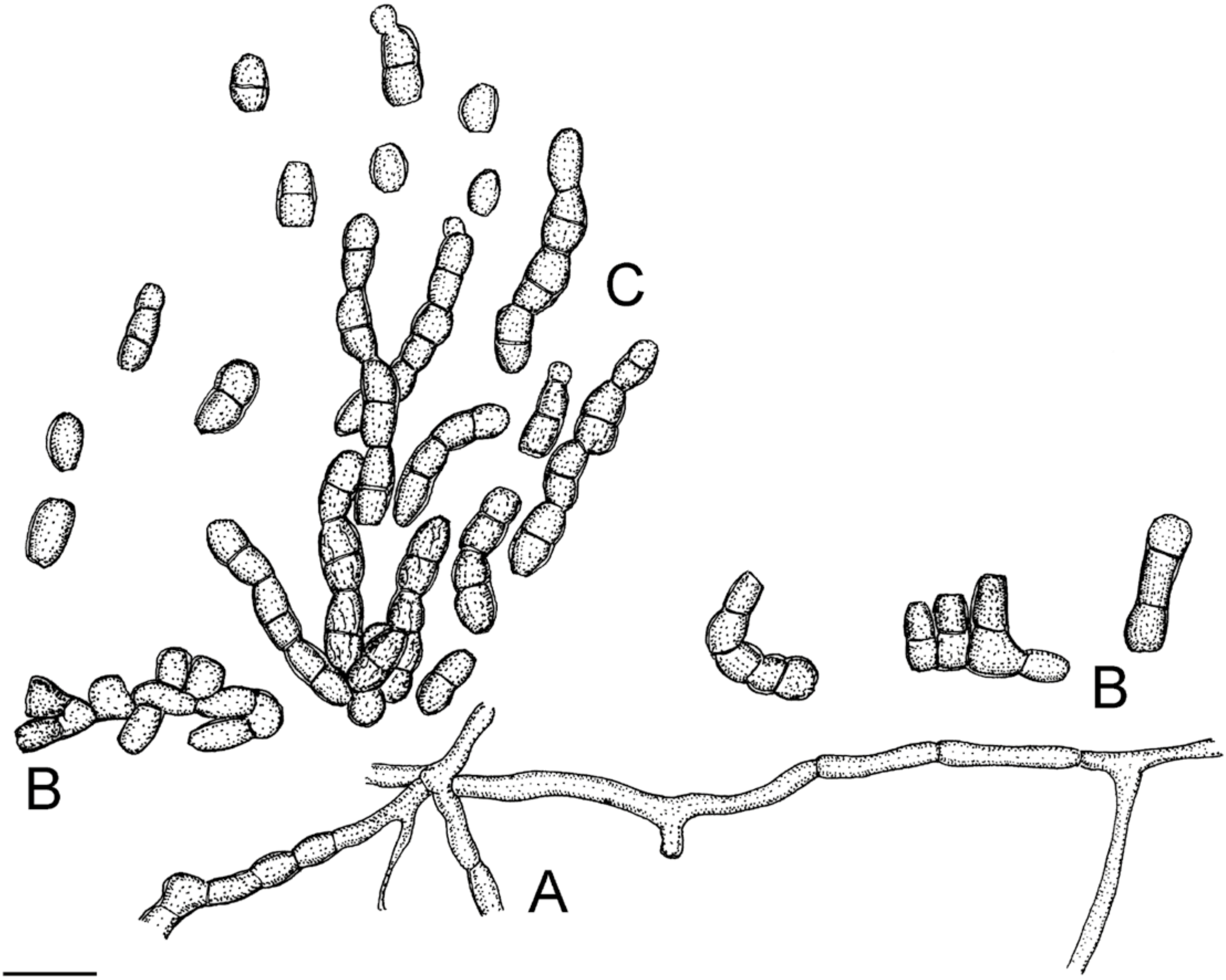

Fig. 24. *Taeniolella friesii* [isoneotype]. **A.** Hyphae. **B.** Semi-micronematous conidiophores. **C.** Conidia in short chains. Bar = 10 µm (B. Heuchert *del.*).

Description: *Colonies* on lichen thalli, sometimes on the margin of perithecia, in small speckles or effuse, forming larger patches, convex to hemispherical, 0.1–0.4 mm diam, or linear, up to 1 mm long, densely caespitose, young colonies greyish black, older ones black or dark brown, without any discolorations of the lichen thalli. *Mycelium* immersed and sometimes superficial; hyphae flexuous, branched, 1–3 µm wide, septate, slightly constricted at the septa, pale brown, smooth, wall thin, up to 0.5 µm, hyphal cells often swollen, 2–8 µm diam, subglobose to somewhat angular in outline, walls thickened, 0.5–1 µm thick, pale to medium dark brown, darker than unswollen hyphae, smooth or almost so, forming variously shaped aggregations, subglobose to irregular, 10–30 µm diam or confluent and larger, immersed to erumpent. *Conidiophores* semi-micronematous, usually reduced to conidiogenous cells, mononematous, solitary, arising from swollen hyphal cells, densely aggregated, erumpent, straight to slightly flexuous-sinuous, unbranched, short, subcylindrical-conical, doliiform or slightly enlarged towards the apex, 3–12(–15) × (1.5–)3–5 µm, mostly aseptate, rarely with a single septum, slightly constricted at the septum, pale to medium brown, smooth to somewhat rough-walled, wall somewhat thickened, sometimes less than 0.5 µm, but usually 0.5–0.75 µm, enteroblastically proliferating conidiogenous cells with obvious sheath-like wall remnants visible as irregular fringe very rare. *Conidiogenous cells* unilocal, determinate, loci truncate or subtruncate-rounded, unthickened, 1–3 µm diam. *Conidia* solitary or in short chains, ellipsoid, broad ellipsoid-ovoid, subcylindrical-doliiform, 0–1(–2)-septate, aseptate conidia 3–7 × 3–5 µm, 1-septate ones 5–9(–10) × 3–5 µm, 2-septate ones 10–12 × 4–5 µm, slightly constricted at the septa, medium olivaceous brown to dark brown, almost smooth to verrucose, irregularly rough, sometimes rimulose, wall 0.5–0.75(–1) µm thick, apex rounded in primary conidia, rounded to truncate in secondary ones, base rounded to truncate, hila convex to truncate, unthickened, not darkened, 1–2 µm diam, often with minute but conspicuous central pore.

Neotype (designated by Hafellner 1998): **France**, Salève, "Parasit auf *Segestrella illinata*" (host = *Strigula stigmatella*, according to Hafellner 1998), on *Fagus*, *s.d.* and without collector (UPS (L-104398) 182988**!**). *Isoneotype*: UPS *s.n.***!**

Host range and distribution: On *Strigula stigmatella* (= *Pyrenula muscorum*); Austria (Hafellner 1998, Hafellner & Komposch 2007), France (Hafellner 1998), Italy (Hafellner 1998), the Netherlands (Aptroot *et al.* 2004 as *Cladosporium arthoniae*),

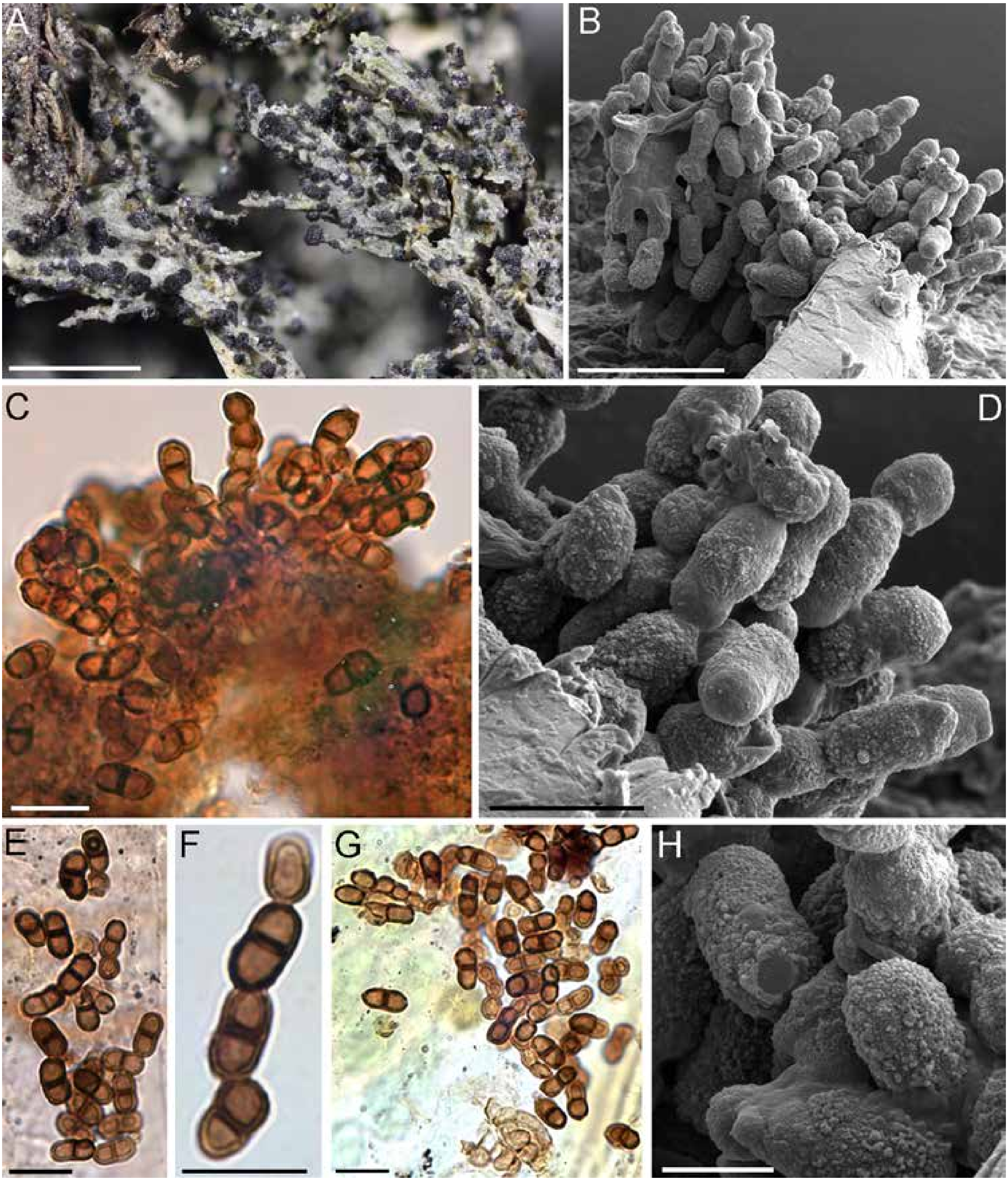

Fig. 25. *Taeniolella friesii* [A: Kukwa *et.al.*, herb. Diederich; B, D, H: Hafellner 39889; C, E–G: isoneotype.]. **A.** Macroscopic overview of colonies. **B–H.** Conidia in short chains. Bars: 1 mm (A) [photo taken by Paul Diederich], 20 µm (B), 10 µm (C, E–G), 7 µm (D), 4 µm (H).

Slovenia (Hafellner 1998, Bilovitz *et al*. 2011), Ukraine, USA (first reports, see specimens examined).

Additional specimens examined [all on *Strigula stigmatella*]: **Austria**, Lower Austria, Northern Limestone Alps, Goeller Group, southern slopes of the Weißmäuer, E of Lahnsattel, alt. ca. 1000 m, 47°46'30" E, *Fagus-Abies-Picea*-forest, on bark of *Fagus*, 22 May 1998, *J. Hafellner 45422* (GZU 01-98); Gailtaler Alps, SE shore of White Lake, N-base of the mountain Laka, surroundings of Ghf Dolomitenblick, alt. ca. 940 m, *Fagus-Abies-Picea*-forest, on the trunk base of *Fagus*, 7 Sep. 1998,

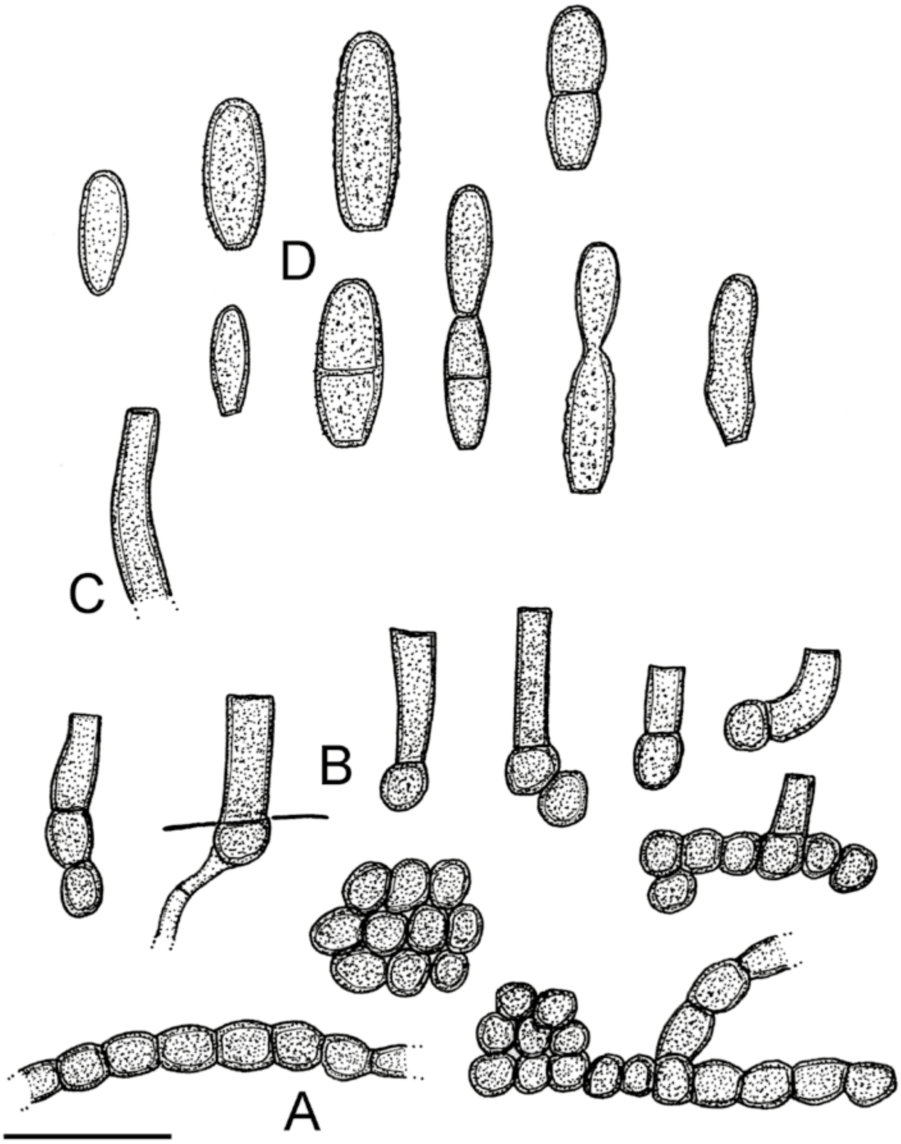

Fig. 26. Lichenicolous hyphomycete on *Dirina massiliensis* [BR, Aptroot 47961, 57602.]. **A.** Monilioid strands and aggregations of swollen hyphal cells. **B.** Semi-micronematous conidiophores. **C.** Tip of conidiophore. **D.** Conidia. Bar = 10 µm (U. Braun *del.*).

J. Hafellner 23988 (herb. Hafellner) (GZU). **Italy**, Prov. Udine, Carnic Alps, Paso del Pura NW of Ampezzo, surroundings of Refugio Tita Piaz, alt. ca. 1400 m, *Fagus-Abies-Picea*-forest with limestone blocks, on bark of *Fagus*, 24 Jul. 1993, *J. Hafellner 39891* (herb. Hafellner) (GZU); Carnic Alps, N-exposed slopes S of the NW of Lake Sauris Ampezzo, Bosco della Stua, alt. ca. 1100 m, *Fagus-Abies-Picea*-forest, on bark of *Fagus*, 16 Aug. 1994, *J. Hafellner 39889* (herb. Hafellner) (GZU). **Slovenia**, Julian Alps, Krma valley at the NE foot of Triglav, S of Mojstrana, alt. ca. 900 m, on *Fagus sylvatica*, 14 May 1978, *J. Hafellner 3246* (herb. Hafellner) (GZU). **Ukraine**, Eastern Carpathians, vicinity of village Stuzhytzia, Zhyduvsky stream valley, at the base of *Fagus sylvatica*, 49°02’ N, 22°36' E, 28 May 1998, *M. Kukwa, J. Motiejūnaite & A. Zalewska* (herb. P. Diederich). **USA**, New York, Essex County, Winch Pond Trail, south of NY Route 86, Wilmington Notch, Sentinal Ridge Wilderness Area, alt. 500–550 ft. 44°20'07" N, 73°53'59" W, on the mossy base of a conifer, on a shaded east-facing slope forested with conifers and *Betula*, and with sunny openings and rock outcrops, 18 Sep. 2007, *J.C. Lendemer et al. 2982* (herb. Diederich).

Notes: Hafellner (1998) discussed and reassessed the generic affinities and taxonomic status of *Abrothallus friesii*, assigned this species to *Taeniolella*, and, due to Hepp’s (1857) meagre original description and lacking type material, designated a neotype.

The recently described species *Taeniolella hawksworthiana* on *Phaeographis* sp. (*Ostropales*, *Graphidaceae*) is very similar to *T. friesii* on *Strigula stigmatella* (*Strigulales*, *Strigulaceae*) (for a detailed comparison, see under *Taeniolella hawksworthiana*).

Despite the strong heterogeneity and polyphyly of *Taeniolella*, *T. friesii* fits only roughly into the currently applied wide concept of this genus. *Taeniolella friesii* is one of the species with the smallest conidia within lichenicolous *Taeniolella* taxa and differs from other species of the genus in having conidia with relatively conspicuous hilar pores reminiscent of tretic conidiogenesis. However, cultures and results of molecular sequence analysis are needed to elucidate details of the conidiogenesis and phylogenetic position of *T. friesii*, which is probably not congeneric with most other lichenicolous *Taeniolella* species.

Two examined specimens of a lichenicolous hyphomycete on *Dirina massiliensis* resemble *T. friesii* superficially [**the Netherlands**, Prov. Geldern, Brummen, on wall of protestant church, 7 May 2000, *A. Aptroot 47961* (BR); **UK**, Somerset, Kingsbury Episcopi, St Martin’s church, 27 Feb. 2003, *A. Aptroot 57602* (BR)]: on thalli of the host, effuse, caespitose, blackish;

mycelium immersed to erumpent, composed of hyphal filaments, mostly forming monilioid strands of swollen cells, constricted at septa, or small to moderately large aggregations of swollen hyphal cells, 10–30 µm diam, cells subglobose to angular-irregular, 2–8 µm diam, pale to dark brown, wall thickened, smooth or almost so; conidiophores micronematous to semi-macronematous, reduced to conidiogenous cells, solitary, arising from cells of hyphal strands, lateral, occasionally terminal, or arising from aggregated swollen hyphal cells, erect, straight to curved, subcylindrical, 5–15 × 2–3(–4) µm, pale to medium brown, wall thin to somewhat thickened, smooth or almost so, with a single terminal conidiogenous locus, truncate, not or only slightly attenuated, 2–2.5 µm wide, not darkened, unthickened or even thinner than the lateral wall of the conidiogenous cell, conidiogenesis holoblastic or holothallic; conidia solitary or in short chains, easily disintegrating, ellipsoid-ovoid, subcylindrical, occasionally somewhat irregularly shaped, (4–)5–8(–12) × 2–4.5 µm, 0–1-septate, pale to medium olivaceous brown, wall somewhat thickened, almost smooth to verruculose-rugose, apex rounded in solitary conidia broad truncate in catenate conidia, base rounded to broad truncate, 1.5–3 µm wide, unthickened, not darkened (Fig. 26). The generic affinity of the *Dirina* fungus, which is barely consistent with *Taeniolella*, is unclear. The conidiogenesis, structure of conidiogenous loci, conidia and hila are reminiscent of asexual morphs of *Venturia* (*Fusicladium*). The *Dirina* fungus undoubtedly justifies a species of its own, but the generic affiliation requires cultures and phylogenetic data. Attempts to cultivate this fungus led to a culture which was the base for the introduction of the new genus and species *Verrucocladosporium dirinae* K. Schub. *et al*. (Schubert *et al.* 2007). The latter species is, however, quite different from the described fusicladioid species and undoubtedly not congeneric.

Taeniolella hawksworthiana Heuchert *et al*., *Fungal Biology* **120**: 1429. 2016. Figs 27–28.

Illustration: Ertz *et al*. (2016: 1430, fig. 7; 1431, fig. 8).

Description: *Colonies* on lichen thalli, effuse, aggregated in tufts or loose groups, confluent, loosely to densely caespitose, dark brown to black, not causing any discoloration of the thallus. *Mycelium* inconspicuous, immersed; hyphae flexuous, branched, 3–6 µm wide, septate, slightly constricted at the septa, subhyaline to pale brown, wall thin, up to 0.25 µm, smooth. *Stromata* lacking; hyphal cells sometimes swollen, subglobose, 4–7 × 5 µm, brown, smooth- walled, rarely aggregated at the base of conidiophores. *Conidiophores* semi-micronematous, usually reduced to conidiogenous cells, mononematous, solitary, arising from hyphae or swollen hyphal cells, loosely to densely aggregated, erect, straight, short, subcylindrical-conical, doliiform, unbranched, 8–15(–20) × 5–6 µm, 0–3(–4)-septate, not or slightly constricted at the septa, brown, smooth; wall somewhat thickened, usually 0.5 µm. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, doliiform, 4–5 µm long; conidiogenous loci truncate, unthickened, 1–3 µm diam. *Conidia* in long, usually unbranched to sometimes

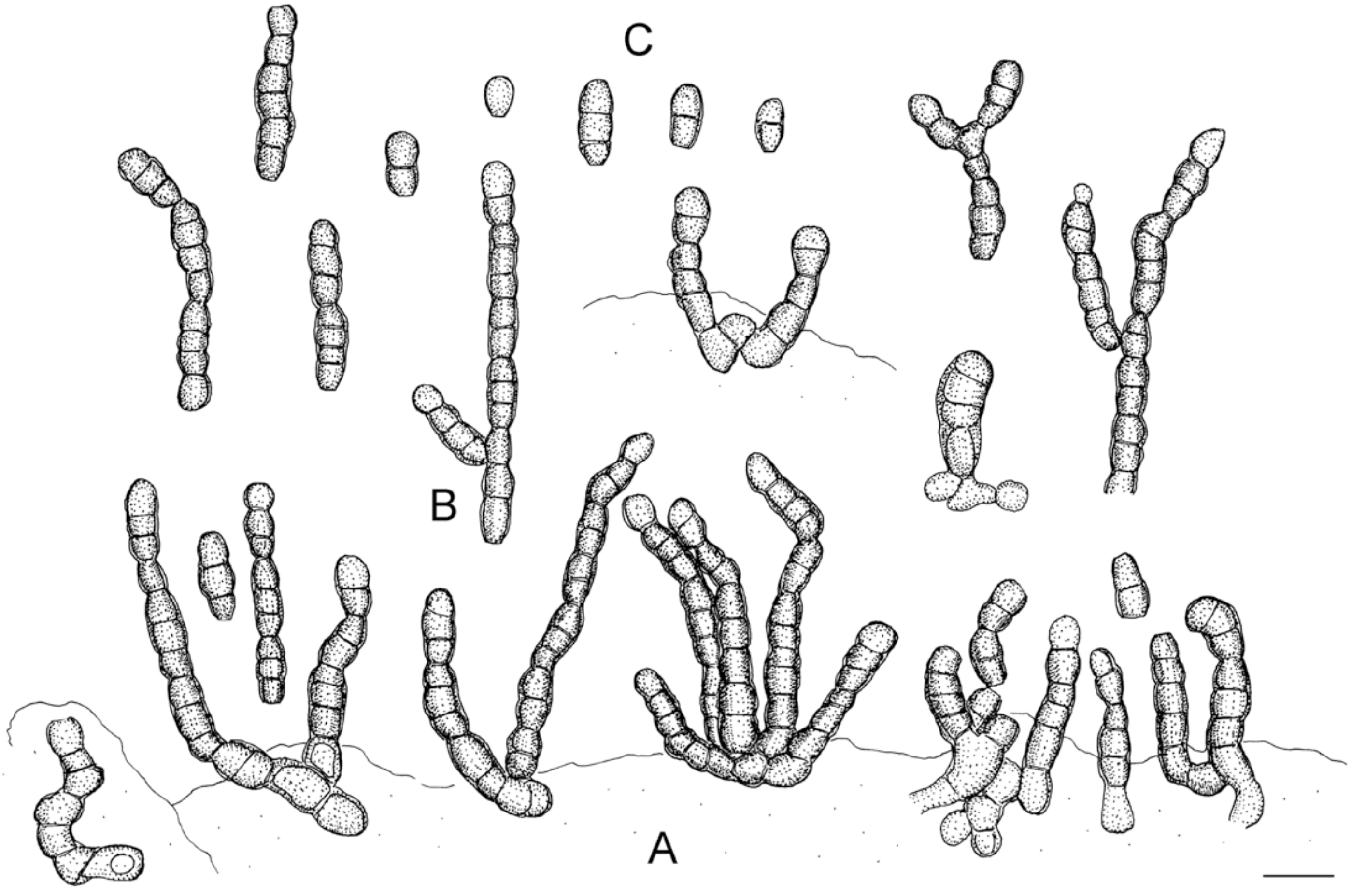

Fig. 27. *Taeniolella hawksworthiana* [holotype]. **A.** Semi-micronematous conidiophores with adhering conidial chains. **B.** Branched conidial chain. **C.** Conidia and fragments of conidial chains. Bar = 10 µm (B. Heuchert *del.*).

Fig. 28. *Taeniolella hawksworthiana* [holotype]. **A.** Macroscopic overview of colony. **B.** Conidiophores with adhering conidial chains. **C, E.** Conidia. **D, F–H.** Conidia adhering in long chains. **I.** Semi-micronematous conidiophores arising from aggregated swollen hyphal cells. Bars: 200 µm (A) [photo taken by Paul Diederich], 10 µm (B–I).

branched chains, not easily disarticulating, up to 60 µm long, finally disintegrating in fragments of different sizes, 3–5-septate, 16–24 × 4–5 µm, conidia straight, ellipsoid, ovoid, subcylindrical, (0–)1–2(–3)-septate, aseptate conidia 5–6 × 4–5 µm, 1-septate ones 7–9 × 4–5.5 µm, 2-septate ones 10–13 × 4–5 µm, 3-septate ones 13 × 5 µm, constricted at the septa, brown to dark brown, smooth to irregularly verrucose, wall 0.25–1 µm thick, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila truncate, unthickened, not darkened, 1–2 µm diam.

Holotype: **USA**, Florida, Hillsborough Co., Hillsborough River State Park, 28°08.60' N, 82°13.79' W, on *Phaeographis* cf. *brasiliensis*, 3 Sep. 2011, *R. Common 9199B* (BR**!**). *Isotypes*: HAL 3031 F, 3186 F, herb. Diederich**!**

Host range and distribution: On *Phaeographis* cf. *brasiliensis* and *Phaeographis* sp.; USA (Ertz *et al*. 2016).

Additional specimen examined: **USA**, Florida, Hillsborough Co., Hillsborough River State Park, trail from parking area 2, 28°08.94' N, 82°13.61', on *Phaeographis* sp., *W, R. Common 9215N* (BR, HAL 3187 F, herb. Diederich).

Notes: The new species is very similar to *Taeniolella friesii* on *Strigula stigmatella*. The conidiophores are also semi-micronematous, but usually somewhat wider, 8–15(–20) × 5–6 µm, vs. 3–12(–15) × (1.5–)3–5 µm in *T. friesii*. The predominantly 1-septate conidia (5–9(–10) × 3–5 µm) in *T. friesii* are formed singly or in very short disarticulating chains, whereas in *T. hawksworthiana* the usually 2-septate conidia (10–12 × 4–5 µm) adhere in long (up to 60 µm), not easily disintegrating chains. The conidial chains are sometimes disarticulating in fragments of different sizes. Unfortunately, molecular data for *T. friesii* are not available. Based on evident morphological differences and the different host-specificity of both species, we prefer to consider the species on *Phaeographis* as a separate species, namely *T. hawksworthiana.*

Taeniolella ionaspisicola Alstrup & E.S. Hansen, *Graphis Scripta* **12**: 48. 2001. Figs 29–30.

Illustration: Alstrup & Hansen (2001: 48, fig. 11).

Description: *Colonies* sparse, effuse, densely caespitose, dark brown to black, without discolorations of the lichen thallus. *Mycelium* immersed; hyphae branched, 1.5–4 µm wide, septate, constricted at the septa, subhyaline to pale greyish brown, smooth, thin-walled. *Stromata* lacking, but with some swollen, subglobose, rarely aggregated hyphal cells, 5–9 µm diam. *Conidiophores* semi-macronematous, mononematous, solitary or in small groups, arising from swollen hyphal cells, sometimes densely aggregated, erect to decumbent, mostly flexuous, partly straight, mostly unbranched, rarely with a single branch at the base, doliiform, clavate, obovoid, 8.5–40 × 4–10 µm, 0–6-septate, often constricted at the septa, pale brown to greyish brown, paler towards the apex, sometimes smooth, irregularly rugose with age, rarely squamulose, walls thickened, 0.5–1 µm, less thickened toward the apex, cell plasma sometimes reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of a thick wall, occasionally with oil-like droplets, enteroblastically proliferating, up to three times, with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, 5–10 × 5–6 µm, loci truncate to convex, 5.5–6.5 µm diam, unthickened, lateral wall somewhat thicker, forming a small fringe. *Conidia* solitary or in short easily disintegrating chains, straight or curved, broad subcylindrical, pyriform, clavate, 0–3-septate, aseptate conidia 7–13 × 6–8 µm, 1-septate ones 13–17.5 × 7–9 µm, 2-septate ones 19–24 × 9 µm, 3-septate ones 24–31 × 8–9 µm, slightly constricted at the septa, brown to greyish brown, young conidia almost smooth, irregularly rugose with age, rarely squamulose, squamules 0.5–1.5 µm diam, wall thickened, 0.25–0.75 µm, less thickened toward the apex, apex rounded, often swollen, or truncate in secondary conidia, base frequently attenuated, hila truncate to convex, 4–6 µm diam, unthickened, not darkened, lateral wall somewhat thicker, forming a small fringe, conidia sometimes enteroblastically proliferating, cell lumen with one or more oil-like droplets.

Holotype: **Greenland**, Kronprins Christian Land, Græselvdal, 80°03' N, 23°11' E, on *Ionaspis odora*, on sandstone fragment, 11 Aug. 1995, *E.S. Hansen* (C, herb. Christiansen 14516**!**).

Host range and distribution: On *Ionaspis odora*; Greenland (Alstrup & Hansen 2001; Alstrup 2005).

Notes: Alstrup & Hansen (2001) described this species with dark greyish brown and smooth conidiophores and conidia. However, a re-examination of the holotype of *T. ionaspisicola* showed that these structures are conspicuously paler, which is remarkable and unusual since conidiophores and conidia are rather broad and thick-walled. None of the known *Taeniolella* species with comparably broad conidiophores and/or conidia, as for instance *T. atricerebrina*, *T. pertusariicola*, *T. phaeophysciae*, *T. punctata*, *T. santessonii*, *T. trapeliopseos* and *T. umbilicariae*, have comparably pale conidiophores and conidia. Most of the species concerned are brown to dark brown, and all of them occur on various host species belonging to other families and, except for *T. atricerebrina*, also to other orders. *T. pertusariicola*, which is also common in Greenland, differs from *T. ionaspisicola* in having narrower conidiophores. Some of the other morphologically similar species are widespread in Europe or they have quite distinct geographical distributions (*e.g.*, *T. santessonii*, *T. umbilicariae* known from Peru and *T. atricerebrina* from Austria).

The conidiophores and conidia of *T. ionaspisicola* are almost smooth when young, but become irregularly rugose to rarely squamulose with age, *i.e.*, the outer wall may disintegrate. Consistently smooth or smooth to verruculose conidia were found in *T. phaeophysciae* and *T. punctata*. The conidiophores of the first species are usually obviously larger (almost up to 200 µm long) and the colonies of *T. punctata* are punctiform, scattered over the whole thallus, and the conidia usually narrower (rarely up to 8 µm) than in *T. ionaspisicola*. *T. santessonii* and *T. umbilicariae* are distinguished by a stronger disintegration of the outer wall and formation of larger squamules or patches (in *T. santessonii* 2–7 × 1–4 µm and in *T. umbilicariae* 0.5–3 µm, vs. 0.5–1.5 µm in *T. ionaspisicola*). Furthermore, *T. santessonii* forms sporodochial colonies, and the conidiophores are usually narrower. *T. atricerebrina* induces the formation of black galls (Hafellner 2007), mostly arising from the flanks of the areoles, and up to 4 mm diam when older. Gall formation was not observed in *T. ionaspisicola*.

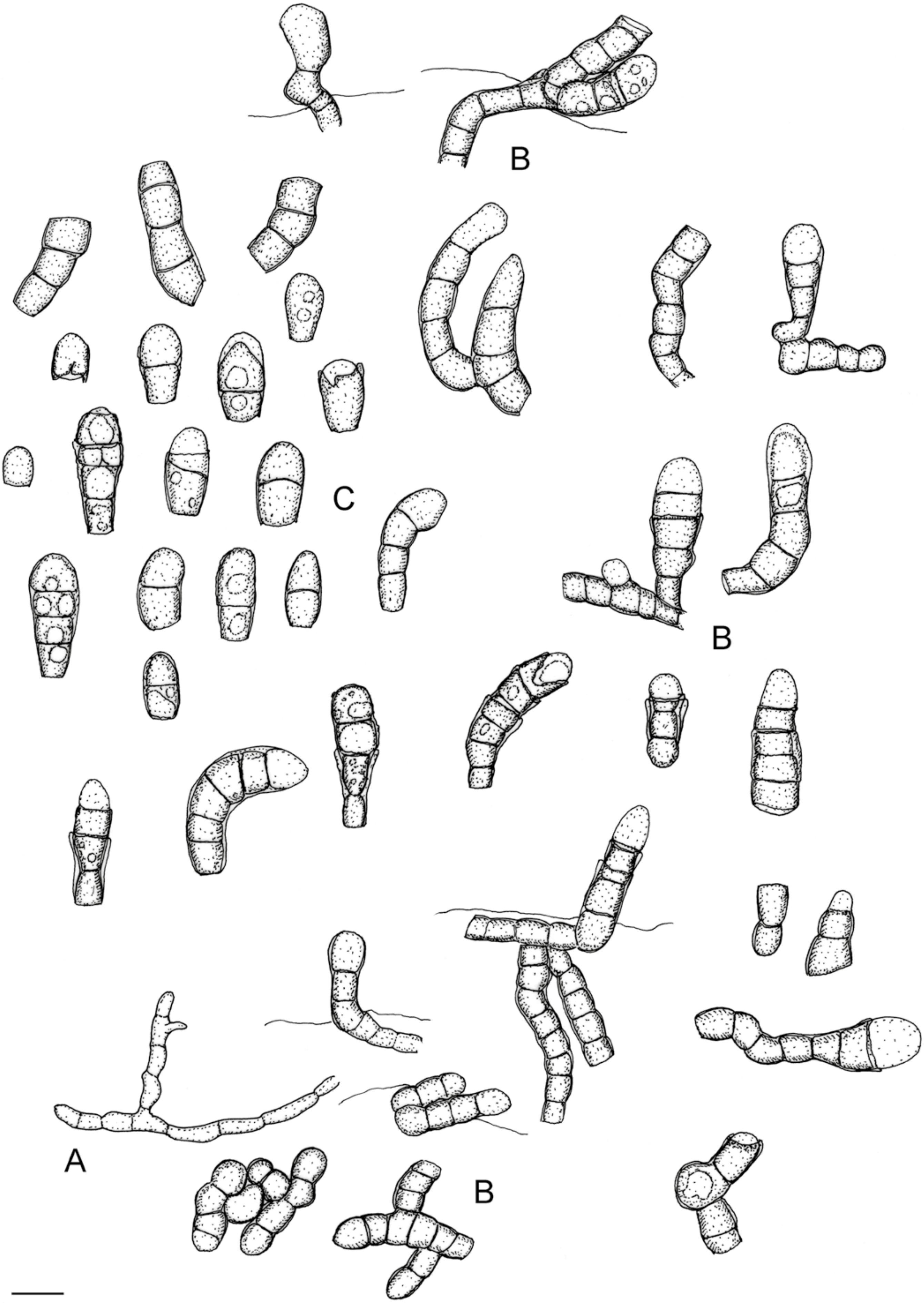

Fig. 29. *Taeniolella ionaspisicola* [holotype]. **A.** Hyphae. **B.** Semi-macronematous conidiophores with adhering conidia. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

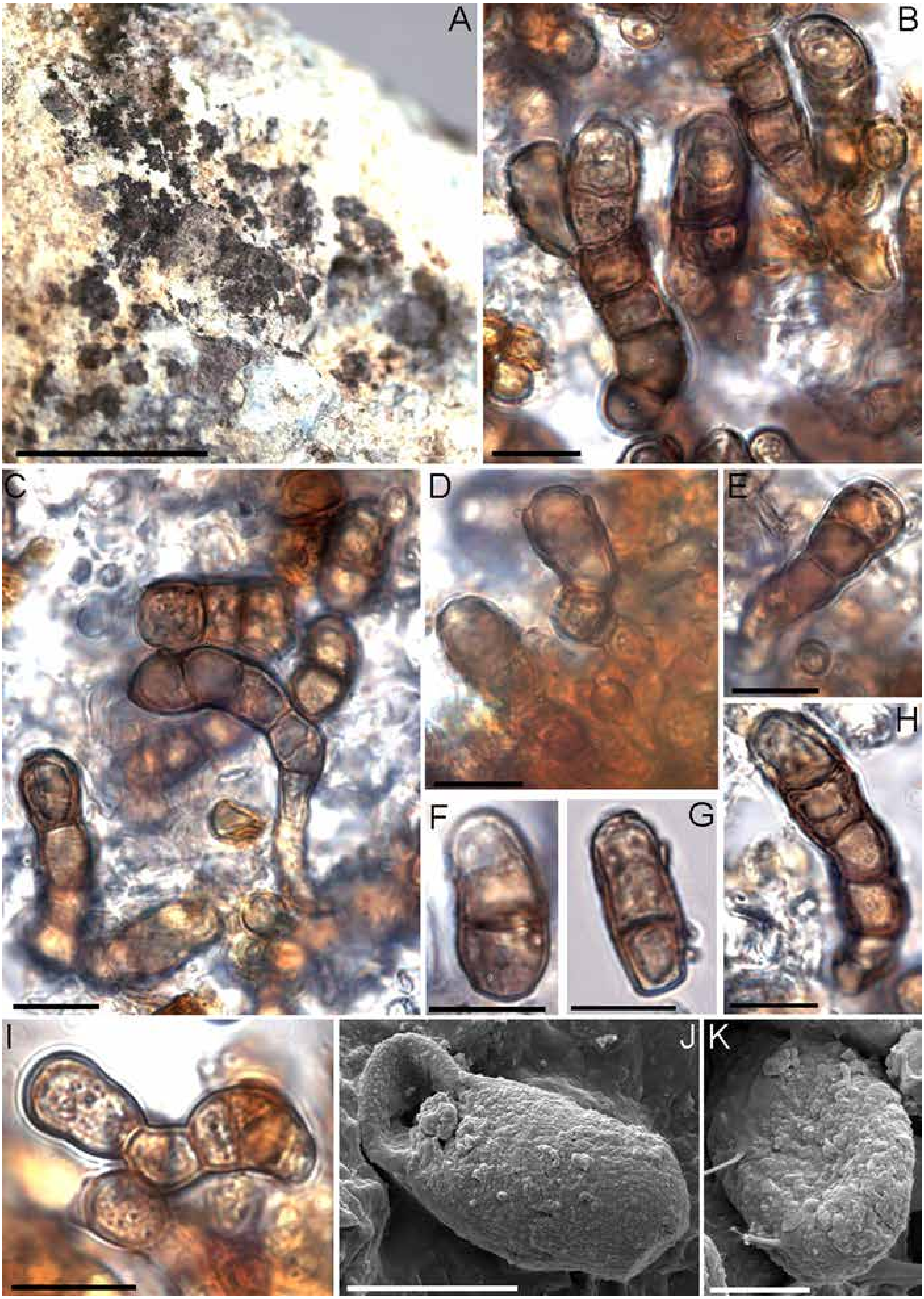

Fig. 30. *Taeniolella ionaspisicola* [holotype]. **A.** Macroscopic overview of colonies. **B–E, H.** Conidiophores with adhering conidia. **F, G, J, K.** Conidia. **I.** Conidiophores initial. Bars: 5 mm (A), 10 µm (B–I), 7 µm (J), 3 µm (K).

In addition to consistently verrucose to squamulose outer walls, *T. trapeliopseos* is easily distinguishable from *T. ionaspisicola* by its conspicuously obconically narrowed (from 8 to 4 µm) conidiogenous cells and bases of conidia.

Taeniolella lecanoricola Heuchert & Diederich, **sp. nov.** MycoBank MB819302. Figs 31–32.

Etymology: Epithet named after the genus of the type host, *Lecanora*.

Diagnosis: Morphologically comparable with *T. umbilicariae*, but walls of conidiophores and conidia inconspicuously squamulose and thick (to 2 µm), multi-layered, and *T. umbilicariicola*, which has narrower conidiophores and conidia with rimulose walls with longitudinal fissures.

Description: *Colonies* on the surface of the lichen thallus, 5 mm diam, black, densely caespitose, thallus without discoloration. *Mycelium* immersed; hyphae branched, 4–7 µm wide, constricted at the septa, pale brown to brown, smooth, wall slightly thickened, up to 0.5 µm wide. *Stromata* lacking.

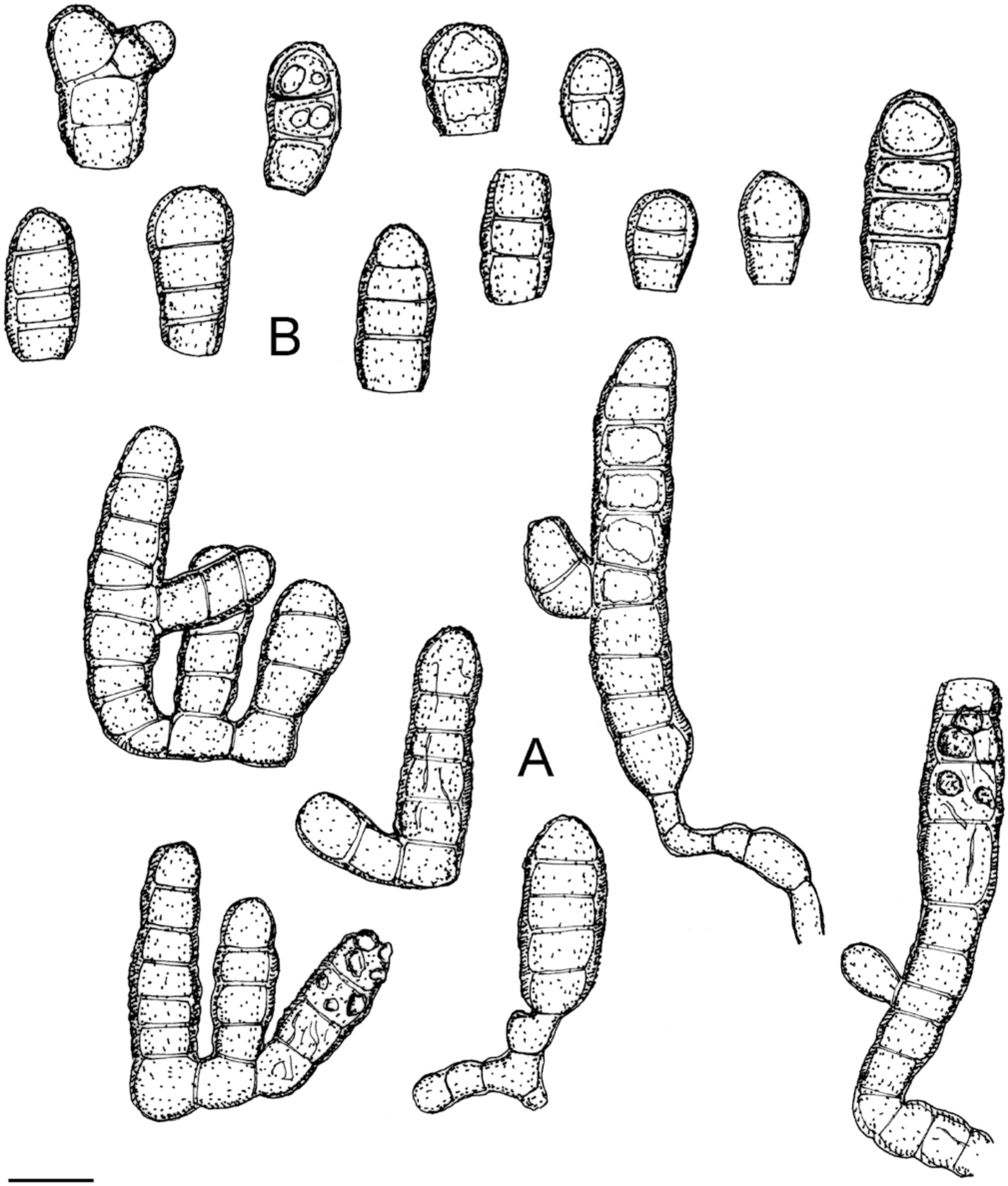

Fig. 31. *Taeniolella lecanoricola* [holotype]. **A.** Conidiophores. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

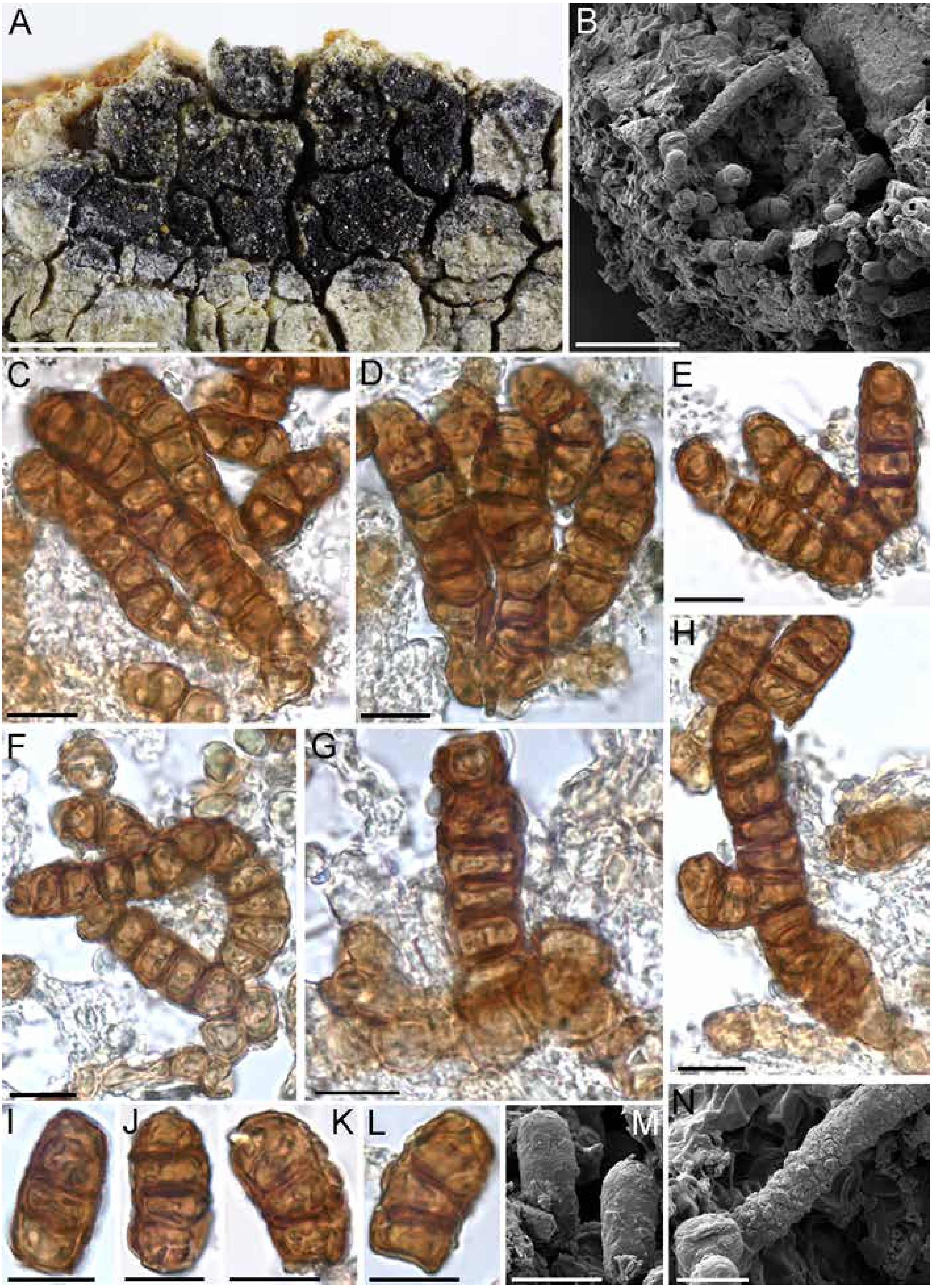

Fig. 32. *Taeniolella lecanoricola* [holotype]. **A.** Macroscopic overview of colony. **B.** SEM-overview of colony. **C–G.** Conidiophores. **H.** Conidiophore with single branch. **I–M.** Conidia. **N.** Conidiophore with conspicuous squamulose wall ornamentation. Bars: 1 mm (A) [photo taken by Paul Diederich], 30 µm (B), 10 µm (C–L), 9 µm (M, N).

Conidiophores solitary or in small groups, arising from hyphae, lateral and terminal, macronematous, mononematous, erect, straight, subcylindrical, unbranched or with single branches, 20–52 × 7–11 µm, 3–11-septate, constricted at the septa, septa distinctly thickened, up to 2 µm, multi-layered, dark brown, wall rarely smooth, usually irregularly verrucose, without distinct fissures, becoming squamulose, but squamules inconspicuous, 1–4 µm wide, irregularly shaped, squamules not detaching, wall thickened, 1–2 µm, distinctly multi-layered, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick walls, sometimes with oil-like droplets, rarely enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic or thalloblastic, monopodial, doliiform or conical, 4–7 µm wide, conidiogenous loci truncate, unthickened, 5 µm diam. *Conidia* solitary or catenate, straight, broad subcylindrical, 1-septate ones 10–16 × 7–10 µm, 2-septate ones 12–17 × 8–10 µm, 3-septate ones 18–25 × 8–10 µm, slightly constricted at the septa, brown to dark brown, ornamentation of the outer wall as in conidiophores, squamules 1–3 µm wide, wall thickened, 1–2 µm, distinctly multi-layered, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick walls, sometimes with oil-like droplets, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, hila truncate to somewhat convex, unthickened, not darkened, 5–7(–8) µm diam.

Holotype: **Germany**, Rhineland-Palatinate, Thallichtenberg (Kusel), on *Lecanora rupicola* var. *rupicola* (= *Lecanora sordida*), 7 Aug. 1984, *P. Diederich 6153* (BR**!**). *Isotype*: herb. Diederich**!**

Host range and distribution: On *Lecanora rupicola* var. *rupicola*; Germany.

Notes: The single collection on *Lecanora rupicola* var. *rupicola* is comparable with the two new *Taeniolella* species on *Umbilicaria*. It differs from *T. umbilicariae* by the lack of conspicuous squamules on walls of conidiophores and conidia, and the presence of distinctly multi-layered and thickened septa (up to 2 µm wide) of conidiophores. The conidiophores and conidia in *T. umbilicariicola* are narrower and have rimulose outer walls with longitudinal fissures.

Taeniolella pertusariicola D. Hawksw. & H. Mayrhofer, *Meddel. Grønland, Biosci*. **31**: 72. 1990. Figs 33–35.

Literature: Vězda (1986: 7, as *T. verrucosa*), Alstrup *et al*. (2008: 6), Brackel (2009: 42).

Illustration: Alstrup & Hawksworth (1990: 70–71, figs 42–43).

Exsiccatum: Vězda, Lich. Sel. Exs. 2125.

Description: *Colonies* scattered or loosely aggregated on the surface of the lichen thallus, especially on apothecia, caespitose, dark brown to black, without any discolorations of the lichen thallus. *Mycelium* immersed; hyphae flexuous, branched, 2–7(–9) µm wide, septate, cells rather short, 5–10 µm long, constricted at the septa, subhyaline or pale brown to brown, smooth, walls thickened, up to 1 µm. *Stromata* lacking, but with solitary swollen hyphal cells, rarely aggregated below conidiophores, oval, doliiform or subglobose, 4–7 µm diam. *Conidiophores* semi-macronematous, mononematous, solitary or in small caespitose tufts, arising from hyphae, terminal or lateral, erect, sometimes decumbent, subcylindrical or doliiform, straight to slightly flexuous, unbranched or mostly branched at the base, forming branched complexes, conidiophores (with adhering conidia) 7–50(–60) × 5–7(–8) µm, (0–)1–8(–9)-septate, constricted at the septa, brown to dark brown, paler towards the apex, outer

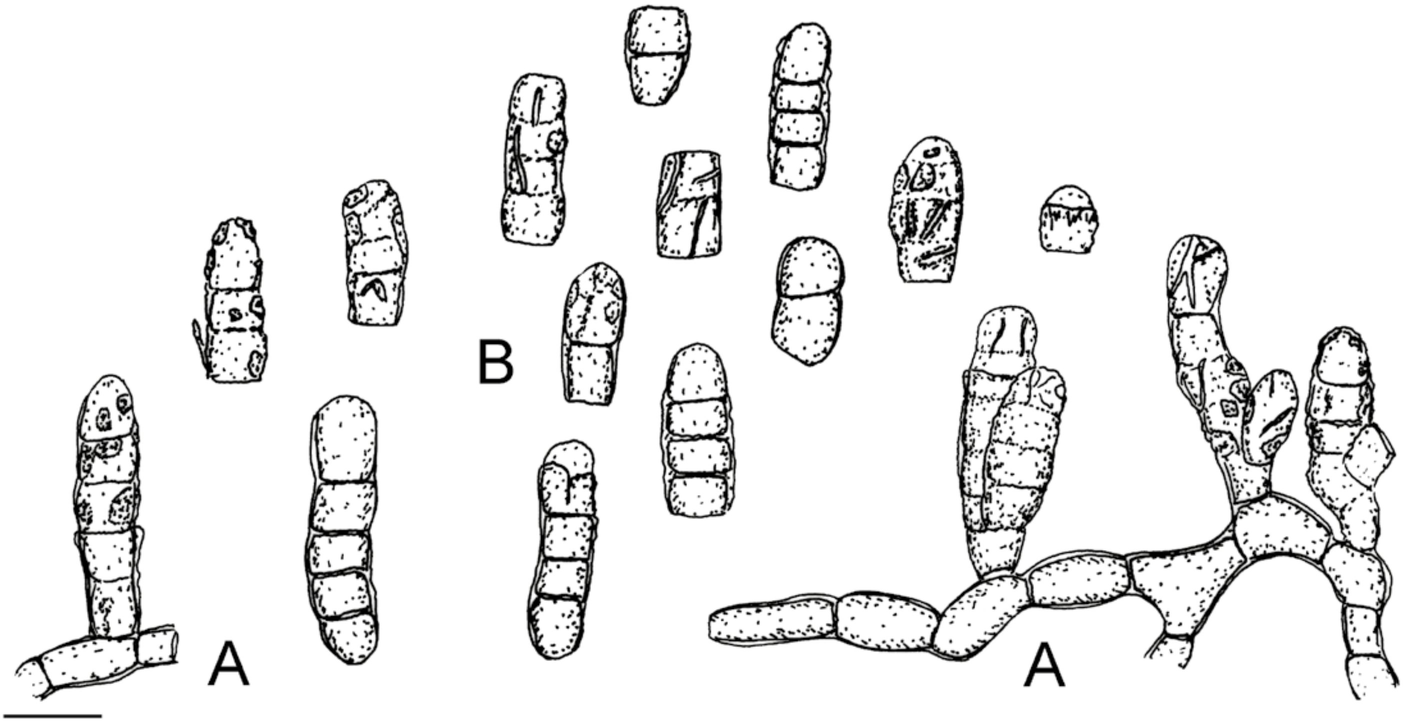

Fig. 33. *Taeniolella pertusariicola* [holotype]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

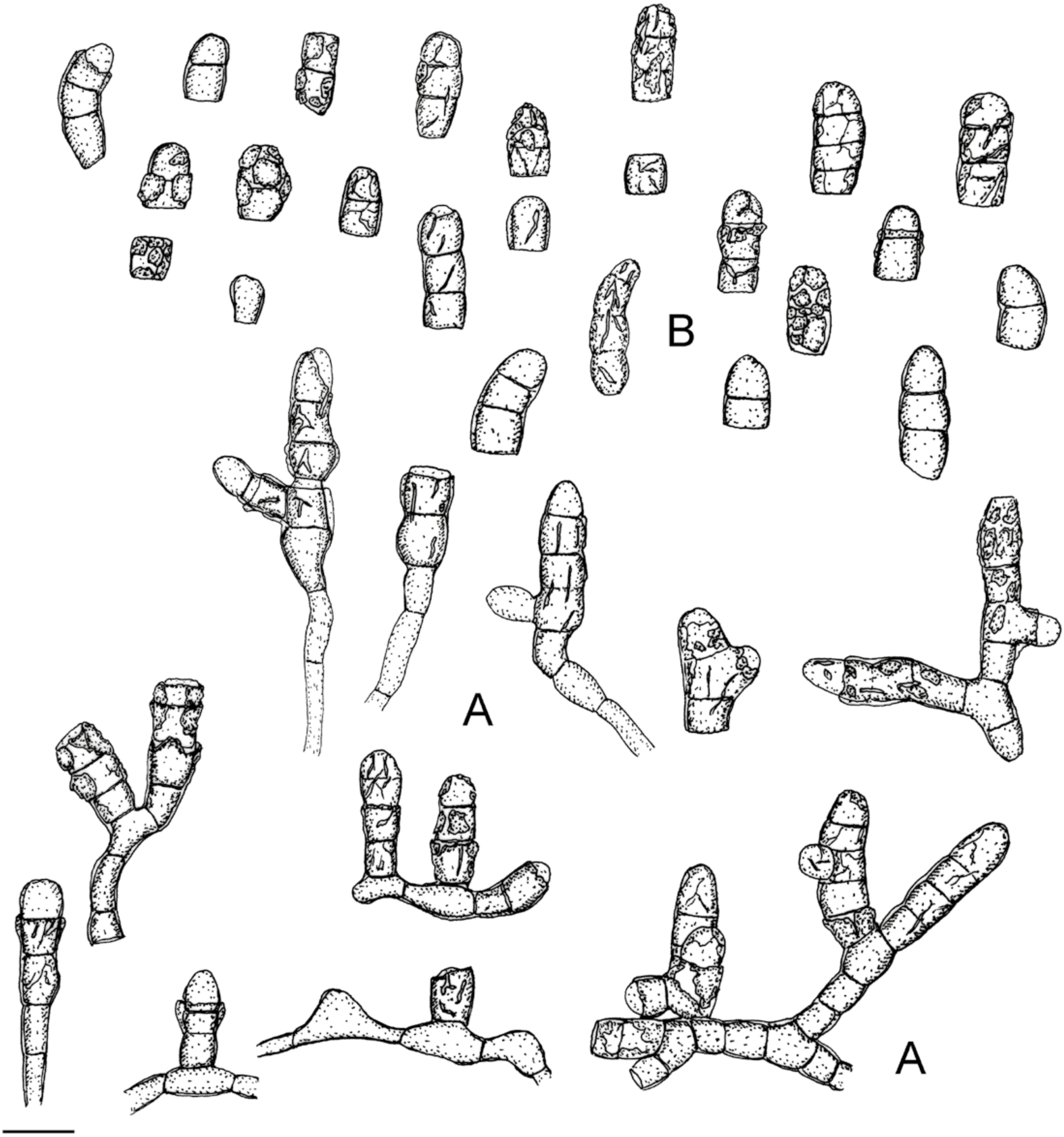

Fig. 34. *Taeniolella pertusariicola* [M-0043803 – isotype]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

wall irregularly rugose, verrucose to rimulose, later squamulose, squamules 1–5 µm wide, irregularly shaped, firm, not detached or only slightly so, wall thickened, 0.5–1 µm, often less thickened towards the apex, frequently enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic or thalloblastic, monopodial, subcylindrical or doliiform, 4–9 µm long, little differentiated, loci truncate, unthickened, (2–)3–5(–6) µm diam. *Conidia* catenate, in unbranched chains, easily disintegrating, straight, rarely slightly curved, broad ellipsoid, doliiform or subcylindrical, (0–)1–3-septate, aseptate conidia 5–13(–15.5) × 4–6 µm, 1-septate ones 7–17 × 4.5–7.5 µm, 2-septate ones 10.5–19 × 5–8 µm, 3-septate ones 13–20.5 × 5.5–7 µm, mostly constricted at the septa, brown to dark brown, paler near the apex, outer wall irregularly verrucose to rimulose, later squamulose, wall thickened, 0.25–1 µm, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila truncate, sometimes slightly convex, unthickened, not darkened, (3–)4–6(–7) µm diam.

Holotype: **Sweden**, Torne Lappmark, Kiruna, Abisko, 1.5 km W of Jieorenjokkstugan, alt. 340–400 m, on *Pertusaria carneopallida*,

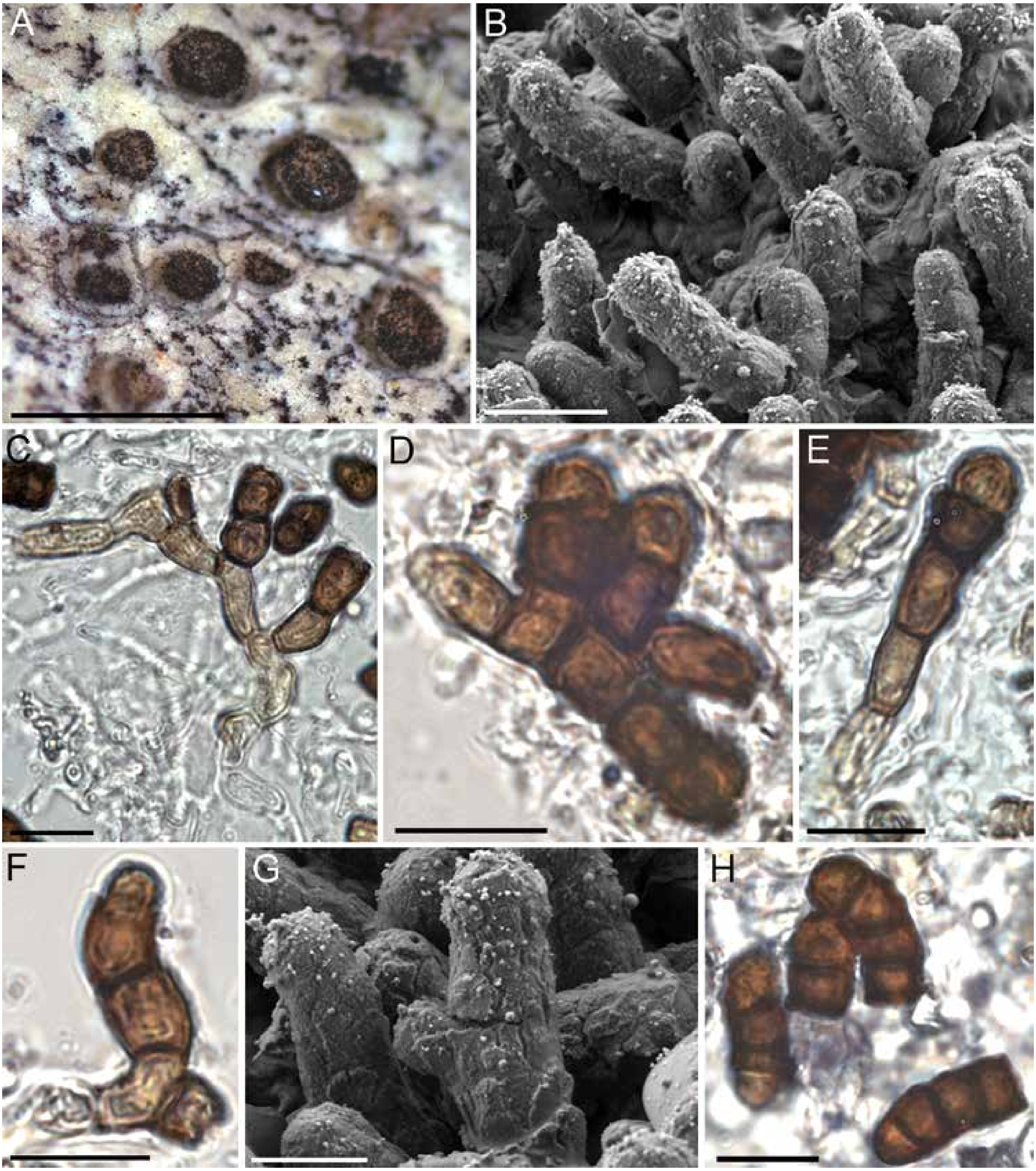

Fig. 35. *Taeniolella pertusariicola* [M-0043803 – isotype]. **A.** Macroscopic overview of colonies. **B–G.** Conidiophores. **H.** Conidia. Bars: 1 mm (A), 10 µm (B–G), 6 µm (H).

on *Alnus incana*, 6 Aug. 1980, *H. Mayrhofer* (K(M) IMI 299417**!**, distributed in Vězda, Lich. Sel. Exs. 2125 [as *T. verrucosa*]). *Isotypes*: H 7038078**!**, M-0043803**!**

Host range and distribution: On *Lecanora rupicola*, *Lepra albescens*, *L. amara*, *Ochrolechia androgyna*, *Ophioparma lapponica*, *Pertusaria bryontha*, *P. carneopallida*, *P. leioplaca*, *Pertusaria* sp., *Varicellaria lactea*; Australia (first report, see specimens examined), Denmark (Søchting *et al*. 2007), Estonia (Suija *et al*. 2007a,b), Finland (Nordin *et al*. 2010), France (Roux *et al*. 2001), Germany (Brackel 2009; Wirth *et al*. 2010), Greenland (Alstrup & Hawksworth 1990, Alstrup 2005, Kristinsson *et al*. 2006, 2010), Italy (Brackel 2011, 2015), Norway (Santesson 1993, Alstrup *et al*. 2008), Poland (Kukwa & Czarnota 2006), Russia (Andreev *et al*. 1996, Karatygin *et al*. 1999, Zhurbenko 1998, 2007, Zhurbenko & Davydov 2000, Zhurbenko *et al*. 2005, 2012b), Svalbard (Zhurbenko & Brackel 2013), Sweden (Vězda 1986 as *T. verrucosa*; Alstrup & Hawksworth 1990, Santesson 1993), Turkey (Halici 2010).

Additional specimens examined: **Australia**, Victoria, Maffra, on *Pertusaria* sp., Mar. 1889, Rev. *F.R.M. Wilson* (NSW-L4335 p.p.). **Estonia**, Ida-Viru county, Agusalu Landscape Reserve, Kivinõmme forestry, forest square 164/4, drained swamp spruce forest, 59°07'19" N, 27°34'38" E, on *Ochrolechia androgyna*, on *Picea abies*, 2 Sep. 2006, *A. Suija 138* (TU-45015) [as *T.* cf. *pertusariicola*]. **Finland**, Enontekis, on *Pertusaria carneopallida*, 1867, *J.P. Norrlin* (H 6067557); Inari Lapland, Utsjoki, Kevo Subarctic Station, ca. 3 km SW, cliff Kotkapahta in Kevojkoki vallej, on *Prunus padus*, on *P. carneopallida*, 20 Aug. 1965, *T. Ahti* (H 6067534). **Germany**, Bavaria, Oberpfalz, Kreis Tirschenreuth, Wäldchen an der Herrmühle bei Erbendorf, an offenem Serpentinfels, 6138/3, alt. 500 m, 49°50'12.6" N, 12°03'41.3" E, on *Lecanora rupicola*, 10 Oct. 2006, *W. v. Brackel* (herb. Brackel 4213). **Greenland**, Søndre Isortoq, head of Kangerdluk, 65°34' N, 51°57' W, alt. 25 m, on *P. carneopallida*, 20 Jul. 1977, *V. Alstrup 77562b* (C); Godthaab distr., W Igassup qáqa, 64°52' N, 50°37' W, alt. 125 m, on *P. carneopallida*, on *Alnus crispa*, 27 Jul. 1976, *V. Astrup* (C, herb. Christiansen 5652); ibid., *V. Alstrup* (C, herb. Christiansen 6107); Søndre Isortoq, Ivnarssuaq, 65°26' N, 52°11' W, alt. 90 m, on *Ophioparma lapponica*, 31 Jul. 1977, *V. Alstrup 771408* (C). **Norway**, Sör Tröndelag, Dovre, Kongsvold nedåt Driva, on *Pertusaria bryontha*, 22 Aug. 1863, *Th.M. Fries* (UPS); Troms, Tromsö, in monte Flöjfjeldet, on *P. carneopallida*, 21 Apr. 1864, *Th.M. Fries* (UPS); Troms, Målsehr, Svortfjellet, on *Pertusaria* sp., Aug. 1977, *D.O. Øvstedal* (K(M)192546). **Russia**, Krasnoyarsk Territory, north of Central Siberia, Taimyr Peninsula, near NW shore of Pyasino Lake, Nyapan hills, alt. ca. 70°05' N, 87°40' E, alt. 40 m, Belyi Yar hill slope, on *P. carneopallida*, on *Alnus*, 18 Jul. 1983, *M. Zhurbenko 83127* (LE 207581); "Lapponia orientalis", on *P. carneopallida*, 1861, *P.A. Karsten* (H 6067556); Oblast Murmansk, sinus Kolaensis [Kola Peninsula], on *P. carneopallida*, 1861, collector illegible (H 6067545); Murmansk, Vuorijärvi, on *P. carneopallida* (= *P. protuberans*), 5 Aug. 1937, *M. Laurila* (H 6067533). **Sweden**, Torne Lappmark, Vassitjåkko, NO-sidan, vindex-ponerad kalkhed, alt. 1000 m, on *P. bryontha*, 16 Aug. 1947, *R. Santesson* (UPS); Jukkasjärvi s:n, Paddos, on *P. bryontha*, 14 Aug. 1936, *R. Santesson* (UPS); Härjedalen, Tännäs par., the valley of the river Ljusnan, ca. 1 km SSE of Ramundberget Fjällgård, alt. 700–800 m, in subalpine forest, on *P. carneopallida*, on *Betula* (bases of trunks) 29 Jun. 1985, *R. Santesson 31244b* (UPS, herb. Diederich).

Notes: Santesson (1993) listed, in addition to *Pertusaria carneopallida*, the hosts *Pertusaria bryontha* and *Varicellaria rhodocarpa*. He noted, however, that the fungi on all host lichens are somewhat deviating from each other, and that they may represent different taxa. A re-examination of Santesson's material deposited in C and UPS showed that the collections on *P. bryontha*, provisionally named *T. bryonthae* (unpublished herbarium name) by R. Santesson, are not sufficiently different from *Taeniolella pertusariicola* to warrant the introduction of a separate species. The collection on *P. bryontha* from Sweden [Torne Lappmark, Jukkasjärvi s:n, Paddos, 14 Aug. 1936, *R. Santesson* (UPS)] is probably a young, immature specimen characterised by proliferating conidiophores that are narrower, paler and almost smooth towards the apex, and hila with a somewhat smaller diameter, (2–)2.5–5 µm, vs. (3–)4–6(–7) µm in mature samples. In 1986, R. Santesson labelled a specimen on *Varicellaria rhodocarpa* provisionally as "*Taeniolella varicellariae* sp. nov. *ined.*". However, this collection does not belong in *Taeniolella*, but can be assigned to *Trimmatostroma s. lat*. [*Trimmatostroma varicellariae* (Heuchert & Braun 2014)].

The ornamentation of conidiophores and conidia in *T. pertusariicola* is similar to that of *T. verrucosa*, described from thalli of *Pachnolepia pruinata* in Sweden, but the former species differs in having shorter and narrower conidiophores. Furthermore, conidia are usually narrower (Hawksworth in Vězda 1986: 7), and 2- or 3-septate conidia, common in *T. pertusariicola*, are rare in *T. verrucosa*.

Taeniolella punctata is another species that is also known from different *Pertusaria* species. The outer walls of conidiophores and conidia of *T. punctata* appear to be smooth by light microscopy, but they may occasionally be slightly rugose or verrucose. Scanning electron microscopical examinations showed that the outer walls are usually verruculose. Outer walls of conidiophores and conidia in *T. pertusariicola* are always verrucose to rimulose, later squamulose, easily discernable by light as well as scanning electron microscopy (Alstrup & Hawksworth 1990).

A re-examination of German material on *Lepra albescens* (Brackel 2009) has shown that it belongs to *T. delicata*. The specimen on *Ochrolechia androgyna* (TU-45015) differs according to Alstrup *et al*. (2008) from the original description in having longer, 1-septate conidia (22 × 5–7 µm). The material is, however, too poor for an accurate identification and can only be listed as *T.* cf. *pertusariicola*.

Taeniolella phaeophysciae D. Hawksw. *Bull. Brit. Mus.* (*Nat. Hist*.), *Bot*., **6**: 255. 1979. Figs 36–38.

Literature: Diederich (1989: 253), Montijūnaitė & Anderson (2003: 82), Nash *et al*. (2004: 708), Clauzade *et al*. (1989: 121), Boqueras (2000: 462), Pirogov & Khodosovtsev (2013).

Illustrations: Hawksworth (1979: 256, fig. 36), Boqueras (2000: 459, fig. 79h), Diederich *et al*. (2017a).

Exsiccatum: Santesson, Fungi Lichenicoli Exs. 342.

Description: *Colonies* scattered on the surface of the lichen thallus, caespitose, dark brown to black, often somewhat shiny, without any discolorations of the lichen thallus. *Mycelium* immersed; hyphae flexuous, branched, 2–5.5 µm wide, septate, mostly constricted at the septa, pale brown, smooth, thin-walled or somewhat thickened, sometimes irregularly lobate. *Stromata* lacking. *Conidiophores* macronematous, mononematous, solitary or in small caespitose tufts, arising from hyphae, erect, sometimes decumbent, subcylindrical, straight to slightly flexuous, usually unbranched, rarely branched at the base, conidiophores (with adhering conidia) (18–)20–216 × 7–13 µm, 1–20-septate, slightly constricted at the septa, dark brown or brown, paler towards the apex, smooth, wall thick, 1–2.5 µm, often less thickened towards the apex, frequently enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe, guttulate, often with one or up to five internal oil-like droplets, cell lumen coarsely granular. *Conidiogenous cell* integrated, terminal, monoblastic or thalloblastic, monopodial, subcylindrical or doliiform, 5–21 µm long, little differentiated, loci truncate, unthickened, 5–10 µm diam. *Conidia* catenate, in unbranched chains, not easily disintegrating, straight, doliiform, subcylindrical, clavate, 0–3-septate, aseptate conidia 9–32 × 9–11 µm, 1-septate

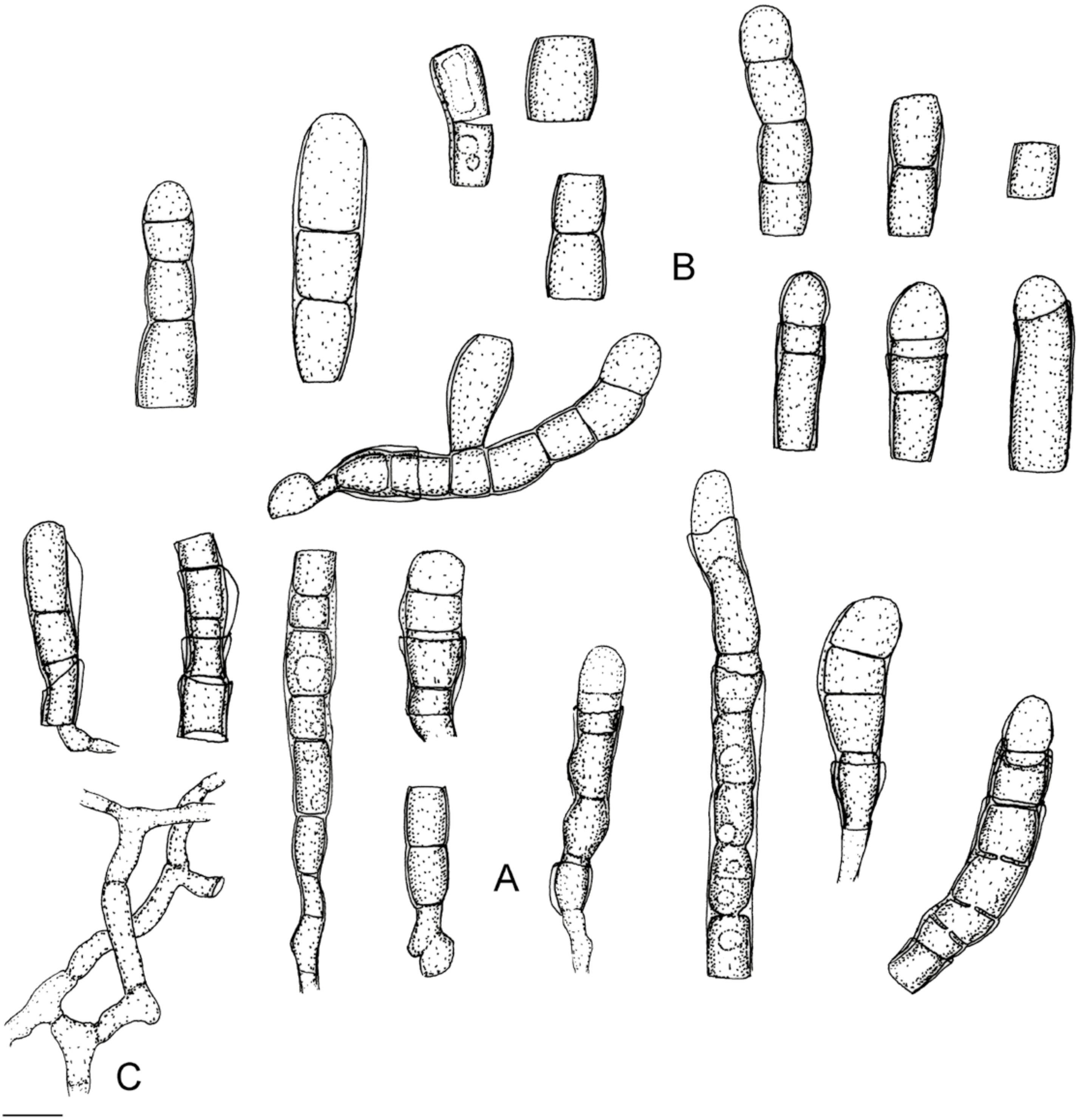

Fig. 36. *Taeniolella phaeophysciae* [holotype]. **A**. Conidiophores arising from hyphae. **B.** Conidia. **C.** Hyphae. Bar = 10 µm (B. Heuchert *del.*).

ones 14–39 × 7–11 µm, 2-septate ones 22–49 × 7–12 µm, 3-septate ones 34–60 × 7–10 µm, slightly constricted at the septa, brown to dark brown, primary conidia often paler at the apex, wall smooth, thick, 0.75–2 µm, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila truncate, unthickened, not darkened, 4–10 µm diam, guttulate, often with one or up to five internal oil-like droplets, cell lumen coarsely granular.

Holotype: **UK**, England, Devon, Slapton, Slapton Ley, prope mare, on *Phaeophyscia orbicularis*, on *Sambucus*, 11 May 1975, *D.L. Hawksworth 3999* (K(M) IMI 194016**!**).

Host range and distribution: On *Hyperphyscia adglutinata*, *Pectenia gayana*, *Pertusaria pertusa*, *Phaeophyscia adiastola*, *P. cernohorskyi*, *P*. *ciliata*, *P*. *constipata*, *P. endophoenicea*, *P. exornatula*, *P. hirsuta*, *P. imbricata*, *P. limbata*, *P*. *orbicularis*, *P.* cf. *spinellosa*, *Physcia aipolia*, *Physconia distorta*; Austria (Türk & Poelt 1993, Hafellner 1996, van den Boom *et al*. 1996), Belarus (Tsurykau *et al*. 2014), Belgium (Sérusiaux *et al*. 1983, Diederich & Sérusiaux 2000, van den Boom & van den Boom 2006), Chile, Denmark (first report, see specimens examined), Estonia (Suija 2005), Finland (Vitikainen *et al*. 1997, Santesson *et al*. 2004), France (Diederich 1986, Santesson *et al*. 2004, Diederich *et al*. 2006, Roux *et al*. 2011, 2017), Germany (John 1990, 1998, Scholz

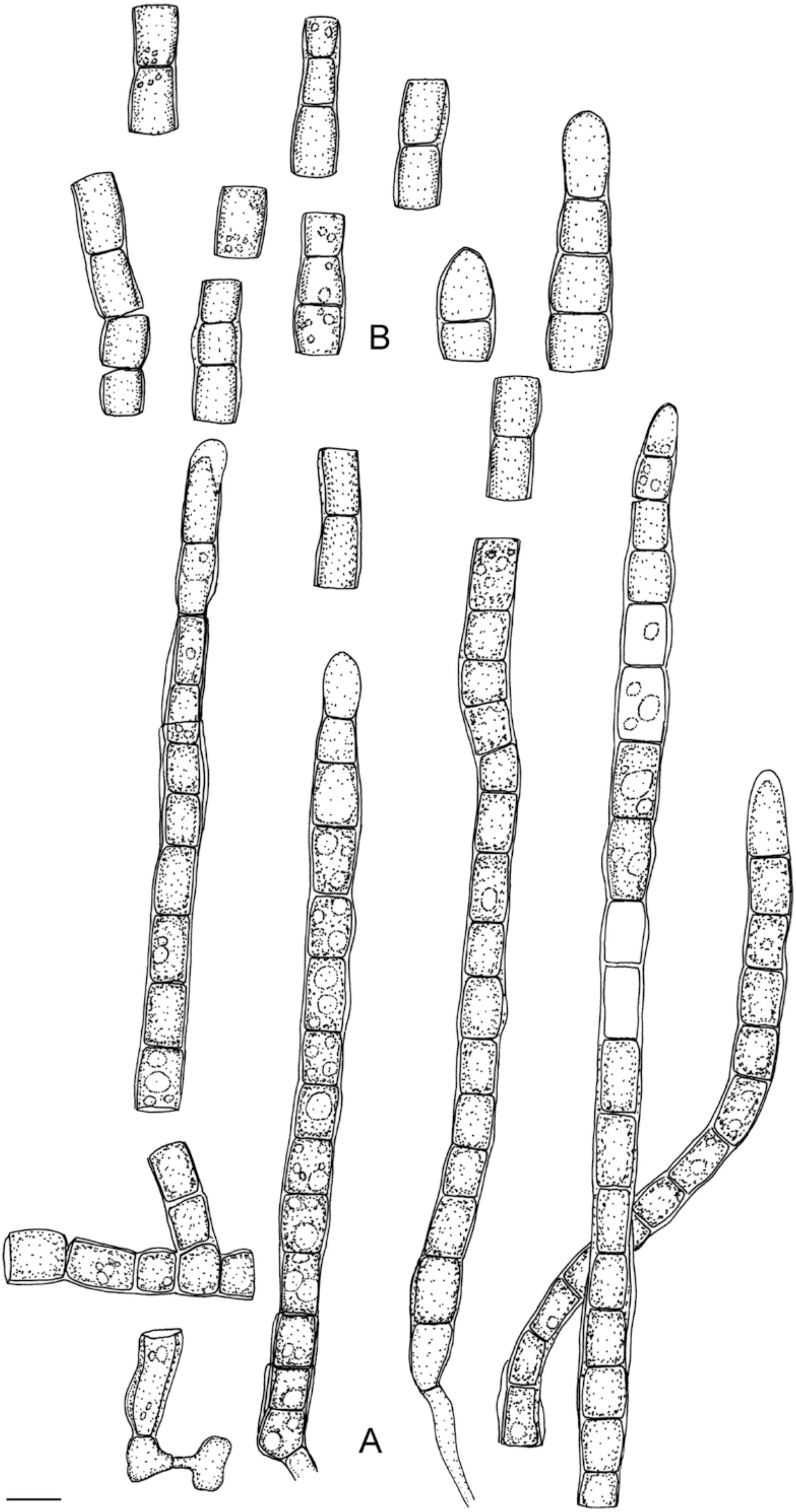

Fig. 37. *Taeniolella phaeophysciae* [Diederich 15829]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

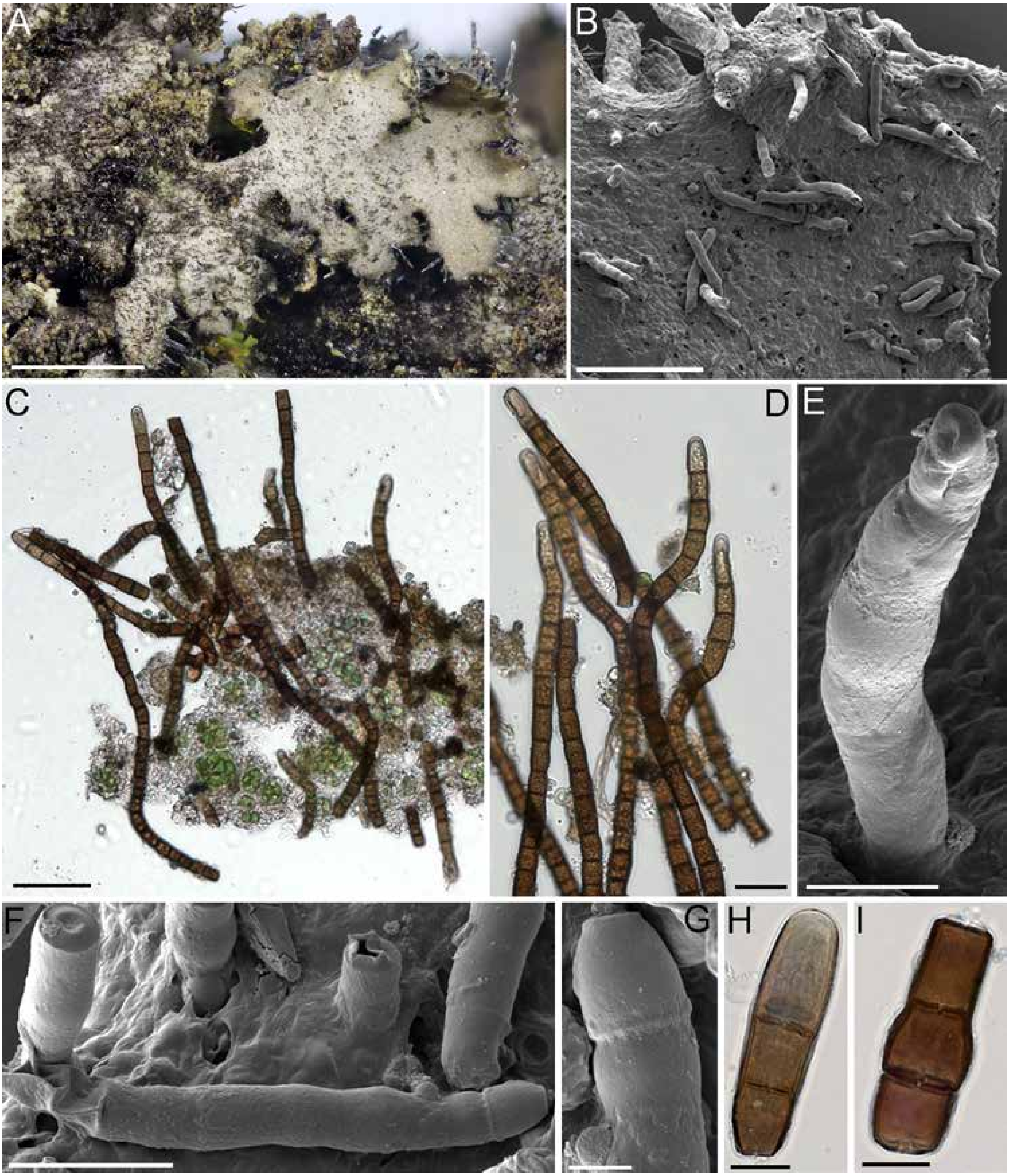

Fig. 38. *Taeniolella phaeophysciae* [A, B, E–G: Diederich 14697; C, D, H, I: Diederich 15829]. **A.** Macroscopic overview of colony. **B–F.** Conidiophores. **G.** Conidiogenous cell. **H, I.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 90 µm (B), 20 µm (C, D, F), 10 µm (E, H, I), 4 µm (G).

2000, Kocourková & Brackel 2005, Brackel & Kocourková 2006, Brackel 2007, 2010a, Cezanne *et al*. 2008, Wirth *et al*. 2010, Cezanne & Eichler 2015), Greenland (first report, see specimens examined), Ireland (Hawksworth 1979, Fox 2001), Italy (Brackel 2010b, 2011, 2013, 2015), Lithuania (Motiejūnaitė & Anderson 2003), Luxembourg (Diederich 1986, 1989, 1990a, Diederich & Sérusiaux 2000, Santesson 2001, 2008), the Netherlands (Aptroot *et al*. 1999, 2004; www.verspreidingsatlas.nl), Poland (Fałtynowicz 1993, Kukwa 2004), Russia (Zhurbenko *et al.* 2012a), South Korea (Kondratyuk *et al*. 2013), Spain (Etayo &

Blasco-Zumeta 1992, Navarro-Rosinés *et al*. 1994, Llimona *et al*. 1998, Boqueras 2000, Llimona & Hladun 2001, Earland-Bennett *et al*. 2006, Burgaz 2006, Vondrák & Etayo 2007, Etayo 2010b, van den Boom & Etayo 2014), Switzerland (first report, see specimens examined), Ukraine (Pirogov & Khodosovtsev 2013, Khodosovtsev & Khodosvtseva 2014), UK (Hawksworth 1979), USA (Diederich 2003, Nash *et al*. 2004, Esslinger 2016, 2018, Kocourková *et al.* 2012).

Additional specimens examined: **Belgium**, De Panne, Westhoek, entre le château d'eau et la station de radar, dune au nord de la forêt à proximité des maisons, on *Phaeophyscia orbicularis*, 6 Jun. 2001, sur *Quercus*, dans une dune, *P. Diederich 14697* (herb. Diederich); Lischert, sur *Sambucus*, dans un jardin, on *P. orbicularis*, 21 Dec. 2001, *P. Diederich 15116 & D. Thoen* (herb. Diederich). **Chile**, Prov. Valdivia, Lago Rinihue, Enco, on *Ugni molinae* in dense scrub in the outskirt of a rain-forest on the shore of the lake, on *Pectenia gayana*, 26 Sep. 1940, *R. Santesson S 423* (UPS). **Denmark**, Zealand, Rye, between Roskilde and Holbæk, on *Acer pseudoplatanus* in the wood "Ryegaard Dyrehave", on *Pertusaria pertusa*, 16 Aug. 1966, *M.S. Christiansen 66.558a* (C, herb. Christiansen 4327) (with *Lichenoconium erodes*); Greenland, Qassiarsuk, N of the village, on rock, alt. 50 m, on *Phaeophyscia constipata*, 23 Jul. 2005, *W. v. Brackel* (herb. Brackel 4214) [as *Taeniolella* cf. *phaeophysciae*]; Anholt, on concrete of a wall along the road in the village Anholt By, on *P. orbicularis*, 4 Jul.1941, *M.S. Christiansen 6358* (C, herb. Christiansen 4067); Zealand, Jungshoved, along the road E of Mölle, on *P. orbicularis*, on *Populus virgiana*, 12 Aug. 1966, *M.S. Christiansen* (C, herb. Christiansen 558); Lolland, Majbölle, NE of Saksköbing, on the trunk of an old poplar along the road in the wood Færgemark, near Guldborg, alt. 0–10 m, on *Physconia distorta*, 19 Jul. 1984, *M.S. Christiansen 84.062* (C, herb. Christiansen 4283). **Finland**, Pudasjärvi, Hirvaskoski, pihapuulla, on *Physcia dubia*, 30 Oct. 1965, *Kalevi Takala* (H). **France**, Meuse, au sud-est de Montmédy, Marville, cimetière de St Hilaire, on *P. orbicularis*, on *Fraxinus*, 3 Sep. 2004, *P. Diederich 15963* (herb. Diederich); Alpes-de-Haute-Provence, Au SW de Sisteron, Montagne de Lure, Notre-Dame de Lure, alt. 1240 m, on *Physconia distorta*, sur *Fagus*, dans une hêtraie, 27 May 1996, *P. Diederich 12954* (herb. Diederich). **Germany**, Bavaria, Mittelfranken, Nordheimer Gipshügel, 6428/1, alt. 350 m, on *Phaeophyscia endophoenicea*, on old *Sambucus*, 26 Mai 2004, *W. v. Brackel* (herb. Brackel 2789); Oberbayern, Stadt München, Blumenau, Terofalstraße Ecke Silberdistelstraße, 7834/4, alt. 540 m, on *P. orbicularis*, on *Acer platanoides*, 24 Sep. 2005, *T. Feuerer* (herb. Brackel 3623); Kreis München, NSG Echingerode, SE Ecke, am Waldrand, 48°17'55.5" N, 11°38'54.3" E, alt. 475 m, on *P. orbicularis*, on *Fraxinus excelsior*, 30 May 2006, *W. v. Brackel* (herb. Brackel 3811); Oberfranken, Kreis Bamberg, NSG Sandgrasheide Pettstadt, an *Prunus spinosa*, alt. 240 m, on *P. orbicularis*, 12 Apr. 2005, *W. v. Brackel* (herb. Brackel 2876); Schwaben, Stadt Augsburg, Wertachau w Inningen, 7631/3, alt. 500 m, on *P. orbicularis*, on *Sambucus nigra*, 5 Apr. 2005, *W. v. Brackel* (herb. Brackel 3603); Kreis Lindau, Lindau, Uferpromenade w der Bahnschranke, 8424/1, alt. 400 m, on *P. orbicularis*, on *Aesculus hippocastanum*, 29 Apr. 2005, *W. v. Brackel* (herb. Brackel 3602); Hessen, Odenwald, Vorderer Odenwald, Ortslage von Darmstadt, Müller-Anlage, alt. 155 m, on *P. orbicularis*, 22 Apr. 2007, *R. Cezanne & M. Eichler* 10875 (herb. Eichler-Cezanne). **Ireland**, South Tipperary, Marlfield House, on *Physconia distorta*, on *Fraxinus*, 1 Jul. 1974, *M.R.D. Seaward* (E00204794). **Italy**, Lombardia, Brescia, Tre Capitelli, along the shore of the lake "Lago d´Idro", alt. 370 m, on *P. orbicularis*, on the trunk of poplars, 4 Sep. 1977, *M.S. Christiansen 77.431* (C, herb. Christiansen 4607, 5644). **Luxembourg**, NE Bissen, an *Fraxinus*, alt. 215 m, on *P. orbicularis*, 14 Sep. 1979, *P. Diederich* (M-0044790); Capellen, near the railway station, on *P. orbicularis*, on *Sambucus*, 22 Mar. 2000, *P. Diederich 14017* (herb. Diederich, distributed in Santesson, Fungi Lichenicoli Exs. 342, M-0043794); ibid., 26 Mar. 2005, *P. Diederich 16039* (herb. Diederich); SE Lasauvage, Grand-bois, on *P. orbicularis*, 8 Nov. 2003, *P. Diederich 15829* (herb. Diederich); Au sud Bertrange, route entre Gréivelserhaff et Gréivelser-Barrière, on *Physconia distorta*, sur *Tilia*, 14 Sep. 2000, *P. Diederich 14414* (herb. Diederich); ibid., 20 Feb. 2007, *P. Diederich 16363* (herb. Diederich). **Spain**, Cataluña, Prov. Tarragona, Els Ports, 10 km al S de l'Horta de San Joan, Mas de Toni, alt. 600 m, on *P. orbicularis*, 9 Feb. 1991, *P. Diederich 9865* (herb. Diederich); Madrid, Mataelpino, in open woodland at junction, on *P. orbicularis*, on trunk of *Fraxinus angustifolia*, 29 Jan. 2006, *P.A. Earland-Bennett* (herb. Earland-Bennett); ibid., 31 Jan. 2006*, P.A. Earland-Bennett* (herb. Earland-Bennett). **Sweden**, Skåne, Brunnby k:n, Kullen, along the road E of Mölle, on *Physconia distorta*, on the trunk of old elms, 21 Aug. 1969, *M.S. Christiansen 69.230* (C, herb. Christiansen 5882, 5883). **Switzerland**, Bern, Entre Brienz et Oberried, on *P. orbicularis*, sur un vieux tombeau, 24 May 1994, *P. Diederich 4956* (herb.Diederich). **UK**, Wiltshire, Burderop Park, on *P. orbicularis*, on *Fraxinus*, Dec. 1972, *H.J.M. Bowen* (K(M) IMI 224496); Huntingdonshire, Glatton, on *P. orbicularis*, 18 Mar. 1977, *P.M. Earland-Bennett* (K(M) IMI 224497). **USA**, California, San Luis Obispo Co., Santa Magarita Lake Recreation Area, E of San Luis Obispo, from Santa Margarita (town), take State Rd. 58, right on Pozo Rd, about 8 min from Santa Margarita to entrance rd to Park, mixed *Quercus agrifolia* and *Q. lobata* on hillsides, with scattered mossy boulders, on *P. orbicularis*, 1996, *Tucker 35125* p.p. (SBBG); Lake Co., Clear Lake State Park, on Soda Bay on S side of Clear Lake, on Soda Bay Rd E of Finley near Lakeport, open savanna forest of oak, madrone and *Umbellularia* on slopes around lake, and on large poplars at lake edge, on *P. orbicularis*, 1992, *Tucker 31712* p.p. (SBBG).

Notes: *Taeniolella phaeophysciae* is the only known lichenicolous *Taeniolella* species with extremely long, mostly unbranched and smooth conidiophores and thereby easily distinguishable from all other lichenicolous species of this genus. Hawksworth (1979) supposed that this fungus is pathogenic, based on his observation of infected lobes of the host tending to become bleached, which could, however, not be confirmed.

Measurements of conidiophores and conidia given in Clauzade *et al*. (1989), Diederich (1989), Boqueras (2000), Montijūnaitė & Anderson (2003) and Nash *et al*. (2004) are within the common range for this species. For one of the Lithuanian specimens, Montijūnaitė & Anderson (2003) mentioned that *T. phaeophysciae* was growing together with *Tremella phaeophysciae* on *Phaeophyscia orbicularis*, but only close to the galls and never on the galls themselves.

A re-examination of the Chilean material from R. Santesson (deposited in UPS) showed that the material on *Pectenia gayana*, provisionally named *Taeniolella degeliana* (unpublished herbarium name) by R. Santesson, are not sufficiently different from *T. phaeophysciae* to warrant the introduction of a separate species. The conidiophores in this specimen are only somewhat narrower [20–100 × 6–9(–10) µm].

The material from Greenland on *Phaeophyscia constipata* (herb. Brackel 4214) is in a poor condition and does not allow an accurate identification, thus can only be listed as *T.* cf. *phaeophysciae*.

Taeniolella pseudocyphellariae Etayo, *Biblioth. Lichenol.* **98**: 247. 2008. Figs 39–41.

Illustration: Etayo & Sancho (2008: figs 116–117).

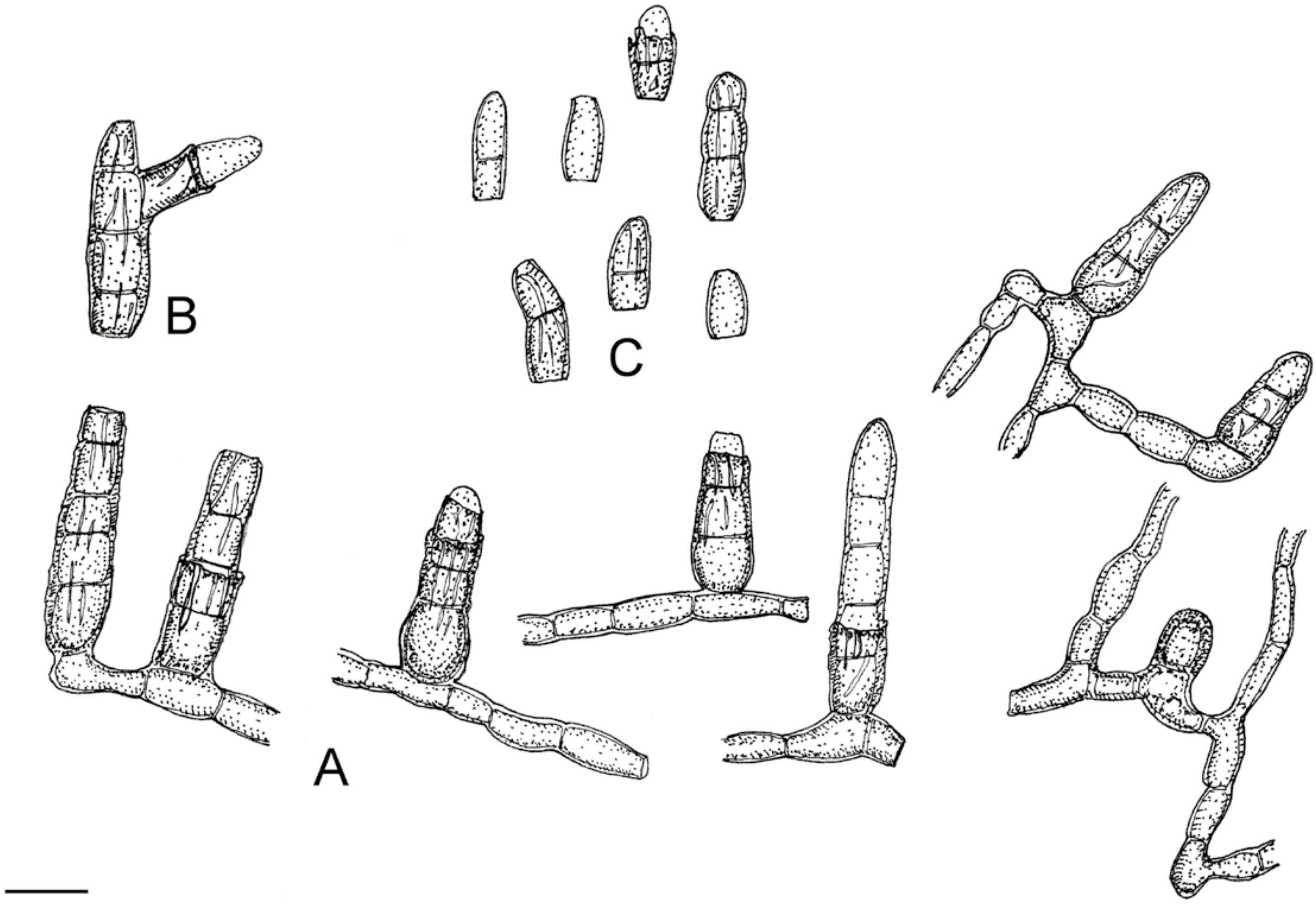

Fig. 39. *Taeniolella pseudocyphellariae* [holotype]. **A.** Conidiophores with monopodial rejuvenation. **B.** Branched conidiophore. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Description: *Colonies* scattered on the surface of thalli, loosely to densely caespitose, black, thallus becoming necrotic, turning dark brown or black. *Mycelium* immersed and superficial, forming a dense network; hyphae growing around and in algal cells, heterogeneous, hyphae inside algal cells (and sometimes also those outside) branched, 2–3 µm wide, septate, smooth, slightly thickened, 0.25–0.5 µm, subhyaline to pale brown, hyphae around algal cells superficial and forming an immersed network, 3–6 µm wide, branched, septate, with constrictions at the septa, smooth, wall thickened, 0.5–2 µm wide, brown to dark brown, fertile hyphae gradually becoming more pigmented. *Stromata* lacking. *Conidiophores* semi-macronematous to macronematous, mononematous, solitary or in small fascicles, loosely aggregated, arising from hyphal cells, terminal and lateral, erect, straight to slightly flexuous, subcylindrical, mostly unbranched, conidiophores with adhering conidia 12–74 × (5–)6–8(–10) µm, somewhat attenuated towards the apex, 2–11-septate, not or only slightly constricted at the septa, dark brown, paler towards the apex, wall irregularly rough to verrucose, with conspicuous longitudinal splits, but without squamules, wall thickened, 0.75–2(–2.5) µm, cell plasma sometimes reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, multi-layered walls, rejuvenation monopodial by enteroblastic proliferation, leaving conspicuous annellations, often with more than two conspicuous sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* directly formed by enteroblastic proliferation, integrated, terminal, doliiform, 4–11 µm long, monoblastic, monopodial, conidiogenous loci truncate, unthickened, 2–3.5 µm diam. *Conidia* catenate, in unbranched, rarely branched chains, straight to slightly curved, doliiform, subcylindrical, ellipsoid, 0–2(–3)-septate, aseptate conidia 8–13 × 4.5–6 µm, 1-septate ones 10–15(–22) × 5–7 µm, 2-septate ones 15–22 × 5–6 µm, 3-septate ones (only a single conidium observed) 15 × 5 µm, slightly or not constricted at the septa, pale brown to brown, rarely dark brown, ornamentation of the outer wall less conspicuous as in conidiophores, wall thickened, 0.5–1.25 µm, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, hila truncate, unthickened, not darkened, 2–3.5 µm diam.

Holotype: **Chile**, Navarino, parque etnobotánico Omora, 54°56'35.0" S, 67°39'26.4" W, alt. 20–30 m, sobre *Pseudocyphellaria hillii* en *Nothofagus pumilio*, 8 Jan. 2005, *J. Etayo 22137, L.G. Sancho & A. Gómez-Bolea* (MAF-Lich 15634-2**!**).

Host range and distribution: On *Nephroma antarcticum*, *Pseudocyphellaria hillii*; Argentina (first report, see specimens examined), Chile (Etayo & Sancho 2008).

Additional specimens examined: **Argentina**, Lago Argentino, Seno Mayo, alt. ca. 1000 m, on *Nephroma antarcticum*, Feb. 1959, *P.W. James* (BM). **Chile**, Navarino, bajada del Cerro Ukika por el rio Guanaco, bosque viejo de lengas en vallonata profonda, 54°57'34.0" S, 67°37'46.4" W, alt. 150 m,

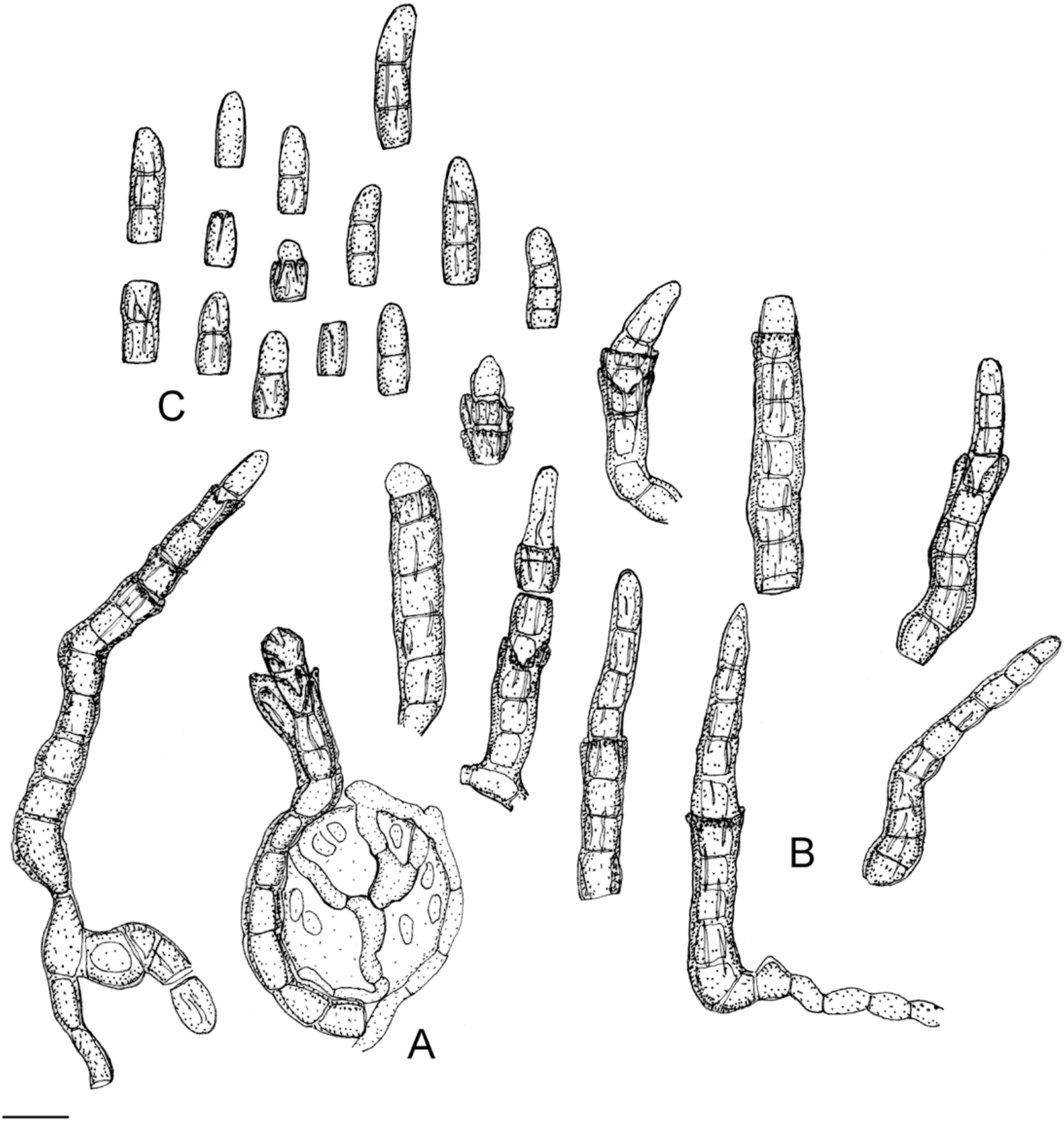

Fig. 40. *Taeniolella pseudocyphellariae* [Etayo 22176]. **A.** Conidiophores with conspicuous annellation arising from hyphae growing around algal cells. **B.** Conidiophores with monopodial rejuvenation. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Nothofagus pumilio, on *N. antarcticum*, 16 Jan. 2005, *J. Etayo et al. 22570* (herb. Etayo); Navarino, subida al Cerro Bandiera, desde la base hasta el mirador, bosque de lengas viejo con muchos troncos caidos, 54°57'36.0" S, 67°37'37.5" W, alt. 80–300 m, on *Nothofagus pumilio*, on *Pseudocyphellaria hillii*, 9 Jan. 2005, *J. Etayo 22176, Gómez & Rancho* (herb. Etayo).

Notes: Based on the general habit and morphological traits such as rough-walled to verrucose conidiophores with percurrent monopodial rejuvenation, unthickened conidiogenous loci, holoblastic conidiogenesis, and rugose-verruculose conidia formed in chains, the South American species *Taeniolella pseudocyphellariae* strongly resembles species of the genus *Talpapellis* (Heuchert *et al*. 2014). However, percurrent proliferations are not uncommon in many *Taeniolella* species. In *T. pseudocyphellariae*, the terminal annellations seem to be connected with direct formation of conidial chains, and the conidia have broad truncate bases (not attenuated) as in holothallic conidiogenesis. Therefore, we prefer to maintain this species in *Taeniolella s. lat*.

Taeniolella pseudocyphellariae is easily distinguishable from all *Talpapellis* species by having wider conidiophores [12–74 × (5–)6–8(–10) µm vs. usually 3–5(–6) µm in other species].

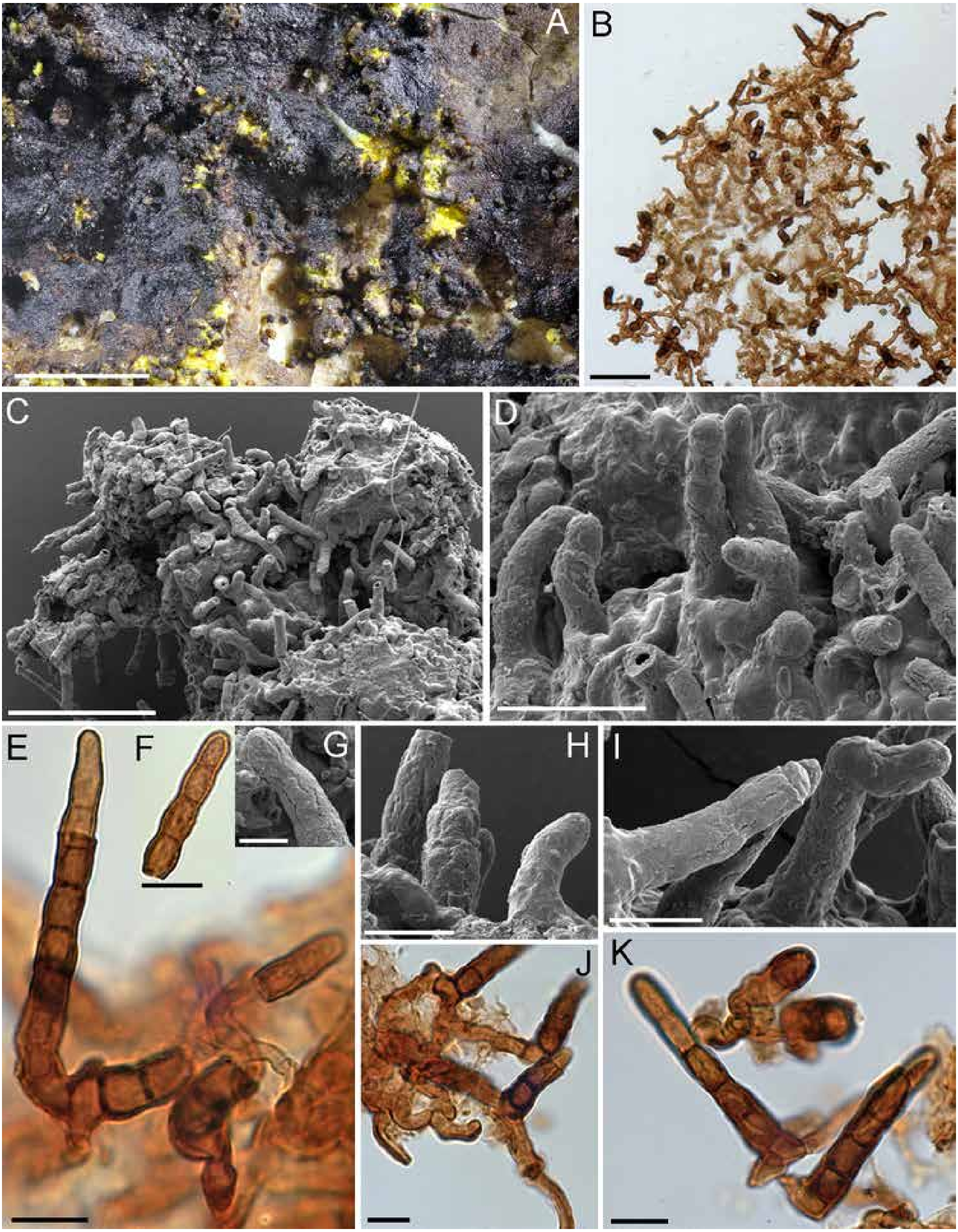

Fig. 41. *Taeniolella pseudocyphellariae* [A, C, D, G–I: Etayo 22176; B, E, F, J, K: holotype]. **A.** Macroscopic overview of colony. **B.** Microscopic overview of colony. **C.** SEM overview of colony. **D, E, H–K.** Conidiophores with monopodial rejuvenation. **F.** Conidial chain. **G.** Tip of conidiophore. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (C), 50 µm (B), 20 µm (D), 10 µm (E, F, J, K), 9 µm (H, I), 5 µm (G).

Taeniolella pseudocyphellariae is easily distinguishable from *T. christiansenii*, the other species with longitudinal splits in the wall of the conidiophores and conidia, by having darker superficial hyphae with thicker walls (0.5–2 µm, vs. 0.25–0.5(–1) µm in *T. christiansenii*), as well as wider and longer conidiophores (12–74 × (5–)6–8(–10) µm vs. 5–55 × 4–7(–9) µm in *T. christiansenii*) with thicker walls (0.75–2(–2.5) µm vs. 0.5–1.5 µm in *T. christiansenii*).

The Chilean collection on *Nephroma antarcticum* (*Etayo 22570*) is sparingly developed. It is very similar to *T. pseudocyphellariae*, but differs in its unusual localization of the colonies, which are confined to the lower side of the thallus, and in lacking mycelial networks. Other characteristics do not differ significantly.

Taeniolella punctata M.S. Christ. & D. Hawksw., *Bull. Brit. Mus.* (*Nat. Hist*.), *Bot*. **6**: 257. 1979. Figs 42–43.

Literature: Diederich (1989: 253), Clauzade *et al*. (1989: 121), Motiejūnaitė & Anderson (2003: 83), Kuznetsova *et al.* (2013), Ertz *et al*. (2016: 1431–1435).

Illustrations: Hawksworth (1979: 258, fig. 37), Diederich *et al*. (2017a), Ertz *et al*. (2016: 1432, fig. 9; 1433, fig. 10).

Exsiccatae: Santesson, Fungi Lichenicoli Exs. 371. Vězda, Lich. Sel. Exs. 1925.

Description: *Colonies* effuse, brown to black, scattered over the host thallus, sometimes in dead or dying portions with grey discolorations, loosely punctiform to densely caespitose, in small tufts, confluent, up to 0.1 mm, usually without any discoloration of the lichen thallus. *Mycelium* rather sparsely developed; hyphae immersed, flexuous, branched, 3–6 µm wide, septate, constricted at the septa, subhyaline to pale brown, smooth; walls slightly thickened, up to 0.5 µm. *Stromata* lacking, but with some swollen, subglobose rarely aggregated hyphal cells, up to 6 µm diam. *Conidiophores* macronematous, mononematous, sometimes solitary, but usually 3–10 in small caespitose tufts, arising from swollen hyphal cells, straight to slightly flexuous, unbranched or mostly once branched at the base, rarely branched in the upper third, subcylindrical; conidiophores (with adhering conidia) 14–83(–95) × 5–8 µm, 2–25-septate; septa up to 0.75 µm thick, slightly constricted at the septa, brown to dark

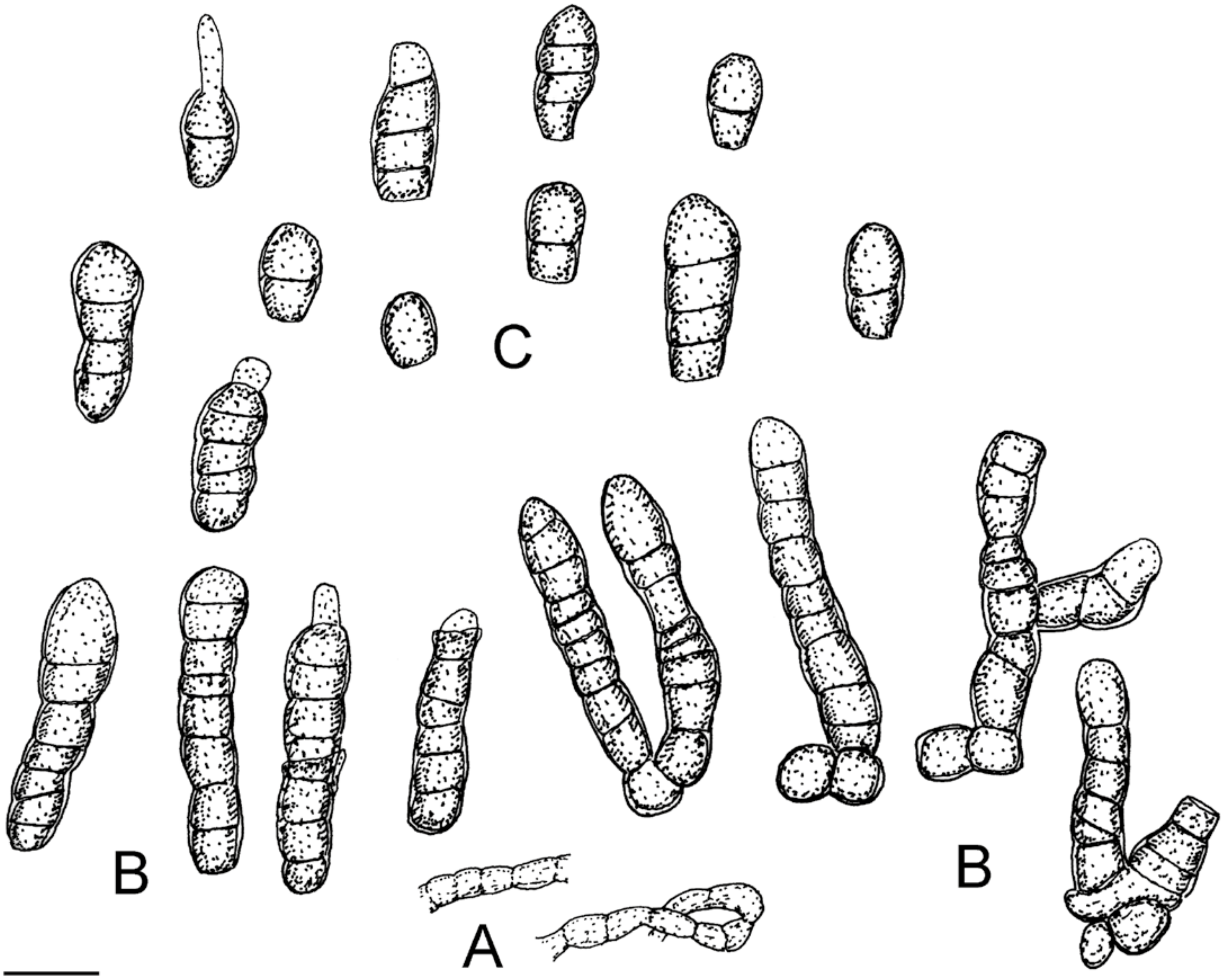

Fig. 42. *Taeniolella punctata* [isotype]. **A.** Hyphae. **B.** Conidiophores arising from hyphae or swollen hyphal cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

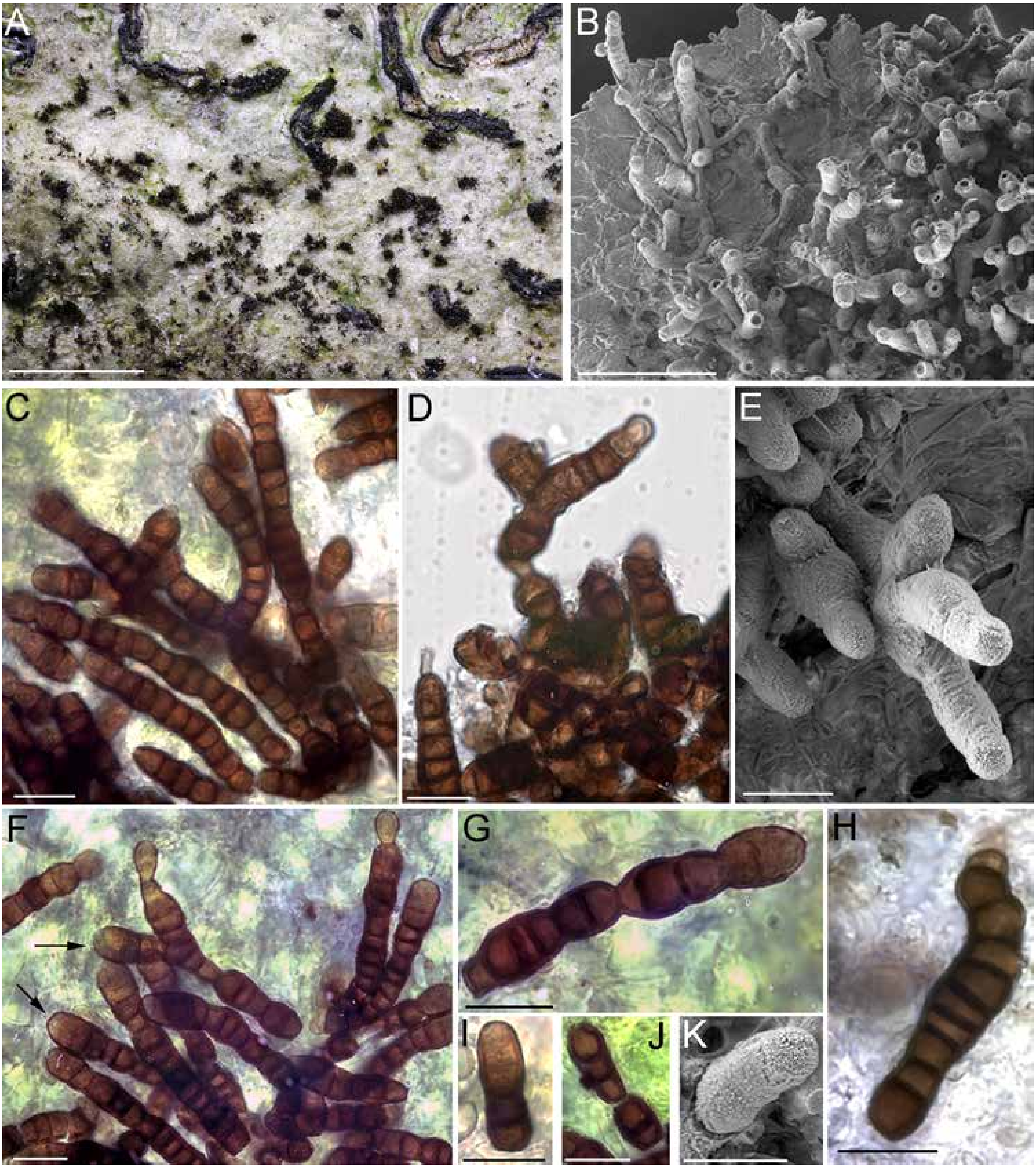

Fig. 43. *Taeniolella punctata* [A: Diederich 16714; B, E, H, K: Diederich 12647; C, D, F, G, I, J: C, herb. Christiansen 5739]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, F, H.** Conidiophores, (arrows) tips of conidiophores and/or the adhering terminal conidium somewhat swollen. **G, I, K.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 50 µm (B), 10 µm (C–K).

brown, paler towards the apex; tips of conidiophores and/or the adhering terminal conidium sometimes somewhat swollen, *i.e.*, either entire terminal conidium or only conidial tip swollen, up to 9 µm wide; wall light microscopically smooth, occasionally slightly rugose or verruculose, scanning electron microscopically usually verruculose; walls thickened, 1(–1.5) µm, thinner or not thickened toward the apex, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular collar. *Conidiogenous cell* integrated, terminal, monoblastic or thalloblastic, monopodial, subcylindrical, doliiform, 3–9 µm long, little differentiated, loci truncate, unthickened, 2.5–5 µm diam. *Conidia* catenate, in unbranched chains, not easily disintegrating, conidiophores often breaking off at the base or separating into fragments of different sizes, conidia doliiform, broad subcylindrical, ellipsoid, (0–)1–3-septate, fragments up to 6-septate, aseptate conidia 7–10 × 5–6 µm, 1-septate ones 8–18 × 5–7 µm, 2-septate ones 10–21 × 5–7 µm, 3-septate ones 13–21 × 5–8 µm, 4- to 6-septate fragments 12–28 × 5–7 µm, mostly constricted at the septa, brown to dark brown, wall light microscopically smooth, occasionally slightly rugose or verruculose, scanning electron microscopically usually verruculose, walls thickened, 0.75–1 µm, apex rounded, sometimes swollen in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed towards the base, hila truncate, unthickened, not darkened, 2–5 µm diam.

Holotype: **Denmark**, Lolland, Ryde, W of Maribo, in the wood Kristianssæde Skov, alt. 9–15 m, on *Graphis scripta* growing on *Carpinus,* 24 Jul. 1977, *M.S. Christiansen 77.140* (K(M) IMI 225002). *Isotype*: C, herb. Christiansen 6062**!**

Host range and distribution: On *Arthonia atra*, *A. radiata*, *A. ruana*, *Fissurina dumastii*, *Graphis scripta s. lat.*, *Graphis* sp., *Pertusaria leioplaca*, *Phaeographis dendritica*; Austria (Hafellner & Maurer 1994, Berger & Türk 1994, 1995, Hafellner 2008a), Belgium (Diederich 1986, van den Boom *et al*. 1998, Diederich & Sérusiaux 2000, Diederich *et al*. 2017a), Czech Republic (Kocourková & van den Boom 2005), Denmark (Hawksworth 1979, Alstrup *et al*. 2004), Estonia (Suija 2005, Suija *et al*. 2007b), France (Diederich & Roux 1991, Sparrius *et al*. 2002, Roux *et al*. 2017, Diederich *et al*. 2017a), Germany (Diederich 1986, John 1990, Scholz 2000, Bruyn 2001, Triebel & Scholz 2001, Rätzel *et al*. 2003, Eichler & Cezanne 2003, Cezanne & Eichler 2004, 2015, Bruyn 2005, Kocourková & Brackel 2005, Otte *et al*. 2006, Cezanne *et al*. 2008, Bruyn *et al*. 2008, Brackel 2010a, Wirth *et al*. 2010, John *et al*. 2011, Schiefelbein 2013, Schiefelbein *et al*. 2017), Ireland (Fox 2001), Italy (Brackel 2008a, b, 2015), Lithuania (Montijūnaitė & Andersson 2003), Luxembourg (Diederich 1986, 1990a, van den Boom *et al*. 1998, Diederich & Sérusiaux 2000, Diederich *et al*. 2004, 2017a), the Netherlands (Sparrius 2000, Aptroot *et al*. 2004, www.verspreidingsatlas.nl), Poland (Jando & Kukwa 2003, Fałtynowicz 2003, Zalewska & Fałtynowicz 2004, Czyżewska *et al*. 2005, Kukwa 2005, Kukwa & Czarnota 2006, Czyżewska *et al*. 2008, Szymczyk & Zalewska 2008, Schiefelbein *et al*. 2012, Kukwa *et al.* 2013), Portugal (Azores) (Berger & Aptroot 2002, Hafellner 2005, Borges *et al*. 2010), Russia (Otte 2004, Kukwa & Jabłońska 2008, Kuznetsova *et al.* 2013), Spain (Etayo 2002, 2006, 2010), Sweden (Santesson 1993), Ukraine (Bielczyk *et al*. 2005), UK (Hawksworth 1990).

Additional specimens examined: **Belgium**, Wellin, à 4 km au sud de Chanly, ruisseau le Glan, alt. 260 m, tronc de *Carpinus*, on *Arthonia atra*, 29 Jan. 2012, *D. Ertz 17390* (BR, sub *A. atra*); *Prov. Luxembourg*: St-Hubert, valley of the Masblette, near the Point Mauricy, alt. 320 m, ancient mixed woodland by the river, on *Graphis scripta*, on *Fagus*, 5 Jun. 1997, *P. Diederich 12647* (herb. Diederich). **Denmark**, Jutland, Yding, WSW of Skanderborg, near the brook "Bjergskov Bæk" in the wood "Yding Skov", alt. 100 m, on *Arthonia ruana*, on the loose bark of a young dead *Fraxinus*, 26 May 1983, *M.S. Christiansen 83.020; 83.018* (C, herb. Christiansen 2702; 2704); Bornholm, Åkirkeby par., Almindingen, Ekkodalen at Fugelsangsrende, on *Carpinus betulus* in shaded position, 55°06' N, 14°53' E, on *G. scripta*, 30 Jun. 1987, *M. Wedin 537* (UPS); EJ, Østjylland, Ry Nørreskov, Ringhoved, on *G. scripta*, 13 May 1995, *V. Alstrup* (C, herb. Christiansen 1962); NJ, Himmerland, Ravnkilde, on beech in the wood Nörlund skov (Rold Skov), on *G. scripta*, 31 Oct. 1971, *M.S. Christiansen* (C, herb. Christiansen 2751); NMJ, Salling, Brigshøj, Krat, on *G. scripta*, 22 Oct. 2002, *V. Alstrup* (C, herb. Christiansen 5739); Zealand, Nordrupöster, east of Ringsted, on the smooth bark of young oak in the woods around the manor house Giesegaard, on *G. scripta*, 14 Sep. 1966, *M.S. Christiansen 66.750a* (C, herb. Christiansen 2886); Vemmetofte, in the wood "Vemmetofte Dyrehave", alt. 5–10 m, on *G. scripta*, on *Corylus*, 6 Aug. 1982, *M.S. Christiansen 82.077* (H, C, herb. Christiansen 2470, C, herb. Christiansen 2471, M-0043798, duplicates distributed in Vězda, Lich. Sel. Exs. 1925). **Estonia**, Ida-Viru county, Puhatu Nature reserve, Kivinõmme forestry, deciduous forest, 59°10'31" N, 27°38'26" E, on *G. scripta*, on *Alnus incana*, 2 Sep. 2006, *A. Suija 123* (TU-45018). **France**, Pyrénées-Atlantiques, au sud de Tardets-Sorholus, Ste-Engrâce, vers Pierre-St-Martin, on *G. scripta*, on *Fagus*, 17 Jul. 1991, *P. Diederich 9521 & J. Etayo* (herb. Diederich); Pas-de-Calais, forêt domaniale de Desvres, parc. 22, coord. Lambert 1 562.8/1332.3, alt. 50 m, on *G. scripta*, on *Fraxinus*, 10 Aug. 2000, *P. Diederich 14297 & J. Signoret* (herb. Diederich). **Germany**, Baden-Württemberg, Nördliches Oberrheintiefland, Hainbuchen-Eschen-Bestand im Kastenwört WSW von Karlsruhe, alt. 107 m, TK 7015-2, on *G. scripta*, 20 Feb. 2007, *R. Cezanne & M. Eichler 7278* (herb. Cezanne-Eichler); Bavaria, Menterschwaige, bei München, on *G. scripta*, on bark of *Carpinus betulus*, 1859, *A. v. Krempelhuber* (M-0043800); Schwaben, Günzburg/Donau, Donauauen "Leibi", alt. 446 m, on *G. scripta* on *Tilia*, 29 Mar. 1963, *Doppelbauer* (M-0043799); Schwaben, Kreis Oberallgäu, Kürnacher Wald W Kempten, Ulmertal, im Mischwald am Bach, 8226/4, alt. 820 m, on *G. scripta* on *Fagus sylvatica*, 9 Sep. 2004, *J. Kocourková & W. v. Brackel* (herb. Brackel 2983); Kreis Oberallgäu, Weißbachtal, SW Oberstaufen, 700 m SW Steinebach, 8425/4, alt. 700 m, on *G. scripta*, on *Corylus avellana*, 10 Sep. 2004, *J. Kocourková & W. v. Brackel* (herb. Brackel 2862); Unterfranken, Kreis Haßberge, ehem. Standortübungsplatz Ebern, S Unterpreppach im Eichen-Hainbuchen-Wald, 5930/2, alt. 300 m, on *G. scripta*, on *Carpinus* 19 Oct. 2008, *W. v. Brackel* (herb. Brackel 4803); Rheinland-Pfalz, S Manderscheid, vallée de la Kleine Kyll, on *G. scripta*, on *Carpinus*, 19 Jun. 1984, *P. Diederich 5524* (herb. Diederich); Baden-Württemberg, Nördliches Oberrheintiefland, alter Hainbuchen-Bestand im Kastenwört WSW von Karlsruhe, alt. 107 m, TK 7015-2, on *Pertusaria* cf. *leioplaca*, 20 Feb. 2007, *R. Cezanne & M. Eichler 7279* (herb. Cezanne-Eichler). **Luxembourg**, entre Mersch et Angelsberg, vallon du Bënzelterbaach, on *G. scripta*, on *Carpinus*, 1 Jul. 1999, *P. Diederich 13824* (herb. Diederich); S of Capellen, Jongebësch, 26 Mar. 2005, on *G. scripta*, on *Carpinus*, *P. Diederich 16040* (herb. Diederich, distributed in Santesson, Fungi Lichenicoli Exs. 371); Vogelsmühle, vallon du Halerbaach, rive gauche, on *G. scripta*, on *Fagus*, 9 Dec. 2007, *P. Diederich 16718* (herb. Diederich). **Portugal**, Azores, Pico, S of Sao Roque do Pico, forest remnants on the shore of Lagoa Capitao, alt. 780 m, 38°29'9" N, 28°18'58" E, on *Fissurina dumastii*, on *Juniperus brevifolia*, 24 Jul. 2010, *P. Diederich 17044* (BR, herb. Diederich); N of Najes do Pico, near Lagoa do Paúl, alt. 790 m, 38°25'58" N, 28°13'58" W, on *F. dumastii*, on branches of *J. brevifolia*, 25 Jul. 2010, *P. Diederich 17027* (herb. Diederich) [*Taeniolella* cf. *punctata*]. **Spain**, Cataluña, Prov. Barcelona, km 32 de la carretera de Cantonigros a Olot, alt. 900 m, on *G. scripta*, 12 Feb. 1991, *P. Diederich 9855* (herb. Diederich). **UK**, Isle of Skye, S Broadford, Kilmore, churchyard and rocks near the sea, NG 66 07, on *G. scripta*, on *Corylus*, 30 May 1987, *P. Diederich 8818* (herb. Diederich).

Notes: Hawksworth (1979) and Diederich (1989) considered *Taeniolella punctata* as a true lichenicolous species, which can be confirmed on the basis of the examination of numerous specimens. The colonies of this species do not penetrate into the adjacent bark tissue. The preferred host is *Graphis scripta* *s. lat.*, but there are additional collections on other hosts (see above), confirmed by our phylogenetic analyses for collections on *Arthonia atra* and *Pertusaria leioplaca* (Ertz *et al*. 2016: 1424, fig. 2). *Taeniolella punctata* is the only *Taeniolella* species known to occur on *Graphis scripta s. lat*. The collections on *Thelotrema lepadinum* reported by Diederich (1986) and Clauzade *et al.* (1989) as *T. punctata* were re-examined and identified as belonging to a similar new species, *Taeniolella toruloides*. Compared to *Taeniolella punctata*, *T. toruloides* has unbranched and shorter conidiophores (6–34 × 4–7 µm, 0-5-septate), lacks conspicuously thickened conidial septa, and has conidial chains that are not easily disintegrating, but usually toruloid. In our phylogenetic analyses (Ertz *et al*. 2016: 1424, fig. 2), *Taeniolella punctata* clusters with *Buelliella minimula* and *Karschia cezannei* in an unsupported polytomy. The species is clearly distinct from two strains of *Taeniolella toruloides* isolated from *Thelotrema antoninii*. Unfortunately, we were unable to obtain sequences from material on *Thelotrema lepadinum* for a comparative analysis.

We have examined two collections on *Fissurina dumastii* from the Azores with conidiophore and conidium measurements within the range of variability of *Taeniolella punctata*. The transition between hyphae and conidiophores is sometimes not very evident in this material. We observed brown to dark brown hyphae, in addition to the subhyaline to pale brown hyphae typical for *T. punctata*. Hyphal cells are densely aggregated, branched, and up to 8 µm wide; the septa are up to 1 µm thick and rarely oblique; the wall is smooth and thickened, up to 0.5 µm. The colonies sometimes developed on damaged portions of the thallus with a grey discoloration. As *Fissurina* is a recent segregate of *Graphis*, according to Lücking (2009) and Dal-Forno (2009), older records of *T. punctata* on *Graphis* sp. from the Azores (Berger & Aptroot 2002, Hafellner 2005, Borges *et al*. 2010) might also refer to material on *Fissurina*. A specimen on *Fissurina dumastii* from the Azores (P. Diederich 17044) was successfully cultured and does not cluster with other sequences of *Taeniolella punctata* in our phylogenetic analyses. However, this specimen is placed close to the cluster of *T. punctata* in a lineage for which the internal relationships are poorly supported (Ertz *et al*. 2016: 1424, fig. 2). For that reason, and owing to morphological similarities, the collections on *Fissurina dumastii* from the Azores are referred to as *Taeniolella* cf. *punctata* (Fig. 44).

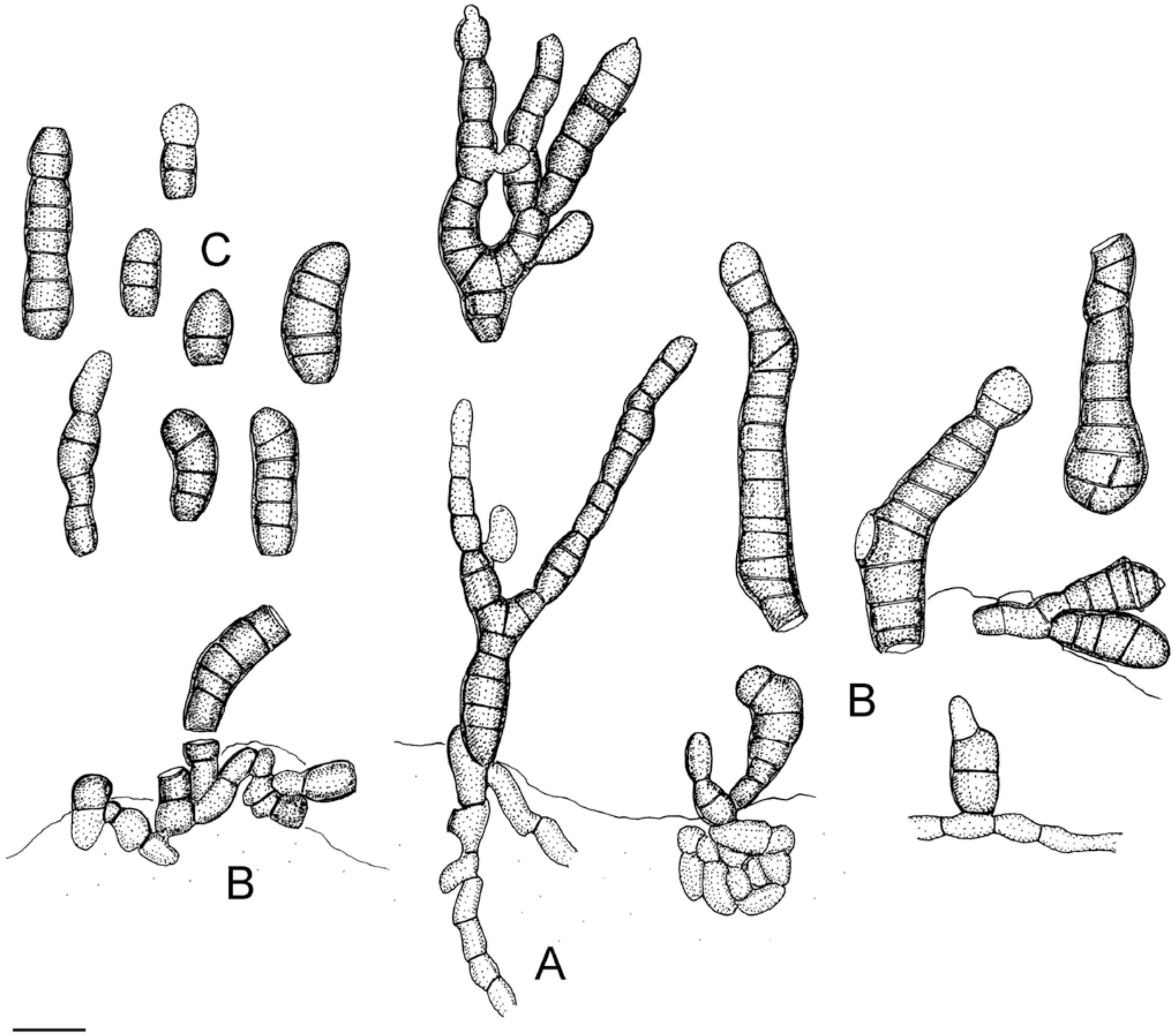

Fig. 44. *Taeniolella* cf. *punctata* on *Fissurina dumastii* [Diederich 17044]. **A.** Hyphae. **B.** Conidiophores arising from hyphae or swollen hyphal cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*)

The wall of conidiophores and conidia in *Taeniolella punctata* appears to be smooth by light microscopy, as described in Hawksworth (1979), Diederich (1989) and Montijūnaitė & Andersson (2003), but we occasionally observed slightly rugose or verrucose walls. Examination by scanning electron microscopy showed that the wall is usually finely verruculose.

Taeniolella caespitosa is very similar to *T. punctata*; the two species are barely distinguishable using dimensions of conidiophores and conidia. Conidiophores in *T. punctata* are slightly longer (14–83(–95) × 5–8 µm, vs. 7–71(–81) × (4.5–)5–8 µm). In *T. punctata* the tips of the conidiophores and/or the adhering terminal conidium are also occasionally swollen up to 9 µm wide (see arrows in Fig. 43). The wall of the conidiophores in the examined material of *T. caespitosa* is mostly smooth, occasionally somewhat irregularly rough, but without cracks and squamules, whereas in *T. punctata* the conidiophore wall can be smooth, slightly rugose or verruculose. The dimorphic mycelium of *T. caespitosa* is composed of pale brown, flexuous to tortuous, 1.5–3 µm wide, smooth and thick-walled hyphae that penetrate the host thallus, as well as of subhyaline to pale brown, densely aggregated, 3–10 µm wide, irregularly shaped, thin-walled, hyphae with a granular surface entering the underlying cortex cells. In the latter case, the hyphae are developed only around the base of conidiophores. Such dimorphic hyphae are unknown in *Taeniolella punctata*.

In addition to the discussed differences, *T. punctata* grows preferably on *Graphis scripta* and only rarely on other hosts such as *Pertusaria leioplaca*, whereas *T. caespitosa* is probably confined to *Pertusaria* spp. In our phylogenetic analysis (Ertz *et al.* 2016), a single specimen from Germany on *Pertusaria leioplaca* (CPS 14809 = Cezanne-Eichler 7279) proved to belong to *T. punctata*, which is in accordance with the morphology of this sample, above all the lacking formation of immersed dimorphic hyphae.

Taeniolella pyrenulae Heuchert & Diederich, *Fungal Biology* **120**: 1435. 2016. Figs 45–46.

Illustrations: Ertz *et al*. (2016: 1436, fig. 12; 1437, fig. 13).

Descriptions: *Colonies* on the surface of thalli and perithecia, in weak infections forming small tufts, effuse, confluent, loosely caespitose, in severe infections densely caespitose over the entire lichen thallus, black; thallus without any discoloration. *Mycelium* immersed; hyphae flexuous, branched, 2–7µm wide, septate, mostly constricted at the septa, pale brown to brown, more intensively pigmented below the conidiophores, smooth, walls thickened, 0.25–0.5 µm wide. *Stromata* lacking, but with swollen, rarely aggregated hyphal cells, subglobose, ellipsoid or square, 3–6 µm diam. *Conidiophores* semi-micronematous, usually reduced to conidiogenous cells, not easily distinguishable from swollen hyphal cells, mononematous, solitary or in small groups, erect, straight, unbranched, subcylindrical, ovoid, doliiform, 3–7 µm long and wide, aseptate, brown, thick-walled, 0.25–0.5 µm wide, smooth. Conidiophores aseptate, *i.e.*, reduced to conidiogenous cells, monoblastic, monopodial, conidiogenous loci truncate, unthickened, 2–4 µm diam. *Conidia* catenate, long-adhering in unbranched chains, not easily disarticulating, chains up to 100 µm long, but later disintegrating into fragments of different sizes, conidia usually easily discernible within the chain by obvious constrictions between individual conidia, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular collar, straight, ellipsoid, subcylindrical to broad subcylindrical, doliiform, pyriform, ovoid, 1–4-septate, septa often conspicuously thickened, up to 1.25 µm, 1-septate ones 6–14 × 5–8 µm, 2-septate ones 11–20 × 5–8 µm, 3-septate ones 15–25 × 6–7 µm, 4-septate ones 18–33 × 6–8(–9) µm, slightly or not constricted at the septa, brown to dark brown, wall thickened, 0.5–2 µm wide, sometimes distinctly multi-layered, usually clearly structured, verrucose-rugose, sometimes rimulose, apex rounded in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed, hila truncate, unthickened, not darkened, 1.5–4(–5) µm diam.

Holotype: **Portugal**, Azores, Pico, between Lajes do Pico and Sao Roque do Pico, Bosque da Junqueira, 1 km S of crossing with road going to the east, 38°27'56" N, 28°17'57" W, on *Pyrenula* cf. *hibernica*, on *Vaccinium cylindraceum*, in laurisilva, 26 Jul. 2010, *P. Diederich 17075* (BR**!**). *Isotypes*: HAL 3032 F, 3185 F, herb. Diederich**!**

Host range and distribution: On *Pyrenula* cf. *hibernica*, *P. laevigata*; Portugal (Azores) (Ertz *et al*. 2016), Russia (Ertz *et al*. 2016). N.B.: *Taeniolella pyrenulae* does not colonize *Pyrenula dermatodes*, also present in the type specimen.

Additional specimens examined: **Russia**, Republic Adygeja, Majkopskij Rajon, Gebiet des Berges Bol. Tcvač, Talgrund beim Lagerplatz am oberen Nal-Sachrai, 44°06' N, 40°24' E, alt. ca. 950 m, on *Pyrenula laevigata*, on *Alnus incana*, 24 Aug. 2003, *V. Otte* (GLM-F23601); Gebiet des Berges Bol. Tcvač, Talgrund beim Bache Bol. Sachrai oberhalb der letzten Furt vor dem Zusammenfluss mit dem Nal-Sachrai, 44°05'30" N, 40°23' E, alt. ca. 920 m, an jungen noch glattrindigen *Acer* cf. *trautvetteri***/***pseudoplatanus*, on *P. laevigata*, 30 Aug. 2003, *V. Otte* (GLM-F23720); ibid., an totem jungen *Ulmus*, on *P. laevigata*, 30 Aug. 2003, *V. Otte* (GLM-F23609). **Portugal**, Azores, Pico, NW of Lages, near Cabeço do Farrobo, 38°26'29" N, 28°16'17" W, alt. ca. 600 m, trunk in remnants of laurisilva along a road, on *Pyrenula* sp., 25 Aug. 2011, *D. Ertz 16807* (BR).

Notes: All collections from Russia are less well-developed: the conidial chains are often shorter and the walls are less thickened and less structured. In specimen GLM-F23609 from Russia, aseptate, smooth conidia (7–8 × 4.5–5.5 µm) were occasionally observed. All other features agree with those of the other specimens. Therefore, the collections from Russia and from the Azores are assigned to the same species.

Taeniolella friesii, currently known only on *Strigula stigmatella*, is similar to *T. pyrenulae*. Conidiophores are also micronematous and conidia are solitary or in short disarticulating chains. However, *T. friesii* is easily distinguishable from *T. pyrenulae* by having distinctly shorter and narrower conidia (*e.g.*, 2-septate ones 10–12 × 4–5 µm, vs. 11–20 × 5–8 µm in *T. pyrenulae*).

Taeniolella toruloides on *Thelotrema* is also similar to *T. pyrenulae* by having conidia that adhere in long firm chains up to 100 µm, but conidia are usually distinctly narrower (*e.g.*, 2-septate ones 14–22 × 4.5–6 µm, vs. 11–20 × 5–8 µm in *T. pyrenulae*). Additionally, *T. toruloides* conidia are mostly smooth, excepting older ones that may be verrucose and with single cracks, compared to the textured conidia of *T. pyrenulae*.

The holotype of *T. pyrenulae* was successfully cultured and sequenced. It is the sister species to two unidentified lichenicolous *Melaspilea s. lat.* specimens from D.R. Congo

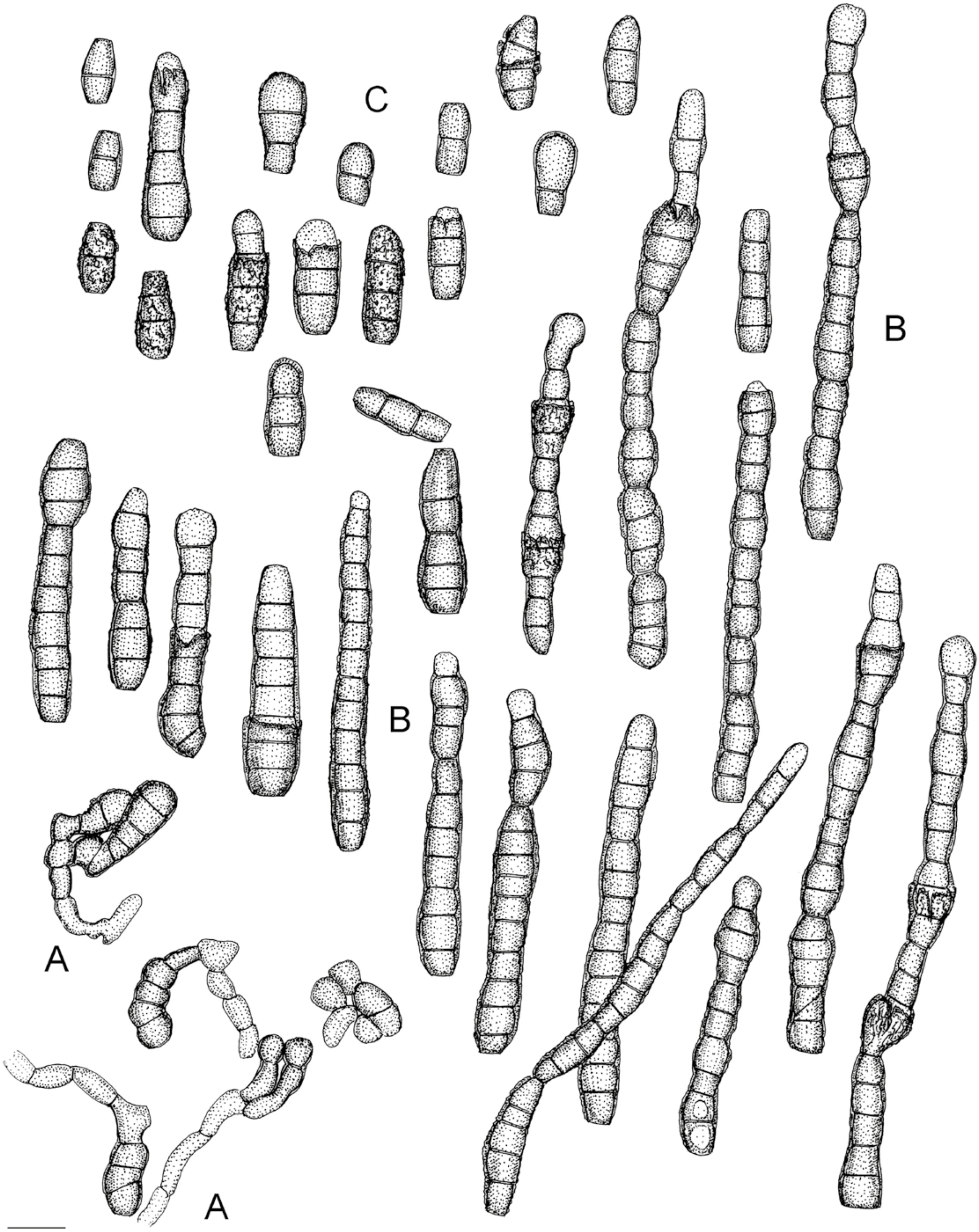

Fig. 45. *Taeniolella pyrenulae* [holotype]. **A.** Hyphae with semi-micronematous conidiophores and adhering conidia. **B.** Conidial chains. **C.** Conidia and fragments of conidial chains. Bar = 10 µm (B. Heuchert *del.*).

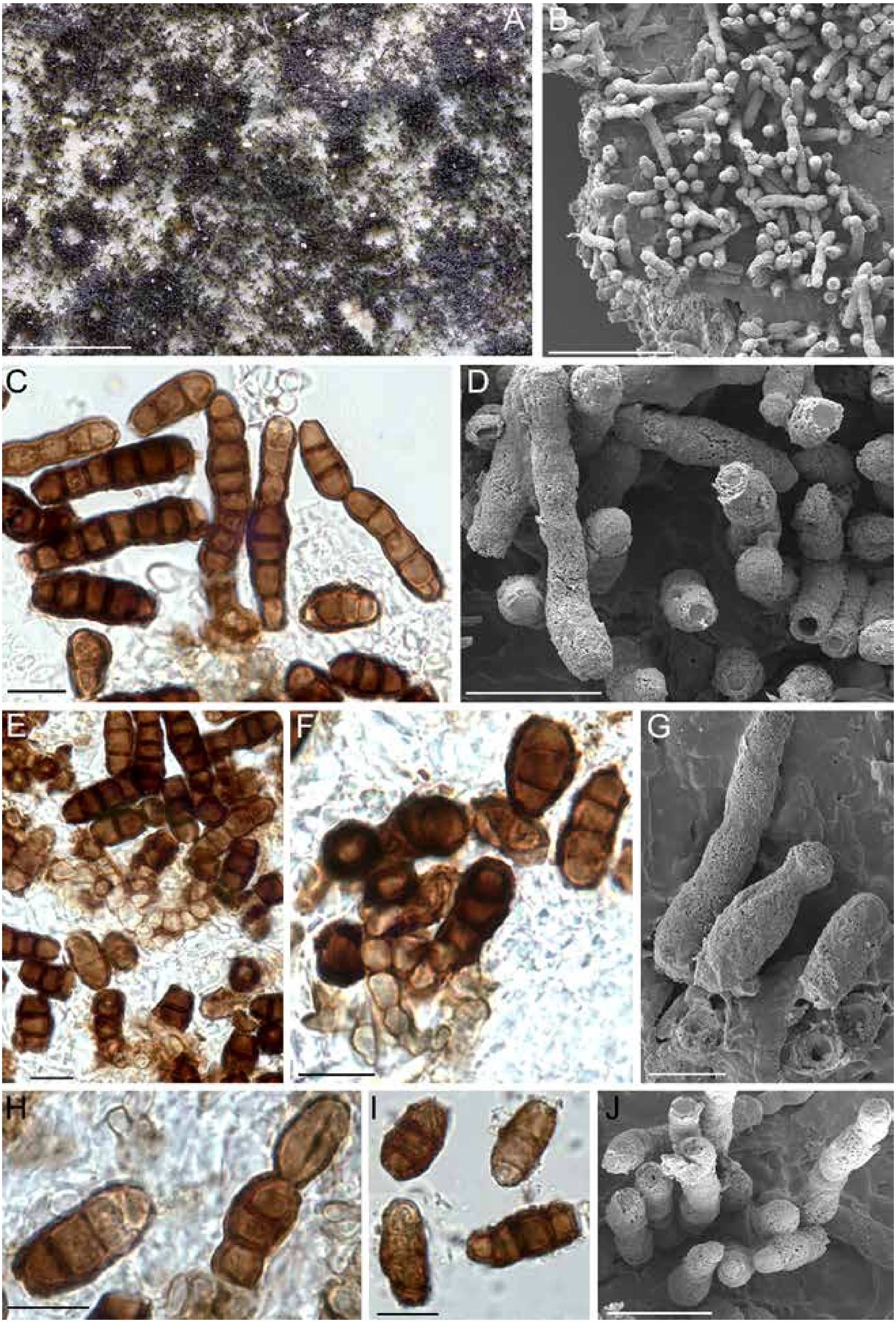

Fig. 46. *Taeniolella pyrenulae* [holotype]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C, D, G–J.** Conidia and conidial chains. **E–F.** Semi-micronematous conidiophores (swollen hyphal cells) with adhering conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (B), 20 µm (D, J), 10 µm (C, E–I).

growing on *Pyrenula.* However, this relationship is only supported by the Bayesian analysis.

Taeniolella rolfii Diederich & Zhurb., *Symb. Bot. Upsal*. **32**: 11. 1997. Figs 47–50.

Literature: Diederich & Zhurbenko (2001: 37–40).

Illustrations: Diederich & Zhurbenko (1997: 12–15, figs 1–4).

Exsiccatum: Norrlin, Herb. Lich. Fenn. 365.

Description: Conidiophores aggregated in delimited, gall-like swellings, capitate, mainly apical on the lobes (typical habit in *Cetraria odontella*, *C. muricata*, *C. nigricans*), labriform, mainly marginal on the lobes (typical habit in *C. islandica*, *C. aculeata*, *Cetrariella delisei*), convex, ± rounded, broad ellipsoid or oblong, 0.2–1(–1.5) mm diam, greenish brown, olive-brown to dark brown, sometimes grey-brown, woolly to caespitose, gall-like swellings inside completely white or whitish due the naked host medulla, without any discolorations of the lichen thallus. *Mycelium* forming a dense network; hyphae, flexuous, differentiation between the hyphae of the host and those of *T. rolfii* not possible, hyphae distinct, branched, 2–8 µm wide, septate, sometimes slightly to clearly constricted at the septa, hyaline, subhyaline to pale brown, lumen with greenish granular pigmentation, wall sometimes smooth, but mostly conspicuously rough, verrucose, near conidiophores becoming rhagadiose-squamulose to squamose, squamules 1–5 µm wide, often detached, wall 0.5–3 µm thick, cell plasma mostly reduced, with a central vacuole-like cavity. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, solitary or aggregated in dense caespituli, arising from hyphae, terminal and lateral, erect, sometimes curved, straight to slightly flexuous, usually unbranched or once branched in the lower or rarely upper part, subcylindrical, 9–122 × 4–6.5 µm, (0–)1–16-septate, constricted at the septa, frequently every second septum more strongly constricted, transition between subhyaline hyphae and pigmented conidiophores more or less abrupt, conidiophores pale brown below, dark brown above, walls similar to those of hyphae, rarely almost smooth, but usually conspicuously rough, rugose or irregularly verrucose, rhagadiose-squamulose to squamose, squamules irregularly shaped, 1–8 µm wide, often detached, wall 0.5–2 µm thick, with a granular inner pigmentation, frequently 1 to 3 times enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, rarely intercalary, doliiform or subcylindrical, mostly monoblastic or thalloblastic, rarely polyblastic with two loci, usually monopodial, 4–13 µm long, loci truncate to convex, unthickened, 2–4 µm wide. *Conidia* catenate, mostly in unbranched, sometimes in branched, rather persistent acropetal chains, distinction between conidiophores and long chains of conidia difficult, conidia straight or slightly curved, doliiform, ellipsoid, subcylindrical, 0–2(–3)-septate, aseptate conidia 5–10 × 3.5–6(–7) µm, 1-septate ones 7–18

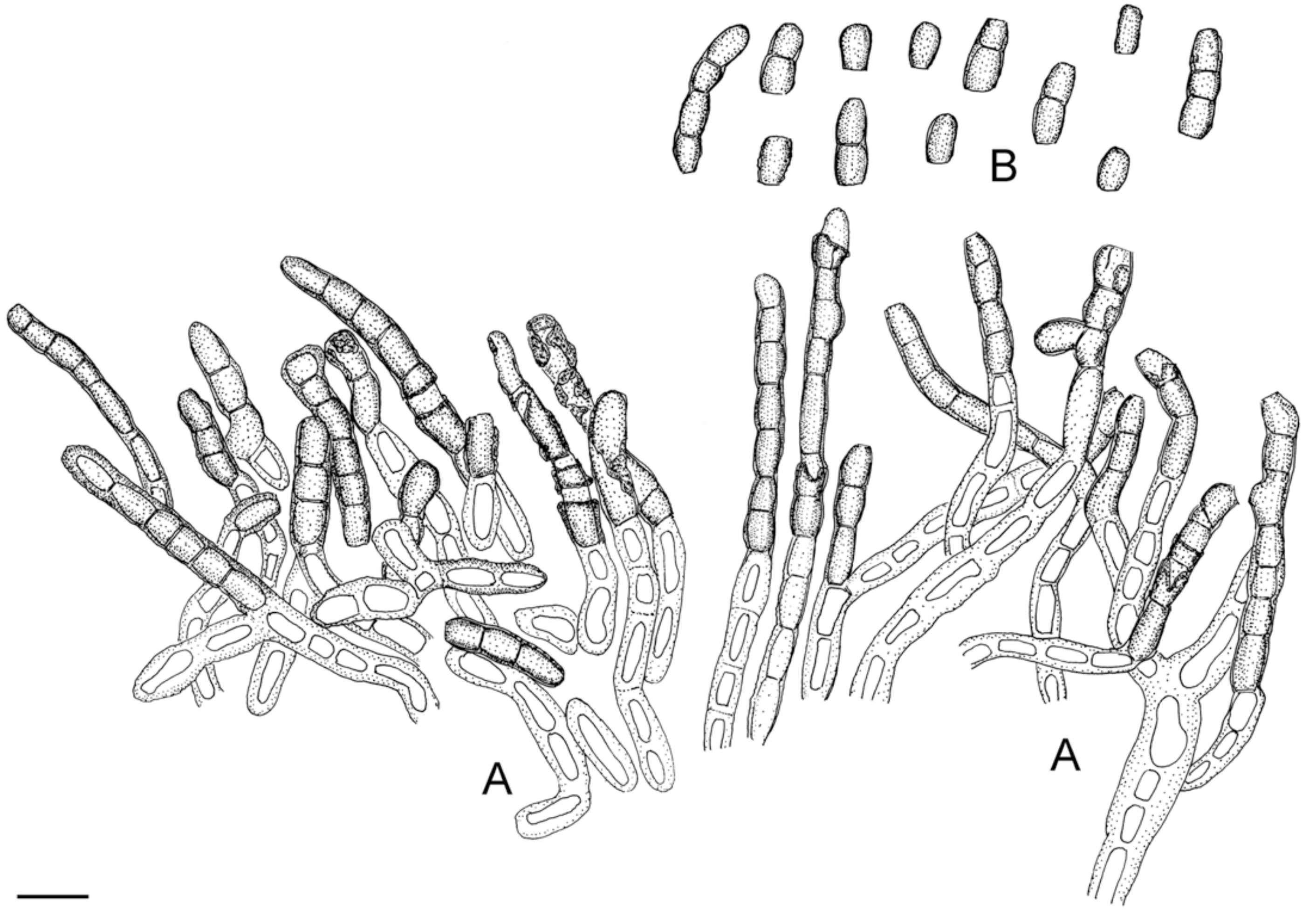

Fig. 47. *Taeniolella rolfii* [holotype]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

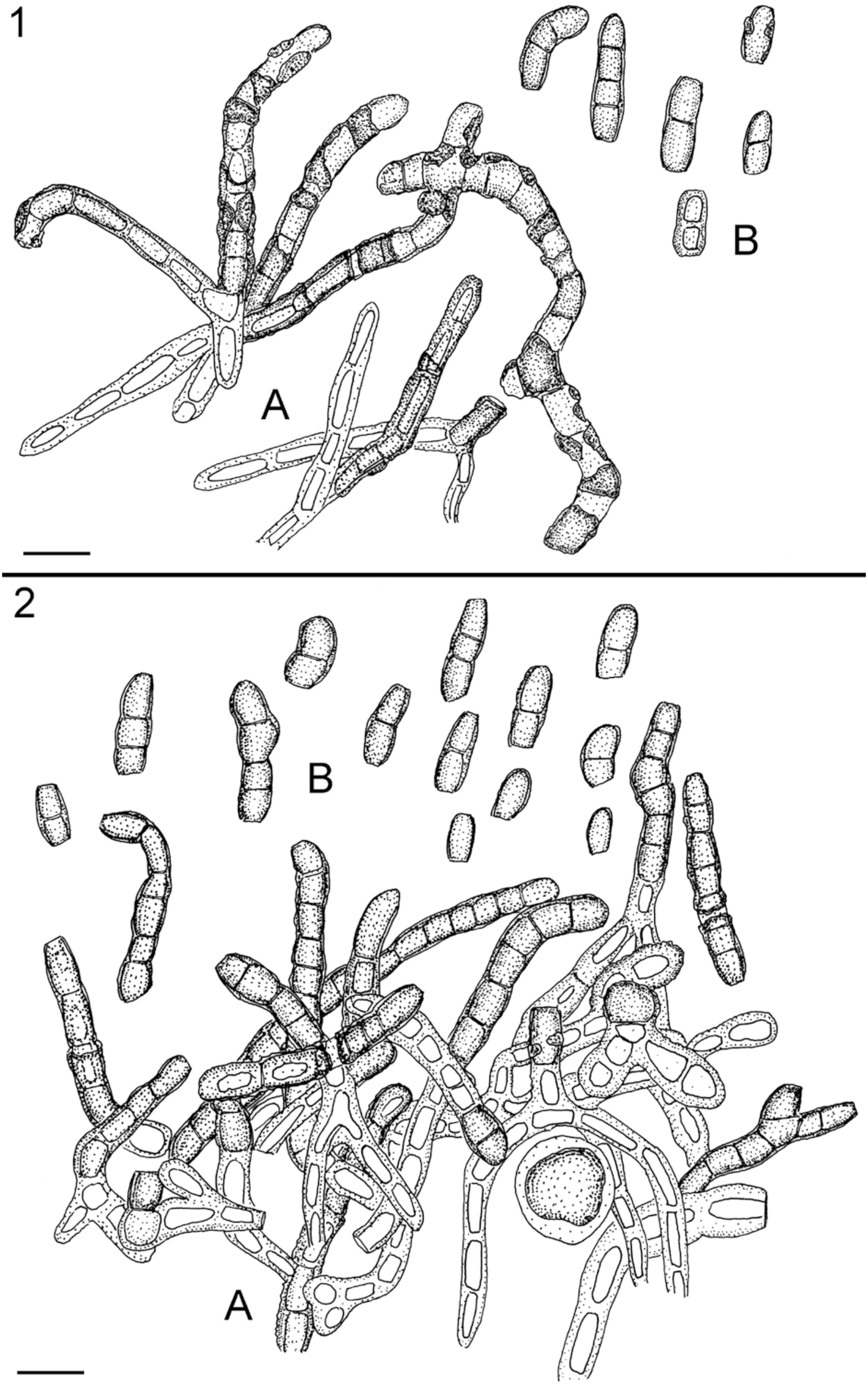

Fig. 48. *Taeniolella rolfii* [1: LE 207583; 2: LE 207585]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

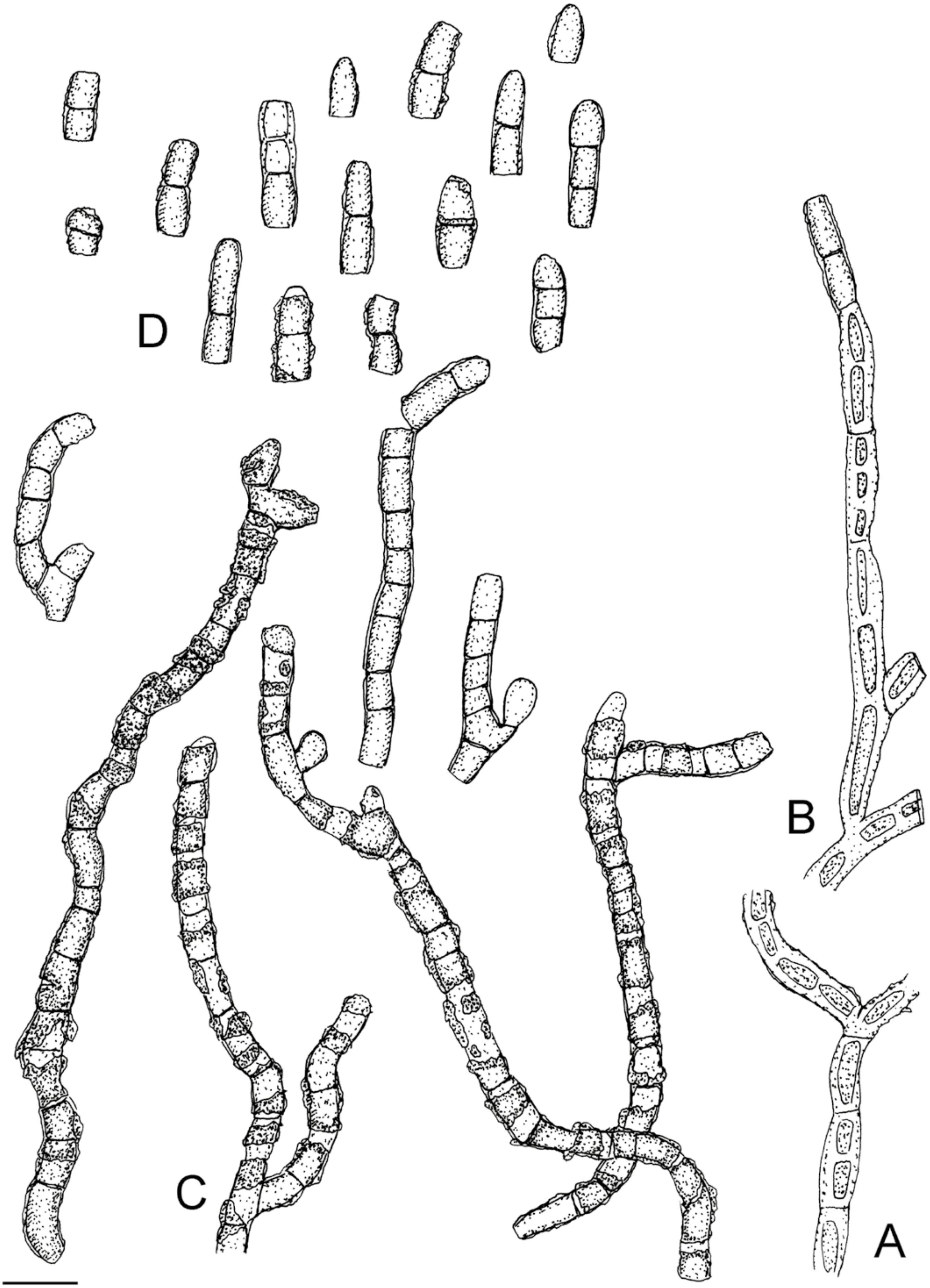

Fig. 49. *Taeniolella rolfii* [H-NYL 36335]. **A.** Hyphae. **B.** Conidiophores arising from hyphae. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

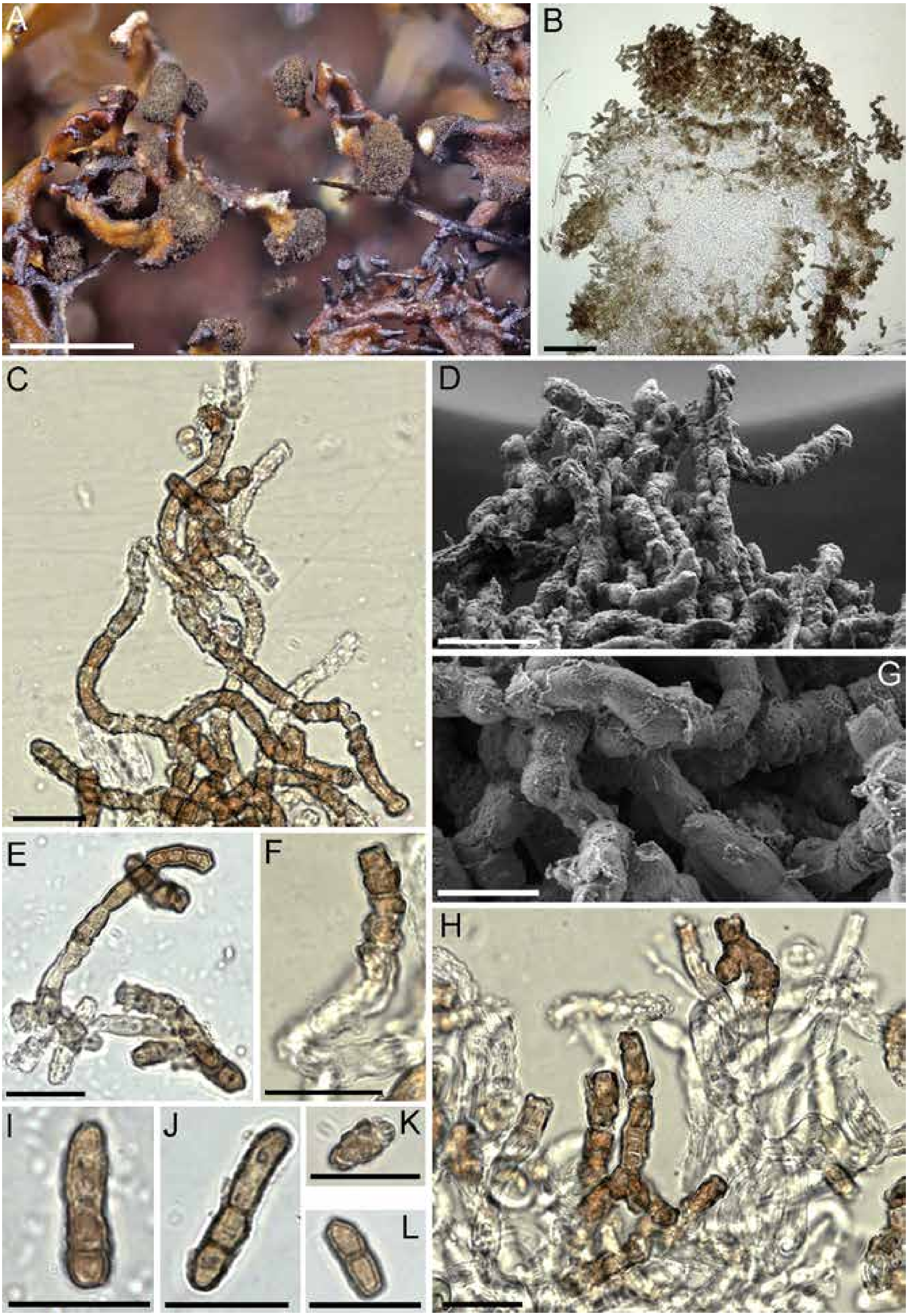

Fig. 50. *Taeniolella rolfii* [A, E, I, J, L: isotype; B: holotype; C, F, K, H: H-NYL 36335; D, G: LE 207585]. **A.** Macroscopic overview of colonies. **B.** Microscopic overview. **C–F, H.** Conidiophores arising from hyphae. **G.** Surface ornamentation of conidiophores. **I–L.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 50 µm (B), 20 µm (D), 10 µm (C, E–H).

× 4–6 µm, 2-septate ones 10–19 × 4–6 µm, 3-septate ones 16–22 × 5–5.5 µm, slightly to more conspicuously constricted at the septa, brown to dark brown, walls similar to those of the conidiophores, conspicuously rough, rugose or irregularly verrucose, rhagadiose-squamulose to squamose, squamules irregularly shaped, 1–8 µm wide, sometimes detached, wall 0.5–1.5 µm thick, with a granular inner pigmentation, cell plasma sometimes reduced, with a central vacuole-like cavity, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila truncate, unthickened, not darkened, 2–4 µm wide.

Holotype: **Russia**, near the coast of Severnaya Zemlya, on a small island in the Vil'kitskogo Strait, on *Cetraria nigricans*, Aug. 1951, *A. Musina* (LE 207586**!**). *Isotype*: herb. Diederich**!**

Host range and distribution: On *Cetraria aculeata*, *C. islandica*, *C. muricata*, *C. nigricans*, *C. odontella*, *Cetrariella delisei*; Canada (Diederich & Zhurbenko 2001, Zhurbenko 2013, Freebury 2014), Finland (Kärnefelt 1979, Diederich & Zhurbenko 2001, Santesson *et al*. 2004, Nordin *et al*. 2010), Greenland (Diederich & Zhurbenko 2001), Mongolia (Diederich & Zhurbenko 2001), Norway (Santesson *et al*. 2004 (”Lynge 1921”), Nordin *et al*. 2010), Poland (Kukwa *et al*. 2010), Russia (Andreev *et al*. 1996, Karatygin *et al*. 1999, Diederich & Zhurbenko 1997, 2001, Kristinsson *et al*. 2006, 2010, Zhurbenko 2001, 2007, 2008), Sweden (Diederich & Zhurbenko 2001, Santesson *et al*. 2004, Nordin *et al*. 2010), UK (Hawksworth 2003), USA (Diederich & Zhurbenko 2001, Zhurbenko 2009, Esslinger 2016, 2018).

Additional specimens examined: **Canada**, Nunavut, Cambridge Bay, Victoria Is., 69°12'13" N, 104°47'18" W, in wet low shrub-graminoid thicket, on *Cetrariella delisei*, 24 Jul. 1999, *W. Gould* (LE *s.n.*); Nunavut, Cambridge Bay, Victoria Is., 69°11'35" N, 104°45'40" W, in *Cassiope* heath, on *Cetraria islandica*, 25 Jul. 1999, *W. Gould* (LE 210241). **Finland**, in monte Pallastunturit Lapponiæ Kemensis, on *Cetraria nigricans*, 1877, *Hj. Hjelt & R. Hult, Norrlin*, Herb. Lich. Fenn. 365 (H) as *C. nigricans* var. *spilomorphoroides*; Lapponia, on *C. nigricans*, 1879, *Silén 504e* (H-NYL 36335, lectotype of *C. nigricans* var. *spilomorphoroides*, designated by Kärnefelt 1979); Regio kuusamoënsis, Salla k:n, Pallatunturi, kalfjallet, på hallae, on *C. nigricans*, 19 Aug. 1936, *Sten Ahlner* (UPS) as *C. nigricans* var. *spilomorphoroides*; Tavastia australis, Luhanka, on *Cetraria odontella*, 1873, *E. Lang* (H-NYL 36319, *isolectotype* of *C. odontella* var. *spilomophora*, selected by Kärnefelt 1986). **Mongolia**, Khangai Upland, Arakhantai Region (“aimak”), Bulgan District (“somon”), pass through Khantai Range between the headwaters of Ured-Tamir and Tuin-gol Rivers, ca. 47° N, 100° E, alt. 2650 m, Kobrezia-meadow, on *Cetraria aculeata*, 23 Aug. 1977, *L.G. Byazrov 7464* (LE 210244). **Russia**, Murmansk Region, Kola Peninsula, Khibiny Mts., 6 km N of Kirovsk, western slope of Mt. Kukisvumchorr, 67°40' N, 33°40' E, alt. 500 m, combination of mountain tundra with subalpine *Betula*-forest, on *C. aculeata*, 13 Aug. 1997, *M. Zhurbenko 9710* (LE 207582, LE 207583); E Siberia, Sakha-Yakutiya Republic, Lena River delta, 3 km W of Cape Krest-Tumsa, Stolb (Ebe-Khaya) Is., 72°24' N, 126°40' E, alt. 50 m, tundra on steep rocky slope, on *C. islandica*, 12 Aug. 1998, *M. Zhurbenko 9873* (LE); *Arkhangel'sk Region*: Nenets Autonomous District ("Okrug"), NW of Malozemel'skaya Tundra, Timan coast, eastern bank of Peschanka-To Lake by the right bank of the Peschanka River, 68°46' N, 53°10' E, dwarf-shrub-lichen tundra on sand terrace, on *Cetraria muricata*, 5 Jul. 1997, *O.V. Lavrinenko 107* (LE 210245); Murmansk Region, Kola Peninsula, 17 km N of Tumannyi settlement, 69°01' N, 35°46' E, alt. 100 m, *Betula nana*-dwarf shrub-moss-lichen tundra on high sandy terrace along the Voron'ya River, on *C. muricata*, 10 Sep. 1997, *M. Zhurbenko 9728* (LE 207584); Krasnoyarsk Territory, Izvestii TsIK Archipelago in Kara Sea, Troinoi Is., ca. 76°00' N, 82°50' E, alt. 20 m, on *C. nigricans*, 10 Jul. 1992, *Y.P. Kozhevnikov* (LE 207585; herb. Diederich); W Siberia, left bank of the Enisey River, near Zotino settlement, ca. 61° N, 89°50' E, alt. 100 m, lichen *Pinus* forest, on *Cetraria odontella*, 16 Jun. 1992, *V.B. Kuvajev 1819* (LE 210243); Krasnoyarsk Territory, north of Central Siberia, Severnaya Zemlya Archipelago, NW extremity of Bol'shevik Is., unnamed peninsula with Cape Baranova at eastern coast of Shokal'skogo Strait, lichen-moss polygonal net on coastal terrace, 79°16' N, 101°40' E, alt. 10 m, on *Cetrariella delisei*, 14 Jul. 1996, *M. Zhurbenko 96342* (LE 210242).

Notes: Based on several collections on various *Cetraria* spp., *Taeniolella rolfii* was described by Diederich & Zhurbenko (1997). During the course of the examination of numerous collections, they lectotypified *Cetraria odontella* var. *spilomorpha*, *C. odontella* var. *sorediata*, *C. nigricans* var. *spilomorphoides*, *C. nigricans* ssp. *capitata*, *C. capitata* and *Cornicularia racemose*. These taxa were considered to be introduced due to symptoms caused by the occurrence of *T. rolfii*, on thalli of the hosts (Diederich & Zhurbenko 2001).

Thus, *C. odontella* var. *sorediata* and *C. odontella* var. *spilomorpha* were reduced to synonymy with *C. odontella*, whereas *C. capitata*, *C. nigricans* ssp. *capitata* and *C. nigricans* var. *spilomorphoides* were considered to be synonyms of *C. nigricans*, and *Cornicularia racemosa* was assigned to *Cetraria aculeata*. The status of some additional older names, possibly also based on the occurrence of *T. rolfii* (*e.g.*, *C. islandica* f. *soralifera*), is not yet clear since the type collections concerned have not been available to Diederich & Zhurbenko (2001).

The report of *T. rolfii* from Norway (Santesson *et al*. 2004) refers to Lynge (1921: 186), published as “*Cetraria odontella*, sometimes sorediate”.

Taeniolella rolfii resembles *T. serusiauxii*, but differs in having often longer and wider conidiophores (12–122 × 4–6.5 µm vs. 9–61(–80) × 2.5–5(–5.5) µm in *T. serusiauxii*) with rimulose to squamulose outer walls forming deep cracks. In *T. rolfii*, conspicuous germ tubes as often seen in *T. serusiauxii* could not be observed. In contrast to statements in Diederich (1992) and Diederich & Zhurbenko (1997), dimensions of conidia in both species are rather similar. There are also similarities in the ornamentation of the outer walls of conidia, but *T. rolfii* is easily distinguishable by inducing convex gall-like swellings on the margin of the host thallus (Diederich & Zhurbenko 1997), and by forming dark brown colonies. The colonies of *T. serusiauxii* are dark reddish brown, scattered or circular (up to 1 mm diam) to linearly aggregated and confluent on the surface of the lichen thallus. Furthermore, hyphae of *T. serusiauxii* are significantly different from the host thallus and narrower and smoother than those of *T. rolfii*. Additionally, *T. rolfii* is widespread in northern Europe and Canada on different species of *Cetraria* and *Cetrariella*, which are unknown as hosts for *T. serusiauxii*. The latter species is known from Brazil, France, Papua New Guinea, and Tanzania.

Taeniolella atricerebrina (Hafellner 2007) is the only other *Taeniolella* species that causes galls. The black, sometimes glossy galls, mostly arising from flanks of areoles, are 0.5–1.2 mm diam when young and up to 4 mm diam when old. Hyphae penetrating the galls are flexuous, toruloid, brown to dark brown, with walls 0.5–1 µm thick and slightly rimulose. Conidiophores in *T. atricerebrina* are shorter and wider (15–47 × 5–10 (–12) µm vs. 12–122 × 4–6.5 µm in *T. rolfii*) and its conidia are usually also wider. *Taeniolella atricerebrina* is only known on *Tephromela atra* from Austria and Poland.

Taeniolella santessonii, known only from the type specimen collected in Peru, is another species that forms sporodochioid colonies, but its conidiophores are shorter (5–38 × 5–7 µm) and conidia are usually wider, 5–8 µm (in *T. rolfii* 3.5–6(–7) µm).

Function, status and habit of *T. rolfii* are still unclear and have to be verified by means of culture experiments or molecular methods. However, examinations of various samples assigned to this species led to the hypothesis that *T. rolfii* probably represents an asexual morph of the mycobionts of the particular "host species", *i.e.*, of the *Cetraria* or *Cetrariella* species involved. Several microscopic characters, such as a continuous, gradual development from colourless, well-structured vegetative hyphae to pigmented conidiophores with a coarse surface structure and a lacking differentiation between vegetative hyphae of the mycobiont and the potential lichenicolous fungus (parasymbiont) are in favour of this assumption.

The formation of anamorphs by lichen mycobionts, mainly belonging to ascomycetes, is known and not unusual, above all the presence of pycnidia, which are, for instance, not uncommon in *Cetraria* (Kärnefelt *et al*. 1993), *Gyalectidium* and *Gomphillus* spp. (Ferraro 2004), as well as *Inoderma* (Frisch *et al*. 2015). Evidence for hyphomycetous asexual morphs of lichen-forming fungi is very limited (Vobis & Hawksworth 1981). Hyphomycetous asexual morphs seem to be extremely rare among lichen-forming ascomycetes with known sexual morphs (Honegger 1985, Ertz *et al.* 2011). Hyphomycetous asexual morphs ascribed to lichen species have been reported and described by various authors, including Tschermak-Woess & Poelt (1976), Coppins (1987), Sérusiaux (1979), Hestmark (1990), Kirk *et al*. (2001), Aptroot *et al*. (2007), and Frisch *et al.* (2015). The term "diahypha" introduced by Vězda (1973) refers to the currently used term "hyphophore" (Ferrara 2004). These structures are synnematous or sporodochial conidiomata widespread within the *Gomphillaceae*. Kirk *et al*. (2001) defined hyphophores as "erect stalked peltate asexual sporophores in the *Asterothyriaceae*" (*e.g.*, *Echinoplaca*, *Gyalideopsis*, *Tricharia*). In any case, such structures are undoubtedly not rare within the *Gomphillaceae* and have to be considered as asexual morphs of the mycobionts.

Coniocybe furfuracea is one of the few lichens with a sexual morph and a hyphomycetous asexual morph. Erect hyphae (conidiophores), mainly found in specimens collected in late winter or spring (March to April), produce a mass of conidia, often in chains. Honegger (1985) confirmed the connection between asexual and sexual morphs in culture experiments. Based on morphological and molecular evidence the genus *Blarneya*, known to produce only sporodochia, was synonymized with *Tylophoron*, a lichenized genus forming ascomata (Ertz *et al.* 2011).

Taeniolella santessonii Etayo & Heuchert, *Bull. Soc. Linn. Provence* **61**: 38. 2010. Figs 51–52.

Illustration: Etayo (2010a: 39, figs 29–30).

Description: *Colonies* on the surface of the thallus, becoming black-gray and necrotic, colonies black, variable, ranging from sporodochioid, subglobose-oval, planate-convex, up to 0.75 mm diam, to effuse, confluent, pulverulent, sooty-granular. *Mycelium* immersed; hyphae branched, 2–5 µm wide, septate, with slight constrictions at the septa, hyaline to subhyaline, rarely pale brown, fertile hyphae gradually becoming more pigmented, smooth, wall thickened, 0.5–1 µm wide, lumina reduced. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, solitary or in small fascicles, densely aggregated, arising from hyphal cells, erect, straight to slightly flexuous, doliiform, subcylindrical or cylindrical, mostly unbranched or occasionally once branched in the lower part, conidiophores (without adhering conidia) 5–21 × 5–7 µm, 0–2-septate, slightly constricted at the septa, conidiophores with adhering conidia 25–38 × 5–7 µm or even longer, 4–7-septate, pale brown to brown, surface granular, outer wall irregularly rough-walled, soon becoming rimulose to strongly sculptured, rhagadiose-squamulose to squamous, squamules loose, 1–4 × 2–7 µm, up to 1.5 µm thick, wall thickened, 0.75–1.75 µm, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of thick walls, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* little differentiated, integrated, terminal, doliiform, 5–10 µm long, thalloblastic, monopodial, conidiogenous loci truncate, unthickened, 2–3.5 µm diam. *Conidia* catenate, mostly in unbranched, rarely in branched chains, straight, doliiform, subglobose, subcylindrical, 0–3-septate, aseptate conidia 7–11 × 5–7 µm, 1-septate ones 10–16 × 5–7.5 µm, 2-septate ones 16–17 × 7–8 µm, 3-septate ones 17–21 × 7–7.5 µm, slightly or not constricted at the septa, dark brown, ornamentation of the wall as in conidiophores, wall thickened, 0.75–1.5 µm, lumen less reduced than in hyphae and conidiophores, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate to slightly obconically truncate, hila truncate, unthickened, not darkened, (2–)2.5–4 µm diam.

Holotype: **Peru**, Prov. Cañete, dep. Lima, mountain 2–3 km NE of Cerro Azul, 13°2' S, 76°28' W, alt. ca. 300 m, on *Roccellina cerebriformis* f. *sorediata* (?), 9 Mar. 1981, *R. Santesson & G. Thor P69:45* (UPS**!**).

Host range and distribution: On *Roccellina cerebriformis* f. *sorediata* (?); Peru (Etayo 2010a), known only from the type collection.

Notes: The transition between hyphae and conidiophores is more or less clearly discernable since the conidiophores are obviously pigmented (pale brown to brown), whereas the hyphae are subhyaline, and become only gradually more pigmented in fertile portions towards conidiophores. The transition between conidiophores and conidia is less obvious. The outer wall of the conidia is obviously more rhagadiose than in the conidiophores which become distinctly rhagadiose with age. The colonies are rather variable, ranging from distinctly sporodochioid, convex to effuse and confluent.

The South American *Taeniolella santessonii* is similar to the European *T. pertusariicola*, but the two species are geographically clearly separated, morphological differentiated, and ecologically distinct, *viz.*, they occur on host species of two different unrelated families. *T. pertusariicola* is characterised by its consistently effuse colonies, pale brown to brown hyphae, and conidia with small squamules 1–3 µm diam (vs. colonies at least partly sporodochioid, hyphae hyaline or subhyaline and squamules larger, 2–7 × 1–4 µm in *T. santessonii*).

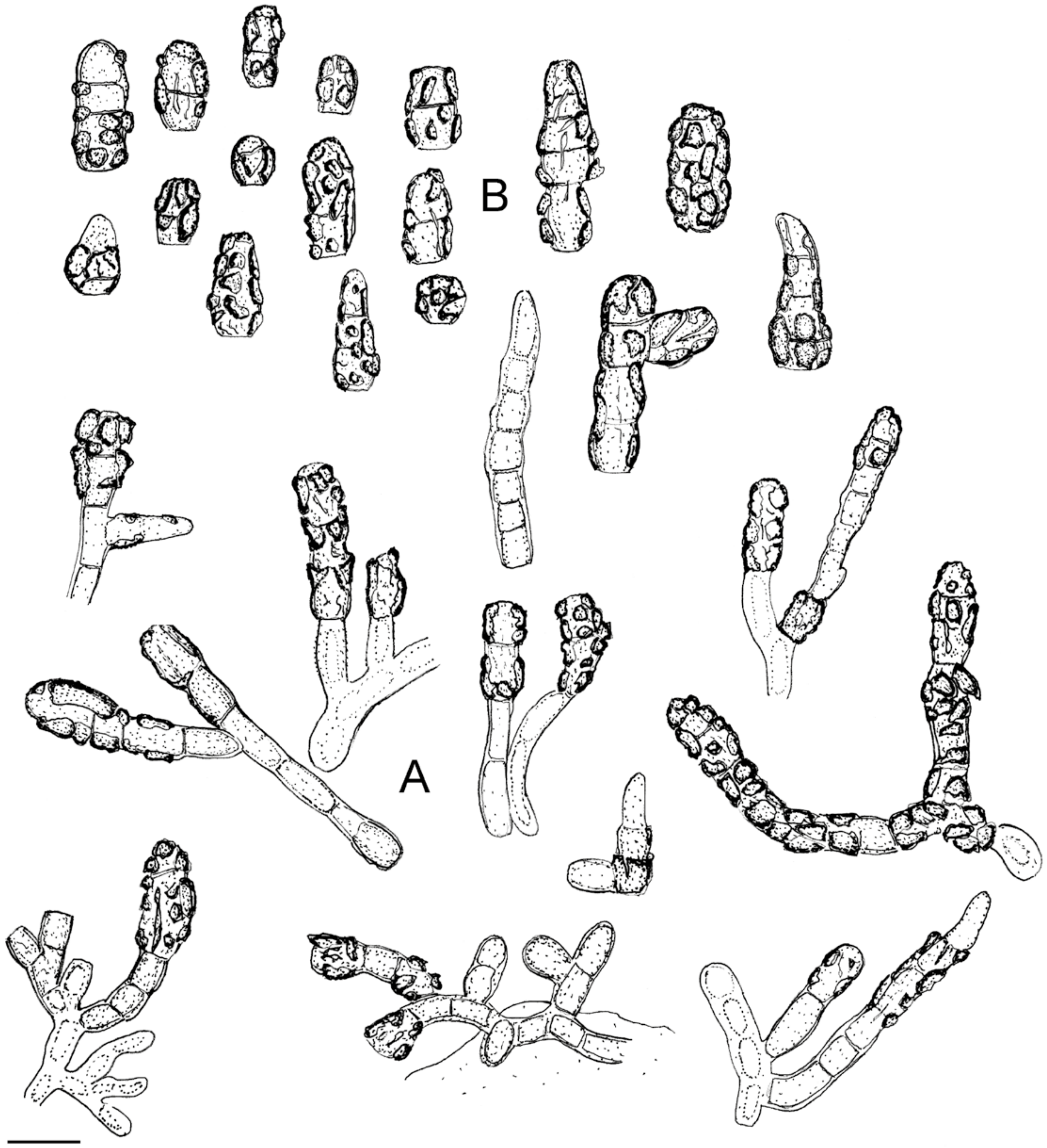

Fig. 51. *Taeniolella santessonii* [holotype]. **A.** Conidiophores arising from hyphae. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

There are several additional species that induce the formation of sporodochioid colonies or colonies on gall-like swellings. *Taeniolella rolfii*, widespread in northern Europe and Canada on different species of *Cetraria*, induce gall-like swellings, 0.2–1(–1.5) mm wide, but its conidiophores are obviously longer (9–122 × 4–6.5 µm) and the conidia are usually narrower, 3.5–6(–7) µm wide (in *T. santessonii* 5–8 µm). Furthermore, doliiform and subglobose conidia are lacking in *T. rolfii*. Infections by *Taeniolella atricerebrina* obviously induce the formation of galls on the host (Hafellner 2007). Young galls are 0.5–1.2 mm diam, older galls up 4 mm diam. The colonies are effuse on the surface of the galls. Pale brown vegetative hyphae distinguishable from host hyphae are only intramatrical. Furthermore, the squamules of the outer wall of *T. atricerebrina* are somewhat smaller, 1–4 µm wide, and the conidiophores are wider, 5–9 µm, up to 12 µm at the very base (vs. 5–7 µm in *T. santessonii*).

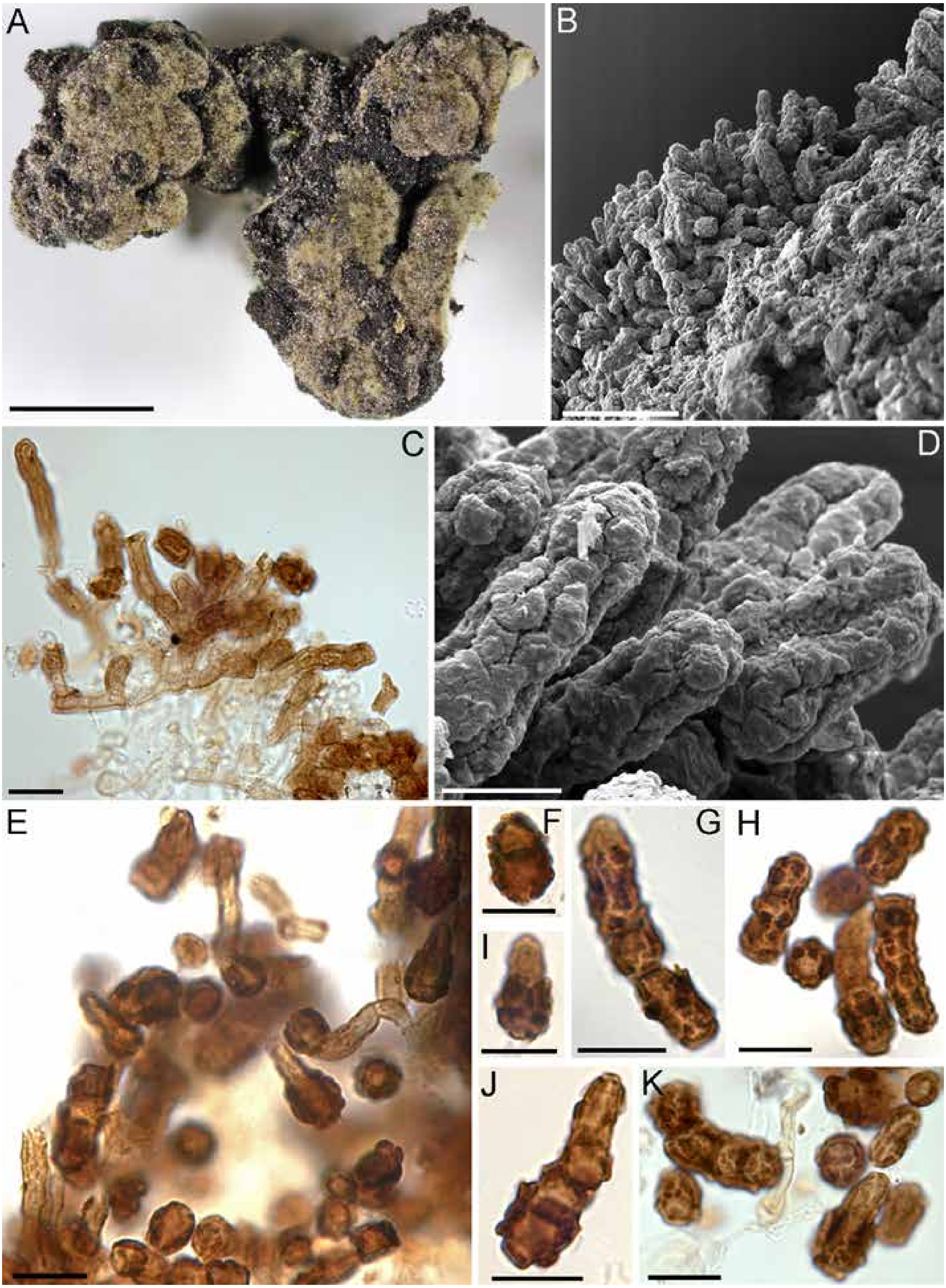

Fig. 52. *Taeniolella santessonii* [holotype]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, E.** Conidiophores arising from hyphae. **D.** Rhagadiose-squamulose surface of conidia. **F–K.** Conidia and conidial chains. Bars: 1 mm (A) [photo taken by Paul Diederich], 30 µm (B), 10 µm (C–K).

Taeniolella serusiauxii Diederich, *Bull. Soc. Nat. Luxemb*. **93**: 158. 1992. Figs 53–54.

Illustration: Diederich (1992: 159–161, figs 3–5).

Exsiccatae: Santesson, Fungi Lichenicoli Exs. 175, 247.

Description: *Colonies* on the surface of the host thallus scattered or circular (up to 1 mm diam) to linearly aggregated, confluent, dark reddish brown, caespitose, without any discolorations of the lichen thallus. *Mycelium* inconspicuous, immersed and partly superficial; hyphae, flexuous, branched, 1–2.5 µm wide, rarely septate, without constrictions or slightly constricted at the septa, hyaline to subhyaline, smooth, walls unthickened or slightly thickened. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, solitary, arising from hyphae, lateral and terminal, erect, straight to slightly flexuous, mostly unbranched, occasionally branched, mostly in the lower part, subcylindrical, 9–61(–80) × 2.5–5(–5.5) µm, 0–5-septate, often constricted at the septa, subhyaline to pale brown, verruculose to verrucose, wall somewhat thickened, 0.5–0.75 µm, with a granular inner pigmentation, enteroblastical proliferation not observed. *Conidiogenous cells* integrated, terminal, doliiform or subcylindrical, monoblastic to thalloblastic, monopodial, 6–25 µm long, loci truncate, unthickened, 1.5–3 µm diam. *Conidia* catenate, mostly in unbranched, sometimes in branched, rather persistent acropetal chains, not easily disintegrating, straight, ellipsoid, subcylindrical, 0–1(–2)-septate, aseptate conidia 5–14 × 3.5–6 µm, 1-septate ones 7–22 × 4–6.5 µm, 2-septate ones 19 × 6 µm, constricted at the septa, pale brown to brown, wall irregularly rough-walled, soon becoming rimulose to strongly sculptured, rhagadiose-squamulose to squamose, coarse ornamentation above all very evident in older conidia, squamules 0.5–5 µm wide, irregularly shaped, squamules firm, not detached, with a granular inner pigmentation, wall thickened, up to 1 µm, apex rounded in primary conidia, truncate in secondary ones, base somewhat obconically truncate, hila truncate, unthickened, not darkened, 2–3.5 µm diam, conidia often germinating, germ tubes subhyaline, up to 50 × 1.5–2 µm, smooth, unthickened.

Holotype: **France**, dép. Landes, Thétieu (E de Dax), vallée de l'Adour, alt. 10–15 m, chênaie riveraine établie au détriment d`une ormaie-frênaie, on *Dendrographa decolorans*, Jul.–Aug. 1985, *E. Sérusiaux 7461* (LG**!**). *Isotype*: herb. P. Diederich**!**

Host range and distribution: On *Dendrographa decolorans*, *Tylophoron moderatum*, *T. protrudens*, unidentified sterile corticolous, crustose lichens sometimes with *Trentepohlia*; Brazil, British Overseas Territories (first report, see specimens examined), France (Diederich 1992, Roux *et al*. 2017), Papua New Guinea (Aptroot *et al*. 1997, Aptroot 2009), Tanzania (Santesson 1994a, b), USA (Diederich 2003, Esslinger 2016, 2018).

Additional specimens examined: **Brazil**, Minas Gerais, Catas Altas, Serra do Caraça, Parque Natural do Caraça near Gruta de Lourdes, alt. ca. 1450 m, on sandstone, 20°06' S, 43°29' W, on *Tylophoron moderatum*, 19 Sep. 1997, *A. Aptroot 41554* (BR); São Paulo, Serra da Mantiqueira, Campos do Jordão, alt. ca. 1500 m, 22°40' S, 45°30' W, in *Araucaria* forest, on *T. moderatum*, on *Araucaria*, 25/26 Sep 1997, *A. Aptroot 41742* (BR). **British Overseas Territories**, St. Helena, Peak Dale, near old Luffkins, slope with large basalt boulders and trees, 15°59.422' S, 5°44.719' W (AstroDos 71/4), alt. 600–700 m, on rock, on an unidentified sterile lichen thallus, 21 Oct. 2006, *A. Aptroot 66494* (BR). **France**, dép. Landes, same locality as type, *E. Sérusiaux 7462*, *7463* (LG – topotypes). **Papua New Guinea**, Northern Province, Owen Stanley Range, Myola, surroundings of guesthouse, 9°09' S, 147°46' E, alt. 2100 m, scattered trees in grassland, fences, margin of forest, on wood, on *Tylophoron* sp., 14–19 Oct. 1995, *A. Aptroot 37210* (BR); Central Province, ca. 22 km E of port Moresby, Varirata National Park, near Varirata Lookout, 9°26' S, 147°21' E, alt. ca. 800 m, dry secondary forest and conglomerate rock outcrops, on conglomerate rock, on *Tylophoron* sp., 23 Oct. 1995, *A. Aptroot 39714* (BR). **Tanzania**, Arusha Prov., Mt Meru, E slope, road to the crater, Jukukmia River, alt. 2100–2200 m, 3°14' S, 36°48' E, in a montane forest, on an unidentified sterile lichen thallus, on *Podocarpus gracilior*, 17 Jan. 1970, *R. Santesson 21576* (C, herb. Christiansen 7105, UPS); ibid., *R. Santesson 21544* (M-0043801, distributed in Santesson, Fungi Lichenicoli Exs. 247); on an unidentified sterile lichen thallus, on *Juniperus procera* by a road in a montane forest, 17 Jan. 1970, *R. Santesson 21572* (C, H 7038055, herb. Diederich, M-0043802, distributed in Santesson, Fungi Lich. Exs. 175); Tanga Prov.: Usambara Mts, Amani, Karimi Estate (road towarts Monga), 5°7' S, 38° 37' E, alt. 800–900 m, on an unidentified sterile lichen thallus, on the trunk of a tree in a rather open secondary forest, 10 Jan. 1971, *R. Santesson 23339* (UPS). **USA**, Hawaii, Oahu Island, Keaiwa Heiau state recr. area near Aiea, on tree in open forest, 21°22' N, 157°53' W, alt. 500 m, on *Tylophoron protrudens*, 8–13 June 1989, *A. Aptroot 26402* (BR); Florida, Clay County, Gold Head Branch State Park, around Devil´s Washbasin (sinkhole lake), 29°50' N, 81°57' W, moist scrub with live oaks, *Serenoa repens* and *Ericaceae*, on *Quercus*, on an unidentified sterile lichen thallus with *Trentepohlia*, 28 Nov. 1992, *R.C. Harris 29170* (herb. Diederich); ibid., along trail through ravine, 29°50' N, 81°57' W, humid hardwoods, on *Ilex*, on an unidentified sterile lichen thallus with *Trentepohlia*, 29 Nov. 1992, *R.C. Harris 29211* (herb. Diederich); Florida, Sarasota County, Myakka River State Park, along Fla. Hwy 72 ca. 0.7 mi SE of park entrance, 0.1 mi SE of Myakka River, 27°14' N, 82°19' W, oak-Sabal hammock, on *Quercus*, on an unidentified sterile lichen thallus with *Trentepohlia*, 5 Dec. 1992, *R.C. Harris 29859* (herb. Diederich); Florida, Wakulla County, Apalachicola National Forest, along Country Rd. 368, 3.6 mi. NW of junction of US 319 at Crawfordville, 30°12' N, 84°27' W, *Taxodium* depressions surrounded by mature live oak forest, very sandy, ABLS field trip, Site 5, on an unidentified sterile lichen thallus, 31 Dec. 1990, *S. Tucker 30279* (SBBG, herb. Diederich).

Notes: Hyphae, conidiophores and conidial chains are easily distinguishable due to clear differences in the ornamentation and pigmentation of the outer walls of these structures. Conidiophores observed in the collections examined were somewhat shorter than given in Diederich (1992) in the original description (9–61(–80) × 2.5–5(–5.5) µm). Conidia are usually adhering in long, unbranched, rather firm chains. Branched chains of conidia were frequently observed in a collection from Tanzania [*R. Santesson 21576* (C, herb. Christiansen 7105)]. In some collections, conspicuous conidial germination was observed. The mass of conidia germinated with long, subhyaline and smooth germ tubes. By scanning electron microscopy the observed granular pigmentation of conidiophores and young conidia was not discernable, indicating an location of these structures inside the wall (Diederich 1992).

Taeniolella arthoniae is also known on *Dendrographa decolorans* (Diederich 1989), but is distinguishable from *T. serusiauxii* by having wider (8–80 × 2.5–6.5(–8) µm), often variously branched conidiophores, and verrucose to rugose, but never rimulose to squamulose conidia.

Taeniolella rolfii resembles *T. serusiauxii*. For a detailed discussion of the differences, see *T. rolfii*.

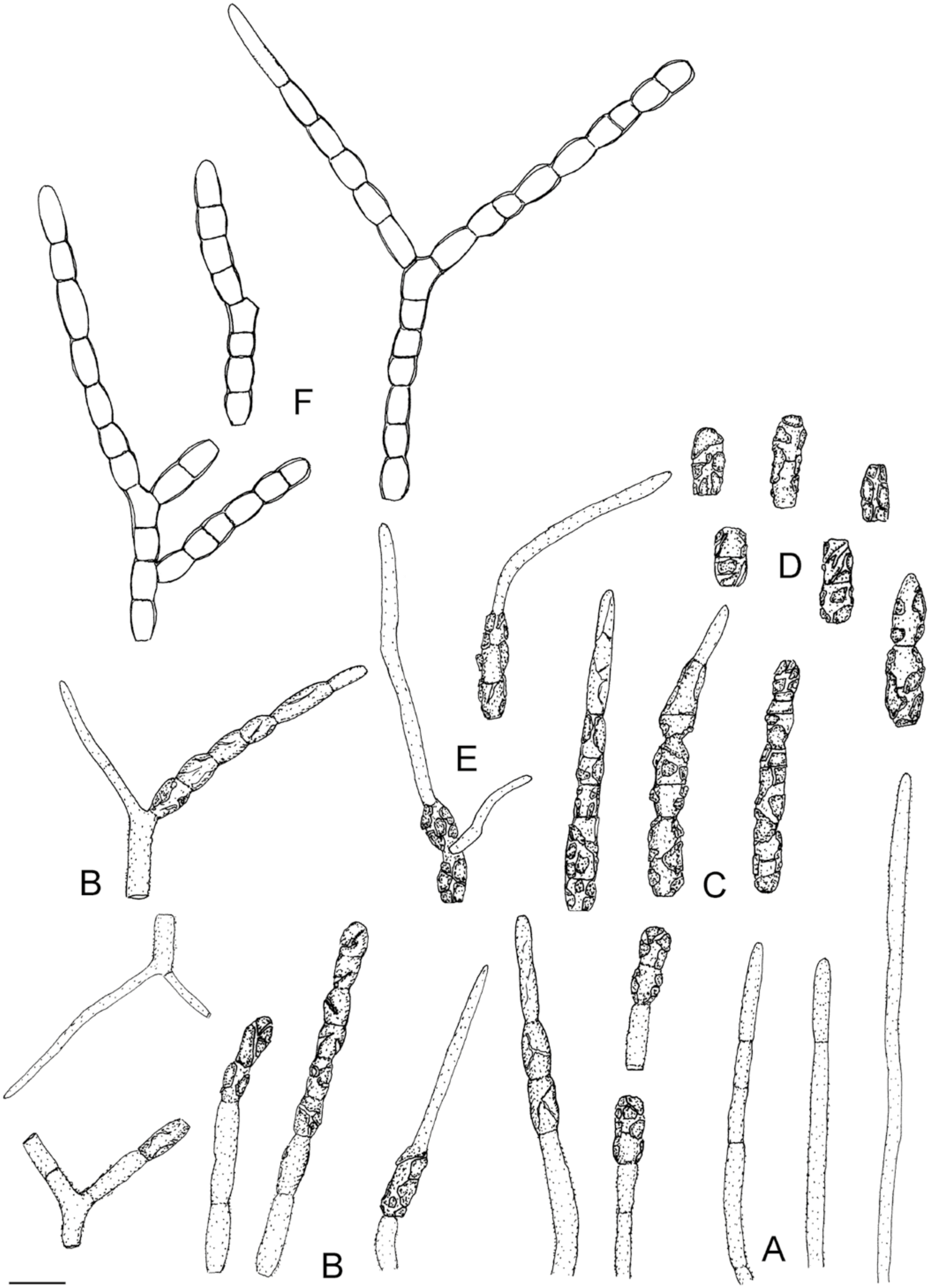

Fig. 53. *Taeniolella serusiauxii* [A–E: isotype; F: C, herb. Christiansen 7105]. **A.** Conidiophores, arising terminal from hyphae and incipient septation. **B.** Conidiophores with adhering conidia. **C.** Conidial chains. **D.** Conidia. **E.** Conidia with germination tubes. **F.** Branched conidial chains. Bar = 10 µm (B. Heuchert *del.*).

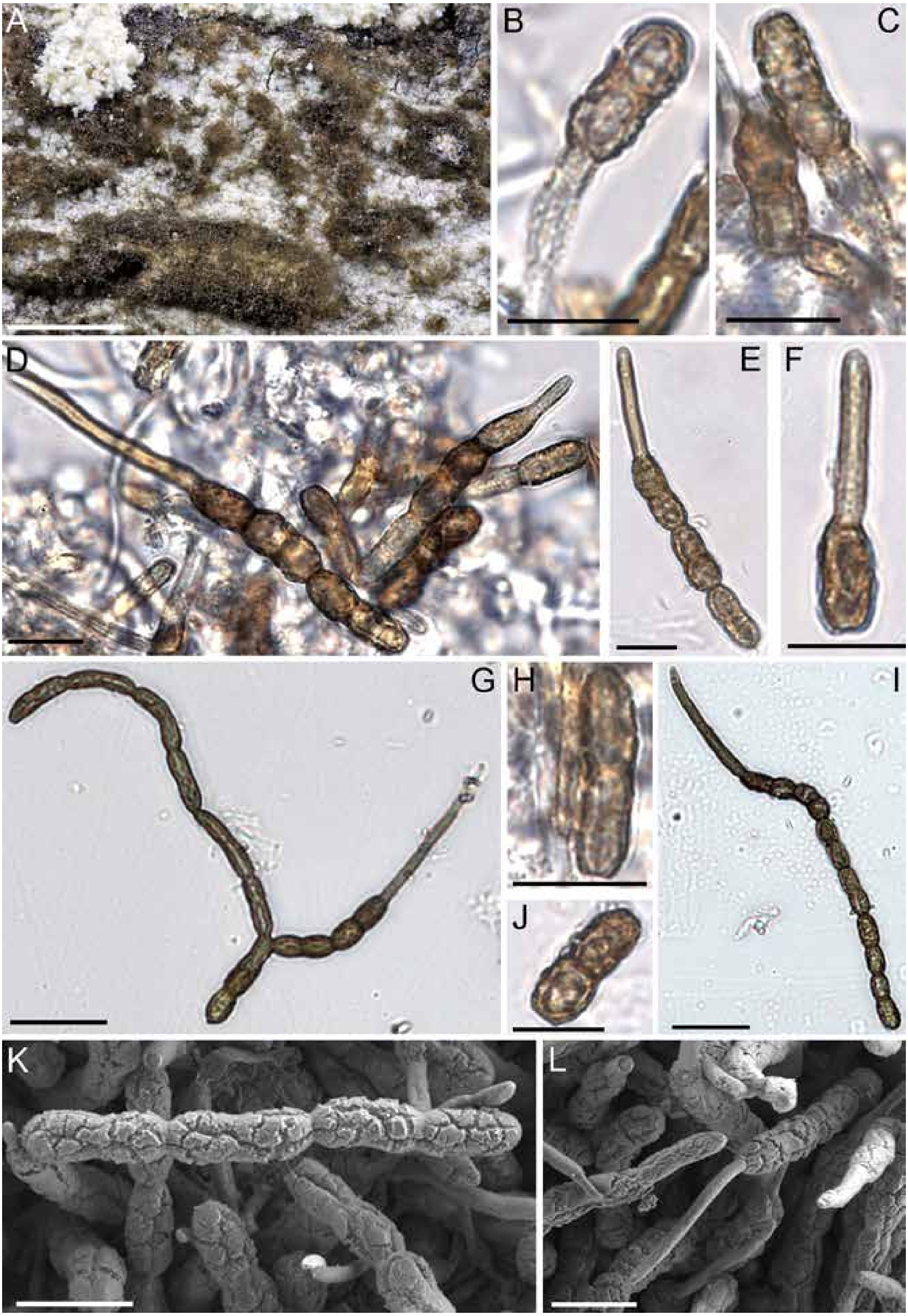

Fig. 54. *Taeniolella serusiauxii* [A, G: Santesson 21572; B–F, H–L: isotype]. **A.** Macroscopic overview of colony. **B–D.** Conidiophores with adhering conidia. **G.** Branched conidial chain. **E, F, I, L.** Conidia or conidial chain with germination tube. **H, J.** Conidia. **K.** Conidial chain with rhagadiose-squamulose surface ornamentation. Bars: 1 mm (A) [photo taken by Paul Diederich], 20 µm (G, I), 10 µm (B–F, H, J, K, L).

Taeniolella strictae Alstrup, *Symb. Bot. Upsal*. **34**: 489. 2004. Figs 55–56.

Illustration: Zhurbenko & Alstrup (2004: 489, fig. 6).

Description: *Colonies* on podetia, effuse, dark brown to black, densely caespitose, confluent, causing brownish discoloration of the thallus. *Mycelium* immersed; hyphae flexuous, branched, 3.5–9 µm wide, septate, constricted at the septa, pale brown to brown, smooth, walls thin to slightly thickened; also with superficial hyphae composed of monilioid cells or forming subglobose or globose cells, sometimes aggregated, 5–7 µm diam, 0–1-septate, not constricted at these septa, brown, walls thickened, up to 0.75 µm, irregularly rough, usually with fine net-like cracks or with squamules, up to 2 µm wide. *Conidiophores* semi-macronematous, mononematous, transition between superficial, subglobose hyphal cells and conidiophores often not very evident, solitary or loosely aggregated, arising from hyphae, lateral and terminal, erect, straight to slightly flexuous, unbranched, broad ellipsoid, obpyriform, subcylindrical or doliiform, 5.5–27.5(–50) × 5–7 µm, (0–)1–5-septate, usually constricted at the septa, brown to dark brown, paler towards the apex, wall verruculose or irregularly rough, usually with fine net-like cracks, sometimes squamulose, walls thickened, up to 1 µm, up to three times enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* little differentiated, integrated, terminal, monoblastic, monopodial, subcylindrical, 3–6 µm wide, loci truncate to slightly convex, 4–4.5 µm diam, unthickened, lateral wall somewhat thicker, forming a small fringe. *Conidia* catenate, disintegrating in fragments of variable size, straight, rarely slightly curved, subcylindrical, doliiform, 0–5-septate, aseptate conidia 6–8 × 6–7 µm, 1-septate ones 7–12 × 4–6.5 µm, 2-septate ones 12–14.5 × 5–5.5 µm, 3–5-septate ones 12–22 × 5–6 µm, not or occasionally constricted at the septa, brown to dark brown, young conidia pale brown, wall rarely smooth, usually verruculose or irregularly rough, usually with fine net-like cracks, less pronounced than in conidiophores or

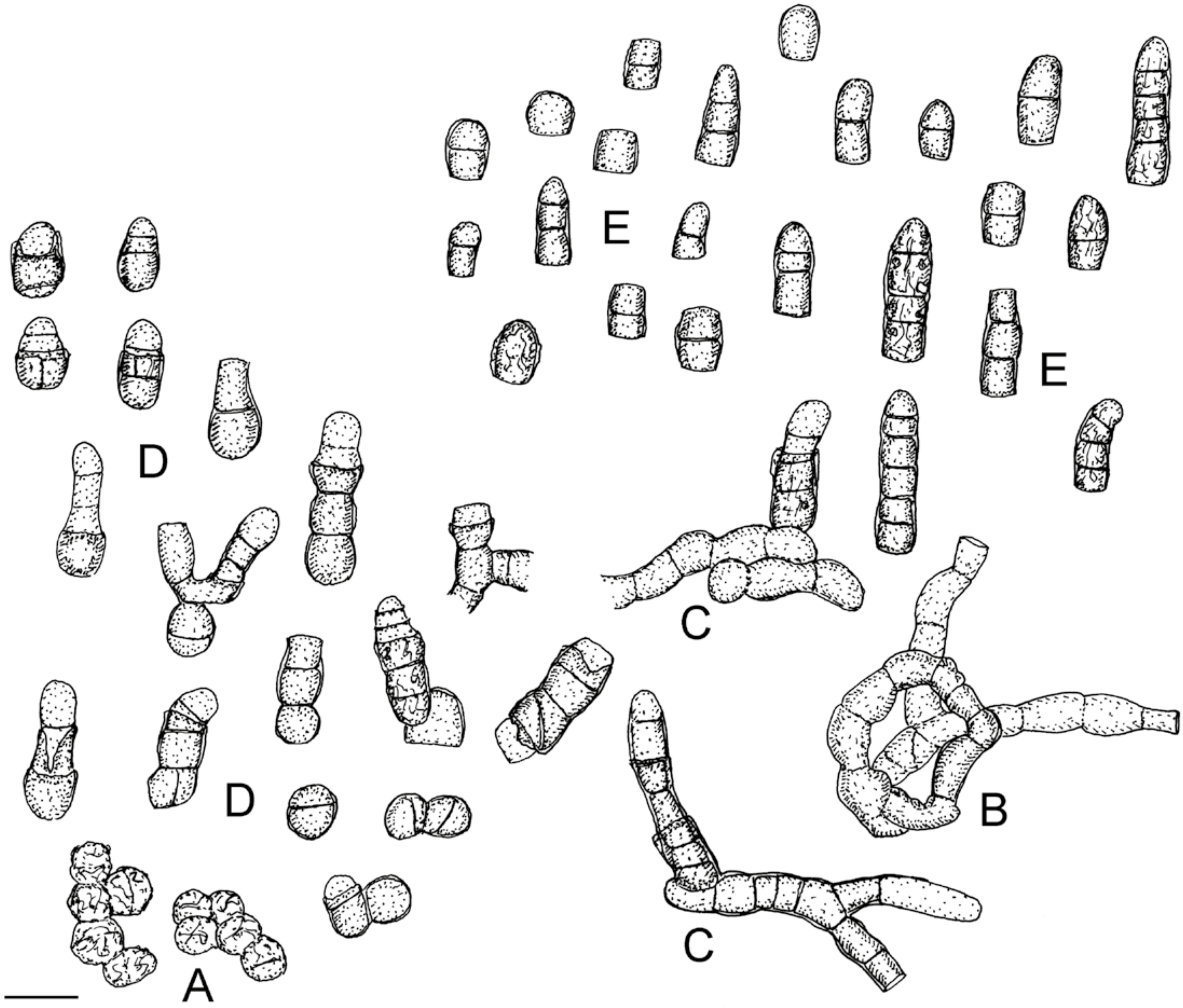

Fig. 55. *Taeniolella strictae* [holotype]. **A.** Superficial hyphae composed of monilioid, subglobose or globose cells. **B.** Hyphae. **C.** Conidiophores arising from immersed hyphae. **D.** Conidiophores arising from superficial subglobose hyphal cells. **E.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

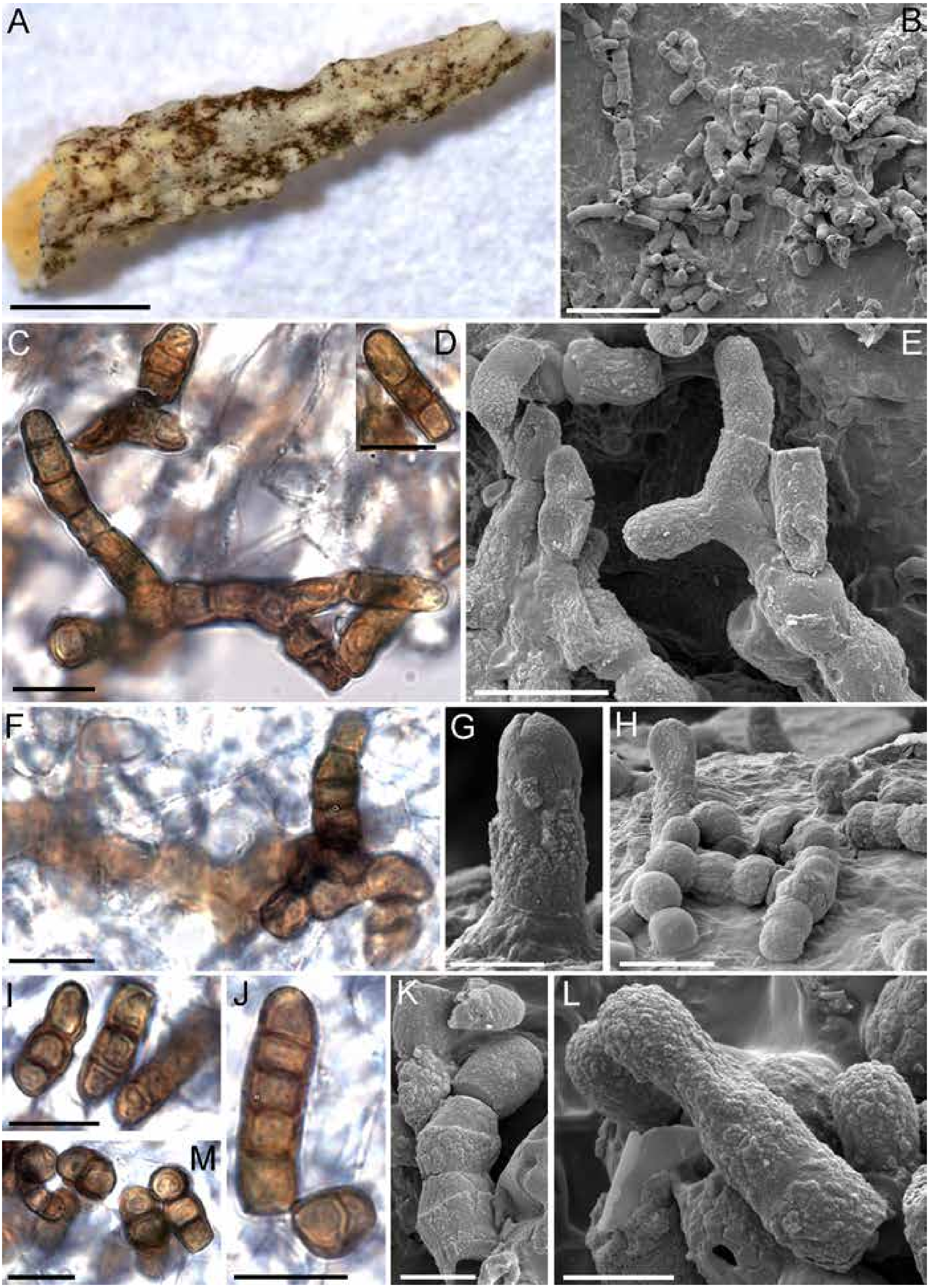

Fig. 56. *Taeniolella strictae* [holotype]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C, E–G.** Conidiophores. **H.** Superficial hyphae composed of monilioid, subglobose or globose cells. **D, I–M.** Conidia and conidial chains. Bars: 1 mm (A), 30 µm (B), 10 µm (C, D, F, I, J, M), 9 µm (E, H), 4 µm (G, K, L).

subglobose hyphal cells, wall up to 1 µm thick, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, hila truncate to slightly convex, 3–4.5(–5) µm diam, unthickened, lateral wall somewhat thicker, forming a small fringe, usually flat and inconspicuous, sometimes up to 1 µm high, not darkened.

Holotype: **Greenland**, Qaanaaq District, Siorapaluk, 50 m, in dwarf shrub heath, on *Cladonia stricta*, 13 Aug. 1993, *V. Alstrup* (C, herb. Christiansen 6048**!**).

Host range and distribution: On *Cladonia stricta*; Greenland (Zhurbenko & Alstrup 2004, Alstrup 2005, Kristinsson *et al*. 2006, 2010).

Notes: The name *Taeniolella strictae* (in Zhurbenko & Alstrup 2004), introduced for a lichenicolous species, might be considered confusable with a very similar name for the saprophytic species, *Taeniolella stricta* (Hughes 1958), and according to ICN Art. 53.3 they might be treated as homonyms. However, in phylogenetic analyses recently conducted by Ertz *et al*. (2016) the genus *Taeniolella* turned out to be polyphyletic, *i.e.*, saprobic species hitherto phylogenetically examined cluster in two different classes (*Dothideomycetes* and *Sordariomycetes*), whereas all lichenicolous species investigated so far are phylogenetically dothideomycetous, but not monophyletic and not congeneric with the type species of *Taeniolella*. Available phylogenetic data are currently not sufficient to disentangle the confusing complex of taeniolelloid species. The phylogeny of lichenicolous species encompasses several fungal genera. A much larger sampling and more comprehensive phylogenetic analyses are necessary, but in any case we expect a generic splitting of lichenicolous and saprobic *Taeniolella* species in future based on monophyletic groups. The saprobic *T. stricta* and the lichenicolous *T. strictae* are undoubtedly not congeneric and as soon as sufficient supporting phylogenetic data will be available they have to be reallocated to different genera, *i.e.*, the two names would not be confusable any longer when assigned to different genera (Art. 53.3, Ex. 11). In anticipation of reallocations of the two species and since they are currently listed in Index Fungorum as well as MycoBank as valid names, we refrain from introducing a new name for *T. strictae*.

Taeniolella strictae, known only from the type collection on *Cladonia stricta*, is easily distinguishable from the other cladoniicolous species, *Talpapellis beschiana* and *Taeniolella cladinicola*. *Taeniolella strictae* causes brownish and *T. cladinicola* reddish or purplish brown discolorations on infected host thalli, whereas the host thallus is usually not discoloured by *Talpapellis beschiana* infections. A superficial mycelium, composed of subglobose or globose, monilioid cells with irregularly rough walls, usually with fine net-like cracks or with squamules, up to 2 µm wide, is formed only in *T. strictae*. A mycelium developing internally in host hyphae is known only in *T. cladinicola*. In *Talpapellis beschiana* and *Taeniolella cladinicola*, conidia are usually aseptate, rarely 1–2-septate, and hila are 1–3 µm diam, whereas aseptate conidia are rare in *T. strictae* and hila are usually 3–4.5(–5) µm diam.

Conidiophores of *T. strictae* form up to three enteroblastic proliferations with obvious sheath-like wall remnants visible as an irregular collar. Whether they are connected with the formation of conidiogenous cells and conidia, as in *Talpapellis* (detailed comparison between *Taeniolella* and *Talpapellis* see under *Talpapellis beschiana*), could not be unambiguously clarified. *Taeniolella strictae* is known only from the type collection. Further material is needed for a more detailed examination. For the interim we prefer to maintain *T. strictae* in *Taeniolella*.

Taeniolella thelotrematis Heuchert & Brackel, **sp. nov.** MycoBank MB819304. Figs 57–59.

Etymology: Epithet named after the host genus of the new species, *Thelotrema*.

Diagnosis: Morphologically close to *Taeniolella toruloides*, but conidia non-toruloid, chains easily disarticulating and mostly with branched conidiophores (9–65 × 4–7.5 µm, 1–9-septate).

Description: *Colonies* on the surface of thalli and apothecia, punctiform, up to 0.1 mm diam, effuse, confluent, loosely to densely caespitose, dark brown to black, host thallus without any discoloration or sometimes with grey discoloration. *Mycelium* immersed, inconspicuous; hyphae flexuous, branched, 2–6 µm wide, septate, sometimes constricted at the septa, pale to dark brown, smooth or irregularly verrucose, walls slightly to distinctly thickened, 0.25–1.5 µm. *Stromata* lacking, but with solitary swollen hyphal cells, sometimes aggregated below conidiophores, subglobose, 5–8 µm diam, wall irregularly verrucose to rimulose. *Conidiophores* semi-macronematous, mononematous, in dense fascicles or forming linear aggregations, sometimes solitary, arising from hyphae, lateral and terminal, or arising from swollen hyphal cells, erect to decumbent, sometimes plagiotropous, straight to curved, sometimes unbranched, mostly with branches at the base and additionally with single branches in the upper part, subcylindrical, doliiform, 9–65 × 4–7.5 µm, wider at the base (up to 10 µm), 1–9-septate, mostly constricted at the septa, yellowish brown to dark brown, paler at the apex, wall 0.5–2 µm thick, thinner near the apex, cell plasma mostly reduced, occasionally with oil-like droplets, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, smooth to irregularly verrucose, with age becoming rimulose-rugose and distinctly verrucose, frequently enteroblastically proliferating, with sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic or thalloblastic, monopodial, subcylindrical, doliiform, 4–9 µm long, conidiogenous loci truncate to slightly convex, unthickened, 2–4 µm diam. *Conidia* catenate, in unbranched chains, easily disarticulating, straight, subcylindrical, ellipsoid, doliiform, pyriform, 0–2(–3)-septate, aseptate conidia 5–10 × 4–5(–6) µm, 1-septate ones 9–16 × 4–6 (–7) µm, 2-septate ones 11–20 × 4.5–6 µm, 3-septate ones 15–17 × 6 µm, constricted at the septa, brown or yellowish brown to dark brown, wall thickened, 0.25–1 µm, smooth or irregularly verrucose, apex rounded to attenuated in primary conidia, truncate in secondary ones, base also truncate, sometimes narrowed, hila truncate to slightly convex, unthickened, not darkened, 1.5–4(–4.5) µm diam.

Holotype: **Germany**, Bavaria, Berchtesgadener Land, Zauberwald at Hintersee near Ramsau, on fir tree in mixed forest, alt. 790 m, on *Thelotrema lepadinum*, *W. v. Brackel* 5411, 18 Jul. 2007 (HAL 2487 F**!**). *Isotype*: herb. Brackel.

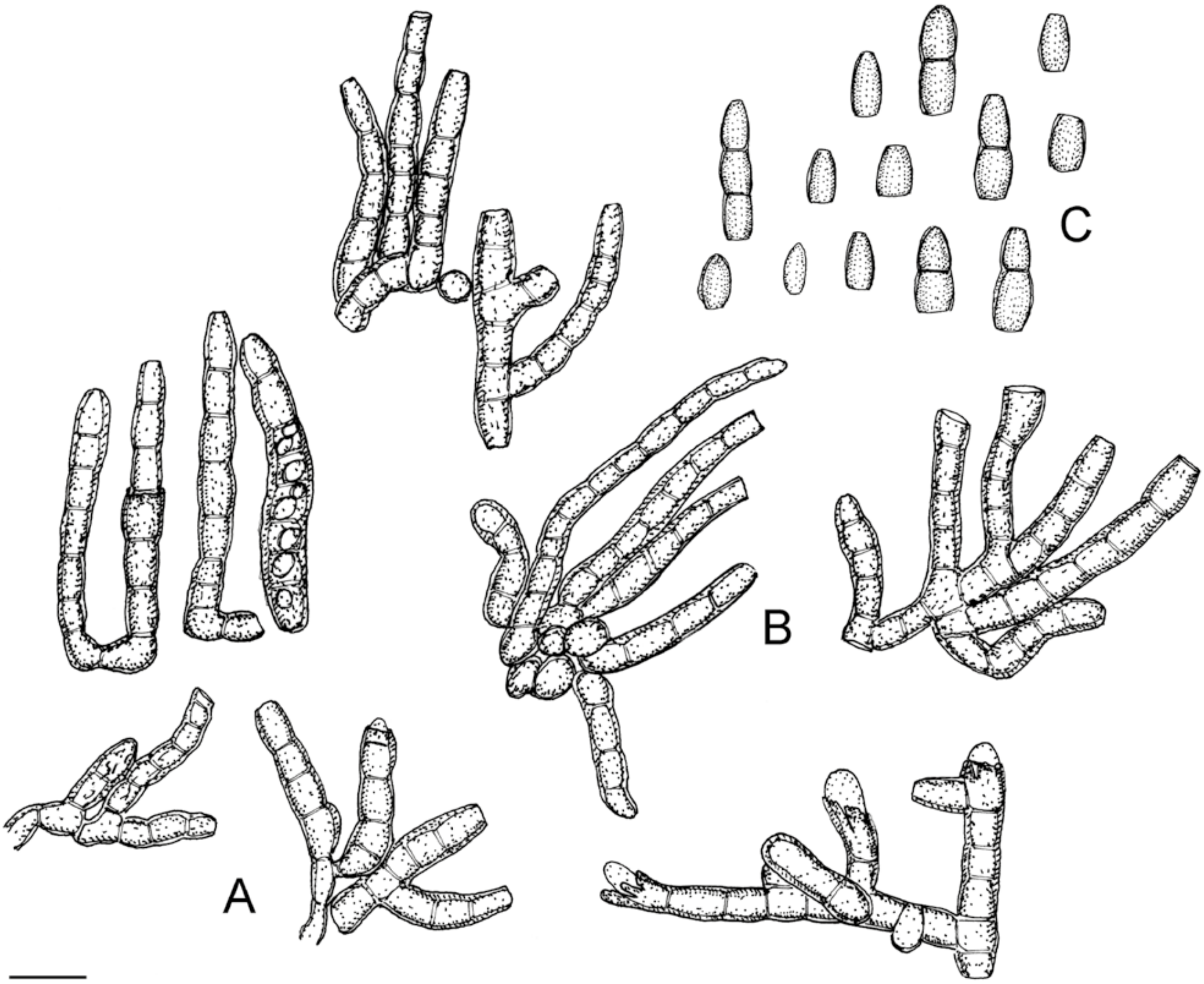

Fig. 57. *Taeniolella thelotrematis* [holotype]. **A.** Conidiophores arising from hyphae. **B.** Conidiophores in dense fascicles arising from swollen hyphal cells. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

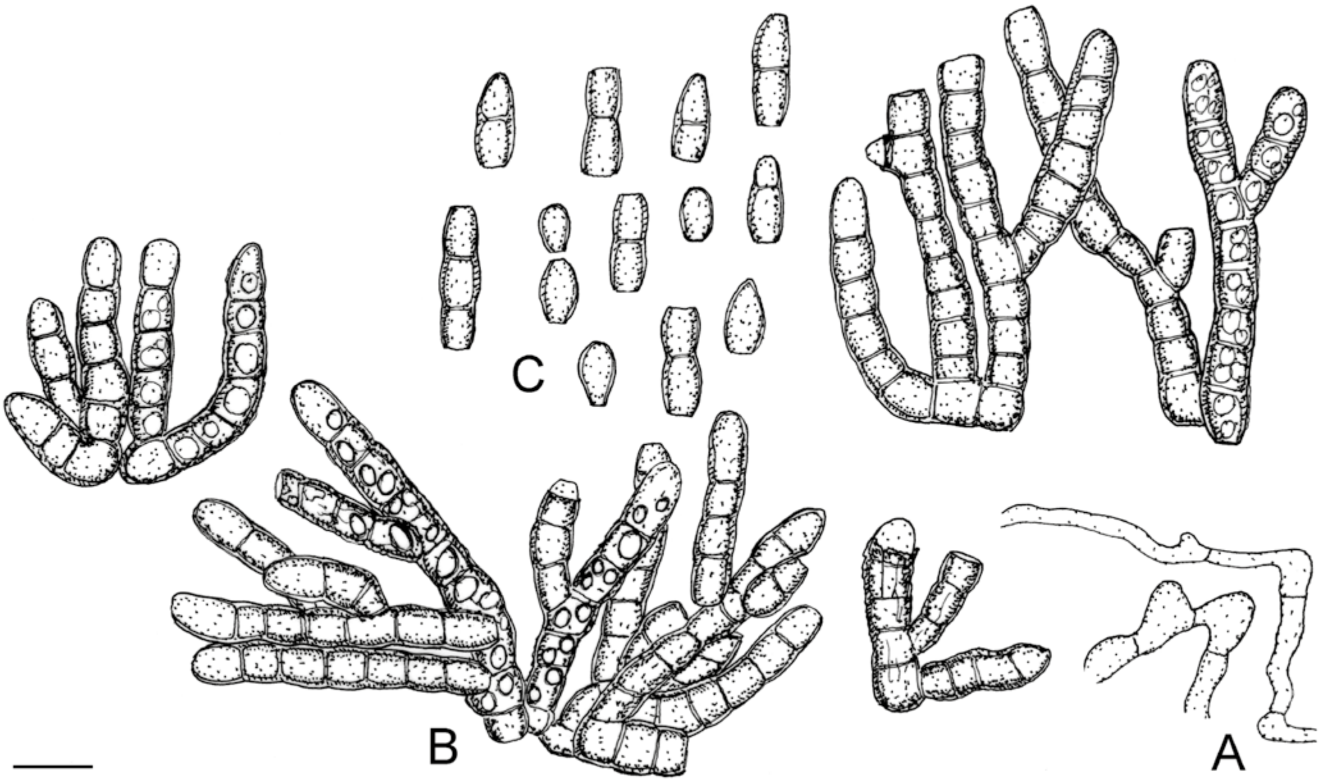

Fig. 58. *Taeniolella thelotrematis* [Santesson 3398b]. **A.** Hyphae. **B.** Conidiophores in dense fascicles. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

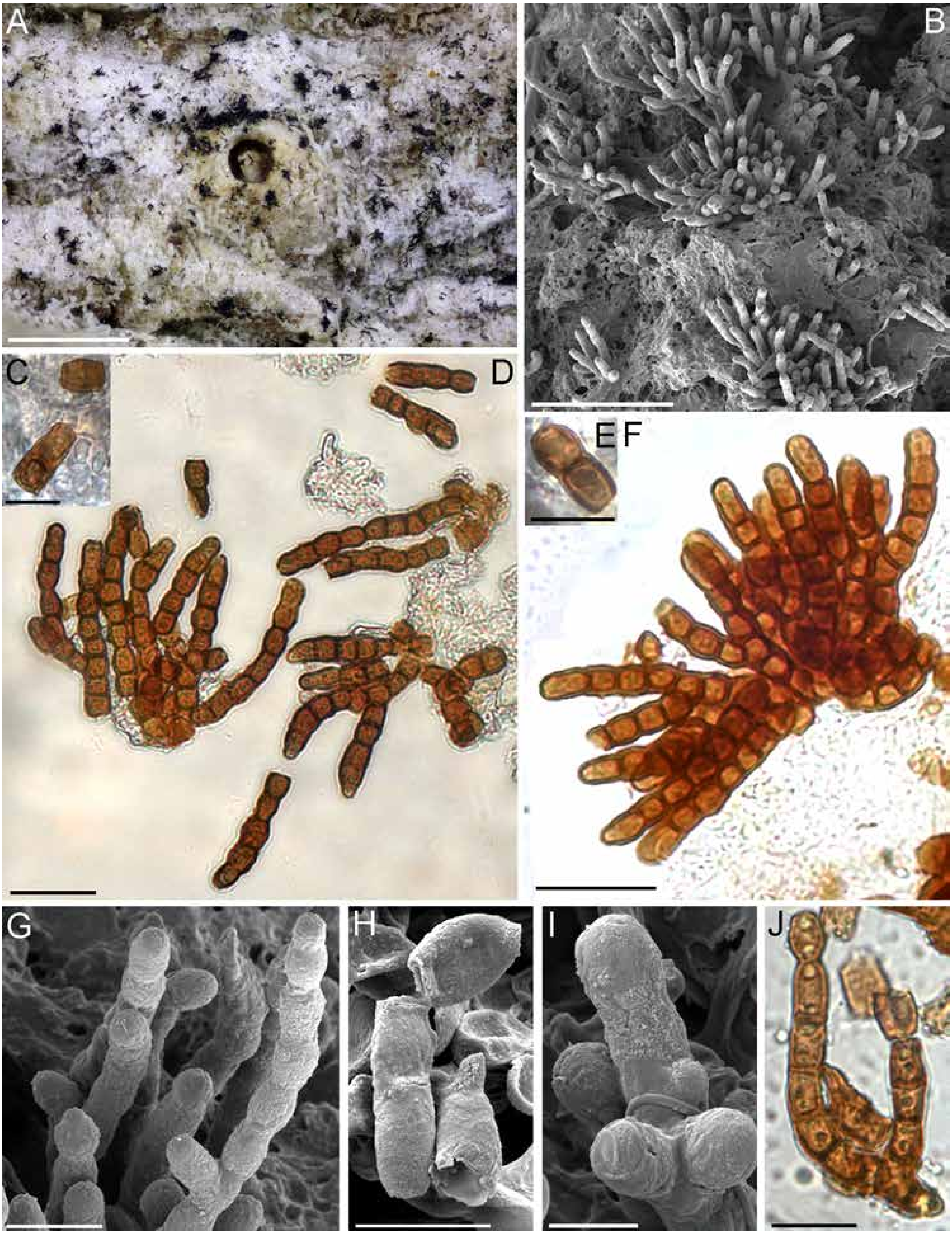

Fig. 59. *Taeniolella thelotrematis* [A: Etayo 16479; B, D, F, G, I: Santesson 3398b; C, E: Etayo 27131; H, J: holotype]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, E.** Conidia. **D, F, I, J.** Branched conidiophores with adhering conidia. **G, H.** Conidia in chains with smooth or irregularly verrucose surface. Bars: 1 mm (A) [photo taken by Paul Diederich], 100 µm (B), 20 µm (D, F), 10 µm (C, E, G, J), 7 µm (I), 5 µm (H).

Host range and distribution: On *Thelotrema lepadinum*, *Thelotrema* sp.; Chile, Columbia, Germany, Spain.

Additional specimens examined: **Columbia**, Dep. Nariño, Pasto, bosque de Daza, via Pasto-Buesaco, 1–12' N, 77.16' W, alt. 2750 m, bosque con *Ficus*, *Brunellia*, *Palicourea*, *Ilex*, *Maytenus*, etc. También talud pista, epifito, on *Thelotrema* sp., 28 Jul. 1998, *J. Etayo 16479, J. Muñoz, B. Ramirez & X. Tivanta* (herb. Etayo). **Chile**, prov. Valdivia, Lago Riñihue, Riñihue, on *Aextoxicum punctatum* at the edge of the forest on the shore of the lake, on *Thelotrema lepadinum*, 18 Sep. 1940, *R. Santesson 3378b* (UPS); ibid., on *T. lepadinum*, on *Drimys winteri*, 18 Sep. 1940, *R. Santesson 3398b* (UPS). **Spain**, País Vasco, Álava, subida a Gorebea desde Murua (Zigoitia), senda Egillolarra, hayedo en limite del bosque, on *Fagus sylvatica*, 43°1'41" N, 2°45'31" W, alt. ca. 900–1100 m, on *T. lepadinum*, 1 Oct. 2011, *J. Etayo 27131* (herb. Etayo).

Notes: *Taeniolella thelotrematis* and *T. toruloides* are two species on *Thelotrema* spp. with a very similar habit characterised by punctiform colonies, up to 0.1 mm diam. *T. toruloides* is well characterised by forming conidia in firm chains up to 100 µm long with distinct constrictions (torula-like) and shorter unbranched conidiophores (6–34 × 4–7 µm, 0–5-septate) compared to conidia in non-toruloid, easily disarticulating chains and mostly branched conidiophores (9–65 × 4–7.5 µm, and 1–9-septate) in *T. thelotrematis*. The common host of both species is the globally distributed *Thelotrema lepadinum*. It can be assumed that the distribution of both species, *Taeniolella thelotrematis* and *T. toruloides*, is much wider than hitherto known, which might be an explanation for the currently registered disjunct collection data.

Taeniolella toruloides Heuchert & Diederich, *Fungal Biology* **120**: 1439. 2016. Figs 60–61.

Illustrations: Ertz *et al*. (2016: 1440, fig. 16; 1441, fig. 17).

Description: *Colonies* on the surface of thalli and apothecia, punctiform, up to 0.1 mm diam, effuse, confluent, loosely to densely caespitose, black; thallus without any discoloration or sometimes with grey discoloration. *Mycelium* immersed, inconspicuous; hyphae flexuous, branched, 2–6 µm wide, septate, sometimes constricted at the septa, cells ellipsoid to irregularly shaped, subhyaline to pale brown, rarely brown, smooth, walls slightly to distinctly thickened, up to 1.5 µm wide;

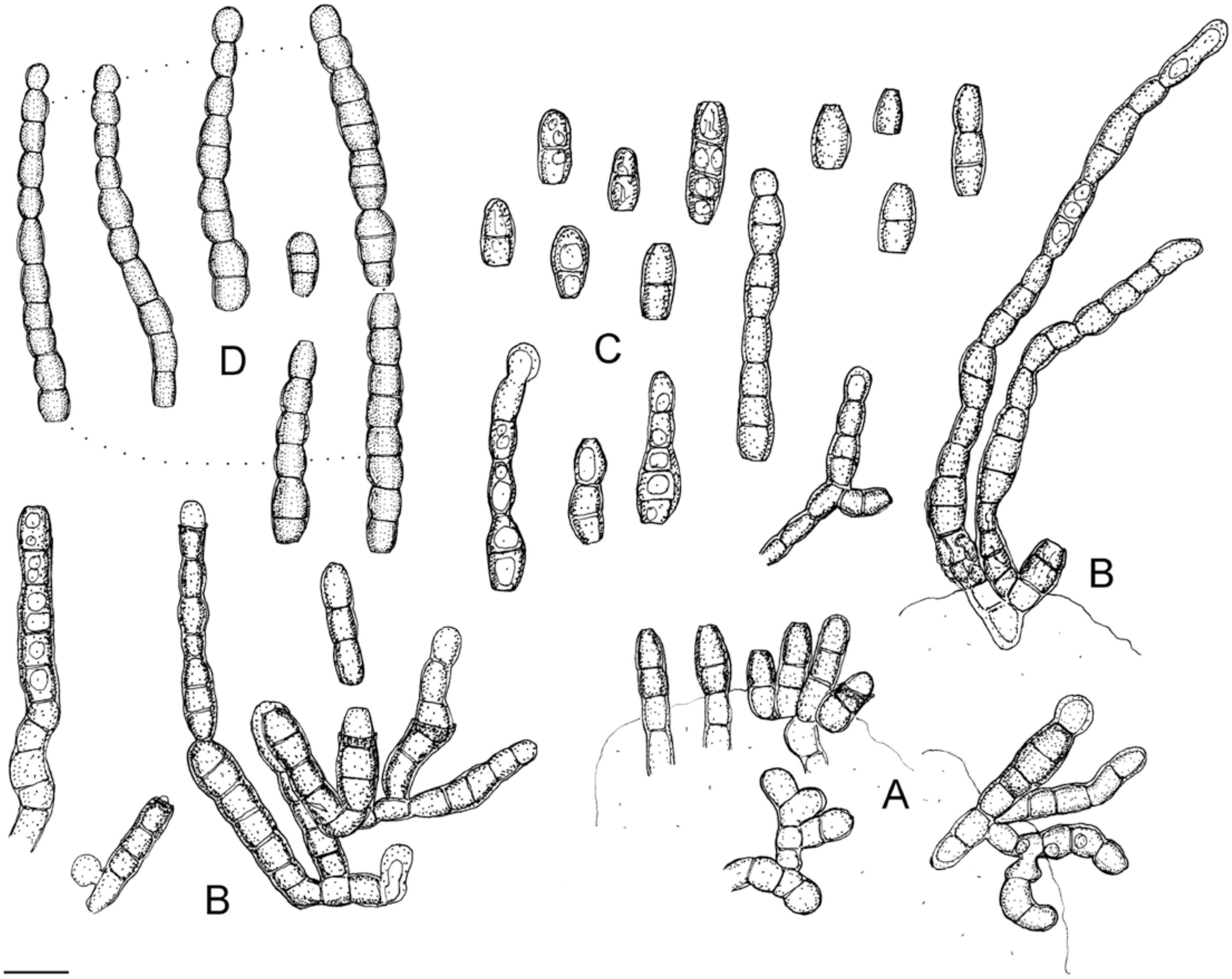

Fig. 60. *Taeniolella toruloides* [A–C: holotype; D: Diederich 18158]. **A.** Hyphae with micronematous or semi-macronematous conidiophores. **B.** Conidiophores with adhering long toruloid chains. **C–D.** Conidia and fragments of conidial chains. Bar = 10 µm (B. Heuchert *del.*).

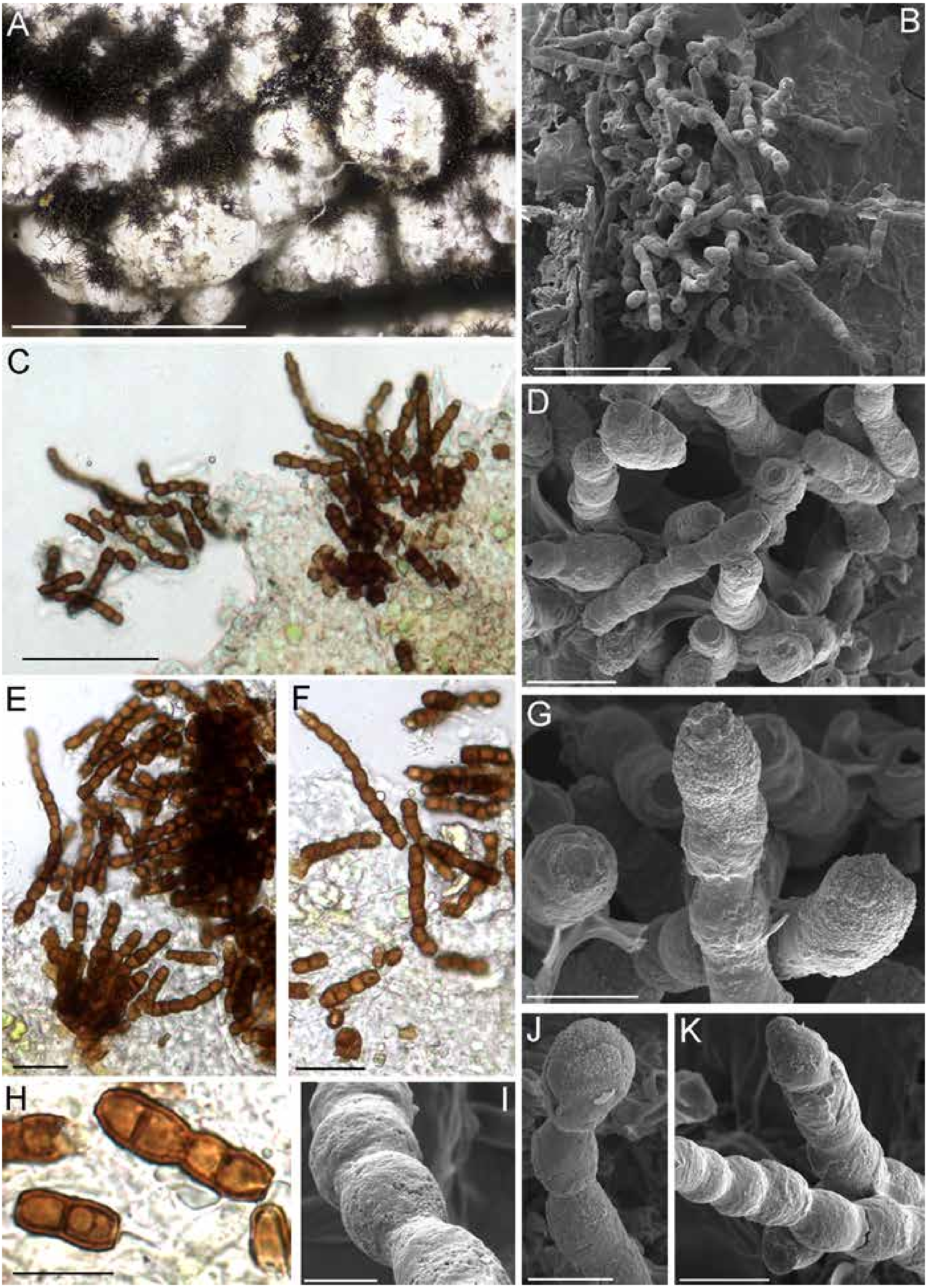

Fig. 61. *Taeniolella toruloides* [A: Diederich 18158; B–K: holotype]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C–F.** Conidiophores with adhering long, unbranched toruloid conidial chains. **G, I–K.** Parts of conidial chains with a smooth, occasionally irregularly rugose-verrucose surface. **H.** Conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 50 µm (B, C), 20 µm (E, F), 10 µm (D, H), 6 µm (G, J, K), 3 µm (I).

cell lumen reduced. *Stromata* poorly developed, only with a few swollen, rarely aggregated hyphal cells, subglobose, 5–8 µm diam. *Conidiophores* micronematous or semi-macronematous, mononematous, solitary or in dense fascicles, arising from hyphae, lateral and terminal, or arising from swollen hyphal cells, erect, straight, unbranched, subcylindrical, doliiform, 6–34 × 4–7 µm, 0–5-septate, non-constricted or slightly constricted at the septa, brown to dark brown, paler at the base, thick-walled, 0.25–0.75(–1) µm wide, smooth, with age becoming rimulose-rugose or irregularly verrucose, rarely enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular collar. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, short cylindrical, narrowed at the apex, 5–7 µm long; conidiogenous loci truncate, unthickened, 2–3 µm diam. *Conidia* catenate, mostly in unbranched chains, adhering in long firm, toruloid chains, *i.e.*, with distinct constrictions, not easily disarticulating, chains up to 100 µm long, straight, subcylindrical, doliiform, obovoid, 0–2-septate, aseptate conidia 4–11 × 3–6 µm, 1-septate ones 9–14(–20) × 4–7 µm, 2-septate ones 14–22 × 4.5–6 µm, chains later disintegrating in fragments of different sizes, mostly constricted at the septa, brown to olivaceous brown or grey, wall thickened, 0.25–1 µm wide, cell-lumen frequently with oil-like droplets, smooth, occasionally irregularly rugose-verrucose, older conidia verrucose or with single cracks in the outer wall, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed, hila truncate, unthickened, not darkened, 2–3.5 µm diam.

Holotype: **Portugal**, Azores, Pico, S of Sao Roque do Pico, forest remnants on the shore of Lagoa Capitao, alt. 780 m, 38°29'9" N, 28°18'58" E, on *Thelotrema antoninii*, on *Juniperus brevifolia*, 24 Jul. 2010, *P. Diederich 17047* (BR**!**). *Isotype*: herb. Diederich**!**

Host range and distribution: On *Thelotrema antoninii*, *T. lepadinum*; France, Luxembourg, Poland, Portugal (Azores), Spain (all records from Ertz *et al*. 2016).

Additional specimens examined: **France**, Pyrénées-Atlantiques, south of Tardets-Sorholus, Ste-Engrace, gorges de Kakouetta, on *Thelotrema lepadinum*, on *Buxus*, 17 Jul. 1991, *P. Diederich 9576* (herb. Diederich); 15 km south-southeast of Saint-Jean-de-Luz, south of Sare, forêt communale de Sare, near road D306 to Col de Lizarrieta, alt. 310–360 m, 43.26115° N, 1.6089° W, on *T. lepadinum*, on very old trunks of *Quercus*, aged 300–400 years, 26 Aug. 2015, *P. Diederich 18158* (HAL 3033 F, 3188 F, herb. Diederich); 20 km southeast of Saint-Jean-Pied-de-Port, forêt d'Iraty, 500 m south of Chalet Pedro, alt. 1000–1030 m, 43.03126° N, 1.07961° W, on *T. lepadinum*, on *Fagus*, 3 Sep. 2015, *P. Diederich 18139* (herb. Diederich). **Luxembourg**, Berdorf, Binzeltschlëff and Predigtstuhl, 49.81° N, 6.33° E, on *T. lepadinum*, on *Acer*, 15 Aug. 1981, *P. Diederich 3870* (herb. Diederich); Berdorf, Binzeltschlëff, on *T. lepadinum*, on *Acer*, 11 Jun. 1984, *P. Diederich 5739* (herb. Diederich). **Poland**, Rówinia Bielska, Białowieża Primeval Forest, Białowieski National Park, forest section no 256, plot B05, *Tilio-Carpinetum*, ATPOL grid square Cg-63, on *T. lepadinum*, on *Carpinus betulus*, May 2014, *M. Kukwa 13803, A. Łubek*, ex UGDA L (HAL 3150F). **Portugal**, Azores, Pico, S of Sao Roque do Pico, forest remnants on the shore of Lagoa Capitao, alt. 780 m, 38°29'9" N, 28°18'58" E, on *T. antoninii*, on *Juniperus brevifolia*, 24 Jul. 2010, *P. Diederich 17048* (herb. Diederich); ibid., 22 Aug. 2011, *D. Ertz 16593* (BR); Azores, Sao Miquel, N of Vila Franca do Campo, forest around Congro lake, alt. 470 m, 37°45'17" N, 25°24'30" W, on *T. lepadinum*, on bark of tree, 29 Jul. 2010, *P. Diederich 17015* (herb. Diederich). **Spain**, Navarra, au nord de Orbaiceta, au nord de la Fabrica de Orbaiceta, on *T. lepadinum*, 19 Jul. 1991, *P. Diederich 9626* (herb. Diederich).

Notes: The morphological traits of *Taeniolella punctata*, with *Graphis scripta s. lat.* (*Graphidaceae*) as preferred host, are very similar to those of *T. toruloides* on *Thelotrema lepadinum*, which also belongs to the *Graphidaceae*. However, *T. punctata* has conidiophores that are often branched at the base or rarely branched in the upper third, longer (14–83(–95) × 5–8 µm), and usually have numerous septa that can be up to 0.75 µm thick. The tips of conidiophores and/or the adhering terminal conidium in *T. punctata* are sometimes somewhat swollen up to 9 µm (see arrows in fig. 43). Conidial chains, even though not easily disintegrating as in *T. toruloides*, are not conspicuously toruloid. The lichenicolous *Taeniolella friesii* is similar to *T. toruloides* by forming conidia in chains with conspicuous constrictions between individual conidia, but *T. friesii*, known only on *Strigula stigmatella*, is distinguishable from *T. toruloides* by its shorter and narrower conidiophores (3–12(–15) × (1.5–)3–5 µm, vs. 6–34 × 4–7 µm in *T. toruloides*). Furthermore, conidia, developed in very short disarticulating chains, are usually much shorter and often narrower (1-septate ones 5–9(–10) × 3–5 µm, vs. 1-septate ones 9–14(–20) × 4–7 µm in *T. toruloides*).

Collections of *T. punctata* and *T. toruloides* were successfully cultured. *Taeniolella toruloides* is phylogenetically clearly distinct from *T. punctata* in our mtSSU+nuLSU tree (Ertz *et al*. 2016: 1424, fig. 2). It is the sister species to ‘*Melaspilea* sp. 18012’, a lichenicolous fungus belonging to *Melaspilea s. lat*. and forming black lirellae on the thallus of a *Pyrenula*.

Taeniolella trapeliopseos Diederich, *Mycotaxon* **37**: 326. 1990. Figs 62–64.

Literature: Kukwa & Jabłońska (2008: 176).

Illustrations: Diederich (1990b: 327–328, figs 15, 16), Diederich *et al*. (2017a).

Description: *Colonies* effuse, dark brown, caespitose, infected thallus becoming brownish. *Mycelium* inconspicuous, immersed; hyphae branched, 2–8 µm wide, septate, sometimes constricted at the septa, almost subhyaline, pale brown to brown, smooth, thin-walled. *Stromata* lacking. *Conidiophores* solitary, arising from hyphae, erumpent, mononematous, macronematous, erect, mostly straight, partly flexuous, mostly unbranched, rarely with basal branches, subcylindrical, 14–55 × 5–8(–9) µm, 0–9-septate, not or only slightly constricted at the septa, sometimes somewhat swollen between the septa, dark brown, paler towards the apex, mostly 1–4 times enteroblastically proliferating, proliferations common, in almost all conidiophores, with obvious sheath-like wall remnants visible as irregular collar, wall irregularly verrucose, becoming rimulose with deep cracks, squamulose with age, squamules 0.5–1.5 µm wide, walls thickened, 0.75–1.25 µm, around proliferations up to 2 µm thick, thin-walled near the tips. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, subcylindrical, conspicuously obconically narrowed (from 8 to 4 µm), 9–13 × 4–7 µm, loci truncate, 2.5–3.5 µm diam, unthickened, lateral wall somewhat thicker, forming a small fringe. *Conidia* solitary, straight, rarely slightly curved, broad ellipsoid, subcylindrical, pyriform, 0–4-septate, aseptate conidia 9–12 × 6–7 µm,

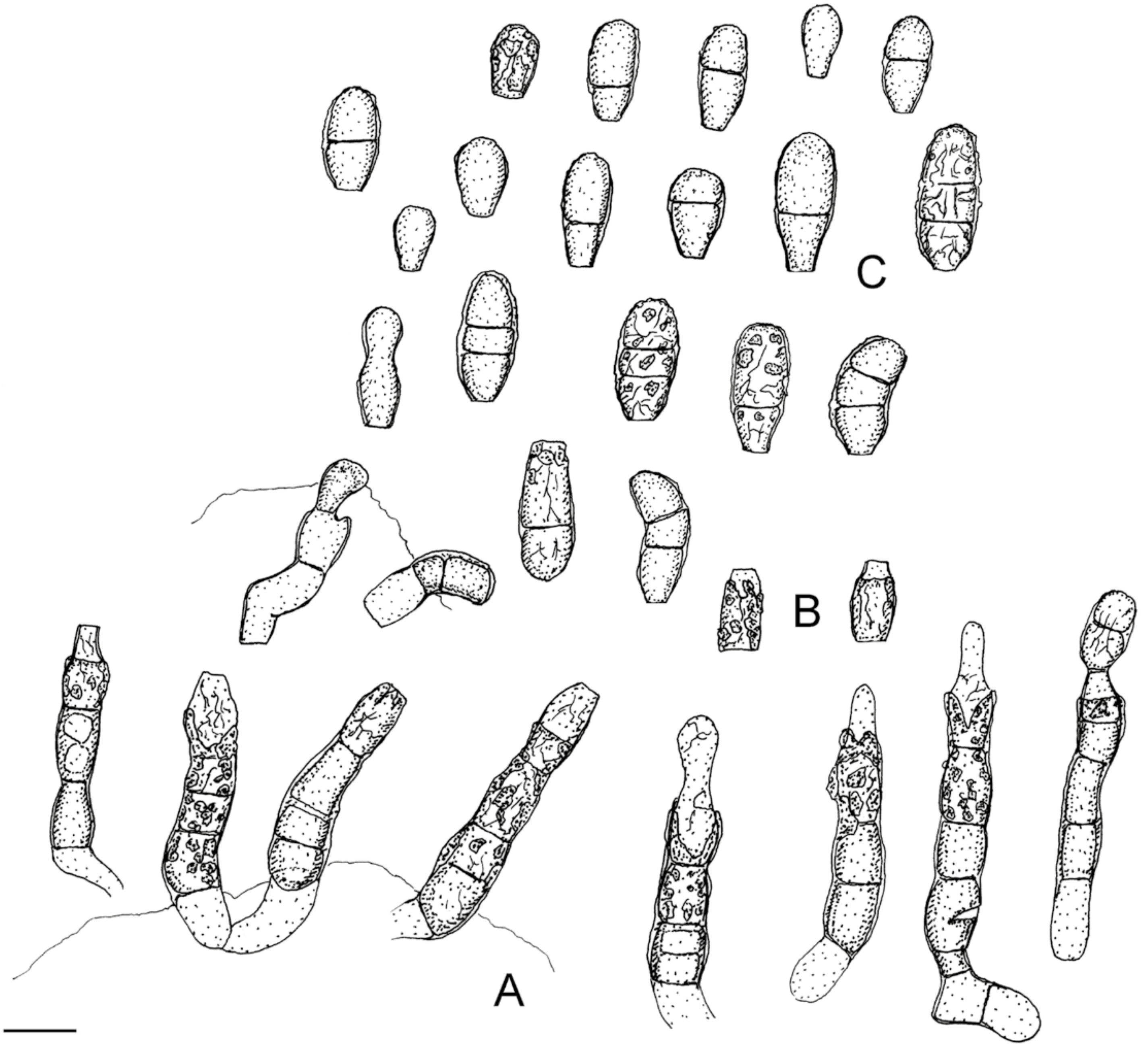

Fig. 62. *Taeniolella trapeliopseos* [isotype]. **A.** Conidiophores. **B.** Conidia. **C.** Detached conidiogenous cell possibly acting like conidia. Bar = 10 µm (B. Heuchert *del.*).

1-septate ones 10–23 × 6–8 µm, 2-septate ones 14–20 × 5.5–8 µm, 3-septate ones 20–24 × 6–8 µm, 4-septate ones 22–26 × 5–7 µm, rarely constricted at the septa, brown to dark brown, outer wall irregularly verrucose, becoming rimulose with deep cracks, later squamulose, squamules 0.5–1.5 µm wide, outer wall thickened, 0.5–1.5 µm, apex rounded, base conspicuously obconically narrowed, hila truncate, unthickened, lateral wall somewhat thicker, forming a small fringe, hila 2.5–4 µm diam.

Holotype: **Luxembourg**, SW of Gonderange, Kriipsweieren, on *Pinus sylvestris*, on *Trapeliopsis flexuosa*, 1 Mai 1986, *P. Diederich 8959* (LG**!**). *Isotype*: herb. Diederich**!**

Host range and distribution: On *Trapeliopsis flexuosa*, *T. granulosa*, *T. pseudogranulosa*; Czech Republic (Šoun *et al*. 2006), Denmark (first report, see specimens examined), Estonia (Suija *et al.* 2008), Luxembourg (Diederich 1989, 1990b, Diederich *et al*. 2017a), Poland (Kukwa & Czarnota 2006, Kukwa & Jabłońska 2008, Kukwa *et al*. 2010).

Additional specimens examined: **Denmark**, Lolland, Vigsnæs, N of Sakskӧbing, on the wood of a dead oak, lying on the ground near Rendebjerg in the forest Storskov, Guldborgland, alt. 0–10 m, on an unidentified sterile, crustose lichen thallus, 14 Aug. 1984, *M.S. Christiansen* (C, herb. Christiansen 4356 as *T. verrucosa*). **Luxembourg**, E of Fouhren, Hinkelsbaach, on *Trapeliopsis flexuosa*, 18 Aug. 1986, *P. Diederich 8960* (herb. Diederich).

Notes: Conidiogenous cells and conidia of this species are distinctly attenuated towards the conidiogenous loci and hila, respectively, a character which is very unusual for *Taeniolella* spp. and could not be observed in any other lichenicolous species of this genus. Conidia consistently formed singly were also observed in *T. umbilicariae.* The outer wall of conidiophores

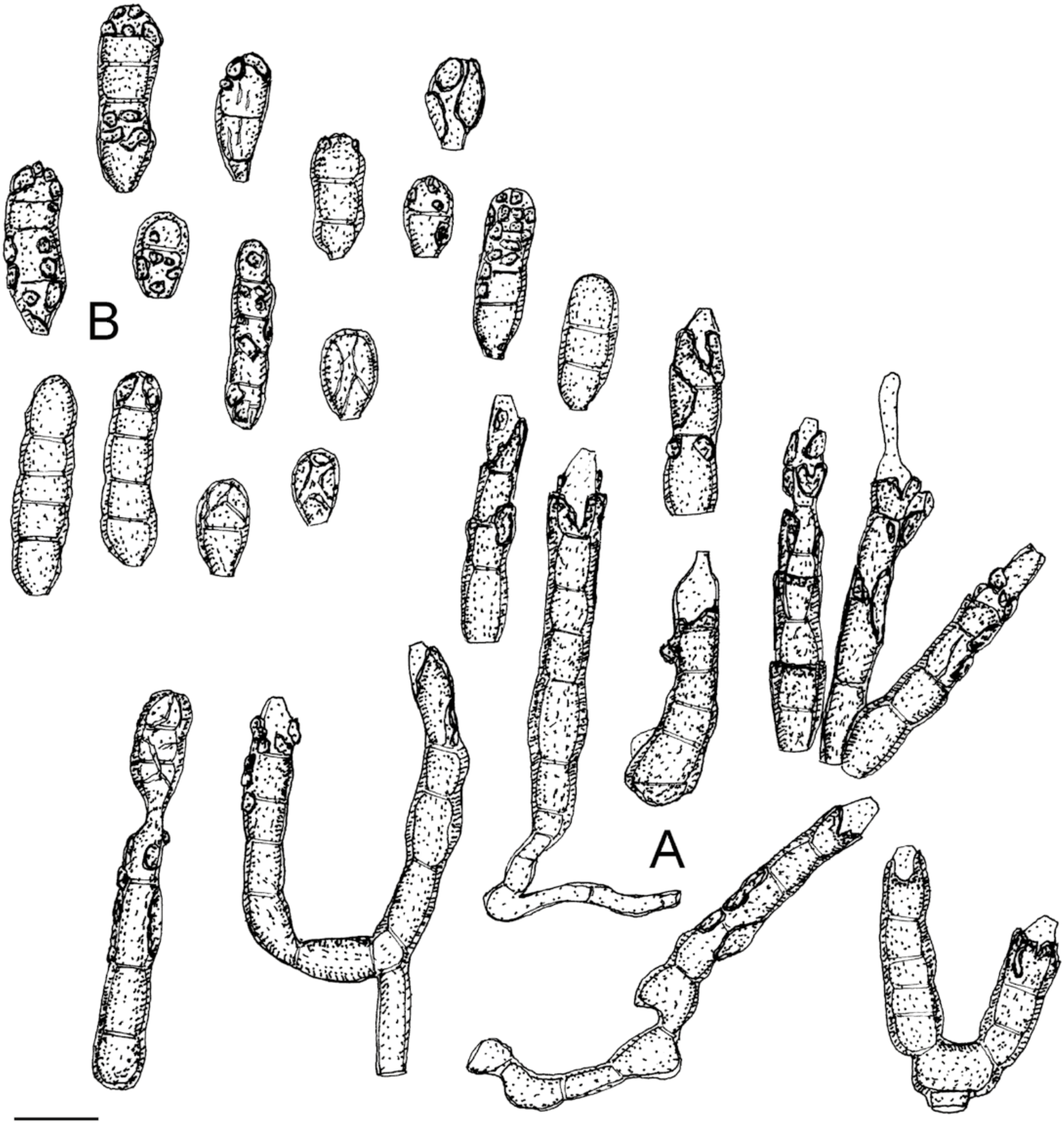

Fig. 63. *Taeniolella trapeliopseos* [C, herb. Christiansen 4356]. **A.** Conidiophores. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.)*.

and conidia in this species is also verrucose, rimulose and later squamulose, but conidiogenous cells are never obconically narrowed.

Diederich (1990b) described this species with conidiophores up to 90 µm long, which was not observed during the course of the re-examination of the type material; maximal measured length 55 µm. On the other hand, detached conidiogenous cells, possibly acting as diaspores (conidia), have been found. It is possible that these conidiogenous cells have been shed due to age or mechanical impacts. Separated fragments of conidiophores have also been observed.

Measurements of conidia given in Kukwa & Jabłońska (2008) are within the common range of this species.

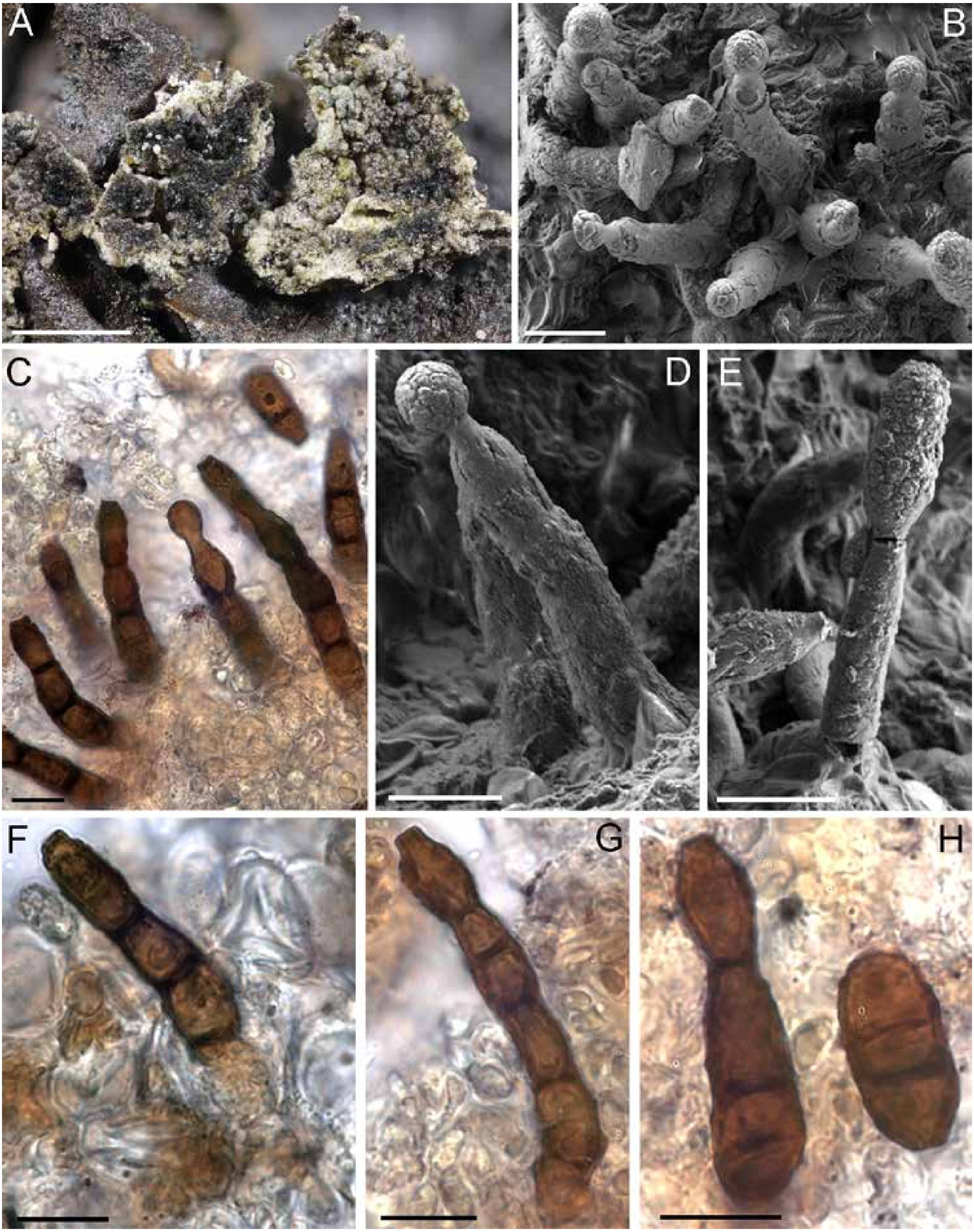

Fig. 64. *Taeniolella trapeliopseos* [isotype]. **A.** Macroscopic overview of colonies. **B–G.** Conidiophores with and without adhering conidia. **H.** Fragment of conidiophores, conidia. Bars: 1 mm (A) [photo taken by Paul Diederich], 10 µm (B, C, E–H), 8 µm (D).

Taeniolella umbilicariae Heuchert & Etayo, **sp. nov.** MycoBank MB819305. Figs 65–66.

Etymology: Epithet named after the genus of the type host, *Umbilicaria*.

Diagnosis: Differs from *Taeniolella umbilicariicola* in having consistently wider conidiophores and conidia [(7–)8–11(–12) µm in *T. umbilicariae*, vs. 5–7(–8) µm in *T. umbilicariicola*], walls of conidiophores and conidia with conspicuous ornamentation, irregularly verrucose, rimulose, squamulose to squamose, squamules 0.2–6 µm wide, irregularly shaped, squamules firm, not detached or only slightly so.

Description: *Colonies* on the surface of the lichen thallus, black, in small circular groups, up to 3 mm diam, loose to dense, confluent,

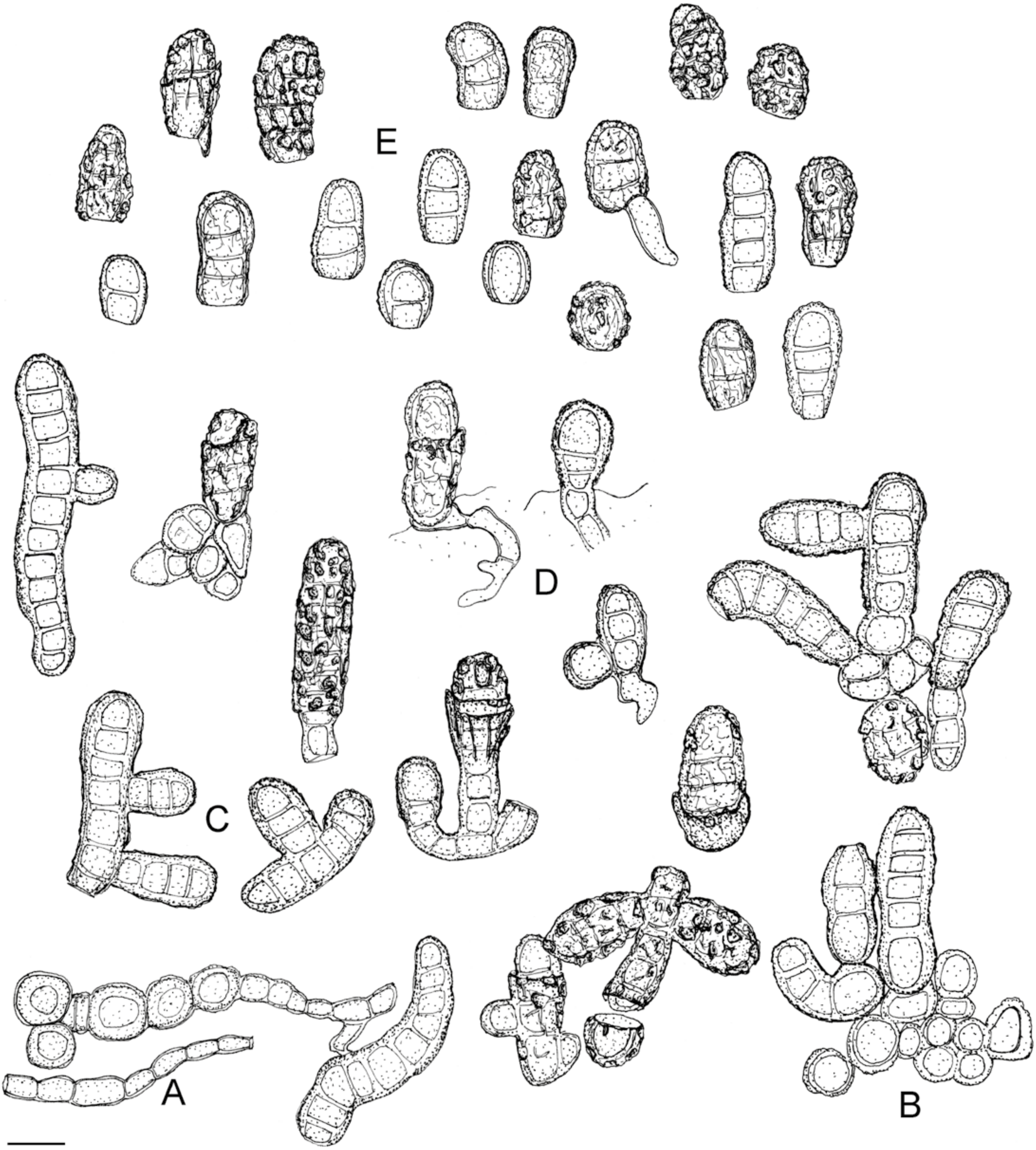

Fig. 65. *Taeniolella umbilicariae* [holotype]. **A.** Torulose hyphae. **B.** Conidiophores arising from stromata. **C.** Branched conidiophores. **D.** Conidiophores arising from hyphae. **E.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

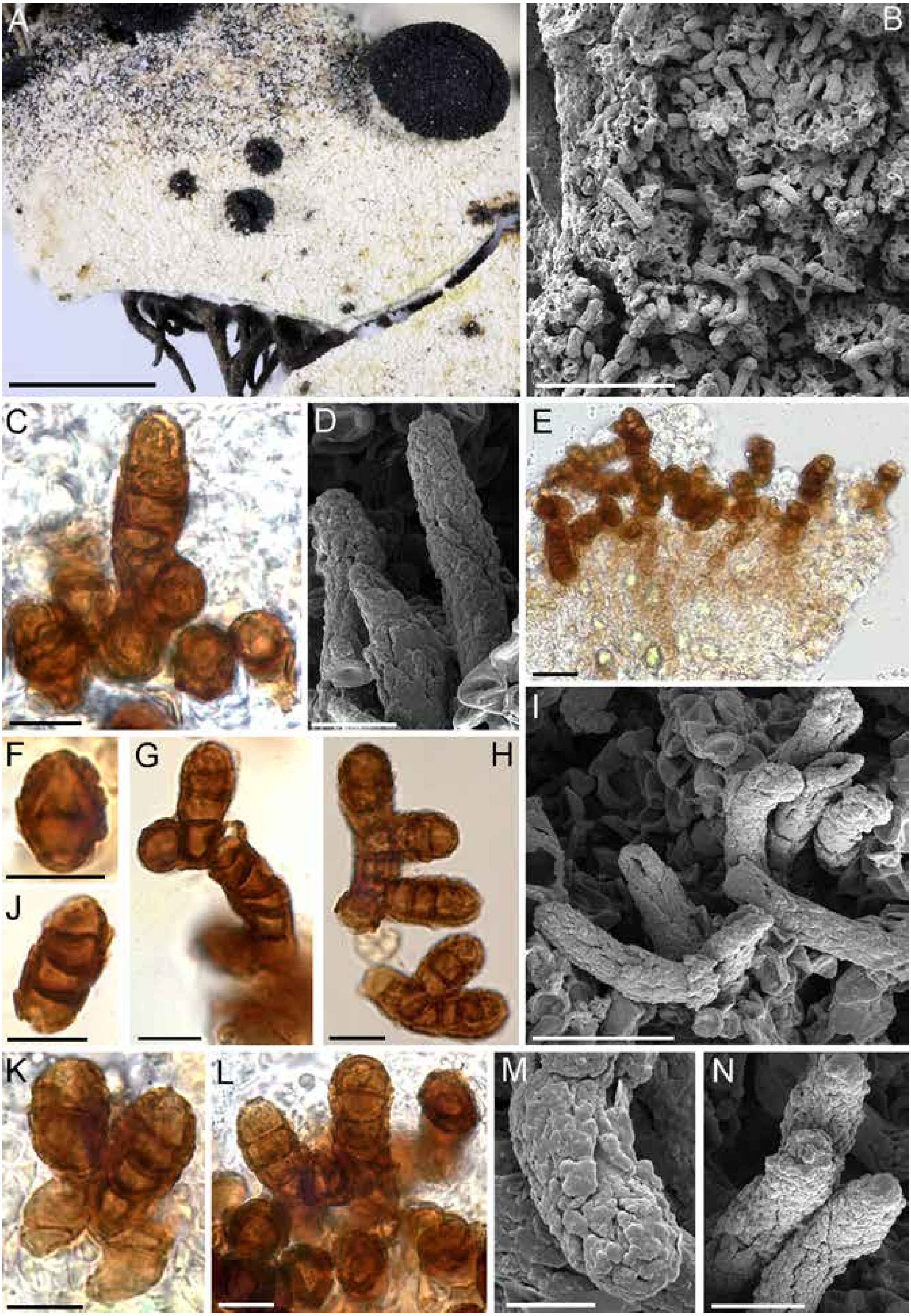

Fig. 66. *Taeniolella umbilicariae* [A, B, D, I, M, N: F-511916; C, E, F–H, J–L: holotype]. **A.** Macroscopic overview of colony. **B.** SEM overview of colony. **C–E, G–I, K, L.** Conidiophores with adhering conidia. **F, J.** Conidia. **M.** Verrucose to squamose surface ornamentation. **N.** Tips of conidiophores. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (B), 20 µm (E), 10 µm (C, F–H, J–L), 9 µm (D, N), 4 µm (M).

covering entire portions of the thalli, caespitose, sometimes causing reddish brown discolorations. *Mycelium* immersed; hyphae torulose, branched, 2–7 µm wide, abundantly septate, cells sometimes torulose, subhyaline, pale brown to brown, smooth, wall slightly thickened, 0.25 µm wide, rarely up to 0.5 µm. *Stromata* diffuse, loose or dense, composed of swollen hyphal cells, irregularly shaped to subglobose or subcylindrical, 3–8(–10) × 4–7(–10) µm, brown to dark brown, smooth to irregularly verrucose, wall thickened, 0.5–2 µm, distinctly multi-layered. *Conidiophores* solitary or usually in dense groups, arising from hyphae, hyphal aggregations or stromata, macronematous, mononematous, erect, ascendant, mostly straight, sometimes flexuous, broad clavate, subcylindrical, unbranched or with up to two branches, conidiophores with adhering conidia 12–46(–55) × (7–)8–11(–12) µm, 0–9(–11)-septate, not or slightly constricted at the septa, dark brown, wall with conspicuous ornamentation, irregularly verrucose, rimulose, squamulose to squamose, squamules 0.2–6 µm wide, irregularly shaped, squamules firm, not detached or only slightly so, outer wall conspicuously thickened, 1–3.5 µm, distinctly multi-layered, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe that increases the thickening in this portion of the wall. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, doliiform or conical, 5–8.5 µm long, conidiogenous loci truncate, unthickened, 5–6.5 µm diam. *Conidia* solitary, straight, sometimes slightly curved, broad obovoid, clavate, subglobose, aseptate conidia rare, 9–11 × (7–)8–10 µm, 1-septate ones 10–15 × (7–)8–10 µm, 2-septate ones 15–21 × (7–)8–11 µm, 3- and 4-septate ones 17–24 × (7–)8–10(–11) µm, conidiophores or fragments sometime breaking off at the basis and functioning as diaspores up to 55 µm long and up to 11-septate, not constricted at the septa, brown to dark brown, ornamentation of the wall as in conidiophores, verrucose, rimulose, squamulose to squamose, squamules irregularly shaped, 0.2–5(–6) µm wide, firm, not detached, wall thickened, 1–2.5(–3) µm, distinctly multi-layered, apex broad rounded, rarely somewhat attenuated, base truncate to slightly obconically truncate, hila truncate or somewhat convex, unthickened, not darkened, 3.5–6(–7) µm diam, germinating conidia observed.

Holotype: **Sweden**, Jämtland, Undersåker par., Sylfjällen, Mt Storsylen, at the summit, alt. 1760 m, on a high vertical rock, on *Umbilicaria virginis*, 31 Jul. 1950, *R. Santesson* (UPS**!**).

Host range and distribution: On *Umbilicaria virginis*, *Umbilicaria* sp.; Sweden, Peru.

Additional specimen examined: **Peru**, Prov. Dos de Mayo, Huanuco, valley of Río Marañón, ca. 58 km WNW of Huanuco, ca. 9°48' S, ca. 76°40' W, 3900 m, on *Umbilicaria* sp., 24 Feb. 1981*, R. Santesson & R. Moberg P50: 45* (UPS F-511916).

Notes: *Taeniolella umbilicariae*, known on *Umbilicaria virginis* from Sweden and on *Umbilicaria* sp. from Peru, is easily distinguishable from *T. umbilicariicola*, also known from Peru on *Umbilicaria* by its consistently wider conidiophores and conidia [(7–)8–11(–12) µm, vs. 5–7(–8) µm in *T. umbilicariicola*]. Furthermore, the ornamentation of the outer wall of conidiophores and conidia of the two species on *Umbilicaria* is different. In *T. umbilicariicola* the outer wall is almost verrucose, soon becoming rimulose with longitudinal fissures when young, but it becomes irregularly rugose or rarely squamulose with age. Both specimens, the holotype and the additional specimen, are listed in Etayo (2010) under *Taeniolella* sp. *Taeniolella umbilicariae* is also easily distinguishable from other species with similar conidiophores and conidia. All morphologically similar species occur on various host species belonging to other orders and families. *T. atricerebrina* has similar dimensions and ornamentation of conidiophores and conidia, but this species induces the formation of galls (Hafellner 2007), which are black, mostly arising from the flanks of the areoles, and are up to 4 mm diam when older. Gall formation was not observed in *T. umbilicariae*. *Taeniolella santessonii*, another similar species, forms sporodochial colonies, and the conidiophores are usually narrower.

Conidiophores and conidia in *T. ionaspisicola* are sometimes smooth, only irregularly rugose or rarely squamulose with age. *T. trapeliopseos*, also a species with verrucose to squamulose conidial walls, is easily distinguishable from *T. umbilicariae* by conspicuously obconically narrowed conidiogenous cells and bases of conidia. *Taeniolella arctoparmeliae* on *Arctoparmelia separata* is comparable with *T. umbilicariae*, but differs in having narrower conidiophores and conidia (6–8 µm wide vs. (7–)8–11(–12) µm wide in *T. umbilicariae*) with obviously less thickened walls (0.5–1.25 µm vs. 1–2.5(–3) µm in *T. umbilicariae*) and by conspicuously obconically narrowed conidiogenous cells and bases of conidia.

Taeniolella umbilicariicola Heuchert & Etayo, **sp. nov.** MycoBank MB819306. Figs 67–68.

Etymology: Epithet named after the genus of the type host, *Umbilicaria* (dweller of *Umbilicaria*).

Literature: Etayo (2010a, as *Taeniolella* sp.).

Diagnosis: Differs from *Taeniolella umbilicariae* in having narrower conidiophores and conidia, 5–7(–8) µm, walls of conidiophores and conidia almost verrucose, soon becoming rimulose with longitudinal fissures when young, but becoming irregularly rugose or rarely squamulose with age. Morphologically similar to *T. christiansenii* which differs, however, in having conidiophores and conidia with smooth to rimulose, sometimes verruculose-striate walls, but without any squamules.

Description: *Colonies* on the surface of the lichen thallus, black, effuse, sometimes denser, forming circular spots, up to 1 cm diam, thallus occasionally discoloured, becoming grey. *Mycelium* immersed; hyphae tortuous, branched, 2–7 µm wide, septate, mostly constricted at the septa, pale brown to brown, rarely subhyaline, smooth to verruculose, rarely becoming rimulose, wall thickened, 0.5 µm wide. *Stroma* diffuse, immersed, dense, confluent, composed of swollen hyphal cells, irregularly shaped to subglobose, doliiform, obovoid or subcylindrical, 2–8 × 2–6 µm, pale brown to brown, smooth, wall thickened, up to 0.5 µm. *Conidiophores* solitary or in small groups, arising from hyphae or swollen hyphal cells, semi-macronematous to macronematous, mononematous, erect to decumbent, mostly straight, partly flexuous, mostly unbranched or occasionally once branched in the upper part, doliiform, subcylindrical or cylindrical, vermicular, conidiophores with adhering conidia 6–47 × 5–7(–8) µm, 0–10-septate, rarely and only slightly constricted at the septa, more constricted with age, brown to

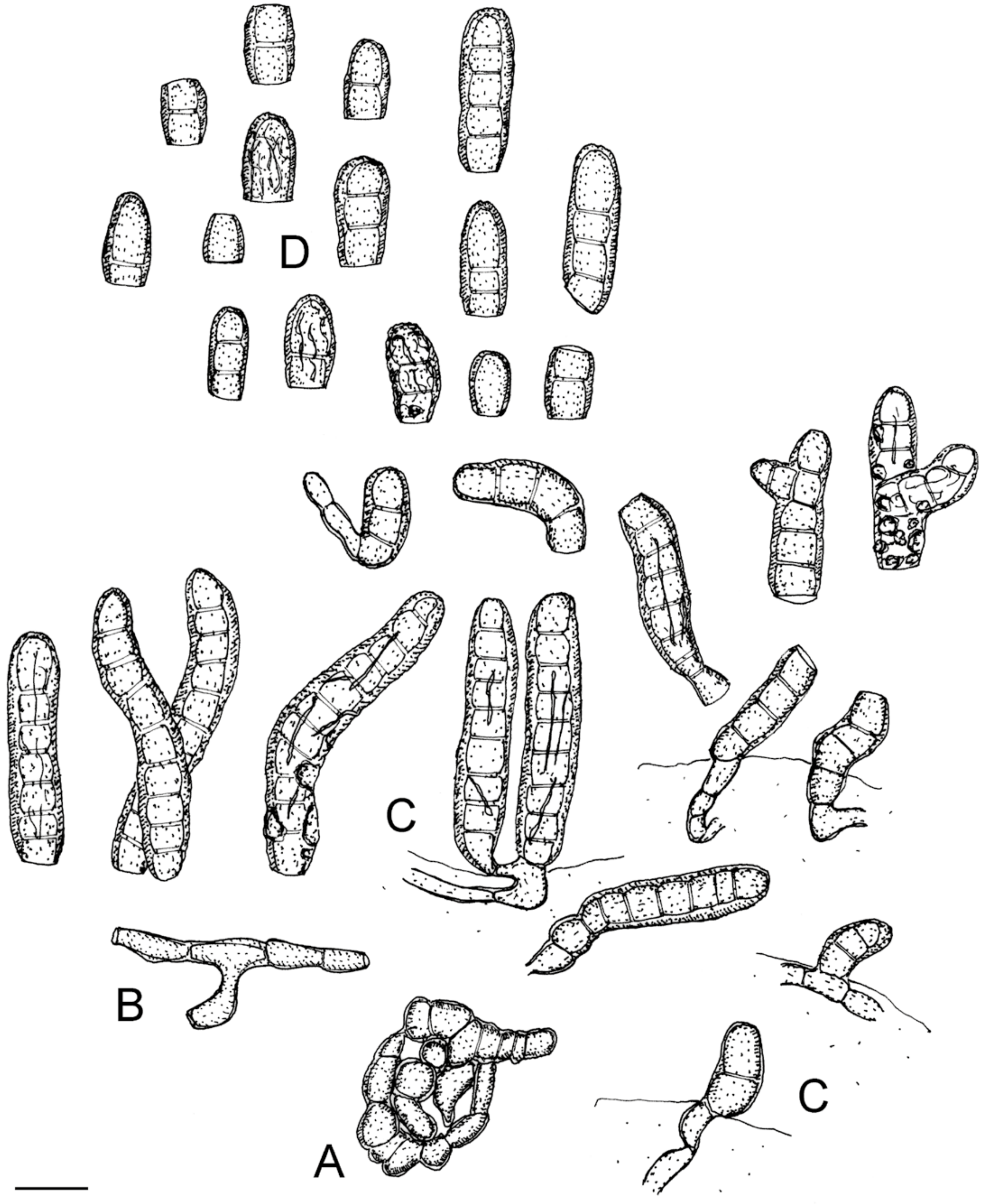

Fig. 67. *Taeniolella umbilicariicola* [holotype]. **A.** Stroma. **B.** Hyphae. **C.** Conidiophores arising from hyphae. **D.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

dark brown, wall irregularly verrucose, soon becoming rimulose, with sparse longitudinal fissures, fissures and transverse cracks more abundant and pronounced with age, then rhagadiose-squamulose to squamose, squamules (patches) 0.25–4 µm, irregularly shaped to subglobose or square, wall thickened, 0.75–2 µm, 0.5 µm near the tip, distinctly multi-layered, rarely enteroblastically proliferating. *Conidiogenous cells* integrated, terminal, thalloblastic or monoblastic, monopodial, doliiform, 4–6 µm long, conidiogenous loci truncate, unthickened, slightly convex, (3.5–)4–5.5 µm diam. Conidiophores disarticulating

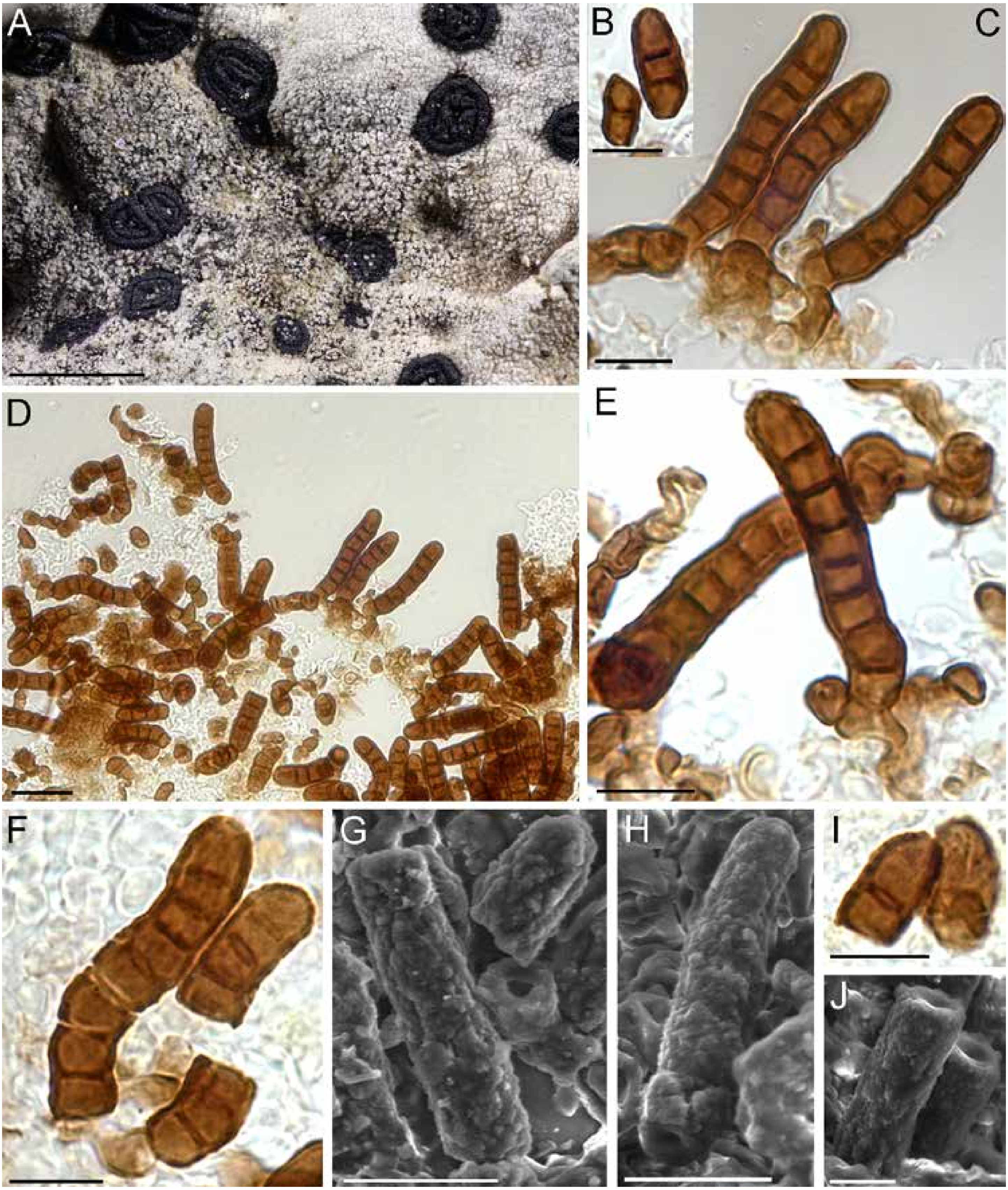

Fig. 68. *Taeniolella umbilicariicola* [A, G, H, J: F-511912; B–F, I: holotype]. **A.** Macroscopic overview of colony. **C–F.** Conidiophores arising from hyphae. **B, I.** Conidia. **G, H, J.** Verrucose to rimulose surface ornamentation with longitudinal fissures and transverse cracks. Bars: 1 mm (A) [photo taken by Paul Diederich], 20 µm (D), 10 µm (B, C, E, F, I), 9 µm (G, H), 4 µm (J).

in irregular large *conidia*, straight, subcylindrical, doliiform, aseptate conidia 5–9(–12) × 5–6(–7) µm, 1-septate ones 10–13(–15) × 5–7(–8) µm, 2-septate ones 11–17 × 5–7 µm, 3-septate ones 16–22 × 5.5–7 µm, 4-septate ones 21–22 × 6–7 µm, conidiophores sometimes breaking off at the basis and functioning as diaspores, up to 55 µm long and 11-septate, not or only slightly constricted at the septa, more constricted with age, brown to dark brown, ornamentation of the wall as in conidiophores, wall thickened, 0.25–1.5 µm, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, hila truncate to somewhat convex, unthickened, not darkened, (2.5–)3–6 µm diam, germinating conidia observed.

Holotype: **Peru**, Prov. Dos de Mayo, Huanuco, valley of Río Marañón, ca. 58 km WNW of Huanuco, ca. 9°48' S, ca. 76°40' W, alt. 3900 m, 24 Feb. 1981, on *Umbilicaria* sp., *R. Santesson & R. Moberg P50:25 bis* (UPS**!**).

Host range and distribution: On *Umbilicaria* sp.; Peru (Etayo 2010a).

Additional specimens examined: **Peru**, Prov. Yungay, Ancash, road Yungay-Llanganuco, ca. 22 km NE of Yungay, 9°5' S, 77°43' W, alt. ca. 3500 m, on *Umbilicaria* sp., 26 Feb. 1981, *R. Santesson & R. Moberg P55: 54 bis* (UPS F-511912); Prov. Dos de Mayo, Huanuco, valley of Río Marañón, ca. 58 km WNW of Huanuco, ca. 9°48' S, ca. 76°40' W, alt. 3900 m, on *Umbilicaria* sp., 24. Feb. 1981, *R. Santesson & R. Moberg P50: 26* (UPS F-511922); Prov. Tarma, Junin, ca. 3 km ENE of Acobamba, 11°22' S, 75°41' W, ca. 3000 m, 7 Feb. 1981, on *Umbilicaria* sp., *R. Santesson & R. Moberg P13: 34 bis* (UPS F-511914).

Notes: *Taeniolella umbilicariicola* is similar to *T. christiansenii*, widespread in Arctic regions (Canadian Arctic, Greenland, Norway, Russian Arctic) on hosts of *Stereocaulaceae* and some of their lichenicolous *Arthoniaceae*. However, the outer wall of conidiophores and conidia in the latter species is smooth to rimulose, sometimes verruculose-striate, but without any squamules. *Taeniolella pseudocyphellariae*, another species with longitudinal fissures is easily distinguishable from *T. umbilicariicola* by having darker superficial hyphae with thicker walls (0.5–2 µm, vs. up to 0.5 µm in *T. umbilicariicola*), conidiophores with annellations, and its hyphae are able to penetrate into algal cells.

Taeniolella verrucosa M.S. Christ. & D. Hawksw., *Bull. Brit. Mus.* (*Nat. Hist.*)*, Bot*. **6**: 258. 1979. Figs 69–70.

Literature: Clauzade *et al*. (1989: 120), Brackel (2009: 43).

Illustration: Hawksworth (1979: 259, fig. 38).

Exsiccatum: Vězda, Lich. Sel. Exs. 2125.

Description: *Colonies* on the surface of thalli, dark brown or almost black, effuse, caespitose, composed of conidiophores or fertile hyphae forming a dense hyphal network, obviously decumbent, sometimes denser, forming small aggregations, 0.25–1.5 mm, without discoloration of the thallus. *Mycelium* immersed or superficial; hyphae torulose, branched, 2–9 µm wide septate, with constrictions at the septa, pale brown to brown, walls thickened, 0.25–0.5 µm, sometimes up to 1 µm wide, smooth to slightly verrucose. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, aggregated in small tufts, arising from basal hyphal cells, loosely caespitose, erect or almost prostrate, decumbent, forming a densely branched sporogenous complex, distinction between conidiophores and superficial hyphae difficult, conidiophores straight to flexuous, subcylindrical, often 1–2 times branched at the base, conidiophores with adhering conidia 9–104 × 7–9(–10) µm, 1–12-septate, mostly constricted at the septa, occasionally with oblique or longitudinal septa, sometimes with intercalary swellings, brown to dark brown, outer wall verruculose to rimulose, wall splitting, not detached or only slightly so, wall thickened, 0.5–1.5 µm, often less thickened towards the apex, usually 1–2 times enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic, rarely polyblastic, monopodial, subcylindrical, poorly differentiated, doliiform, 3–10 µm long, conidiogenous loci truncate to slightly convex, unthickened, 3–5 µm diam. *Conidia* catenate in unbranched chains, not easily disintegrating, straight, doliiform, subcylindrical, obovoid, 0–1(–3)-septate, aseptate conidia 6–12 × 6–7 µm, 1-septate ones 8–14 × 6–10 µm, 2- and 3-septate ones 17–19 × 6–7 µm, mostly constricted at the septa, brown to dark brown, ornamentation of the outer wall similar as in conidiophores, wall thickened, 0.25–1 µm, rarely slightly detached, apex rounded in primary conidia, truncate in secondary ones, base truncate to slightly convex, hila truncate, unthickened, not darkened, thick outer wall forming a small rim, 3–5 µm diam.

Holotype: **Sweden**, Skåne, Genarp, Häckeberga, on *Quercus*, on thalli of *Pachnolepia pruinata* (≡ *Arthonia pruinata*), 24 Apr. 1946, *M.S. Christiansen 12.967* p.p. (C, herb. Christiansen 569**!**).

Host range and distribution: On *Aspicilia caesiocinerea*, *Micarea denigrata*, *Pachnolepia pruinata*, *Rhizocarpon geographicum*; Denmark (Alstrup *et al*. 2004, Santesson 2008), Germany (Brackel 2009, 2010a, Wirth *et al*. 2010), Greenland (Alstrup *et al*. 2009), Sweden (Hawksworth 1979, Santesson 1993, Nordin *et al*. 2010).

Additional specimens examined: **Denmark**, Bornholm 47, Christiansø, on *Aspicilia caesiocinerea*, 2 Jul. 1987, *V. Alstrup* (C, herb. Christiansen 5936); Zealand, Greve, Mosede Strand, on decaying wood of the roof of a house near the sea-shore, on *Micarea denigrata*, 29 Aug. 1980, *M.S. Christiansen 80.410* (C, herb. Christiansen 1322); Karlstrup, Karlstrup Strandpark, on the horizontal surface of a wooden rail on the parking ground of the public park "Trylleskoven", near the sea-shore, on *M. denigrata*, 2 Jan. 1981, *M.S. Christiansen 81.001* (C, herb. Christiansen 1326, 1325). **Sweden**, Skåne, Häckeberga, on old oaks at the lake, on *Pachnolepia pruinata*, 24 Apr. 1946, *M.S. Christiansen 12.967b* (C, herb. Christiansen 571).

Notes: A re-examination of *Taeniolella verrucosa* was rather difficult. The existing collections, including type material, are sparingly developed and/or mixed with *T. delicata*, as already observed by Hawksworth (1979). A few fragments seen in the scanty collections on *Micarea denigrata* (C, herb. Christiansen 1322, 1326, 1325) may belong to *T. verrucosa*. These samples are tentatively referred to as *T. verrucosa*. In another collection on *Micarea denigrata* [Denmark, Zealand, Greve, Mosede Strand, on wood of a wicked to a garage, near the ground, 16 Aug. 1980, *M. S. Christiansen 80.160a* (C, herb. Christiansen 1245)] only *T. delicata* was found. A collection on *Enterographa zonata* and *Chrysothrix candelaris* [on old *Quercus*, Denmark 44: NEZ, Jægerspris, Nordskoven, Store Eskemose, 25 Jun. 1988, *V. Alstrup* (C, herb. Christiansen 6041)], published in Alstrup (1993b), proved to be a misidentification and represents the first record of *Trimmatostroma quercicola* Diederich, U. Braun & Heuchert (published in Diederich *et al*. 2010) from Denmark. Material on *Pertusaria carneopallida* (Sweden, Torne Lappmark,

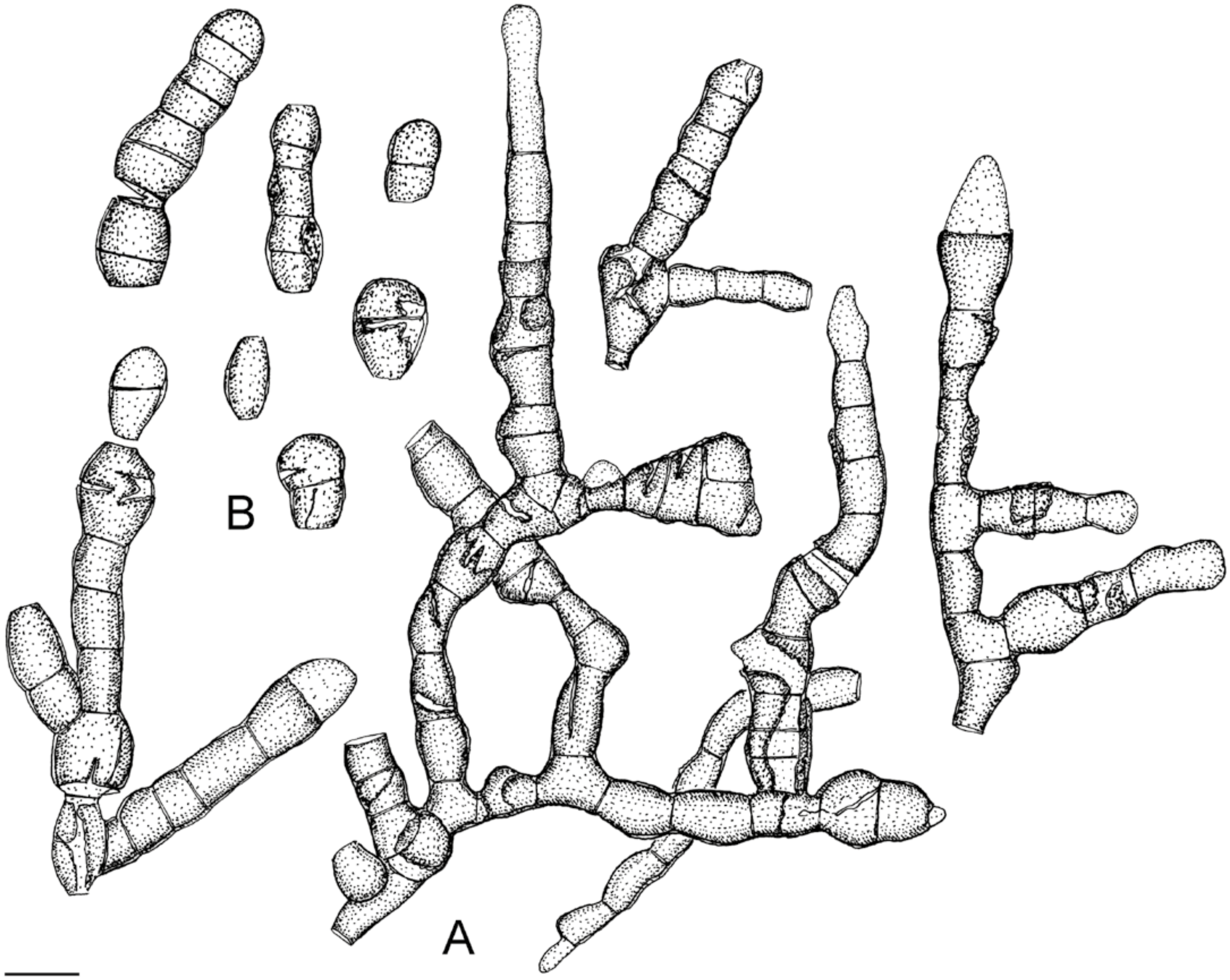

Fig. 69. *Taeniolella verrucosa* [holotype]. **A.** Superficial hyphae and conidiophores forming densely branched sporogenous complex with adhering conidia. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Kiruna, Abisko, 1.5 km W of Jieorenjokkstugan, alt. 340–400 m, on *Alnus incana*, 6 Aug. 1980, *H. Mayrhofer*, Vězda, Lich. Sel. Exs. 2125), distributed as *T. verrucosa*, has later been re-identified as *T. pertusariicola* by D. Hawksworth and H. Mayrhofer (in Alstrup & Hawksworth 1990). The ornamentation of the conidiophores and conidia in *T. pertusariicola* is similar to that of *T. verrucosa*, but the former species differs in having shorter and narrower conidiophores. Furthermore, conidia are usually narrower (Hawksworth in Vězda 1986: 7), and 2- or 3-septate conidia, predominant in *T. pertusariicola*, are rarely formed in *T. verrucosa*.

Taeniolella verrucosa is characterised by conidiophores and fertile hyphae forming a densely branched sporogenous complex. The distinction between conidiophores and superficial hyphae is, however, rather difficult. Hawksworth (1979) described the conidiophores as erect or almost prostrate. Superficial hyphae and conidiophores form at times an irregularly branched net overgrowing the substrate, which is easily visible, even at a magnification of ×40. A similar network could be observed in *Trimmatostroma umbilicariicola* (Heuchert & Braun 2014).

Oblique or longitudinal septa, as depicted in Hawksworth (1979: 259, fig. 38), are rarely formed in *Taeniolella verrucosa*. This type of septation is unusual for *Taeniolella*, but common in *Trimmatostroma s. lat*. However, species of *Taeniolella*, including *T. verrucosa*, are easily distinguished from *Trimmatostroma* by having superficial, semi-macronematous conidiophores, and conidia are formed in acropetal chains. Multicellular aggregations of conidial cells, characteristic for *Trimmatostroma* species, are lacking in *Taeniolella* (Diederich *et al*. 2010). Otherwise, *T. verrucosa* does not share any common traits with *Trimmatostroma* spp.

Taeniolella christiansenii, known on some *Stereocaulon* species and some of their lichenicolous *Arthonia* species, is characterised by forming areas on the host thalli with torulose hyphae. The ornamentation of the outer wall of conidiophores and conidia is similar to that in *T. verrucosa*, but conidiophores and conidia in the latter species are usually wider (conidiophores 9–104 × 7–9(–10) µm vs. 5–55 × 4–7(–9) µm in *T. christiansenii*).

Taeniolella umbilicariicola is another *Taeniolella* species with verrucose to rimulose outer walls of conidiophores and conidia, but its mycelium is immersed, *i.e.*, a superficial hyphal network is lacking. The mostly unbranched conidiophores of *Taeniolella umbilicariicola* do not form densely branched sporogenous complexes. In addition, walls of older conidiophores turn rhagadiose-squamulose to squamose, conidiophores disarticulate in irregular, large conidia up to 55 µm long and 11-septate, and

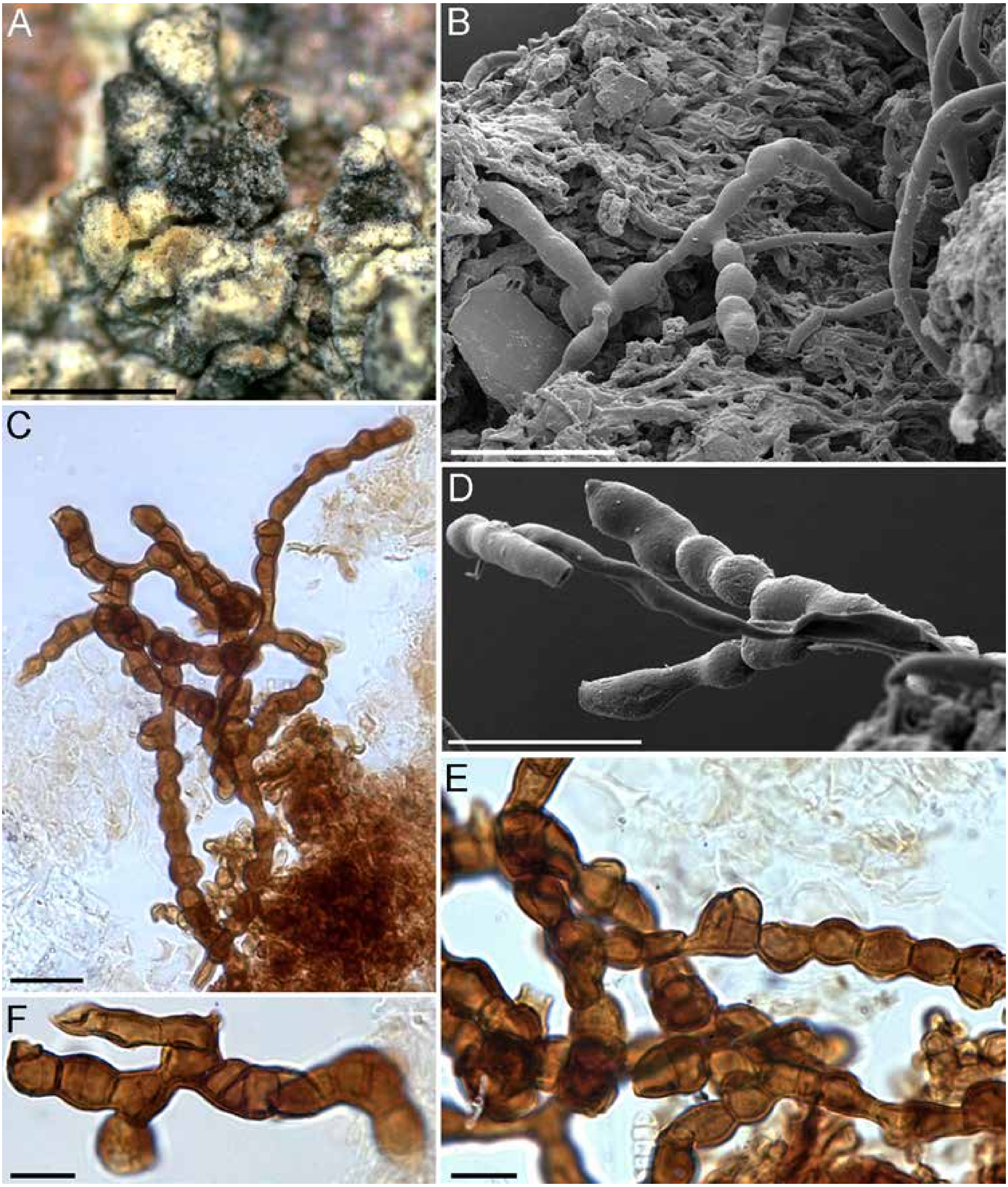

Fig. 70. *Taeniolella verrucosa* [holotype]. **A.** Macroscopic overview of colony. **B–F.** Superficial hyphae and conidiophores forming densely branched sporogenous complex with adhering conidia. Bars: 1 mm (A), 30 µm (B), 20 µm (C, D), 10 µm (E, F).

conidiophores and conidia are rarely and only slightly constricted at the septa.

Taeniolella arthoniae is also known on *Pachnolepia pruinata*, but distinguished from *T. verrucosa* by having usually narrower conidiophores (8–80 × 2.5–6.5(–8) µm in *T. arthoniae*), and the frequently branched conidiophores do not form any sporogenous complexes.

Taeniolella weberi Heuchert & Sparrius, **sp. nov.** MycoBank MB819307. Figs 71–72.

Etymology: Name derived from the epithet of the type host, (*Thelotrema*) *weberi*.

Diagnosis: Differs from all lichenicolous *Taeniolella* species in having conidiophores arranged in well-developed sporodochia and broad conidia (6–8 µm) with conspicuously thickened (0.75–2 µm) and darkened, distinctly multilayered septa.

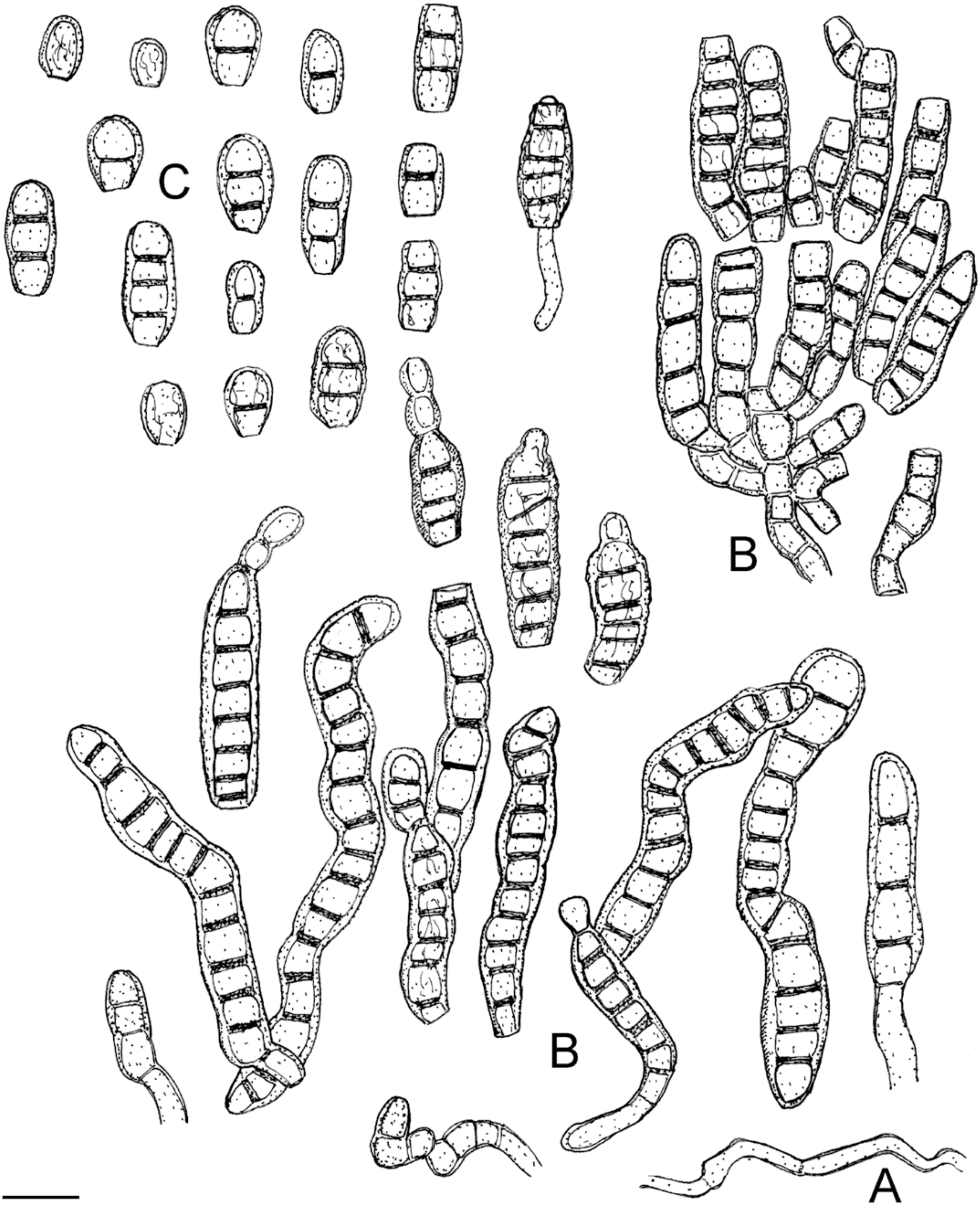

Fig. 71. *Taeniolella weberi* [holotype]. **A.** Hyphae. **B.** Conidiophores arising from hyphae with adhering conidia. **C.** Bar = 10 µm (B. Heuchert *del.*).

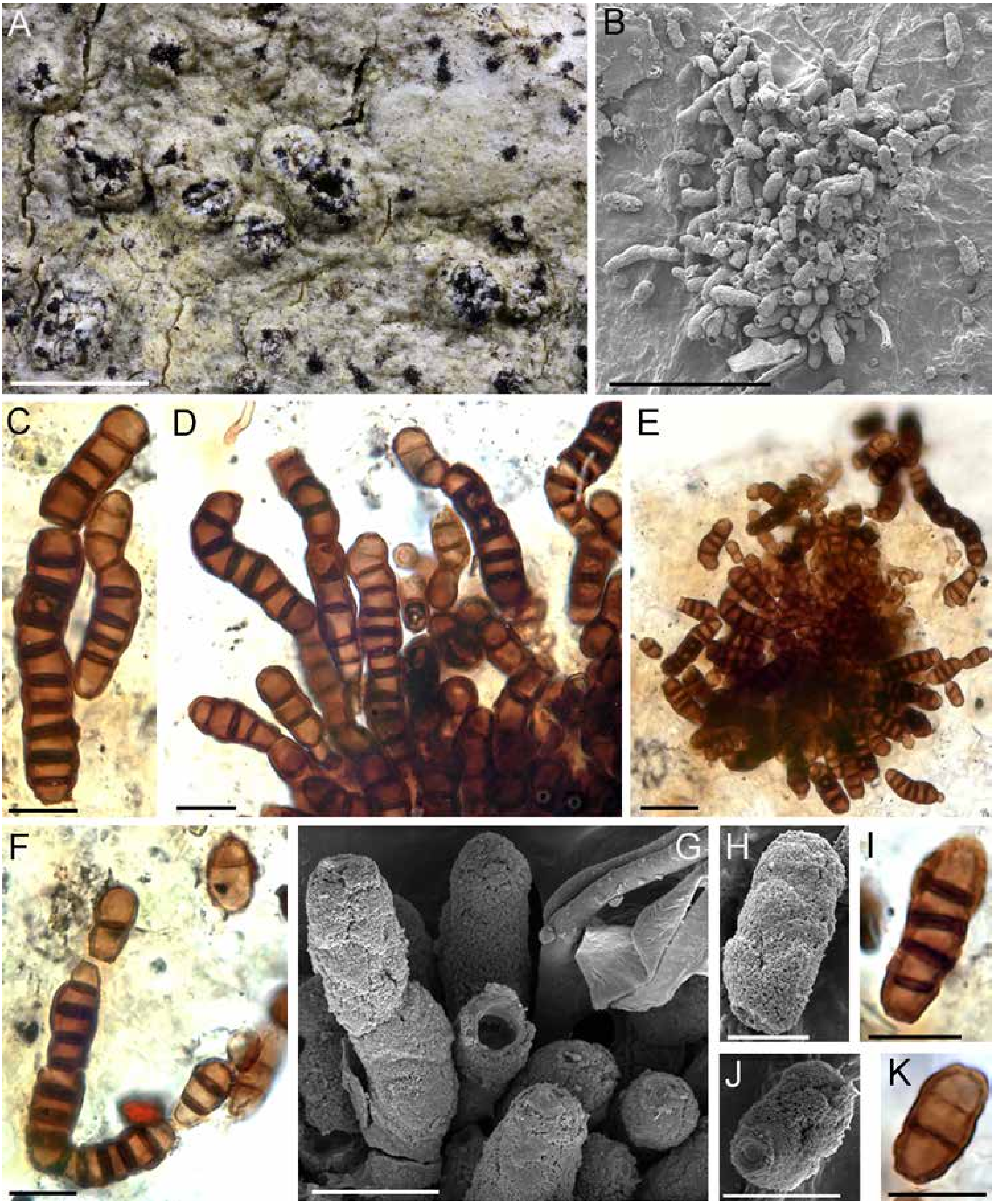

Fig. 72. *Taeniolella weberi* [holotype]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, D, F.** Conidiophores with adhering conidia. **E.** Conidiophores in sporodochial conidiomata. **G–K.** Conidia with irregular verrucose surface and conspicuous thickened and darkened septa. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (B), 20 µm (E), 10 µm (C, D, F, I, K), 9 µm (G, J), 5 µm (H).

Description: *Colonies* on the surface of thalli and at the margin of apothecia, punctiform, up to 0.2 mm diam, effuse, confluent, caespitose, black, thallus without discoloration. *Mycelium* immersed and superficial; hyphae flexuous, branched, 2–5 µm wide, septate, slightly constricted at the septa, pale brown, smooth, thick-walled, 0.25–0.5 µm wide. Hyphal cells below fascicles of conidiophores stromatically aggregated, swollen, subglobose, brown, smooth to irregularly verrucose, 4–7 µm diam. *Conidiophores* semi-macronematous, mononematous, mostly densely fasciculate, in sporodochial conidiomata, up to 100 µm diam, rarely solitary, arising from hyphae or swollen hyphal cells, erect, straight to slightly curved, broad subcylindrical, unbranched, 12–70 × 5–8 µm, 2–5-septate, slightly to distinctly constricted at the septa, septa conspicuously thickened, 0.75–2 µm, darkened, distinctly multi-layered, conidiophores dark brown, paler towards the apex, wall thickened, 0.5–1.5 µm wide, irregularly verrucose, somewhat rimulose, rarely smooth. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, doliiform, short cylindrical, narrowed at the apex, 4–6 µm long, conidiogenous loci truncate to slightly convex, unthickened, 2–3 µm diam. *Conidia* catenate, in unbranched, easily disarticulating chains, straight or slightly curved, broad subcylindrical, obovoid to ellipsoid, 0–3-septate, aseptate conidia 6–8 × 5–5.5 µm, 1-septate ones 9–12 × 5–7 µm, 2-septate ones 10–15 × 5.5–8 µm, 3-septate ones 15–16 × 7 µm, slightly constricted at the septa, brown to dark brown, wall thickened, 0.5–1.5 µm wide, septa conspicuously thickened and darkened, distinctly multi-layered, 0.5–1.25 µm wide, irregularly verrucose, rimulose, rarely smooth, apex rounded in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed, hila truncate, unthickened, not darkened, 1.5–3 µm diam.

Holotype: **Taiwan**, Hualien Country, Taroko National Park, Hohuan Shan, *Pseudotsuga* forest, 2950 m alt., 13 Oct. 2001, 24°07'12" N, 121°15'35" E, on *Pseudotsuga*, on *Thelotrema weberi*, *L.B. Sparrius 6364* (HAL 3140 F**!**).

Host range and distribution: On *Thelotrema weberi*; Taiwan, known only from the type collection.

Notes: *Taeniolella weberi*, known only from Taiwan on *Thelotrema weberi*, is readily distinguished from *T. toruloides* and *T. thelotrematis*, two other species growing on *Thelotrema*, by its unbranched conidiophores in large sporodochial conidiomata. Furthermore, *T. weberi* is an unusual species of *Taeniolella*, unique within this genus by its rather broad (6–8 µm) conidia and conspicuously thickened (0.75–2 µm) and darkened, distinctly multi-layered septa that distinguish it from all other *Taeniolella* spp. The arrangement of conidiophores in well-developed sporodochia is reminiscent of conidiomata of *Spilodochium*. However, the latter genus is clearly distinct from *Taeniolella* by its conidia formed in branched acropetal chains directly arising from particular outer stroma cells, *i.e.*, separate, multicellular conidiophores are not differentiated (Ellis 1971, 1976). The formation of conidiophores in sporodochial conidiomata is of little relevance on generic level within hyphomycete genera, as demonstrated within *Fusicladium* (see Schubert *et al*. 2003), *Pseudocercospora* and other genera of the *Mycosphaerellaceae* with hyphomycetous asexual morphs (see Braun 1995, Crous & Braun 2003). Therefore, *T. weberi* cannot be excluded from *Taeniolella s. lat.* just based on differences in the arrangement of conidiophores. The generic affinity of this species needs to be verified by means of molecular sequence analyses.

Taeniolella sp. (putative asexual morph of *Sphaerellothecium thamnoliae* Zhurb.). Figs 73–74.

Description: *Colonies* spreading widely over the surface of podetia, on old decaying parts as well as on undamaged portions, punctiform, aggregated in tufts or loose groups, confluent, loosely caespitose, rarely with superficial hyphae, dark brown to black, not causing any discolorations of the thallus. *Mycelium* immersed, partly superficial; hyphae flexuous, branched, 2–3 µm wide, older parts 5–6 µm wide, septate, with constrictions at the septa, cells ellipsoid, sometimes swollen, sinuous, pale brown to brown, walls slightly thickened, up to 0.5 µm, smooth. *Stromata* lacking, swollen hyphal cells rarely aggregated below conidiophores. Conidia formed on *micronematous conidiophores* seemingly "sessile", *i.e.*, formed on conidiophores reduced to conidiogenous cells, integrated in hyphae, intercalary and terminal, solitary or in small groups, unbranched, straight, broad ellipsoid, doliiform, subcylindrical, 4–5 × 3–4 µm, aseptate, pale brown, distinctly paler than conidia and semi-macronematous conidiophores, smooth, wall slightly thickened, up to 0.5 µm, monoblastic, mostly with peg-like lateral protuberances giving rise to conidia. *Semi-macronematous conidiophores* mononematous, solitary or in small tufts, mostly 3–5, arising from plagiotropous hyphae, lateral and terminal, densely caespitose, erect, straight to slightly flexuous at the tip, subcylindrical, obovoid or broad ellipsoid, mostly unbranched, occasionally branched at the base or in the lower part, conidiophores with adhering conidia 15–32 × 5–6 µm, 3–9-septate, not or slightly constricted at the septa, brown to dark brown, sometimes paler towards the apex, wall verruculose or irregularly rough, usually with fine net-like cracks, sometimes squamulose, thick-walled, up to 1 µm, rarely enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic or thalloblastic, monopodial, doliiform, 4–5 µm long, conidiogenous loci truncate to slightly convex, unthickened, 2–4 µm diam. *Conidia* usually single, rarely catenate or conidiophores disintegrating in fragments, straight, rarely slightly curved, subcylindrical, obovoid, ellipsoid, 1–5-septate, 1-septate ones 6–10 × 5–6 µm, 2-septate ones 8–13.5 × 5–5.5 µm, 3-septate ones 12–15 × 5–5.5 µm, 4–5-septate ones 15–20 × 5–6 µm, not or only occasionally slightly constricted at the septa, brown to dark brown, wall slightly thickened, 0.25–0.5 µm, wall of young conidia smooth, later verruculose or irregularly rough, usually with fine net-like cracks, sometimes squamulose, apex rounded, base truncate to slightly convex, hila truncate, unthickened, not darkened, 2–4 µm diam.

Specimens examined: **Norway**, Troms County, Storfjord Municipality, Skibotndalen River valley, Skibotnelva, 500 m NW of Kavelnes, rocks and boulders on forested slope, 69°19' N, 20°21' E, alt. 100 m, on *Thamnolia vermicularis* var. *vermicularis*, 6 Aug. 2003, *M.P. Zhurbenko 03457* (LE 309433). **Russia**, Krasnoyarsk Territory, Taimyr Peninsula, Byrranga Mts., northern coast of Levinson-Lessing Lake, mountain slope with arctic tundra, 74°32' N, 98°33' E, alt. 300 m, on *T. vermicularis* var. *vermicularis*, 29 Jul. 1994, *M.P. Zhurbenko 94132* (LE 309431); Chukotka Autonomous Area, lower Kymyneiveem River, arctic tundra, 67°26' N, 175°25' W, on *T. vermicularis* var. *vermicularis*, 23 Jul. 1989, *A.E. Katenin* (LE 309432); Krasnodar Territory, Greater Caucasus Range, Caucasian Biosphere Reserve, northern slope of Armovka Mt., alpine vegetation, 43°52'28" N, 40°39'20" E, alt. 2250 m, on old decaying part of podetium

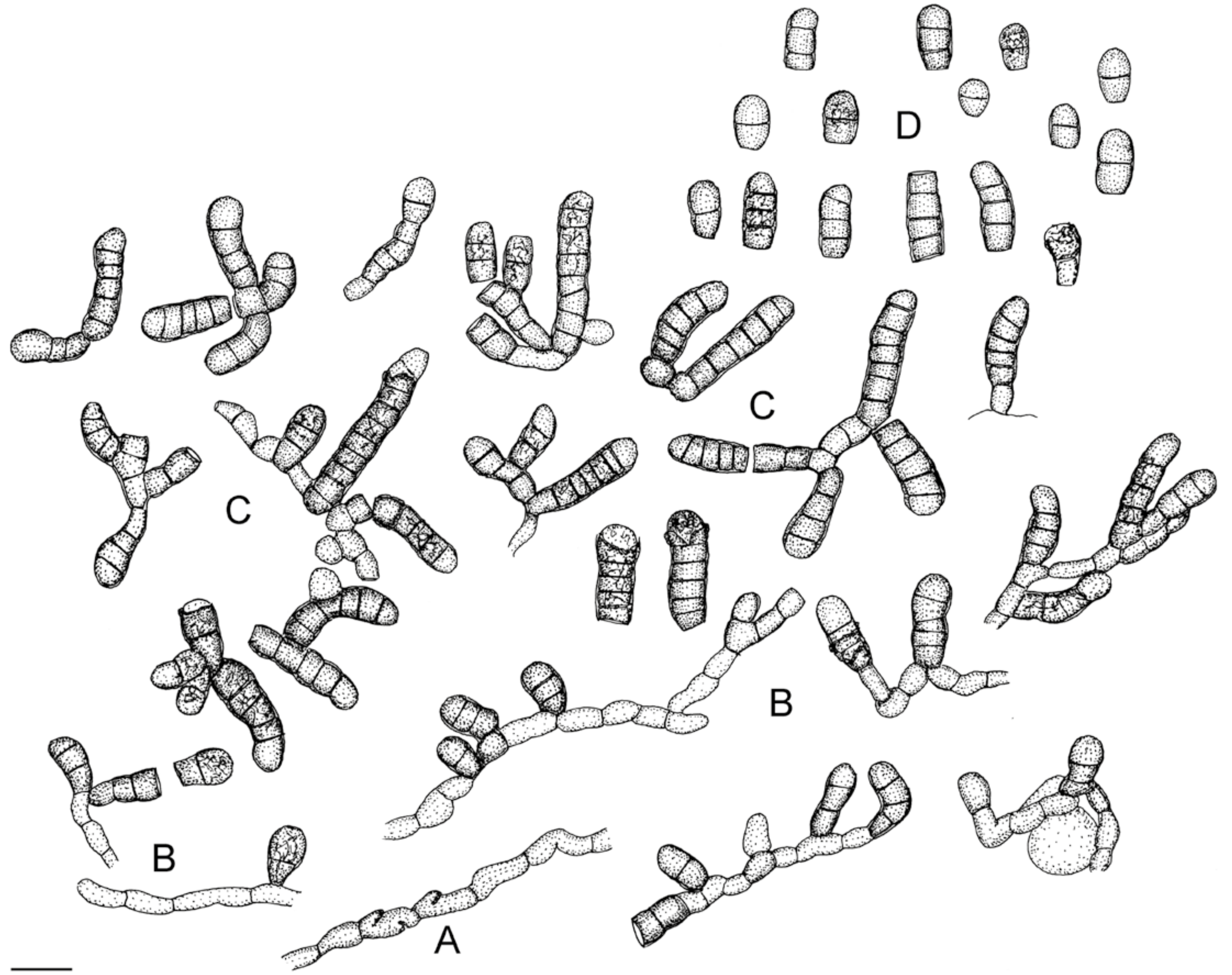

Fig. 73. *Taeniolella* sp. (putative asexual morph of *Sphaerellothecium thamnoliae*) [HAL 3138 F]. **A.** Hyphae. **B.** Conidia formed on micronematous conidiophores. **C.** Semi-macronematous conidiophores in small tufts with adhering conidia. **D.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

of *T. vermicularis* var. *subiliformis*, 30 Aug. 2014, *M. Zhurbenko 14154* (HAL 3138 F).

Notes: Taeniolella-like asexual fructifications have frequently been found on *Thamnolia vermicularis*, including the collections cited above, as well as numerous additional specimens examined by M. Zhurbenko. In some of the collections, the taeniolella-like asexual morphs are associated with typical colonies assignable to *Sphaerellothecium thamnoliae* (Zhurbenko 2012), characterised by forming reticulate mycelial mats and ascomata. In other collections, reticulate mycelial colonies are lacking or less evident, and ascomata are not developed. *Sphaerellothecium thamnoliae* is very common and widespread on *Thamnolia vermicularis*. The taeniolella-like asexual morph described above has been found on *T. vermicularis* several times. It might be the putative asexual morph of the latter species, although a definitive proof is still lacking and requires cultures and molecular sequence analyses on the basis of data retrieved from the asexual and sexual morphs independently of each other. In most of the specimens on *Thamnolia* with taeniolella-like asexual morphs, characteristic symptoms with a reticulate mycelial coating are not or only rudimentarily developed. However, superficial reticulate mycelial covers may not always be present in *S. thamnoliae*, *e.g.*, in *S. thamnoliae* var. *taimyrica* Zhurb. (Zhurbenko 2012) the hyphae are usually immersed. *Sphaerellothecium* is traditionally assigned to the capnodialean family *Mycosphaerellaceae* (Lumbsch & Huhndorf 2009), but the phylogeny of *Sphaerellothecium* in general and *S. thamnoliae* in particular is still unconfirmed. In the event that the two morphs found on *Thamnolia vermicularis* belong to a single species, as currently thought, and if the mycosphaerellaceous affinity of *Sphaerellothecium* will prove to be correct, this would be the first case of a *Taeniolella* (*s. lat*.) connected with an ascomycete belonging to the *Mycosphaerellaceae*.

With regards to biometric data and the structure of outer walls of conidiophores and conidia, the present taeniolella-like asexual morph on *Thamnolia* is very similar to *Taeniolella strictae*, which is hitherto known only from the type collection on *Cladonia stricta* from Greenland. *T. strictae* is distinguished from the species on *Thamnolia* by forming a superficial mycelium, composed of subglobose or globose, monilioid cells with irregularly rough walls, usually with fine net-like cracks or with squamules up to 2 µm wide. In addition, obovoid and

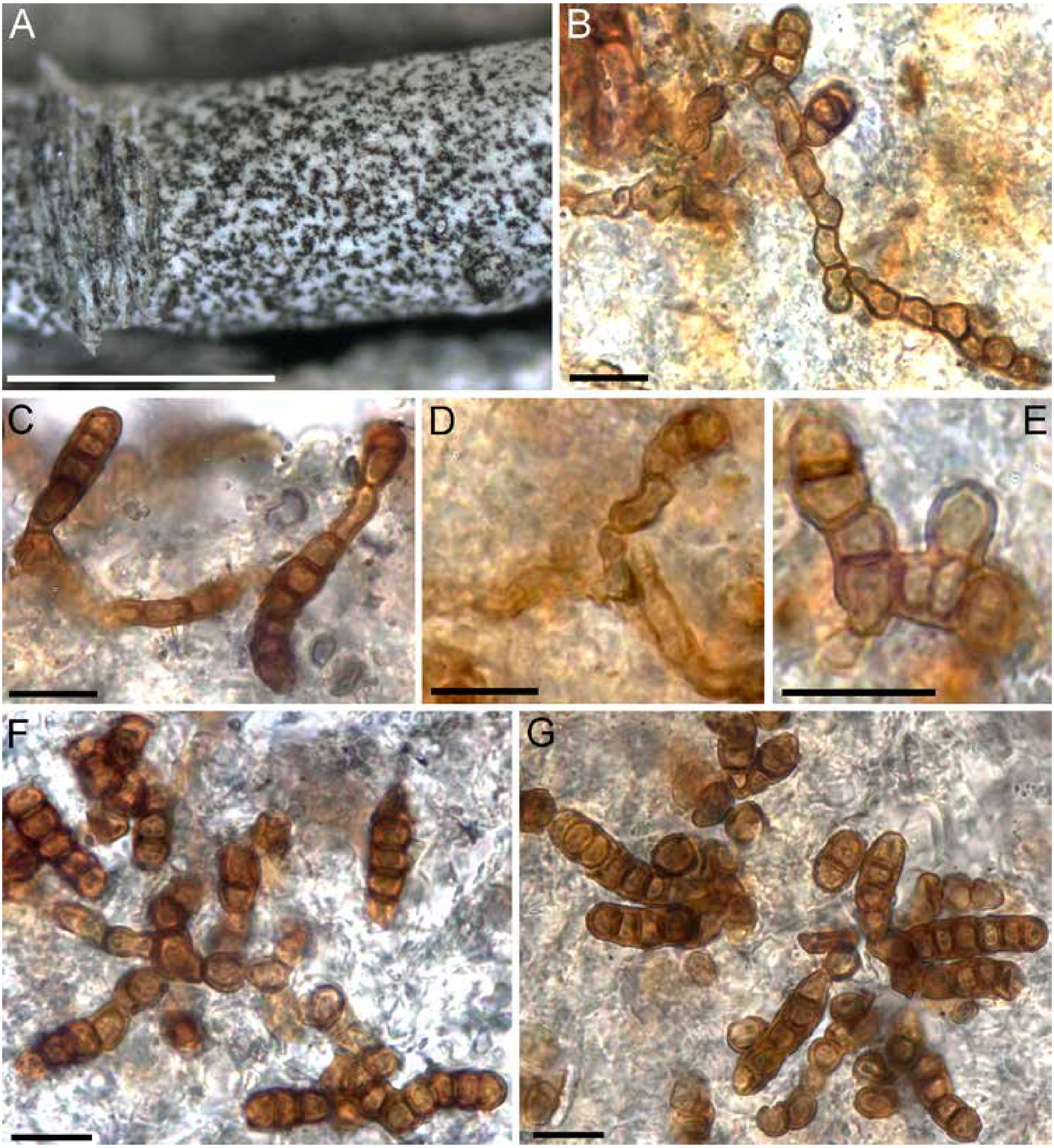

Fig. 74. *Taeniolella* sp. (putative asexual morph of *Sphaerellothecium thamnoliae*) [HAL 3138 F]. **A.** Macroscopic overview of colony. **B–E.** Conidia formed on micronematous conidiophores. **F, G.** Semi-macronematous conidiophores in small tufts with adhering conidia. Bars: 1 mm (A), 10 µm (B–G).

ellipsoid conidia, which are characteristic for the asexual morph on *Thamnolia*, have not been observed in *T. strictae*.

Taeniolella diederichiana, probably confined to *Placopsis* in Columbia, Canary Islands, French Southern Territories, Iceland, Peru and Russia, as well as *T. pertusariicola*, widespread in Northern Europe on various hosts, *e.g.*, *Lecanora rupicola*, *Pertusaria bryontha* and *P. carneopallida*, are both with regard to size and formation of semi-macronematous conidiophores arising from plagiotropous hyphae morphologically very similar to the putative asexual morph of *S. thamnoliae*, but they differ significantly in having wider conidiophores and conidia (up to 8 µm broad in *T. diederichiana* and *T. pertusariicola* vs. up to 6 µm in the fungus on *Thamnolia vermicularis*) and walls with irregularly shaped squamules, 0.5–3 µm wide. In the present asexual morph on *Thamnolia*, the wall of conidiophores and conidia is verruculose or irregularly rough, usually with fine net-like cracks. The stereocaulicolous species *T. christiansenii*, known from British Columbia, the Canadian Arctic, Greenland, Norway, Russia, and USA, is another comparable species, but small, aseptate conidia formed in *T. christiansenii* (4–12 × 3–6.5(–7) µm) are lacking in the asexual morph on *Thamnolia*, 1–3-septate conidia are usually wider (up to 7.5 µm) in *T. christiansenii*, and the outermost wall layer of conidiophores and conidia are longitudinally splitting and form a verruculose-striate surface that is easily distinguishable from walls with fine net-like cracks in the taeniolella-like morph on *Thamnolia vermicularis*.

Saprobic Taeniolella species

Taeniolella alta (Ehrenb.) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 75–76.

Basionym: *Hormiscium altum* Ehrenb., *Sylv. mycol. Berol*.: 10, 22. 1818.

Synonyms: *Torula alta* (Ehrenb.) Pers., *Mycol. Europ*. **1**: 22. 1822.
Monilia alta (Ehrenb.) Link, in Willd., *Sp. pl.*, Ed. 4, **6**: 126. 1824.
Taeniola alta (Ehrenb.) Bonord., *Handb. Mykol*.: 36. 1851.
Torula alnea Peck, Rep. (*Annual*) *New York State Mus. Nat. Hist*. **25**: 89. 1873 [*lectotype* (designated here, MycoBank MBT380027: **USA**, *New York*, North Elba, Adirondrack Mts., on dead branches

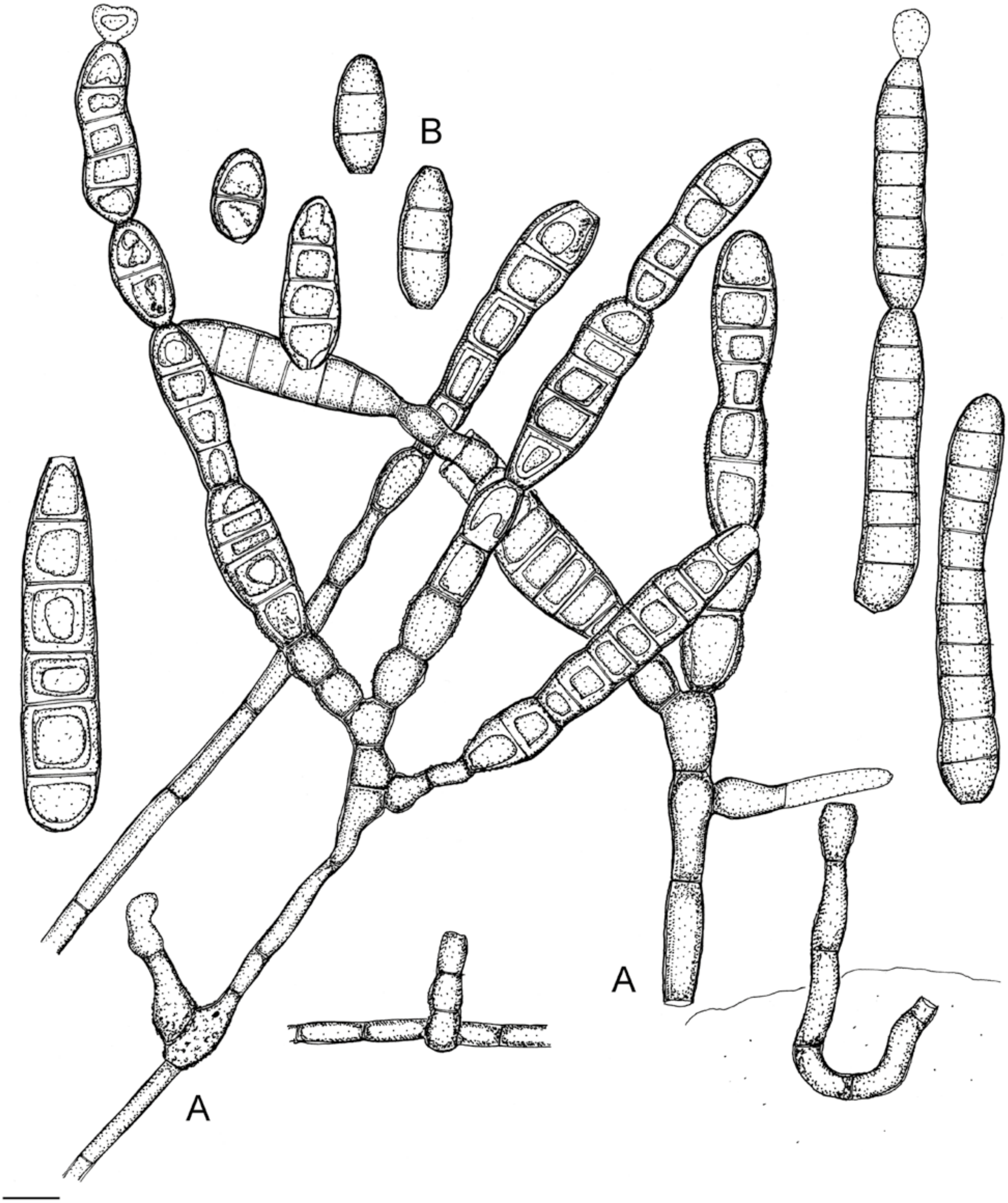

Fig. 75. *Taeniolella alta* [BP 77867]. **A.** Conidiophores arising from hyphae with adhering conidia. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

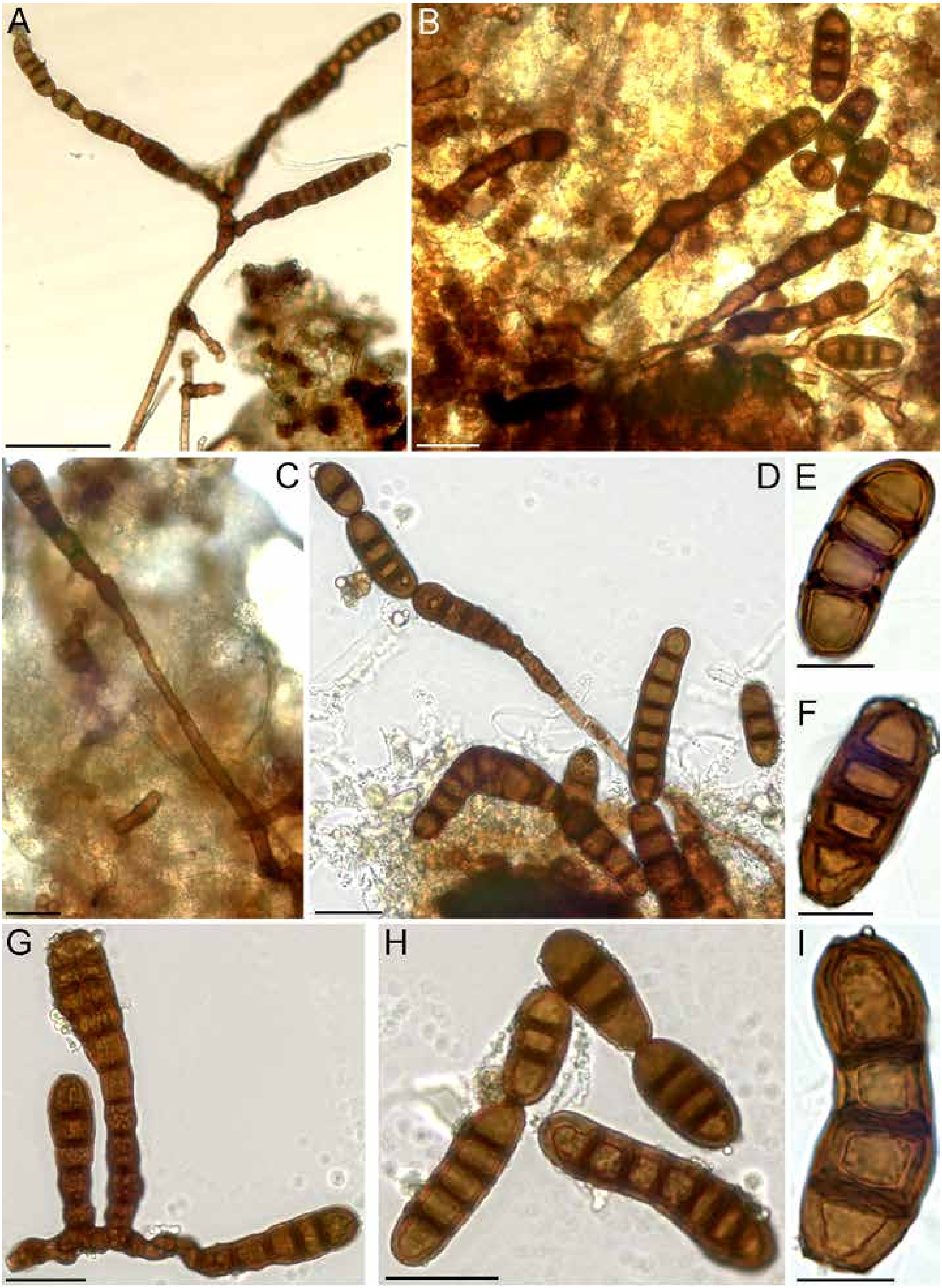

Fig. 76. *Taeniolella alta* [BP 77867]. **A–D, G.** Conidiophores arising from hyphae with adhering conidia. **E, F, H, I.** Conidia. Bars: 50 µm (A), 20 µm (B–D, G, H), 10 µm (E, F, I).

of *Alnus* sp., July, *C.H. Peck* (NYS-F-197**!**); *syntypes*: NYS-F-198, 199].

Septonema dichaenoides Peck & Clinton in Peck, Rep. (*Annual*) *New York State Mus. Nat. Hist*. **30**: 53. 1878 [*holotype*: **USA**, *New York*, Cattaraugus, Olean, on *Alnus* sp., May, *G.W. Clinton* (NYS-F-1005**!**)].

Septonema nitidum P. Karst., *Meddeland. Soc. Fauna Fl. Fenn*. **16**: 44. 1888 [*holotype*: **Finland**, Tammela, Mustiala, on bark of *Alnus glutinosa*, Oct. ("In cortice Alni ad Mustiala, m. Oct.") (H 6052525)].

Literature: Ellis (1976: 59), Hughes (1980b: 1–2), Révay (1985: 69), Ellis & Ellis (1997: 91), Mel'nik (2000: 306), Yurchenko (2001: 47–49), Cruz & Gusmão (2009: 1138), Wang (2010: 191), Bülbül *et al.* (2011: 164), Hayova (2011: 868).

Illustrations: Ellis (1976: 60, fig. B), Hughes (1980b: 1, figs 1–4), Révay (1985: pl. IV, fig. 1), Ellis & Ellis (1997: pl. 38, fig. 365), Mel'nik (2000: 305, fig. 213), Yurchenko (2001: 48, fig. 15), Cruz & Gusmão (2009: 1139, figs 18–19), Hayova (2011: 866, fig. 1, C).

Description: *Colonies* scattered over the substrate, effuse, loosely caespitose or in small tufts, slightly shiny, dark brown to black, long chains of conidia often visible even by stereomicroscopy. *Mycelium* superficial, partly immersed; hyphae straight to flexuous, branched, 1.5–5 µm wide, septate, not constricted at the septa, pale brown to brown, smooth, wall slightly thickened, 0.5–0.75 µm. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, arising from hyphae, terminal or lateral, solitary, unbranched or with one basal branchlet, erect, straight, subcylindrical, doliiform, 8–30 × 5–10 µm, usually aseptate, rarely 1–2-septate, not or slightly constricted at the septa, rarely smooth, usually distinctly irregularly verruculose to verrucose, above all the basal wall of young conidiophores and the wall of involved hyphal cell giving rise to them distinctly verruculose or verrucose, in the upper part of older conidiophores less roughened, wall thickened, 0.5–0.75 µm, dark brown, distinctly more pigmented than hyphal cells, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls. *Conidiogenous cells* integrated, terminal, conidiophores often reduced to conidiogenous cells, usually monoblastic, rarely polyblastic, with two loci, monopodial, subcylindrical or doliiform, 8–12 × 5–10 µm, little differentiated, loci truncate, unthickened, 3–5 µm diam. *Conidia* in unbranched chains, up to six, not easily disintegrating, adhering for a long time, 2–4 µm wide in constricted or narrow segments between individual conidia, straight or slightly flexuous, cylindrical, ellipsoid, somewhat obclavate, 0–12-septate, not or slightly constricted at the septa, aseptate conidia 9–10 × 7–9 µm, 1-septate ones 16–28 × 9–13 µm, 2-septate ones 19–38 × 8–14 µm, 3-septate ones 30–38(–45) × (7.5–)9–14 µm, 4-septate ones 30–51 × (8–)10–13 µm, 5-septate ones 40–65 × 10–14 µm, 6-septate ones 60–67 × 12–13 µm, 7–12-septate ones 44–107 × 10–15 µm, dark brown, olivaceous brown, young conidia at the tip of conidial chains distinctly paler, wall in older conidia often roughened by disintegration of the outer wall layer, wall of younger conidia usually smooth, thickened, 0.5–0.75 µm, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, up to 1–2 µm thick, lumen distinctly structured and slightly greenish brown, the wall at the apex often less thickened and the cell lumen slightly reduced, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate, sometimes slightly obconically truncate, hila truncate, unthickened, not darkened, (1–)2–5(–6) µm diam.

Holotype: [**Germany**, Berlin], on *Alnus* sp., labelled as '*Hormiscium altum*' by Ehrenberg (L-90.0.H.No. 910, 267-936).

Host range and distribution: On corticated branches and roots of *Acacia cornigera*, *Alnus barbata*, *A. glutinosa*, *A. incana*, *A. rugosa*, *Alnus* sp., *Betula*?, *Berberis* sp., *Carpinus betulus*, *Fraxinus* sp., *Picea* sp., *Quercus* sp. and on decaying wood of conifers; Belarus (Yurchenko 2001), Brazil (Cruz & Gusmão 2009), Canada (Bisby *et al.* 1938, Conners 1967, Hughes 1980b, Ginns 1986), Finland (Karsten 1888), Georgia (Svanidze 1984), Germany (Link 1824), Hungary (Révay 1985, 1998), Lithuania (Treigien & Markovskaja 2007), Mexico (Ale-Agha *et al.* 2007), Russia (Mel'nik & Popushoi 1992, Andreev *et al.* 1996, Karatygin *et al.* 1999, Mel'nik 2000, Popov *et al.* 2013 as *T. stilbospora* and *T. stricta*), Turkey (Bülbül *et al.* 2011, Selçuk *et al*. 2014), Ukraine (Hayova 2011), UK (Ellis 1976), USA (Peck 1873 as *Torula alnea*, Peck 1878, as *Septonema dichaenoides*; Hughes 1980b, Wang 2010).

Additional specimens examined: **Hungary**, in Mts. Börzsöny-hegység pr. pag. Verőcemaros, on *Alnus glutinosa*, 15 Jun. 1984, *Á. Révay* & *J. Gönczöl* (BP 77725); montes Börzsöny-hegység in mte Morgó-hegy pr. pag. Verőcemaros, on *Alnus glutinosa*, 14 Sep. 1984, *Á. Révay* & *J. Gönczöl* (BP 77867); Com. Borsod-Abauj-Zemplén, pr. pag. Szinpetri, in valley Kecskekut-völgy, on rotten wood, 28 Oct. 1988, *Á. Révay* & *J. Gönczöl* (BP 84379). **Russia**, Novgorod Oblast, Okulovsky District, vicinity of Zarechnaya, on *Alnus incana*, 3 Jun. 2006, *D.A. Shabunin* (LE 246872); ibid., 3 Jun. 2006, *D.A. Shabunin* (LE 246876); environs of Zarechnaja village, 6 May 2015, *D.A. Shabunin* (LE 256918). **Turkey**, Kirklareli Prov., Demirköy Distr., Karanhkköy village, 41°53'170" N, 27°33'730" E, alt. 275 m, on *Carpinus betulus*, 18 Jun. 2005, *E. Hüseyin* (Mycological Collection of the Arts and Sciences Faculty, Ahi Evran University, Kırşehir, Turkey, no. 51).

Notes: *Taeniolella alta* usually occurs on corticated branches and roots of different species of *Alnus*. Hughes (1980b) detected this fungus on *Quercus* and re-examined one of the collections of "*Torula alnea*" from Canada (Bisby *et al.* 1938), which proved to be a *Trimmatostroma*. The collection reported on *Betula*? could not be examined by him. Bülbül *et al.* (2011) observed *T. alta* on *Carpinus betulus*. Yurchenko (2001) reported that in Belarus *T. alta* is commonly found in association with the hyphomycete *Excipularia fusispora* and with basidiomata of *Hyphoderma setigerum* which may be penetrated by this fungus and bear conidiophores and conidia.

Hughes (1980b) provided a detailed and comprehensive description of *T. alta*. The common characteristics of this species fully coincide with the current circumscription of *Taeniolella*. Data given in literature suggest a wide range of the length of conidiophores and conidia. Hughes (1980b) described conidiophores 15–160 µm long and conidia up to 135 µm in length with up to 14 septa. Révay (1985) and Yurchenko (2001) observed conidiophores 120–150 µm long, but the conidia only up to 45 µm. Other authors, *e.g.*, Cruz & Gusmão (2009) and Bülbül *et al.* (2011), described much shorter conidiophores and conidia (conidiophores up to 75 µm and conidia up to 60 µm). Shorter conidia with a smaller number of septa

[(2–)3(–5)-septate, 20–50 × 10–13 µm] were described by Ellis (1976) and Mel'nik (2000), reflecting the general difficulty to distinguish conidiophores and conidia. The widest conidia (up to 15 µm) were observed by Hayova (2011).

The conidiogenous cells in *T. alta* are usually monoblastic but may occasionally be polyblastic with two loci. Hughes (1980b) and Yurchenko (2001) described the conidiophores as usually unbranched or seldom branched near at the base.

The description and illustration of the Chinese *T. hunanensis* is very similar to *T. alta*, and the illustration indicates that the conidiogenous cells might be polyblastic as well, but *T. alta* is easily distinguishable from *T. hunanensis* by its often rough-walled, sometimes even verrucose conidiophores and conidia. *T. stricta*, another similar saprophytic *Taeniolella* species, occurring on wood of several trees (*e.g.*, *Bruguiera gymnorrhiza*, *Leucadendron* sp., *Palmae* sp., *Rhizophora mucronata*) is easily distinguishable from *T. alta* by its always smooth-walled conidiophores and conidia and usually monoblastic conidiogenous cells without basal branchlets.

The phylogeny of *Taeniolella alta* is still unresolved. The phylogenetic placement of this species in a lineage with *Phomopsis* sp. and species of *Diaporthe* was assumed in previous studies (Crous *et al.* 2006, Damm *et al.* 2007, Crous *et al.* 2011) using the nuLSU sequence originally published by Masclaux *et al.* (1995). *Taeniolella alta* is known from corticated branches of various tree genera (*e.g.*, *Alnus*, *Quercus*) and from decaying wood of conifers (Hughes 1980b). Species of *Diaporthe-Phomopsis* represent a large group of plant-inhabiting fungi, which are commonly encountered as endophytes of woody plants and are often responsible for plant diseases (*e.g.*, Uecker 1988, Rossman *et al.* 2007). The published nuLSU sequence of *T. alta* was obtained from a specimen growing on *Carpinus betulus* in Switzerland. Its reliability is questioned here because the related culture was non-sporulating and could thus not be identified by one of us (B.H.). Moreover, morphological features of *Taeniolella alta* agree with common characteristics of the genus *Taeniolella* and strongly differ from species of *Diaporthe* (sexual) and *Phomopsis* (asexual), the asexual state *Phomopsis* being characterised by pycnidia producing hyaline, simple conidia.

Taeniolella breviuscula (Berk. & M.A. Curtis) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 77–78
Basionym: *Septonema breviusculum* Berk. & M.A. Curtis, *Grevillea* **3**(25): 15. 1874.
Synonym: *Torula opaca* Cooke, *Syll. Fung*. **10**: 574. 1892 [*syntypes*: **USA**, New Jersey, Newfield, 'on bark of various dead and living shrubs', Nov. 1881, *J.B. Ellis*, Ellis, N. Am. Fungi, 759 (*e.g.*, BPI 421738, 421739; ILL 97937; ILLS 885; PH 311520, 323875; WIS-F-86706)].

Literature: Ellis (1976: 59), Hawksworth (1979: 253), Kirk (1982: 73), Ellis & Ellis (1997: 64), Clauzade *et al.* (1989: 120).

Illustrations: Ellis (1976: 60, fig. 42A), Ellis & Ellis (1997: pl. 25, fig. 254).

Description: *Colonies* effuse, black, thin [according to Ellis & Ellis (1976)]. *Mycelium* superficial and immersed; two different hyphal types present, 1) flexuous, sometimes irregularly aggregated, branched, 3–7(–10) µm wide, septate, also with longitudinal septa, slightly to distinctly constricted at the septa, yellowish brown to brown, smooth, obviously paler than conidia, wall slightly thickened, up to 0.25 µm, 2) straight to flexuous, branched, 4–9 µm, septate, without longitudinal septa, slightly constricted at the septa, dark brown as the conidia, smooth, wall thick, up to 1 µm. *Stromata* lacking. *Conidiophores* micronematous to semi-macronematous, distinction between conidiophores and adhering conidia difficult, solitary to densely aggregated, arising from hyphae of the second type, terminal, erect, straight, unbranched, subcylindrical to broad subcylindrical, conidiophores (with adhering conidia) 21–120 × 9–11 µm, 2–17-septate, septa distinctly thickened, up to 2 µm, not or slightly constricted at the septa, sometimes with longitudinal distosepta, dark brown, smooth, 1–2 µm thick, enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic, little differentiated, 6–7 µm long, loci truncate, unthickened, 4–8 µm diam. *Conidia* catenate, in unbranched chains, not easily disintegrating, conidia long adhering, straight, broad ellipsoid, broad obovoid, subcylindrical, 1–3(–5)-septate, septa strongly thickened, up to 2 µm, not constricted at the septa, sometimes with longitudinal distosepta, 1-septate ones 14–19 × 8–11 µm, 2-septate ones 17–21 × 9–11 µm, 3-septate ones 22–25 × 9–11 µm, 4- and 5-septate fragments 25–32 × 11–13 µm, dark brown, smooth, wall thickened, up to 2 µm, portions with proliferation, *i.e.*, with conidium initials, pale yellowish brown, wall not or only slightly thickened, apex rounded in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed towards the base, hila truncate, unthickened, not darkened, 2.5–7 µm diam, within the acropetal chain, between individual conidia, sometimes with very distinct wall remnants caused by enteroblastic proliferations resembling broad collarettes, up to 15 µm long, thin and pale brown.

Holotype: **USA**, South Carolina, on living trunk of *Acer* sp., *M.A. Curtis 4956* (K(M) 166400**!**).

Host range and distribution: On *Acer* sp., *Castanea sativa*, *Pinus sylvestris*; France (Clauzade *et al.* 1989, Roux *et al.* 2001, Roux *et al.* 2017), Turkey (Selçuk *et al*. 2014), UK (Kirk 1982), USA (Berkeley 1874).

Notes: Only a preparation (slide) made from holotype material deposited at K has been examined. Therefore, the description of colonies is based on Ellis (1976). This author, Hawksworth (1979), Kirk (1982) and Clauzade *et al.* (1989) described longer conidia (up to 45 µm), which may be influenced by conidia adhering to conidiophores or shed conidial chains. The distinction between conidiophores and adhering conidia is often difficult. Distinctly visible wall remnants, resembling broad collarettes, as results of proliferations are well illustrated in Ellis (1976: 60, fig. 42A). Such distal proliferations within conidial chains prove the acropetal conidial formation in *Taeniolella* species, which separate them from confusable genera with basipetal conidial formation, as *e.g.*, *Trimmatostroma*. *T. breviuscula* is easily distinguishable from other *Taeniolella* species by conspicuous, broad collarettes and the presence of longitudinal distosepta. Hawksworth (1979) classified this primarily saprobic species as a fortuitously lichenicolous fungus, based on *Torula opaca*, originally described by Cooke (in Saccardo 1892) on lichen thalli on various dead and living shrubs, which he reduced to synonymy with *T. breviuscula*. Clauzade *et al.* (1989) recorded this species on thalli of *Lecanora* and *Pertusaria*, and Brackel (2015) reported it on a thallus of *Caloplaca ferruginea* in Italy.

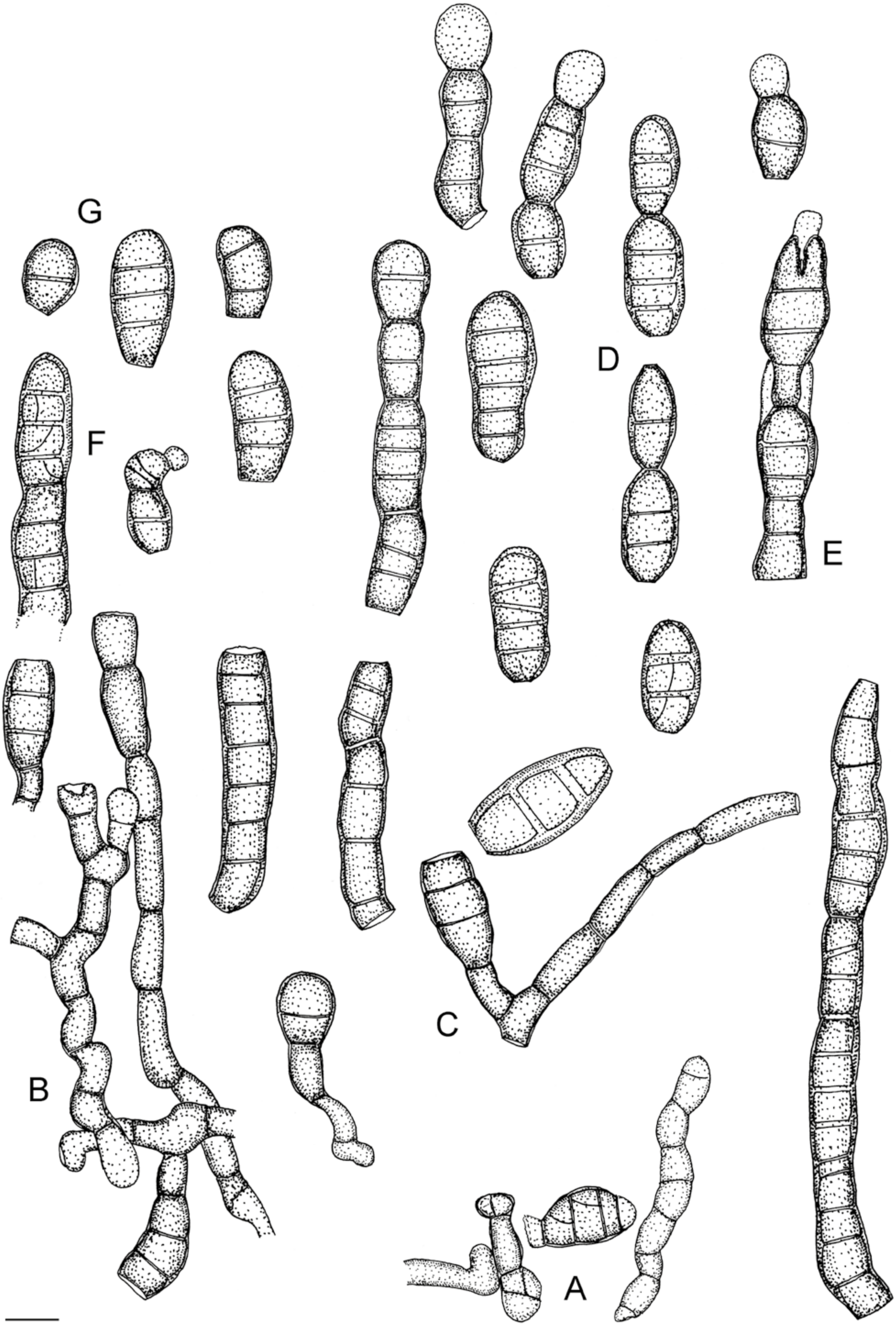

Fig. 77. *Taeniolella breviuscula* [holotype]. **A.** First hyphal type, one hypha with longitudinal septa. **B.** Second hyphal type, without longitudinal septa. **C.** Conidiophores arising from hyphae. **D.** Conidial chains. **E.** Conidial chain with wall remnants resembling broad collarettes. **F.** Conidia with longitudinal distosepta. **G.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

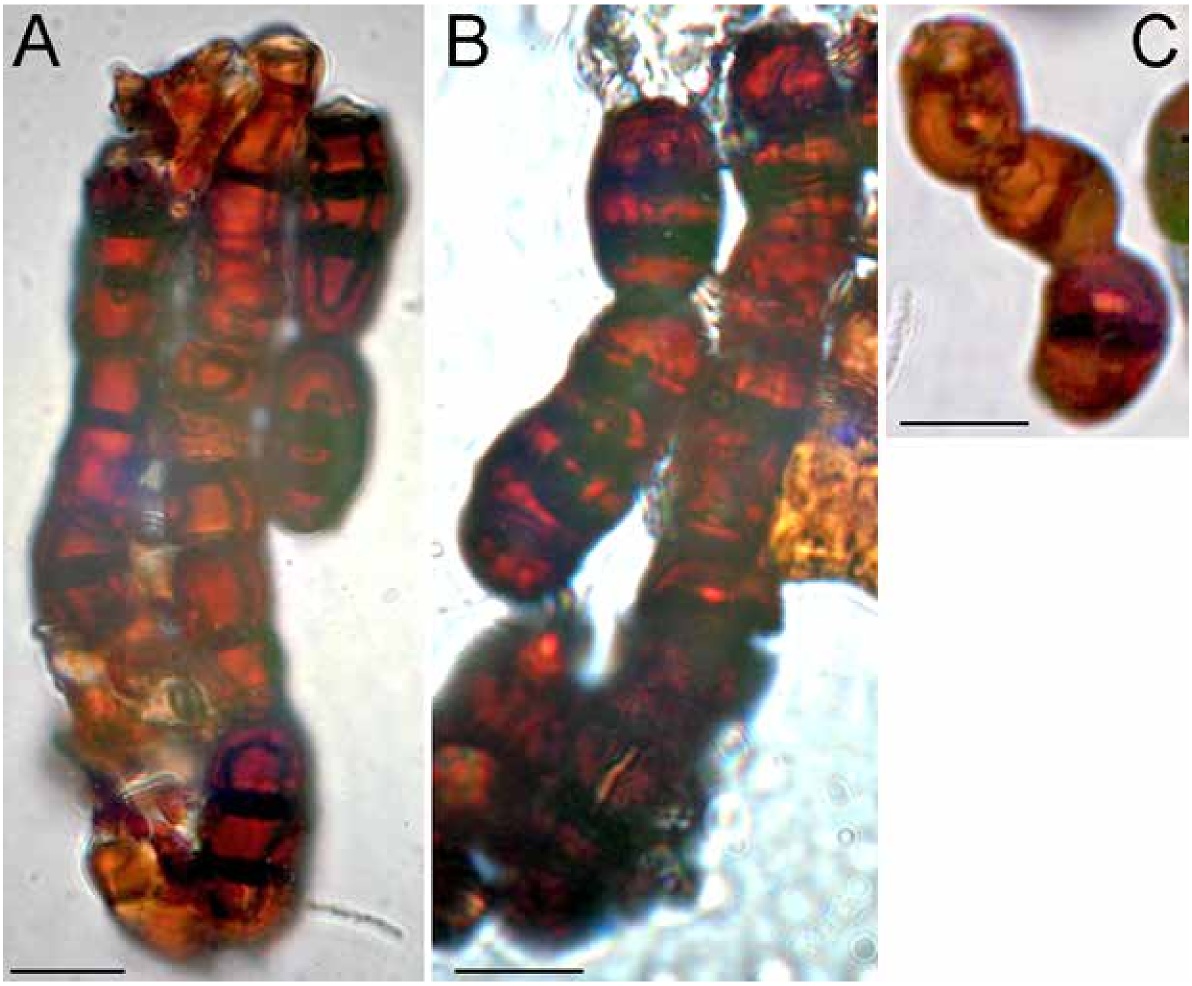

Fig. 78. *Taeniolella breviuscula* [holotype]. **A–C.** Conidial chains. Bars: 10 µm (A–C).

Taeniolella curvata (Peck) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 79–80.
Basionym: *Torula curvata* Peck, Rep. (*Annual*) *New York State Mus. Nat. Hist*. **30**: 53. 1878.
Synonym: *Hormiscium curvatum* (Peck) Sacc., *Syll. fung*. **4**: 265. 1886.

Description: *Colonies* scattered on bark, effuse, visible as reticular coat when using a stereomicroscope, formed by curved and branched conidial chains, erect or decumbent, dark brown to black. *Mycelium* superficial, sometimes immersed; hyphae straight to flexuous, branched, 2–6 µm, septate, not or only slightly constricted at the septa, pale brown, smooth, sometimes verruculose in the region of the transition between hyphae and conidiophores or conidiophores and conidia, wall slightly thickened, up to 0.5 µm. *Stromata* lacking. *Conidiophores* micronematous to semi-macronematous, often reduced to conidiogenous cells, distinction between conidiophores and adhering conidia difficult, transition gradual, solitary, arising from superficial or immersed hyphae, lateral or terminal, erect, straight, unbranched, doliiform, subcylindrical, sometimes peg- or stalk-like, 5–20 × 3–5 µm, aseptate, pale brown to brown, smooth or often verruculose to verrucose, wall slightly thickened, up to 0.5 µm, monoblastic or thalloblastic, loci truncate, unthickened, up to 5 µm diam. *Conidia* solitary, branched, or in branched chains, forming branched complexes (propagules), adhering for a long time, distinction of individual conidia within the chain difficult or even impossible, chains probably only breaking off during gross preparations or in nature by violent mechanic impacts, forming fragments of different sizes, conidia or conidial chains rarely straight, usually falcate to sigmoid, subcylindrical, vermicular, 10–210 × 5–7 µm, 1–48-septate, not or only slightly constricted at the septa, dark brown, basal cell sometimes somewhat paler, rarely almost smooth, usually conspicuously verrucose, sometimes rimulose, wall thickened, 0.5–1 µm, cell plasma reduced, with a central vacuole-like cavity, giving the impression of thicker, two-layered walls, up to 1.5 µm thick, apex rounded in primary conidia, sometimes ruptured at the apex, possibly due to mechanical impacts, base more or less truncate, 5–7 µm diam.

Holotype: **USA**, New York, Adirondack Mts., on dead branches of *Myrica gale*, Aug., *C.H. Peck* (NYS-F-922**!**). *Isotype*: ILLS 807.

Host range and distribution: On dead branches of *Myrica gale*; USA (Peck 1878), known only from the type collection.

Notes: *Taeniolella curvata* is easily distinguishable from all other saprobic *Taeniolella* species by its conspicuously falcate to sigmoid, branched conidia. The distinction of individual conidia within the chain is difficult or even impossible, because constrictions between individual conidia are not evident. Only the aquatic *T. caffra* is very similar to *T. curvata*. The conidial chains in both species are falcate to sigmoid, but the smooth conidia in *T. caffra* are usually wider than the conspicuously verrucose conidia in *T. curvata* (10–210 × 5–7 µm vs., 35–155 × 7–11 µm in *T. caffra*). Additionally, both species differ in their habitats.

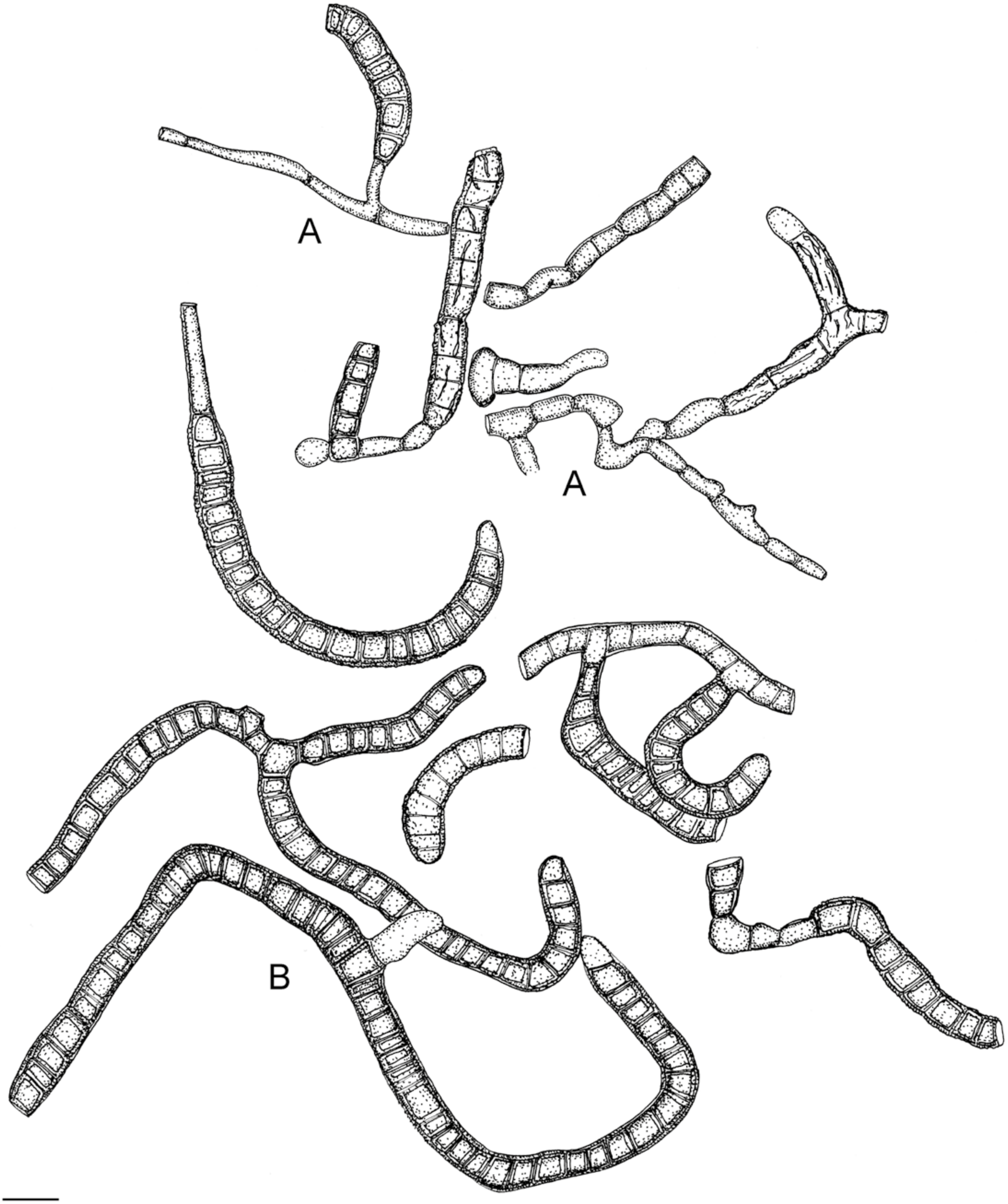

Fig. 79. *Taeniolella curvata* [holotype]. **A.** Conidiophores arising from hyphae with adhering conidia. **B.** Falcate to sigmoid conidia or conidial chains. Bar = 10 µm (B. Heuchert *del.*).

Taeniolella stilbospora is rather similar to *T. curvata*. Conidia or conidial chains of both species are adhering for a long time and form branched complexes (propagules). Single branches in *T. curvata* are longer than in *T. stilbospora* (10–210 × 5–7 µm, 1–48-septate vs., 25–160 × 6–10 µm, up to 40 septa in *T. stilbospora*) and the distinction between the individual conidia in *T. stilbospora* is also difficult or even impossible. However, the conidia or conidial chains in *T. stilbospora* are usually straight to flexuous but never falcate or sigmoid.

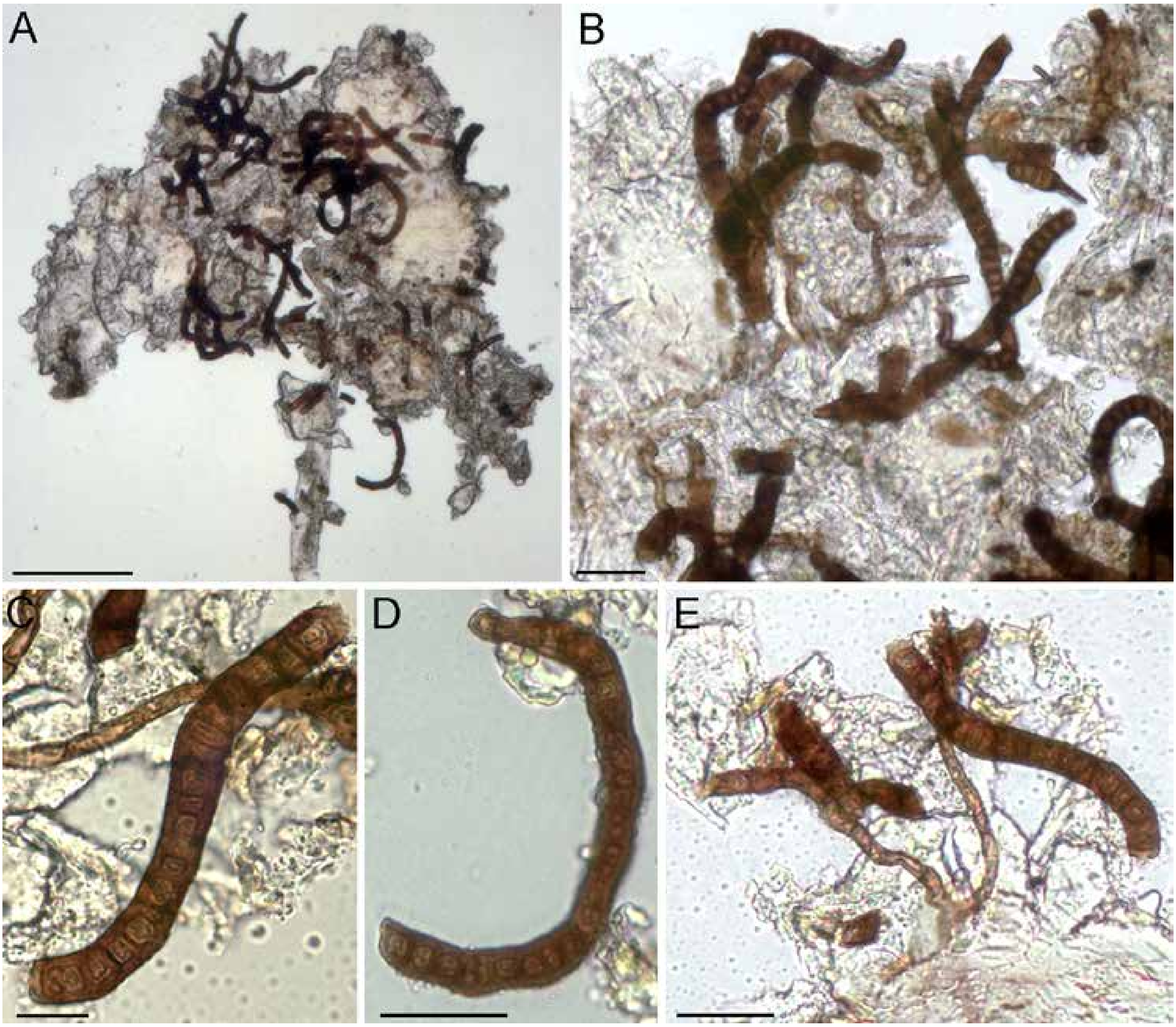

Fig. 80. *Taeniolella curvata* [holotype]. **A.** Colony. **B, E.** Conidiophores arising from hyphae with adhering conidia. **C, D.** Falcate to sigmoid conidia. Bars: 100 µm (A), 20 µm (B, D, E), 10 µm (C).

Taeniolella exilis (P. Karst.) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 81–83.
Basionym: *Septonema exile* P. Karst., *Meddeland. Soc. Fauna Fl. Fennica* **14**: 98. 1887.

Literature: Karsten (1892: 439), Saccardo (1892: 609), Migula (1934: 324), Ellis (1971: 93), Hughes (1980a: 1–2), Mel'nik (2000: 307), Ertz *et al*. (2016: 1426–1429).

Illustration: Ellis (1971: 92, fig. 55), Hughes (1980a: 1, figs 1–10), Mel'nik (2000: 307, fig. 214), Ertz *et al*. (2016: 1427, fig. 5; 1428, fig. 6).

Description: *Colonies* scattered on bark, effuse or more or less restricted to lenticels, reticular, caespitose to velvety, sometimes scattered in small tufts or sometimes dense and narrowly oval, somewhat sooty, confluent, black, 1–17 × 0.5–2 mm; bark rarely discoloured, reddish brown. *Mycelium* immersed and partly superficial; composed of flexuous hyphae, branched, (2–)3–10 µm wide, septate, not constricted at the septa in narrow hyphae, sparingly to distinctly constricted at the septa in wider hyphae, subhyaline to dark brown, smooth, wall somewhat thickened, 0.25–0.5 µm. Hyphae sometimes aggregated in scattered, immersed to sometimes superficial, flattened cell layers 1 to 4 cells thick, forming *stromata*, 150–320 × 30–60 µm; or penetrating deeply into the tissue and forming a continuous or interrupted, superficial or partly immersed, crust-like stroma composed of brown to dark brown irregularly shaped cells, 3–20 × 2–10 µm. *Conidiophores* seldom micronematous, reduced to conidiogenous cells, usually semi-macronematous to macronematous, mononematous, arising from hyphae, terminal or lateral, or from stroma cells, mostly in small caespitose tufts of 3–10 conidiophores, sometimes solitary, erect, straight, unbranched, subcylindrical, conidiophores with attached conidia (11–)30–140(–200) × 8–14 µm, 1–11-septate, slightly or distinctly constricted at the septa, dark brown,

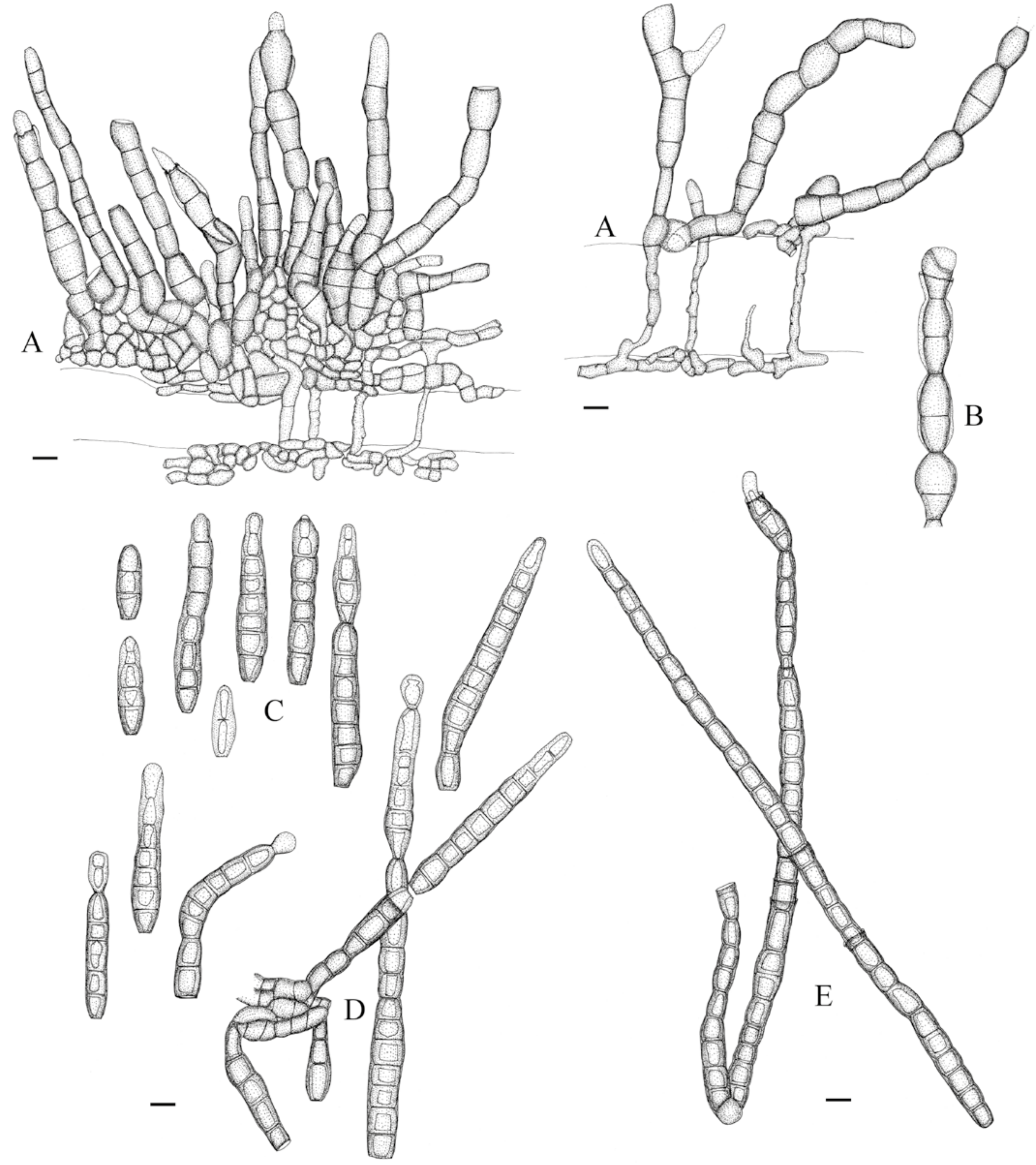

Fig 81. *Taeniolella exilis* [A–B: ex DAOM 59235; C–E: ex DAOM 173671]. **A.** Conidiophores arising from hyphae or crust-like stroma. **B.** Conidial chain. **C.** Conidia. **D.** Conidiophores arising from hyphae. **E.** Conidiophores with enteroblastical proliferations with obvious sheath-like wall remnants visible as an irregular collar. Bars = 10 µm (B. Heuchert *del.*).

paler towards the apex, smooth; wall thickened, up to 0.75 µm wide, often thinner towards the apex; granular cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, up to 3 µm wide, frequently enteroblastically proliferating with obvious sheath-like wall remnants visible as an irregular collar. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, determinate, subcylindrical, doliiform, attenuated at the tip, 9.5–18 µm long; loci truncate to convex, 4–8 µm diam, unthickened, lateral wall thickened, forming a small rim. Distinction between conidiophores and conidial chains difficult. *Conidia* catenate, usually in unbranched chains, up to five conidia per chain, straight to slightly curved, doliiform, subcylindrical to nearly obclavate, (0–)1–7(–13)-euseptate, sometimes also with 1–2 intermixed distosepta, aseptate conidia 19–21 × 11 µm, 1-septate ones 20–32(–45) × 8–15 µm, 2-septate ones

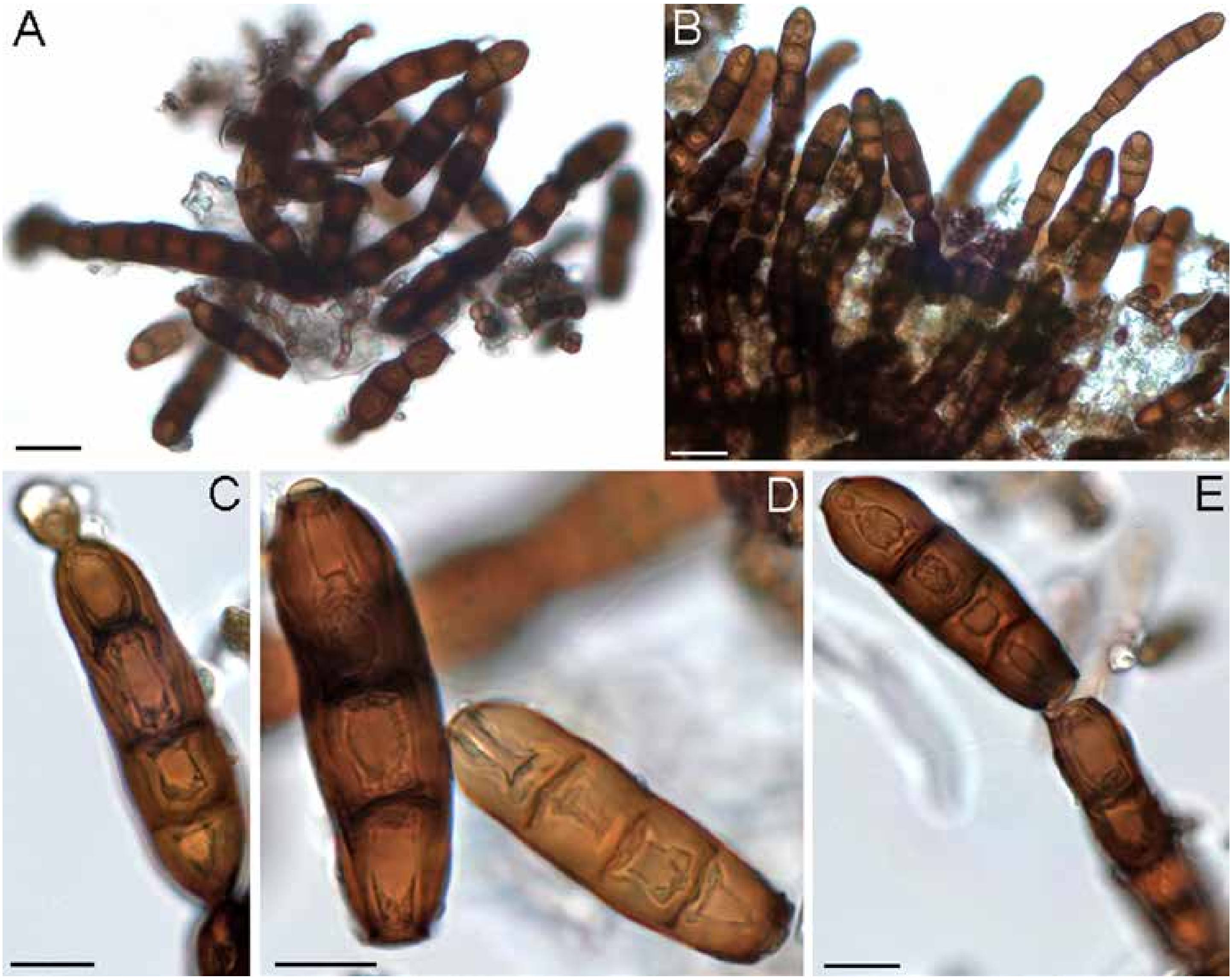

Fig. 82. *Taeniolella exilis* [holotype]. **A, B.** Conidiophores with adhering conidia. **C, D.** Conidia. **E.** Conidium detached from the conidiogenous cell. Bars: 20 µm (A–B), 10 µm (C–E).

30–42(–56) × 10–15 µm, 3-septate ones 39–49(–68) × 10–17 µm, 4–11-septate ones 50–108(–180) × 10–14(–17) µm, mostly constricted at the septa, brown to dark brown, paler near the apex in secondary conidia, outer wall smooth or seldom roughened, slightly thickened, up to 0.75 µm wide, granular cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, 1.5–3 µm thick, apex rounded in primary conidia, truncate or often slightly obconically truncate in secondary ones, base truncate, sometimes narrowed towards the base, hila truncate to convex, 3–6.5 µm diam, thickened lateral wall sometimes visible as conspicuous rim, in one case microcyclic conidiogenesis observed.

Holotype: **Finland**, Naantali, Merimasku, on bark of living *Betula* sp., *P.A. Karsten 4022* (H 6040714!).

Host range and distribution: On bark of *Betula alleghaniensis*, *B. papyrifera*, *B. pendula*, *B. platyphylla* ssp. *mandshurica*, *Betula* sp., *Carpinus betulus*, *Corylus avellana*, *Quercus robur*; Austria (Migula 1934), Canada (Hughes 1980a, Ginns 1986), Finland (Karsten 1887, 1892), Georgia (Svanidze 1984, www.cybertruffle.org.uk), Poland (Borowska 1987, Chlebicki & Chmiel 2006), Russia (Mel'nik 2000).

Additional specimens examined: **Canada**, Quebec, Lake Bernard, Masham Township, Gatineau Co., on felled trunk of *Betula papyrifera*, 13 Jul. 1958, *S.J. Hughes*, ex DAOM 59235 (a) (H 7035653, K(M) IMI 76361); Gatineau Park, Church Hill Area, 106 m east of Eardley Rd., 45°34'51.7" N, 76°05'25.7" W, alt. 217 m, on standing *Betula papyrifera*, 4 Apr. 2013, *C.E. Freebury 1968* (CANL); Outaouaia Region, Pontiac, Eardley Escarment, Luskville Falls Trail, *Quercus rubra-Q. alba-Ostrya virginiana* forest on steep hillside, alt. 325 to 350 m, 45°32'24" N, 75°59'17" W, *T. Ahti 74177 & C. Freebury* (H); Ontario, Pembroke, in backyard wood pile, on *Betula papyrifera*, 4 Nov. 1979, *G.P. White*, ex DAOM 173671 (H). **Poland**, Warsaw, Reserve Bielański, on the damaged trunk of a living tree of *Carpinus betulus*, 5 Jan. 1975, *A. Borowska* (WA 27758).

Notes: Hughes (1958) had previously seen type material and compared it (Hughes 1980a) with collections deposited in DAOM. The descriptions of morphological features of this species in Karsten (1887), Migula (1934), Ellis (1971), Hughes (1980a) and Mel'nik (2000) are largely in agreement.

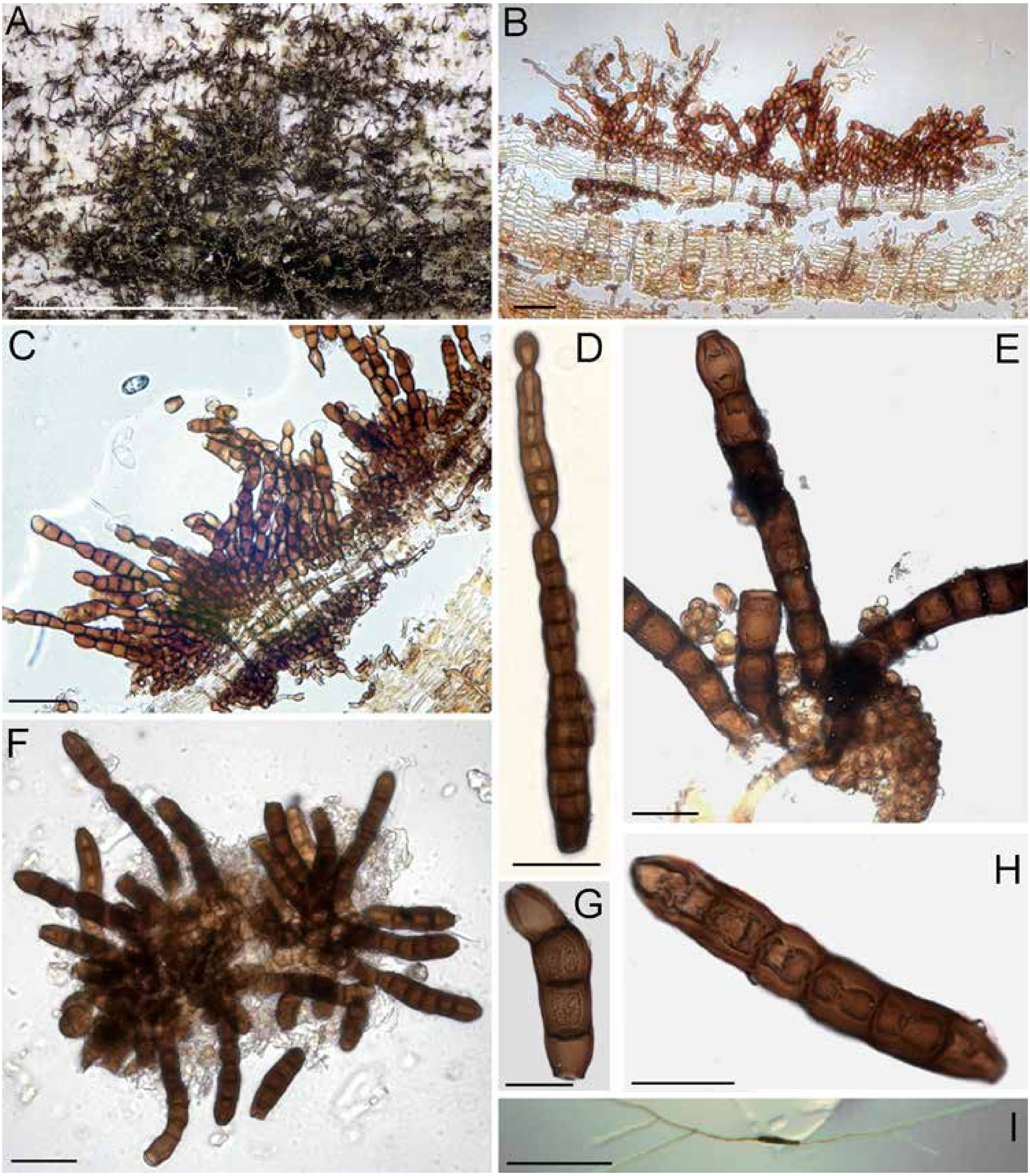

Fig. 83. *Taeniolella exilis* [A, I: Freebury 1968; B, C, E, G, H: ex DAOM 59235; D, F: ex DAOM 173671]. **A.** Macroscopic overview of colony. **B, C, E, F.** Conidiophores with adhering conidia arising from hyphae or crust-like stroma. **D.** Conidial chain. **G, H.** Conidia. **I.** Germinating conidium in culture after three days. Bars: 1 mm (A) [photo taken by Paul Diederich], 200 µm (I) [photo taken by Damien Ertz], 50 µm (B–C), 20 µm (F), 10 µm (D–E, G–H).

The identification of *T. exilis* recorded on *Corylus avellana* in Georgia (Svanidze 1984) could not be confirmed. Borowska (1987) published observations of *T. exilis* in Poland on *Betula pendula*, *Carpinus betulus* and *Quercus robur*. The re-examination of a sample on *Carpinus betulus* (WA 27758) confirmed the original identification and the occurrence of this species in Central Europe. Previous authors reported the species from Austria (Migula 1934), Canada (Hughes 1980a) and Finland (original description). Senthilkumar *et al.* (1993) mentioned a species that he identified as *T. exilis* during a study about the successional pattern of the mycoflora associated with litter degradation in a *Cymbopogon caesius*-dominated tropical grassland in South India; the correctness of the identification of this collection is, however, doubtful and not verifiable.

A sequence erroneously referred to as "*Taeniolella exilis*" (IP2199.93) was included in a phylogenetic analysis based on partial LSU rRNA sequences by Masclaux *et al*. (1995). The sequenced material was isolated from a human skin lesion, whereas genuine *T. exilis* is usually found on bark, which raised doubts about the correct identification of this strain. In the tree published by Masclaux *et al*. (1995), the sequences based on this culture isolated from human skin clustered adjacent to the type strain (CBS 146.33) of *Cladosporium elatum* (now *Ochrocladosporium elatum*), which phylogenetically belongs to *Pleosporales*, incertae sedis (Crous *et al*. 2007), which is in severe conflict with the recently confirmed phylogenetic position of true *T. exilis* within the *Kirschsteiniotheliaceae* (Ertz *et al.* 2016).

In a paper dealing with the morphology of *T. rudis*, Jones *et al*. (2002) listed several examined specimens of *Taeniolella* species, including one collection of *T. exilis* (IMI 76361). The type material of *T. exilis* was not examined. Jones *et al*. (2002) noted that the examined material of *T. exilis* 'did possess a penicillate head' comparable to similar structures in the aquatic species dealt with in this paper (*T. rudis*). Several collections of *T. exilis* have been examined in the course of a revision of the genus *Taeniolella*, but no trace of any synanamorph has been found, which implies that the observations of Jones *et al*. (2002) are unclear and doubtful. The molecular data and morphological peculiarities of the synanamorphs (penicillately branched heads and colourless conidia) formed by *T. rudis* justify the reallocation of this species to the genus *Sterigmatobotrys*.

The colonies of *Taeniolella exilis* are effuse or more or less restricted to lenticels, usually dense, narrowly oval, somewhat sooty and 1–17 × 0.5–2 mm. These distinctive characteristics and the presence of well-developed stromata facilitate the differentiation from other saprophytic *Taeniolella* species. *Taeniolella alta*, a similar saprobic species, mainly occurs on bark of branches or roots of *Alnus* spp., whereas *T. exilis* mainly inhabits *Betula* spp., *Carpinus betulus* and *Quercus robur*. The mycelium of *T. alta* grows superficially and is sometimes immersed, and the hyphae are narrower (1.5–5 µm wide, vs. (2–)3–10 µm in *T. exilis*). *Taeniolella alta* lacks true stromata, which are frequently formed in *T. exilis* (150–320 × 30–60 µm). Furthermore, the conidiophores of *T. alta* are usually irregularly verruculose to verrucose and only rarely smooth; specifically the basal wall of young conidiophores and the walls of supporting hyphal cells are usually distinctly verruculose or verrucose, while the upper part of older conidiophores is less roughened. In contrast, the conidiophores of *T. exilis* are usually smooth. Conidia in both species are doliiform, subcylindrical to nearly obclavate and of similar in size [(19–108(–180) × 8–14(–17) µm, 0–13-euseptate in *T. exilis*, vs. 0–12-septate, 9–107 × 7–14 µm in *T. alta*].

Taeniolella subsessilis, a similar saprobic species mainly occurring on bark of *Smilax hispida*, often forms stromatically aggregated cells at the base of conidiophores, but these aggregations are less pronounced than the crust-like stromata, composed of flattened cell layers 1 to 4 cells thick, in *T. exilis*. Furthermore, conidiophores of *T. subsessilis* are usually distinctly shorter (8–28 × 6–8 µm, vs. (11–)30–140(–200) × 8–14 µm in *T. exilis*) and conidia are usually narrower (15–60 × 7–11 µm, vs. 19–108(–180) × 8–17 µm in *T. exilis*).

Taeniolella faginea (Fuckel) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 84–85.
Basionym: *Torula faginea* Fuckel, *Hedwigia* **5**: 30. 1866.
Synonym: *Septonema radians* Berk. & Ravenel, *Grevillea* **3**: 15. 1874 [*syntypes*: **USA**, South Carolina, on *Fagus sylvatica*, *H.W. Ravenel*, Car. Inf. Ravenel. 1399 (K); Ravenel, Fungi Carolin. Exs. Fasc. ii. 87 (*e.g.*, BPI 428197, 428198)].

Literature: Fuckel (1870: 349), Saccardo (1886: 251), Ellis (1976: 56), Kirk (1982: 73), Ellis & Ellis (1997: 135).

Illustrations: Fuckel (1870: tab. 1, fig. 3), Ellis (1976: 58, fig. 40 A), Ellis & Ellis (1997: pl. 60, fig. 590).

Exsiccatae: Fuckel, Fungi Rhen. Exs. 1620.

Description: *Colonies* scattered on host bark, caespitose-floccose, effuse, dark brown to black. *Mycelium* immersed; hyphae straight, slightly flexuous, branched, 2–5(–7) µm, septate, sometimes slightly constricted at the septa, pale brown, smooth, thin-walled or somewhat thickened, up to 0.25 µm. *Stromata* lacking. *Conidiophores* semi-macronematous, mononematous, solitary, often densely aggregated, arising from hyphae, terminal or lateral, erect, often decumbent, subcylindrical, straight to slightly flexuous, usually with several branches at different points of the conidiophores, forming branched complexes, rarely unbranched, conidiophores (with adhering conidia) (5–)15–57 × 4–7(–9) µm, 0–13-septate, mostly constricted at the septa, dark brown, wall verrucose, somewhat irregularly rough, often with cracks, wall thickened, up to 1 µm, guttulate, often with one or up to three internal oil-like droplets, cell lumen granular, with distinct cytoplasm, not enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, monoblastic or thalloblastic, monopodial, subcylindrical or doliiform, sometimes somewhat narrowed at the tip, up to 7 µm long, little differentiated, loci truncate, slightly thickened, somewhat protuberant, 2–3 µm diam. *Conidia* catenate, in simple or branched chains, up to 105 µm long, disarticulating or often adhering in chains for a longer time, chain fragments often persistent (confusable with pluriseptate conidia), conidia straight, broad ellipsoid, doliiform, subcylindrical, 0–2(–3)-septate, at the tip of conidial chains with one to three subglobose, aseptate conidia, 7–10 × 6–9 µm, 1-septate ones 10–18 × 5–9 µm, 2-septate ones 15–20 × 6–9(–10) µm, 3-septate ones 20 × 6 µm, slightly to clearly constricted at the septa, brown to dark brown, wall verrucose, somewhat irregularly rough, often with cracks, wall thickened, up to 1 µm, apex rounded in primary conidia, truncate and sometimes slightly conically truncate in secondary ones, base truncate or often slightly obconically truncate, hila truncate, sometimes slightly thickened, not darkened, somewhat protuberant, 3–10 µm diam, guttulate, often with one or up to three internal oil-like droplets, cell lumen granular, with distinct cytoplasm.

Lectotype (designated here, MycoBank MBT373910): **Germany**, Baden-Württemberg, Weinheim, on bark of *Fagus sylvatica*, Fuckel, Fungi Rhen. Exs. No. 1620 (HAL**!**). *Isolectotypes*: Fuckel, Fungi Rhen. Exs. 1620 (*e.g.*, BPI 421627, FH, G, K, ILLS 38642, 36957; S-F267607).

Host range and distribution: On bark of *Fagus sylvatica*; Denmark (Lind & Rostrup 1913), France (Brunaud 1888), Germany (Fuckel 1866, 1870), UK (Kirk 1982).

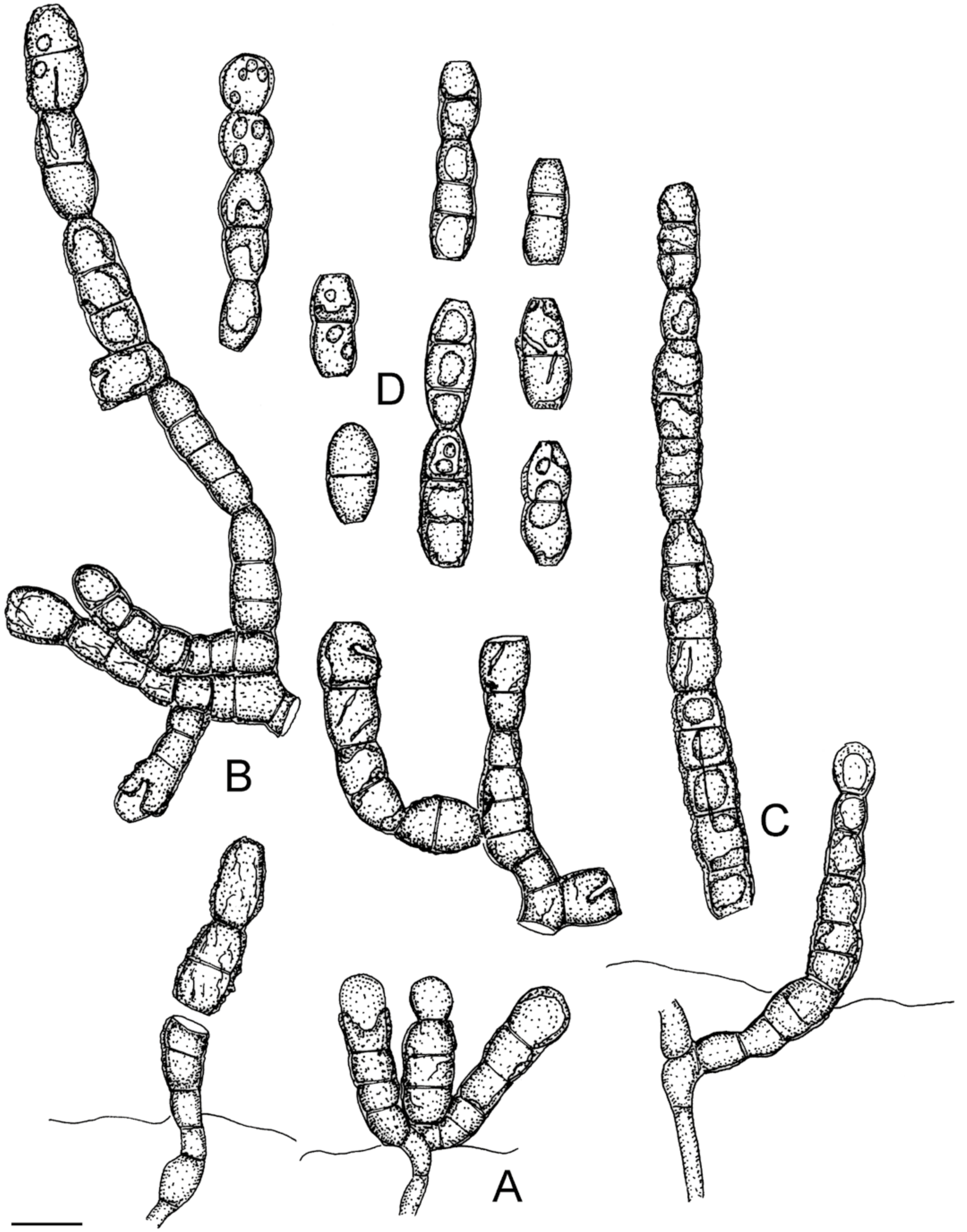

Fig. 84. *Taeniolella faginea* [lectotype]. **A.** Conidiophores arising from hyphae. **B.** Conidiophores with adhering conidia forming branched complexes. **C.** Conidial chain. **D.** Conidia. Bars = 10 µm (B. Heuchert *del.*).

Notes: Fuckel (1870) provided the following detailed type data [on the cortex of still green trunks of *Fagus sylvatica*, very rare, in spring. Near Weinheim, on the mountain road in the Korksheimer Thal (Gorxheimertal)] and illustrated two

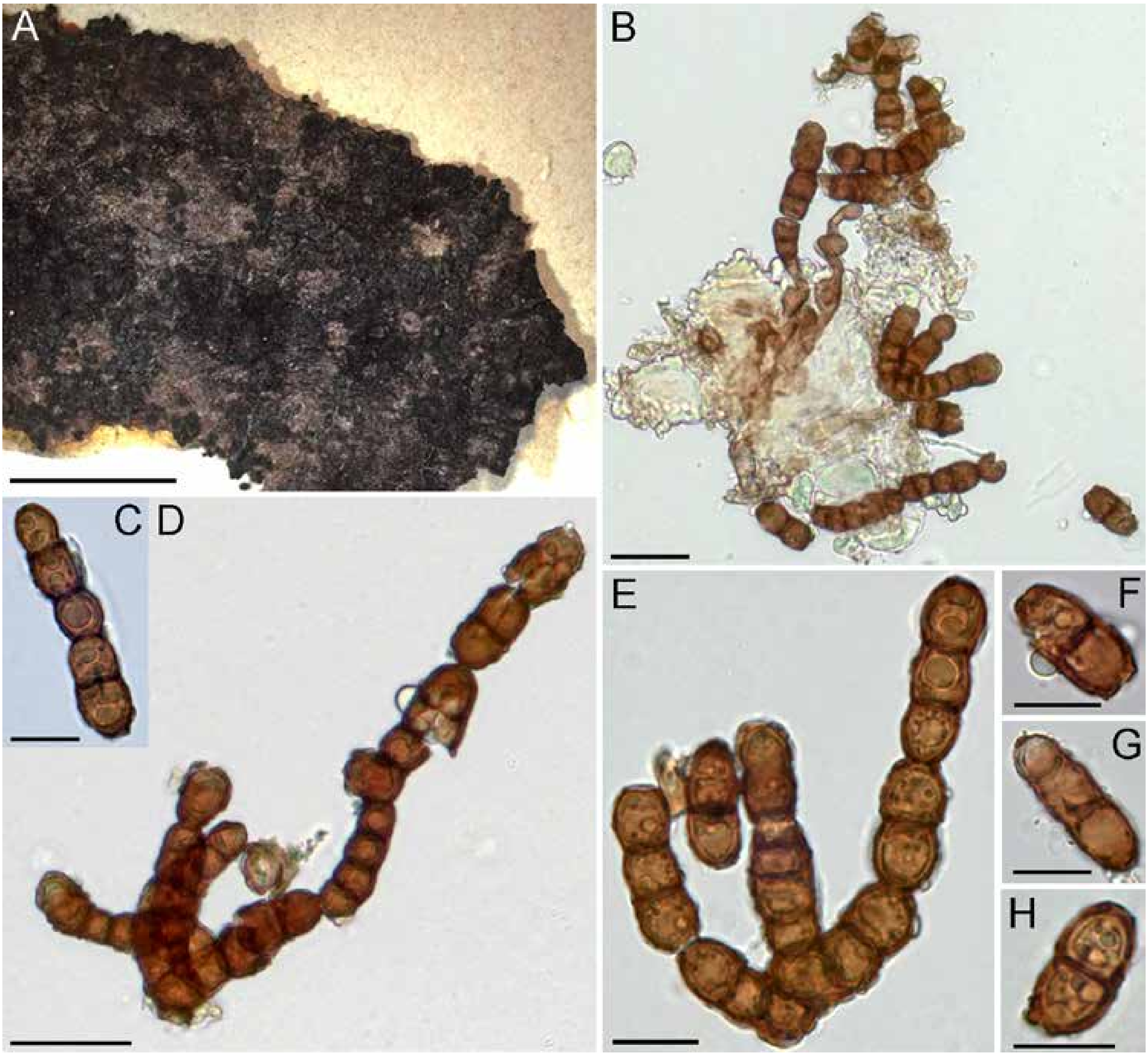

Fig. 85. *Taeniolella faginea* [lectotype]. **A.** Macroscopic overview of colony. **B, D, E.** Conidiophores with adhering conidia forming branched complexes. **C.** Conidial chain. **F–H.** Conidia. Bars: 5 mm (A), 20 µm (B, D), 10 µm (C, F–H).

chains of conidia with two different conidial shapes. The first corresponds to the 1–2-septate conidia which represent the most common conidial type in the re-examined authentic material. The subglobose, aseptate conidia, which are illustrated in Fuckel's second conidial chain, could not be observed as a separate chain, but frequently at the tip of common chains. Ellis (1976) and Ellis & Ellis (1997) described up to 5-septate conidia, probably referring to more or less persistent chain fragments that are easily confusable with pluriseptate conidia. Ellis (1976) described pale to mid brown conidiophores, 2–5 µm thick, perhaps based on the assumption that they are micronemate as illustrated in his work (Ellis *l.c.*: 56, fig. 40 A). Conidia in the material from Devon (UK) described by Kirk (1982) are noticeably wider than those described in Ellis (1976) [9–12 µm vs. 6–9 µm] as well as in the examined material from HAL [6–9(–10) µm].

The verrucose ornamentation with cracks of the outer wall is less known in saprobic *Taeniolella* species than in lichenicolous ones. The outer conidial wall of *T. muricata* is coarsely verrucose to vesicle-like and thus clearly distinguishable from *T. faginea*. Additionally, *T. muricata* is characterised by longer conidia, 15–118 µm, with up to 3 eusepta and 1–20 distosepta.

Taeniolella faginea is similar to the lichenicolous species *Taeniolella arthoniae*, usually growing on *Pachnolepia pruinata* on *Quercus* sp. Conidiophores of *T. arthoniae* are also often branched and the outer wall is irregularly verruculose to verrucose, but conidia are narrower than in *T. faginea* [3–6.5(–7.5) µm vs. 6–9(–10) µm, in the key of Ellis (1976) even cited to be up to 13 µm broad].

According to 'JSTOR Plants' (http://plants.jstor.org) and 'Mycology collections portal' (http://mycoportal.org) there are two collections of *Torula faginea* in ILLS (ILLS 38642, 36957) labelled as isolectotypes (see also Crane & Tazik 1992). Unfortunately, this 'Catalog of Types of the Illinois Natural History Survey Mycological Collections (ILLS)' does not contain any information about the types of *T. faginea*. According to our knowledge, a lectotypification of this species has not yet been validly published. Therefore, a formal lectotypification is hereby done in this paper.

Taeniolella filamentosa Heuchert, **sp. nov.** MycoBank MB819308. Figs 86–87.

Etymology: Derived from *filum* = filament, referring to the long filamentous, often simple superficial hyphae *in vivo*.

Diagnosis: Resembling *T. stilbospora* but forming long filamentous, often simple superficial hyphae even visible by stereomicroscopy; conidial chains often branched, long, up to 245 µm, composed of up to 12 conidia.

Literature: Ellis (1971: 94, as *T. stilbospora*), Ellis & Ellis (1997: 65, 252, as *T. stilbospora*).

Illustration: Ellis (1971: 93, fig. 56 A).

Exsiccatae: Karsten, Fungi Fenn. Exs. 191.

Description: *Colonies* scattered on bark, effuse, caespitose, fuliginous, black to red-brown, somewhat shiny, superficial, with long, filamentous hyphae, even visible by stereomicroscopy. *Mycelium* superficial, rarely immersed; aerial hyphae long, filiform, straight to slightly flexuous, mostly unbranched, rarely branched, 2–5(–7) µm wide, septate, not or slightly constricted at the septa, pale brown to brown, smooth, thick-walled, mostly 0.25–0.5 µm thick, sometimes cell plasma reduced, with a central vacuole-like cavity, giving the impression of thicker walls, up to 1 µm. *Stromata* lacking. *Conidiophores* micronematous to semi-macronematous, transition between fertile hyphae and barely differentiated conidiophores gradual, conidiophores often reduced to conidiogenous cell, distinction between conidiophores and adhering conidia difficult, solitary, erect, straight, unbranched, doliiform, subcylindrical, 15 × 5–7.5 µm, 1–2-septate, not constricted at the septa, brown, smooth, wall slightly thickened, to 0.5 µm, conidiogenous cells monoblastic, 4–6 µm long, loci truncate, unthickened, 3–4 µm diam. *Conidia* usually in long, often repeatedly branched chains, mostly in the upper part, sometimes unbranched or almost so, conidia adhering for a long time, often to 12 conidia in one chain, chains to 245 µm long, distinction between individual conidia within the chain sometimes difficult, usually 3–5 µm wide at the points of attachment between individual conidia in chains, but sometimes without distinct constrictions, disintegrating chains forming fragments of different sizes, individual conidia very variable, subcylindrical, doliiform, ellipsoid, broad ellipsoid, 0–7-septate, sometimes with one or two distosepta, aseptate conidia 10–13 × 7–8 µm, 1-septate ones 14–22 × 7–10 µm, 2-septate ones 12–22 × 7–10(–11) µm, 3-septate ones 18–26 × 6–9 µm, 4–7-septate ones 22–41 × 6–10 µm, not or slightly constricted at the septa, brown, young conidia pale brown, smooth, sometimes irregularly rough or granulose, wall thickened, to 1.25 µm, cell plasma reduced, with a central vacuole-like cavity, giving the impression of thicker, two-layered walls, up to 2 µm thick, the wall of younger conidia mostly only slightly thickened, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate or sometimes slightly obconically truncate, hila 2–5 µm diam.

Holotype: **Russia**, Murmansk Oblast, Kola Peninsula, on bark of *Salix* sp., 2 Jul. 1861, *P.A. Karsten* (H 4957).

Host range and distribution: On wood of *Salix* sp., *Sorbus aucuparia* (?); Finland, UK, Russia.

Additional specimens examined: **Finland**, Nylandia, Borgå, på Salix, Apr. 1927, *W. Nyberg* (H). **Russia**, Murmansk Oblast [Vid Kola på Salix], Kola, h. o. d., on *Salix* sp., Juli, *Karsten*, Fungi Fenn. Exs. 191 (H); Leningrad Oblast', Kirovk Rajon, vicinities of village Vasil'kovo, valley of river Lava, on a dead twig of *Sorbus aucuparia* (?), 13 May 2009, *E.S. Popov* (HAL 2534 F). **UK**, on wood, *A. Bloxam* (H, herb. W. Nylander).

Notes: Ellis (1971) described and illustrated *Taeniolella stilbospora s. lat.* but his drawings showed a wider range of morphological types indicating that possibly various taxa were involved. Unfortunately, it is not known which collections Ellis had examined. The illustration on the left can be interpreted to represent the new species *Taeniolella filamentosa*, which is based on several collections originally deposited as *Taeniolella stilbospora*, but easily distinguishable from all other *Taeniolella* species by the formation of well-developed, conspicuous, superficial, filiform, often unbranched hyphae that are even visible by stereomicroscopy.

The frequently and variously branched, long conidial chains, often with pleurogenous conidia, adhering for a long time, often to 12 per chain and up to 245 µm long, are additional characters relevant for *T. filamentosa*. The conidia of other saprobic *Taeniolella* species are mostly formed in unbranched or only rarely branched chains. In *T. stilbospora*, the conidial chains may be branched at the base, often with additional branches in the upper part, but this species is easily distinguishable from *T. filamentosa* by the absence of aerial hyphae and a characteristic outer conidial wall composed of a subhyaline to pale brown outer layer, 0.5–1 µm wide, and a darker inner layer. The combined two-layered wall is up to 2 µm thick, the cell plasma is mostly reduced, with a central vacuole-like cavity, and the surrounding plasma gives the impression of very thick, three-layered walls. In *T. filamentosa*, thin, subhyaline outer wall layers are not present.

Ellis (1976) introduced the genus *Taeniolina* for taeniolella-like hyphomycetes characterised by semi-macronematous conidiophores producing much branched, septate conidia. The branched conidial chains in *Taeniolina* species are often breaking off at the base, functioning as propagules, which is quite distinct from the type of ramification in *T. filamentosa*. Conidiophores or conidial chains of some lichenicolous *Taeniolella* species (*e.g.*, *T. arthoniae* or *T. caespitosa*) are occasionally branched, but never as frequently as in *Taeniolina* and *Taeniolella filamentosa*. The phylogeny of *Taeniolina* and its relationship to *Taeniolella* are still unclear and unconfirmed. In the interim, we prefer to maintain *Taeniolina* as a separate genus. The placement of the new species *T. filamentosa* in the genus *Taeniolella*, based on morphological features, is also tentative until molecular data will be available.

The branched conidial chains are reminiscent of members of the genus *Septonema*, but in the latter genus conidiophores are usually macronematous, whereas in *Taeniolella*, especially in saprobic members, conidiophores are usually micronematous

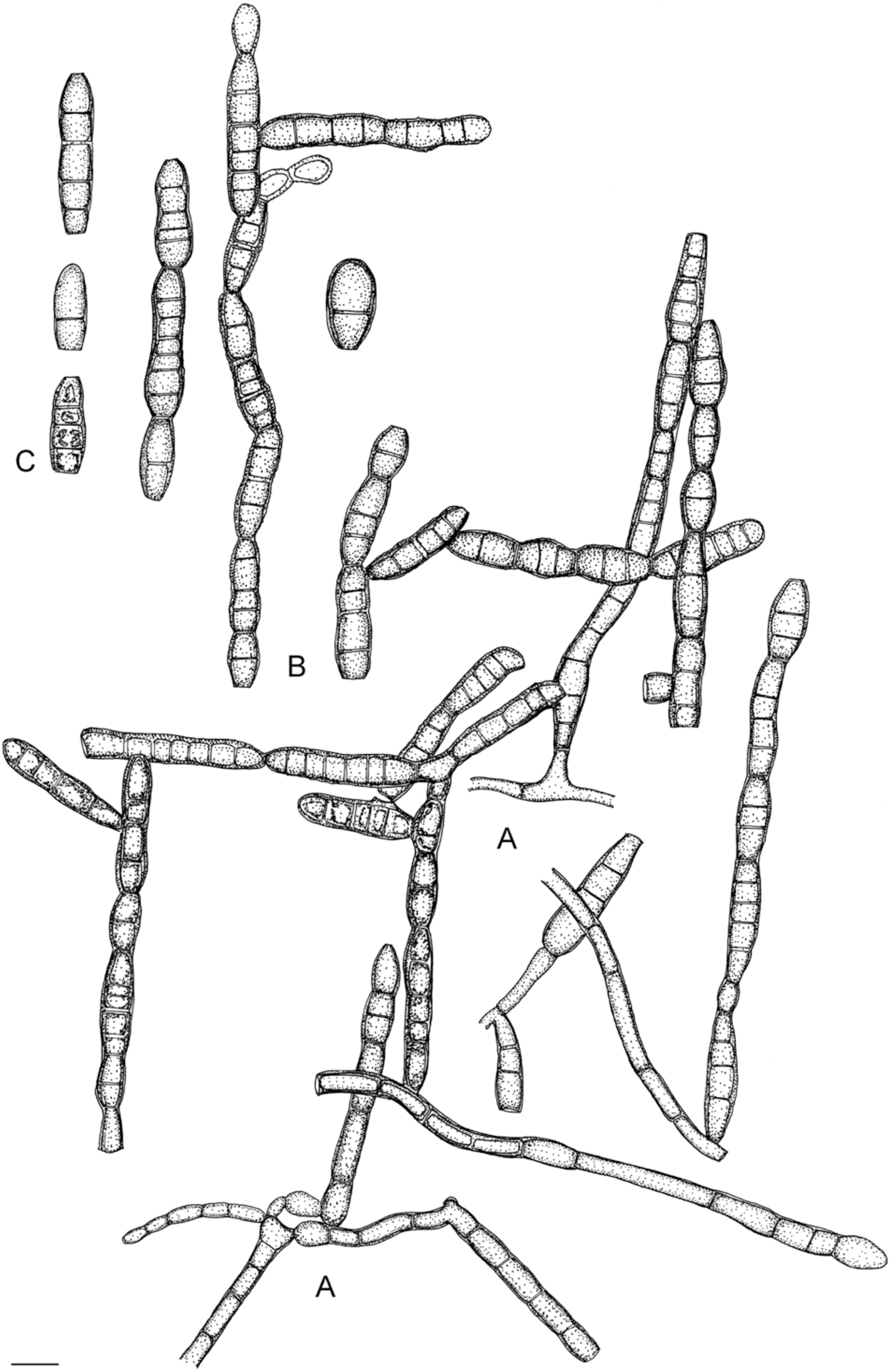

Fig. 86. *Taeniolella filamentosa* [holotype]. **A.** Micronematous to semi-macronematous conidiophores with adhering conidial chains arising from hyphae. **B.** Branched conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Fig. 87. *Taeniolella filamentosa* [A: HAL 2534 F; B–F: holotype]. **A.** Macroscopic overview of colonies. **B.** Microscopic overview. **C–F.** Branched conidial chains. Bars: 5 mm (A), 100 µm (B), 50 µm (D), 20 µm (C, E, F).

to semi-macronematous, and the transition between fertile hyphae and barely differentiated conidiophores is gradual. Conidiophores are often reduced to conidiogenous cell and the distinction between conidiophores and adhering conidia is difficult.

Taeniolella multiplex (Berk. & M.A. Curtis) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 88–90.
Basionym: *Septonema multiplex* Berk. & M.A. Curtis, *Grevillea* **3**: 16. 1874.

Literature: Lohman (1934: 314–327).

Illustration: Lohman (1934: 325, pl. 1, figs 1–3).

Description: *Colonies* scattered over the substrate, effuse, dense, up to 1 × 2 cm, dark brown to black, long chains of conidia often visible even by stereomicroscopy. *Mycelium* immersed and sometimes superficial; hyphae straight to flexuous, branched, 4–6 µm wide, septate, not constricted at the septa, brown, smooth, wall thickened, up to 1 µm. *Stromata* lacking. *Conidiophores* semi-macronematous, distinction between conidiophores and adhering conidia difficult, transition gradual, mononematous, arising from hyphae, terminal or lateral, solitary, unbranched, erect, straight, subcylindrical, ellipsoid, 15–40 × 5–7 µm, 2–7-septate, not constricted at the septa, light microscopically smooth, brown to dark brown, wall thickened, multilayered, cell lumen reduced, forming a second inner wall layer, 0.5–2 µm thick, sometimes enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe, up to 3 times. *Conidiogenous cells* integrated, terminal, monoblastic, subcylindrical or doliiform, 5–6 µm long, conidiogenous loci truncate, unthickened, 2–4 µm diam. *Conidia* in unbranched acropetal chains, not easily disintegrating, adhering for a long time, distinction between individual conidia within the chain sometimes difficult or even impossible, chains probably only breaking off during gross preparations or in nature by violent mechanic impacts, forming fragments of different sizes, conidia or conidial chains straight or slightly flexuous, chains subcylindrical, 35–135(–215) × 5–8(–9) µm, 6–26(–)40-septate, single conidia subcylindrical, ellipsoid, 12–47 × 7–8 µm, 2–9-septate, eu- and distoseptate, slightly constricted at the septa, septa thickened, up to 2 µm, dark brown, sometimes paler at the tip, wall thickened, multilayered, cell lumen reduced, forming a second inner wall layer, 0.5–2 µm thick, wall of young conidia thinner, light microscopically smooth, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate, sometimes slightly obconically truncate, hila truncate, unthickened, not darkened, 3–5 µm diam, sometimes with a marked porus, up to 1 µm diam, still attached conidia occasionally enteroblastically proliferating.

Lectotype (designated here, MycoBank MBT373911): **USA**, South Carolina, Society Hill, "lign. *Nyssa*" (on weathered wood, *Nyssa* sp.), 1853, *M.A. Curtis*, Car. Inf. 4033 (FH 00458308**!**). *Isolectotype*: K(M) 187576.

Host range and distribution: On *Nyssa* sp., *Quercus alba*, [*Eucalyptus*?]; USA (Curtis 1867, Berkeley 1874, [Cooke & Harkness 1881], Lohman 1934).

Additional specimens examined: **USA**, South Carolina, Society Hill, "intra trunc. cav. *Q. alba*: dej." (occurring within cavity of decaying trunk, *Quercus alba*), Oct. 1849, *M.A. Curtis*, Car. Inf. 2751 (FH 00458307**!**, K(M) 187580, K(M) 187581 – syntypes of *S. multiplex*); [*Septonema multiplex* B. & C., trunco cavo *Quercus albus*, Soc. Hill, ex Curtis, 1563] (K(M) 187578).

Notes: The re-examination of the three syntype collections of *Taeniolella multiplex* cited in Berkeley (1874) showed that they are heterogeneous. The original description of *T. multiplex* by Berkeley and Curtis (in Berkeley 1874) is very meagre and without any information about the dimensions of conidiophores and conidia as well as the surface ornamentation. One syntype (*H.W. Ravenel 1563*) is easily distinguishable from the other two syntype collections (*Curtis 2751, 4033*) by the dimensions of the conidial chains (55–170 × 7–14 µm vs. 35–135(–215) × 5–8(–9) µm, 6–26(–)40-septate) and the surface ornamentation of conidia, which is very variable, *viz.* irregularly verrucose or coarsely verrucose with verrucae up to 1 µm high and wide, hemispherical with rounded apex to conical and pointed, sometimes with elongated projections, linear or rod-shaped, projections and verrucae hyaline, older walls sometimes cracked, rimulose. The conidial wall of the other two syntypes collected by Curtis (2751, 4033) is smooth by light microscopy. These obvious morphological differences reflect the heterogeneity of the syntypes of *S. multiplex* and suggest the involvement of two different species. Therefore, we introduce the new species *Taeniolella ravenelii* for the specimen collected by H.W. Ravenel [1563] (for more details see under *T. ravenelii*).

A label with a number is attached to the collection deposit at K (K(M) 187578) ["*Septonema multiplex* B. & C., trunco cavo *Quercus albus*, Soc. Hill, ex Curtis, 1563]. This number [1563] belongs to the collections of Ravenel. The re-examination of this collection revealed that it was not, as presumed, the new species *Taeniolella ravenelii*, but *Taeniolella multiplex*. The colonies of *Taeniolella ravenelii* are rather scattered over the substrate, undoubtedly over bark of *Quercus* sp. But in the mentioned collection, the colonies are scattered over wood, comparable to the lectotype and examined syntypes of *T. multiplex*. Possibly, the label with this number of Ravenel was erroneously attached to this collection.

There are some other saprobic *Taeniolella* species with similar dimensions of conidiophores and/or conidial chains, but they are distinguishable by the following features. Conidia of *Taeniolella curvata* are often arranged in long, branched chains (10–210 × 5–7 µm, 1–48-septate), adhering for a long time and forming branched complexes (propagules). Conidia and/or chains of conidia are rarely straight, but usually falcate to sigmoid and the conidial wall is less thickened (0.5–1 µm in *T. curvata* vs. 0.5–2 µm in *T. multiplex*). Conidia of the European *Taeniolella faginea*, known on bark of *Fagus sylvatica*, are also often formed in long adhering chains, but single conidia are shorter and have fewer septa (7–20 × 5–9(–10) µm, 0–2(–3)-septate vs. 12–47 × 7–8 µm, 2–9-septate in *T. multiplex*), the wall is less thickened (up to 1 µm in *T. faginea* vs. 0.5–2 µm in *T. multiplex*) and usually verrucose, somewhat irregularly rough, often with cracks, whereas the conidial wall in *T. multiplex* is smooth by light microscopy. Conidia of other saprobic *Taeniolella* species are also often formed in long chains adhering for long time, *e.g.*, in *T. plantaginis* and *T. stricta*, but distinguishable by having usually wider conidia (7–10(–13) µm wide in *T. plantaginis*, 7–13 µm wide in *T. stricta* vs. 5–8(–9) µm in *T. multiplex*).

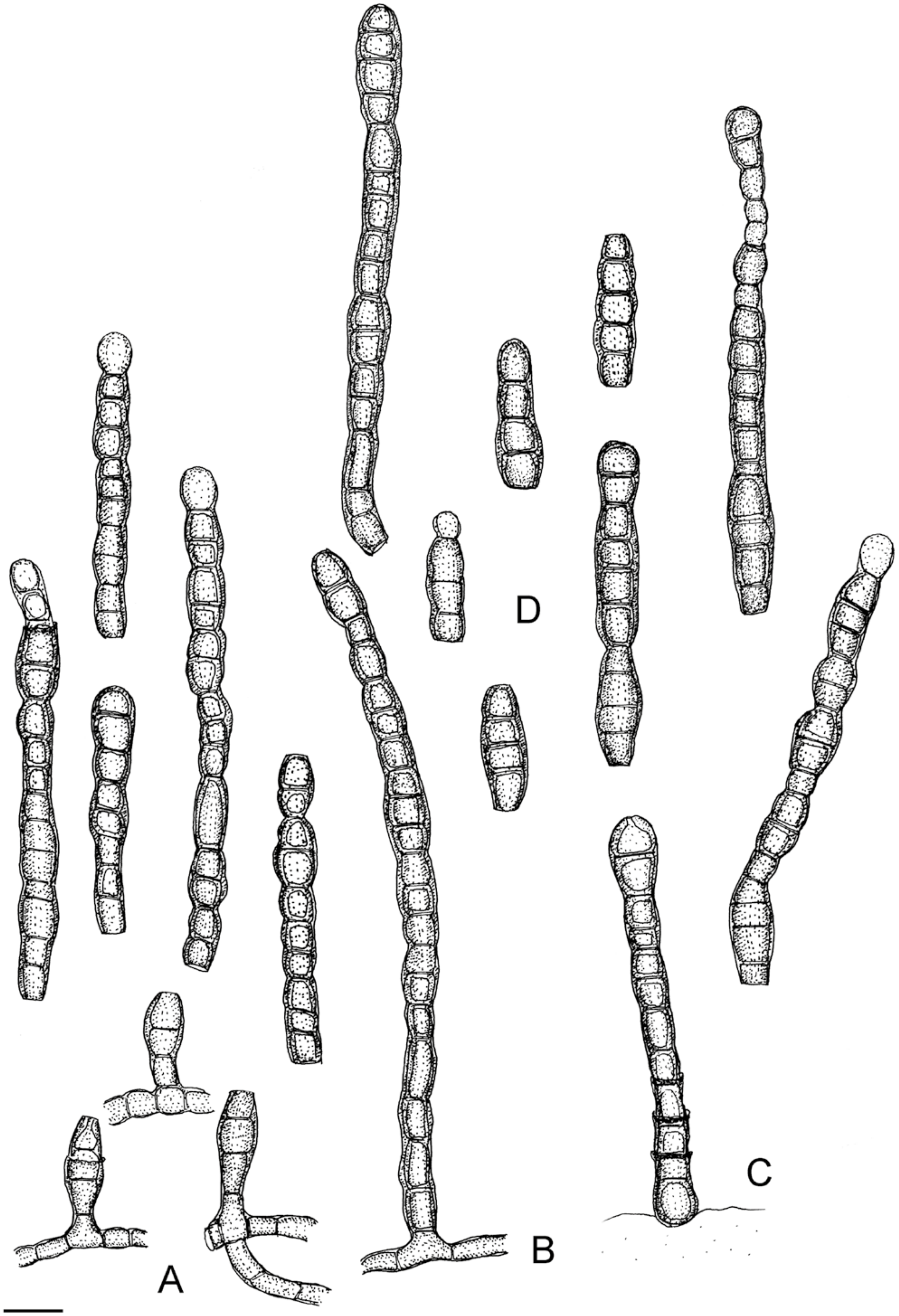

Fig. 88. *Taeniolella multiplex* [lectotype]. **A.** Conidiophores arising from hyphae. **B.** Conidiophore arising from hyphae with adhering conidial chain. **C.** Conidiophore with enteroblastical proliferations with obvious sheath-like wall remnants visible as an irregular collar. **D.** Conidial chains and conidia. Bar = 10 µm (B. Heuchert *del.*).

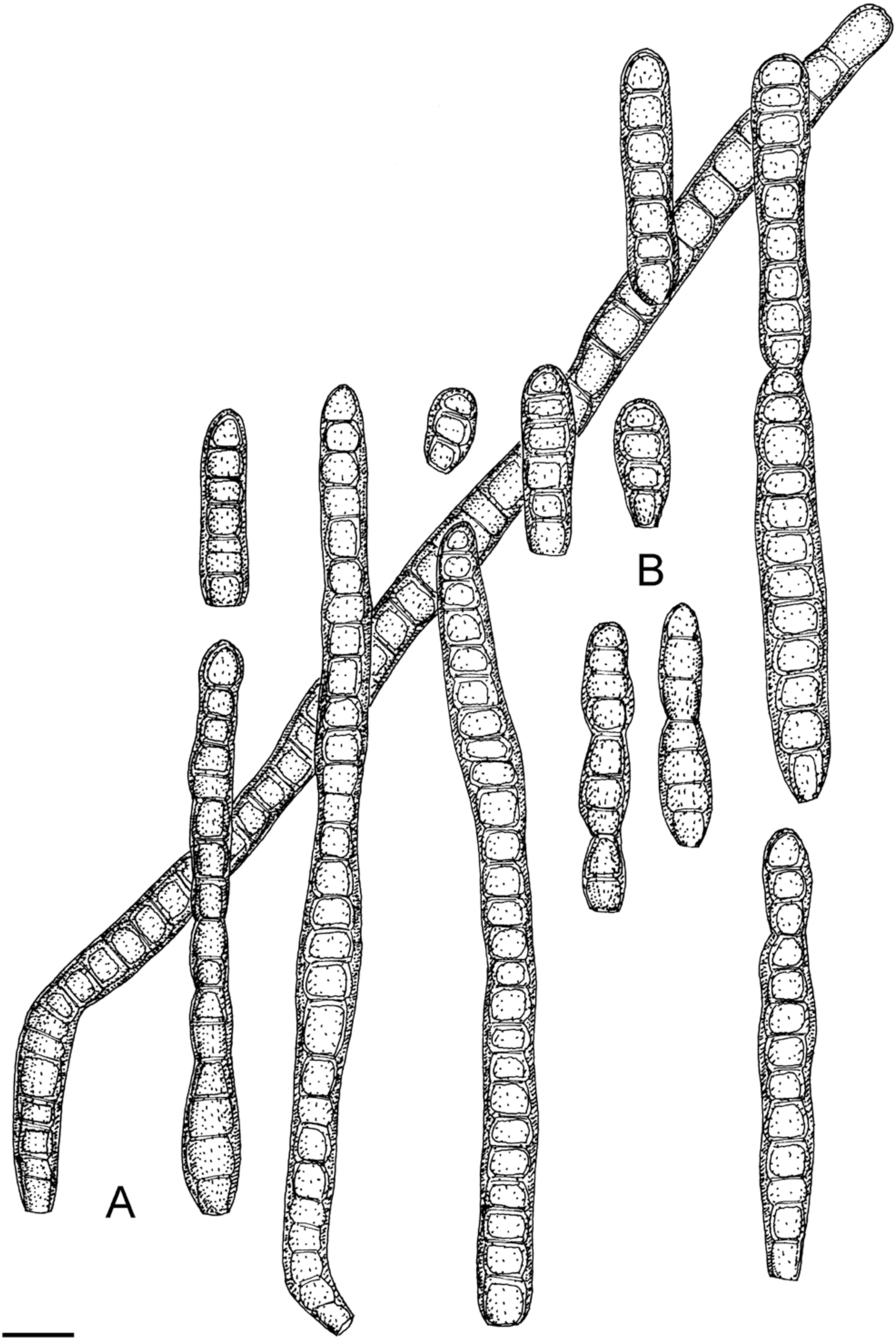

Fig. 89. *Taeniolella multiplex* [FH 00458307]. **A.** Conidial chains. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

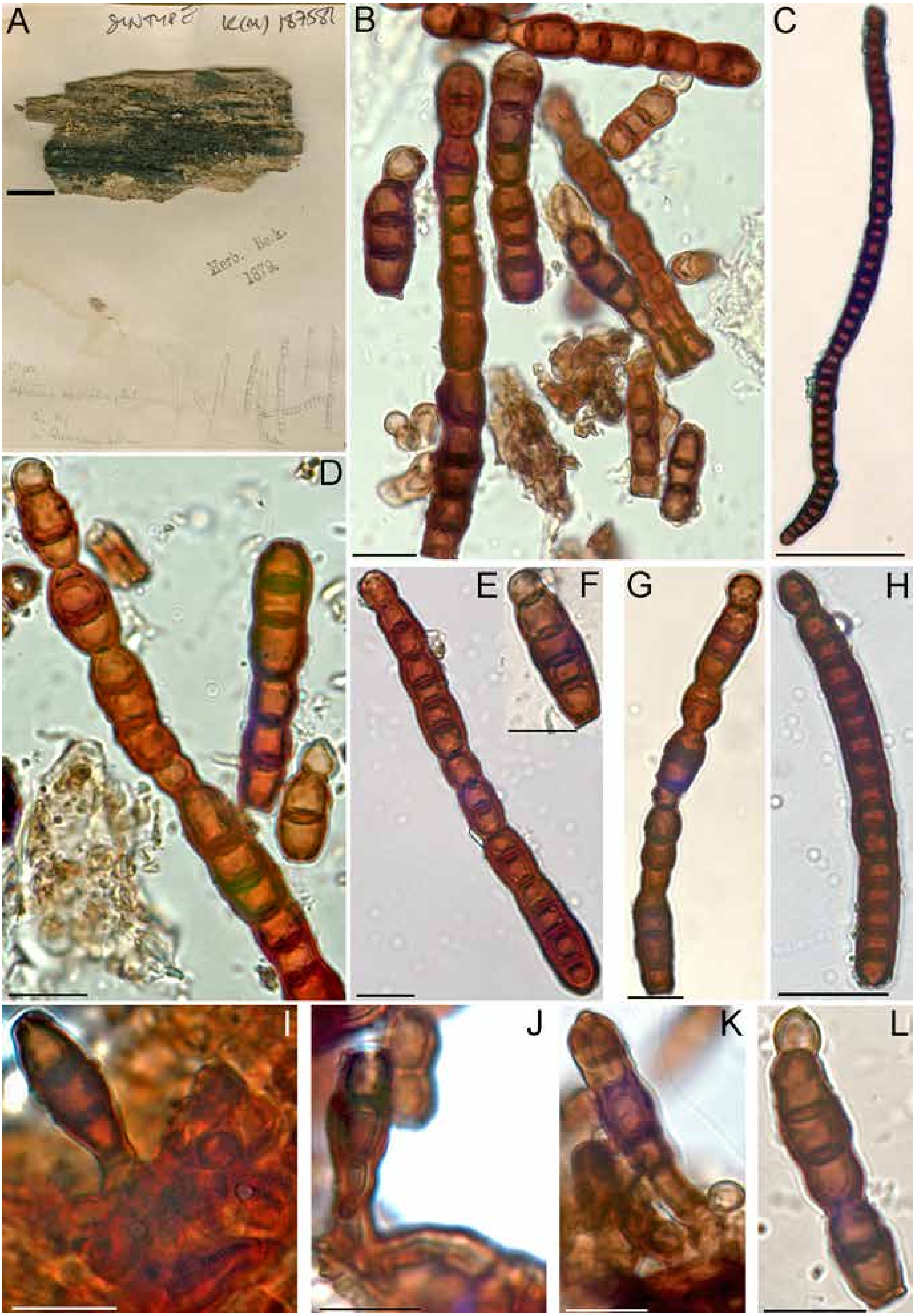

Fig. 90. *Taeniolella multiplex* [A: K(M) 187581; B, D, F–L: lectotype; C, E: FH 00458307]. **A.** Macroscopic overview of colony, label with original drawings. **B–E, G, H, L.** Conidial chains. **F.** Conidia. **I–K.** Conidiophores arising from hyphae. Bars: 1 cm (A), 50 µm (C), 10 µm (B, D–L).

Lohman (1934) studied *Taeniolella multiplex in vivo* (syntypes and other collections) and *in vitro* (based on mono-ascospore cultures) and discussed the connection between *Septonema multiplex* and *Lophiosphaera velata* (Ellis & Everh.) M.L. Lohman. She re-examined the cited syntype collections (*Curtis 2751, 4033*), but the third syntype (*H.W. Ravenel 1563*), now distinguished and here described as *Taeniolella ravenelii*) was not seen by Lohman. The description of conidia of *T. multiplex* in Lohmann (1934) agrees with our own observation based on lectotype material. Lohmann (1934) postulated an asexual/sexual connection between *Septonema multiplex* and *Lophiosphaera velata*, but without examination by means of modern molecular methods this connection is unconfirmed and remains doubtful.

According to Lohman (1934), the report on bark of *Eucalyptus* in California by Cooke and Harkness (1881) needs verification.

Taeniolella muricata (Ellis & Everh.) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 91–92.
Basionym: *Dendryphion* [as '*Dendryphium*'] *muricatum* Ellis & Everh., *Proc. Acad. Nat. Sci. Philadelphia* **43**: 92. 1891.
Synonyms: *Septonema hormiscium* Sacc. var. *padinum* P. Karst., *Meddeland. Soc. Fauna Fl. Fenn*. **14**: 98. 1887 [*lectotype* (designated here, MycoBank MBT373912): **Finland**, Tammela, Mustiala, on bark of *Prunus padus*, 22 Dec. 1865, *P.A. Karsten* (H 4956**!)**].
Helminthosporium repens Dearn. & Barthol. [as '*repente*'], *Mycologia* **9**: 363. 1917 [*syntypes*: **USA**, Utah, Red Butte Canyon, on bark of dead *Acer grandidentatum*, Jun. 1913, *E. Bartholomew 5826* (DAOM, NY 3021301)].
Dendryphion brunneum Dearn. & Barthol., in Dearn., *Mycologia* **21**: 330. 1929 [*type*: **USA**, Wyoming, Jenny Lake, on bark of dead, firm branches of *Sorbus scopulina*, 12 Juli 1924, *E. Bartholomew 8788* [D. 5712] (DAOM)].

Literature: Saccardo (1892: 663), Sydow (1897: 179), Ellis (1976: 56), Wang (2010: 191).

Illustration: Ellis (1976: 57, fig. 39).

Description: *Colonies* effuse or aggregated in small groups, later confluent, larger parts of the bark completely overgrown by fungal colonies, densely caespitose, dark brown, slightly shiny, chains of conidia easily discernable by means of a stereo-microscope. *Mycelium* immersed; hyphae straight to flexuous, 2–5 µm wide, septate, slightly constricted at the septa, pale brown, yellowish brown, smooth, wall slightly thickened, up to 0.25 µm; below conidiophores sometimes with stromatically aggregated cells, subglobose, square or irregularly shaped, 3–6 × 5–10 µm, pale brown to medium brown, smooth, outer wall slightly thickened, cell lumen reduced, wall thick, 0.5–2 µm, conspicuously multilayered. *Conidiophores* semi-macronematous, mononematous, distinction between conidiophores and adhering conidia difficult, solitary to densely aggregated, arising from stromatic cells, decumbent to erect, straight to slightly flexuous, unbranched, seldom with a single branch, subcylindrical, 20–82 × 5.5–8 µm, 2–11-septate, slightly or non-constricted at the septa, pale brown to brown, smooth, wall slightly thickened, cell lumen reduced, forming a second inner wall layer, wall up to 1.5 µm thick, rarely enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, little differentiated, 5–10 µm long, loci truncate, sometimes somewhat concave, unthickened, 2.5–7 µm diam. *Conidia* catenate, in unbranched chains, not easily disintegrating, conidia long adhering, chains at least up to 130 µm long, conidia straight, broad ellipsoid, subcylindrical, phragmosporous, often (0–)1–3-euseptate and additionally 1–20-distoseptate, distosepta often not easily discernable in conidia with strongly structured cell lumen, 15–118 × 7–11 µm, distinction between individual conidia within the chain sometimes difficult, yellowish brown to dark brown, paler at the tip, wall thickened, up to 1 µm, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick walls, up to 1.5 µm thick, cells filled with up to 5 oil-like droplets, often attached at distosepta, outer wall of young conidia sometimes smooth, and with unstructured or less structured cell plasma, wall later usually irregularly verrucose to coarsely verrucose, verrucae vesicle-like, 0.5–4 µm diam, up to 1.5(–2) µm high, thick-walled, sometimes irregularly formed, apex rounded in primary conidia, truncate and narrowed in secondary ones, base truncate, sometimes narrowed towards the base, occasionally with a somewhat narrower, peg- to stalk-like base, doliiform, 3.5 × 4 µm, hila truncate, sometimes somewhat concave, unthickened, thickened wall sometimes visible as conspicuous rim, not darkened, 2–5.5 µm diam, germinated conidia observed, germ tubes subhyaline, smooth, unthickened, about 2 µm wide.

Lectotype (designated here, MycoBank MBT373913): **USA**, Montana, Sand Coulee, Pascade Rd., on dead bark of *Prunus virginiana*, 28 May 1889, *F.W. Anderson* [Parasitic fungi of Montana 492] (NY 00883700**!**). *Isolectotype*: NY 00883699**!**

Host range and distribution: On wood and bark of *Acer grandidentatum*, *Prunus virginiana*, *P. padus*, *Tectona grandis*; Finland (Karsten 1877), India (Agarwal *et al*. 1993), Russia, USA (Saccardo 1892, Sydow 1897, Cash 1952, Shaw 1973, Ellis 1976, Wang 2010, Glawe 2014).

Additional specimens examined: **Finland**, Tammela, Mustiala, on bark of *Prunus padus*, 28 Dec. 1865, *P.A. Karsten* (H 4960) [syntype of *Septonema hormiscium* Sacc. var. *padinum* P. Karst.]. **Russia**, Sakhalin region, Sakhalin Island, Makarovskij District, sea shore on the left of mouth of river Tikhaya, on twig of an unidentified tree, 20 Aug. 2003, *A.V. Bogacheva* (HAL 2687 F). **USA**, Utah, Salt Lake County, Red Butte Canyon, on bark of *Acer grandidentatum*, 26 Jun. 1917, *A.O. Garrett 2288* (NY 3021301); Montana, Sand Coulee, on *Prunus virginiana*, Nov. 1889, *F.W. Anderson & F.D. Kelsey* (NY 3021298).

Notes: This species is easily distinguishable from all other saprophytic *Taeniolella* species, except for *T. multiplex*, by its characteristic ornamentation of the outer conidial wall. The irregularly arranged, coarse verrucae are often vesicle-like, rather large, 0.5–4 µm diam, up to 1.5(–2) µm high and thick-walled. *Taeniolella multiplex* has a similar conspicuous wall structure but linear or rod-shaped elongated projections as in *T. multiplex* are, however, not formed in *T. muricata*.

The synonymy follows Hughes (1958). Two syntype collections of *Septonema hormiscium* var. *padinum* deposited in the herbarium of the University of Helsinki (H) have been examined and one of them is designated here as lectotype.

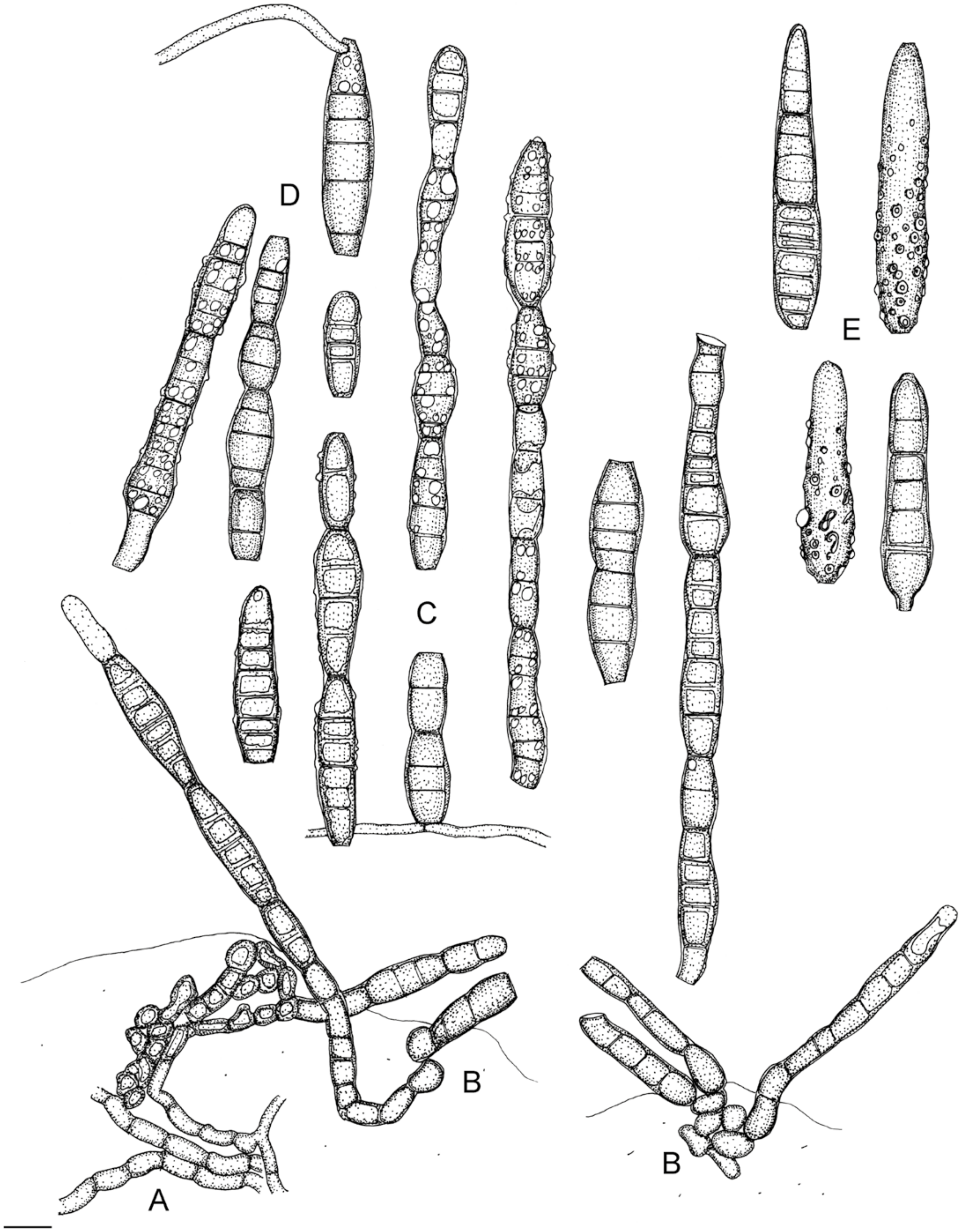

Fig. 91. *Taeniolella muricata* [A–D: lectotype, E: Garrett 2288]. **A.** Hyphae. **B.** Conidiophores arising from stromatic cells. **C.** Conidial chains. **D.** Germinated conidium. **E.** Conidia with vesicle-like verrucae. Bar = 10 µm (B. Heuchert *del.*).

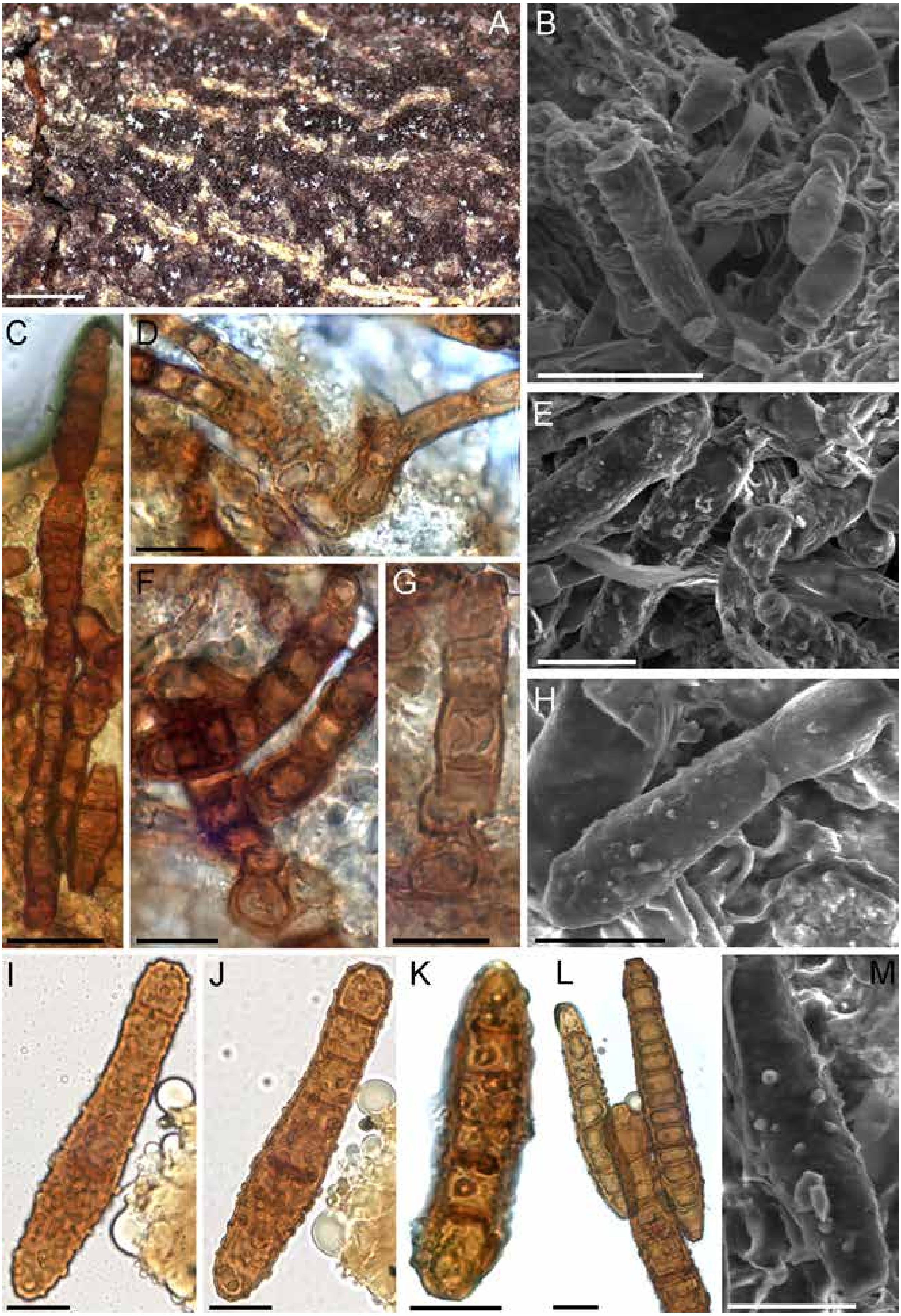

Fig. 92. *Taeniolella muricata* [A, I–L: NY 3021301; B, E, H, M: NY 3021298; C, D, F, G: lectotype]. **A.** Macroscopic overview of colony. **B.** Conidiophore. **C.** Conidiophore with adhering conidial chain. **D, F, G.** Conidiophores arising from stromatic cells. **E, H–M.** Conidia with vesicle-like verrucae (SEM- and light microscopy). Bars: 1 mm (A), 20 µm (B, C), 10 µm (D–G, I–L), 9 µm (E, H, M).

Taeniolella plantaginis (Corda) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 93–95.
Basionym: *Torula plantaginis* Corda, *Icon. Fung*. **3**: 5. 1839.
Synonyms: *Gyrocerus plantaginis* (Corda) Sacc., *Syll. Fung*. **4**: 267. 1886.
Helicoceras plantaginis (Corda) Linder, *Ann. Mo. Bot. Garden* **18**: 5. 1931.

Literature: Lindau (1909: 605), Ellis (1971: 94), Ellis & Ellis (1997: 402).

Illustrations: Corda (1839: tab. 1, fig. 14), Saccardo (1881: fig. 794), Lindau (1909: 605, fig. 2), Linder (1931: 8, pl. 1, figs 17–20), Ellis (1971: 93, fig. 56B), Ellis & Ellis (1997: pl. 155, fig. 1616).

Description: *Colonies* scattered on the lower surface of senescent leaves of *Plantago* ssp., effuse, in small tufts, sooty, dark brown to black. *Mycelium* superficial, sometimes penetrating the substrate; hyphae straight to flexuous, branched, 1.5–5 µm wide, septate, not or slightly constricted at the septa, pale brown to brown, smooth, wall up to 0.25 µm thick. *Stromata* lacking. *Conidiophores* micronematous to semi-macronematous, often reduced to conidiogenous cells, distinction between conidiophores and adhering conidia difficult, scattered, solitary or usually aggregated in small caespitose tufts with up to six conidiophores, arising from hyphae, lateral or terminal, erect, straight, unbranched, doliiform, subcylindrical, sometimes peg-like, 5–15(–20) × 4–8(–10) µm, 0–2-septate, not constricted at the septa, dark brown, smooth, wall slightly thickened, up to 0.5 µm, monoblastic to thalloblastic, loci truncate, unthickened, up to 5 µm diam. *Conidia* in branched chains, usually branched at the base or in the upper part, conidia adhering for a long time, distinction between individual conidia within the chain sometimes difficult or even impossible, chains probably only breaking off during gross preparations or in nature by violent mechanic impacts, usually flexuous, sometimes straight, erect to decumbent, vermicular, subcylindrical, 15–230 × 7–10(–13) µm, 3–35-septate, not or slightly constricted at the septa, dark brown, paler towards the apex, smooth when young, sometimes irregularly verrucose when mature, wall thickened, 0.5–1 µm, the wall at the apex often only slightly thickened, cell lumen reduced, sometimes granular, rarely enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe, disintegrating chains forming fragments of different sizes, doliiform, vermicular, subcylindrical, 17–50 × 8–11 µm, 1–8-septate, wall irregularly verrucose, rarely smooth, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila 5–10 µm diam.

Lectotype (designated here, MycoBank MBT373914): **Czech Republic**, Prague, Marienschanze, Reichsthor, on the underside of leaves of *Plantago* spp., 1836, *A.C.J. Corda* (PRM 155695**!**); **Czech Republic**, Bubeneč near Prague, 1838, *Dr. Hoser* (syntype, not examined).

Host range and distribution: On underside of old leaves of *Plantago major*, *P. media*; Austria (Lindau 1909), Belgium (Lindau 1909), Czech Republic (Corda 1839, Saccardo 1878, 1886, Lindau 1909), France (Linder 1931), Germany (Lindau 1909, Linder 1931), Hungary (Révay 1998), Italy (Saccardo 1878, 1881, 1886, Lindau 1909), Switzerland (Lindau 1909, Linder 1931), UK (Saccardo 1886).

Additional specimens examined: **Austria**, Steiermark, Voitsberg, on *Plantago media*, *Nees v. Esenbeck*?, herb. *P.A. Karsten 4953* (H). **Germany**, Bavaria, München, Wiesen zwischen Solln und der Staatsbahn, on *P. media*, 4 Nov. 1898, *J.N. Schnabl 1398* (H); München, a. d. Theresienwiese, Feb. 1881, *J.N. Schnabl 792* (H).

Notes: This species was placed by Saccardo (1886) in the genus *Gyrocerus*, introduced by Corda (1837) for hyphomycetes with spirally coiled conidial chains based on the original description and illustration in Corda (1837). Linder (1931) considered the introduction of this genus founded on a misinterpretation of its morphological structures. He reduced *Gyrocerus* to synonymy with *Sarcopodium* and reallocated *G. ammonis*, its type species, to the latter genus. In order to accommodate the remaining species, Linder (1931) introduced for *Gyrocerus sensu* Saccardo (1886) the new genus *Helicoceras* (classified in the original description as “n. nom.” = new name, but as a matter of fact a new genus accompanied by a Latin description) and designated *H. celtidis* as type species. This species was later placed by Ellis (1963) in *Sirosporium*, a genus widened and broadly defined by Ellis to accommodate various plant pathogenic species characterised by short conidiophores arising from superficial hyphae, sometimes also in fascicles, and with conspicuous, thickened and darkened conidiogenous loci (Ellis 1971, 1976). Therefore, the name *Helicoceras* has to be considered a facultative (heterotypic) synonym of *Sirosporium* and does not threaten the genus *Taeniolella*. Hughes (1958) regarded the phylogenetic position of the genus *Gyrocerus* as unresolved and placed *Torula plantaginis* in the genus *Taeniolella*. Various descriptions and illustrations of *T. plantaginis*, *e.g.*, in Lindau (1909), Linder (1931), and Ellis (1971), are rather uniform and in agreement with the type material.

Taeniolella stricta, a European saprobic species known from wood, is very similar to *T. plantaginis*. Conidia or conidial chains, composed of conidia adhering for a long time, are in both species very long and multiseptate (2–40-septate, (12–)25–277 × 7–13 µm in *T. stricta* vs. 3–35-septate, 15–230 × 7–10(–13) µm in *T. plantaginis*), but in *T. stricta* conidial chains are unbranched, usually straight or only rarely curved. The distinction between individual conidia within the chain is sometimes difficult or even impossible in *T. stricta* and above all in *T. plantaginis*, in which constrictions at points of attachments between individual conidia are absent or almost so.

Zelski *et al.* (2011) described the new freshwater ascomycete *Chaetorostrum quincemilensis* and its taeniolella-like anamorph, which superficially resembles *T. plantaginis* and *T. typhoides*. According to Zelski *et al.* (2011), the cylindrical phragmospores (20–280 × 7–13 µm, 2–40-septate) are unbranched, paler near the apex and produced on terminal ends of hyaline vegetative hyphae. Based on morphological features, Zelski *et al.* (2011) placed *Chaetorostrum quincemilensis* in the *Sordariomycetes*. The genus *Stanjehughesia*, to which *Taeniolella lignicola* is reallocated in this work, is also a member of the *Sordariomycetes* suggesting that taeniolelloid asexual morphs may also be formed in the latter ascomycete class, although not yet proven on the basis of molecular sequence analyses.

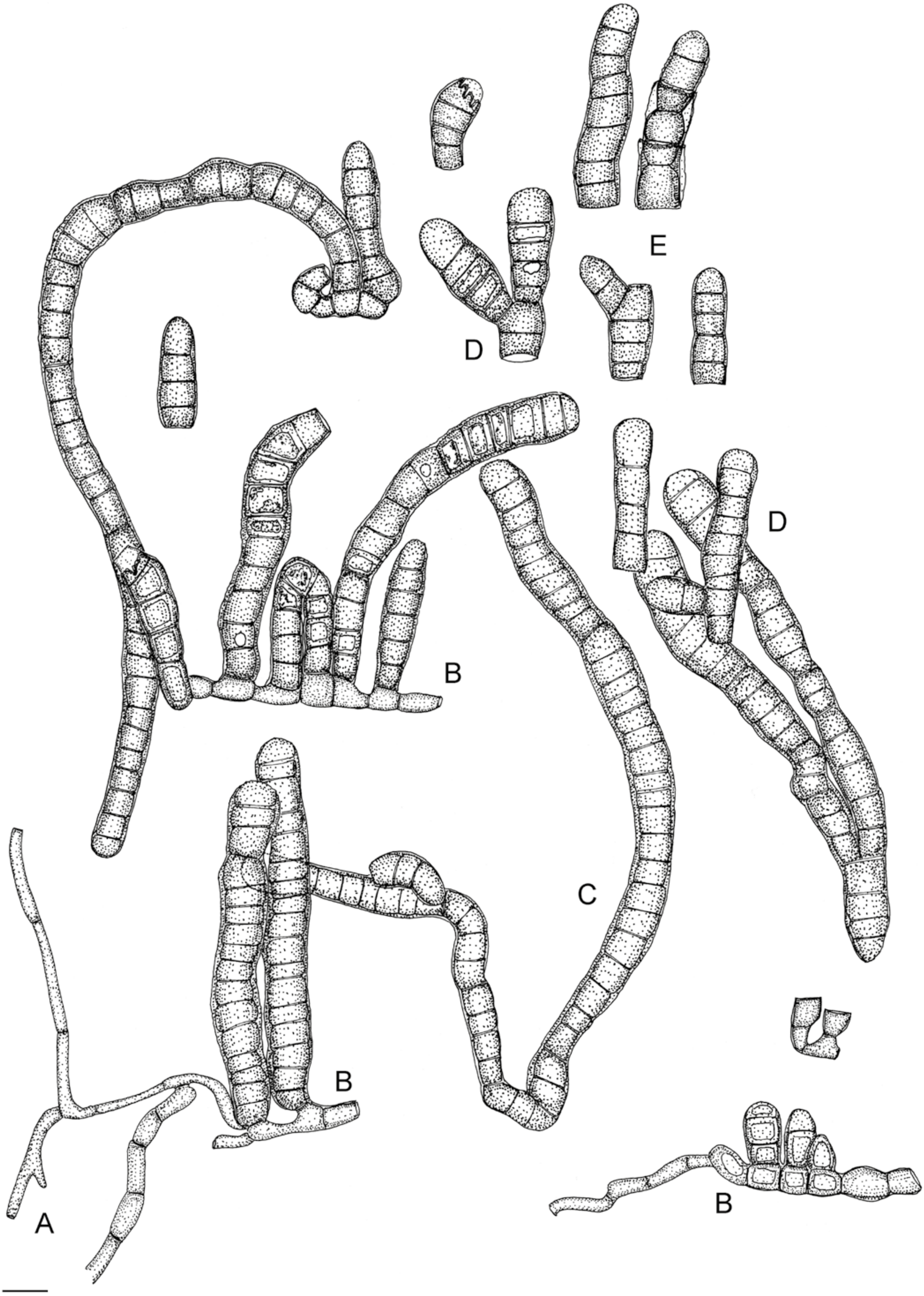

Fig. 93. *Taeniolella plantaginis* [H, Schnabl 1398]. **A.** Hyphae. **B.** Micronematous conidiophores arising from hyphae with adhering conidia. **C.** Conidial chains. **D.** Branched conidial chain. **E.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

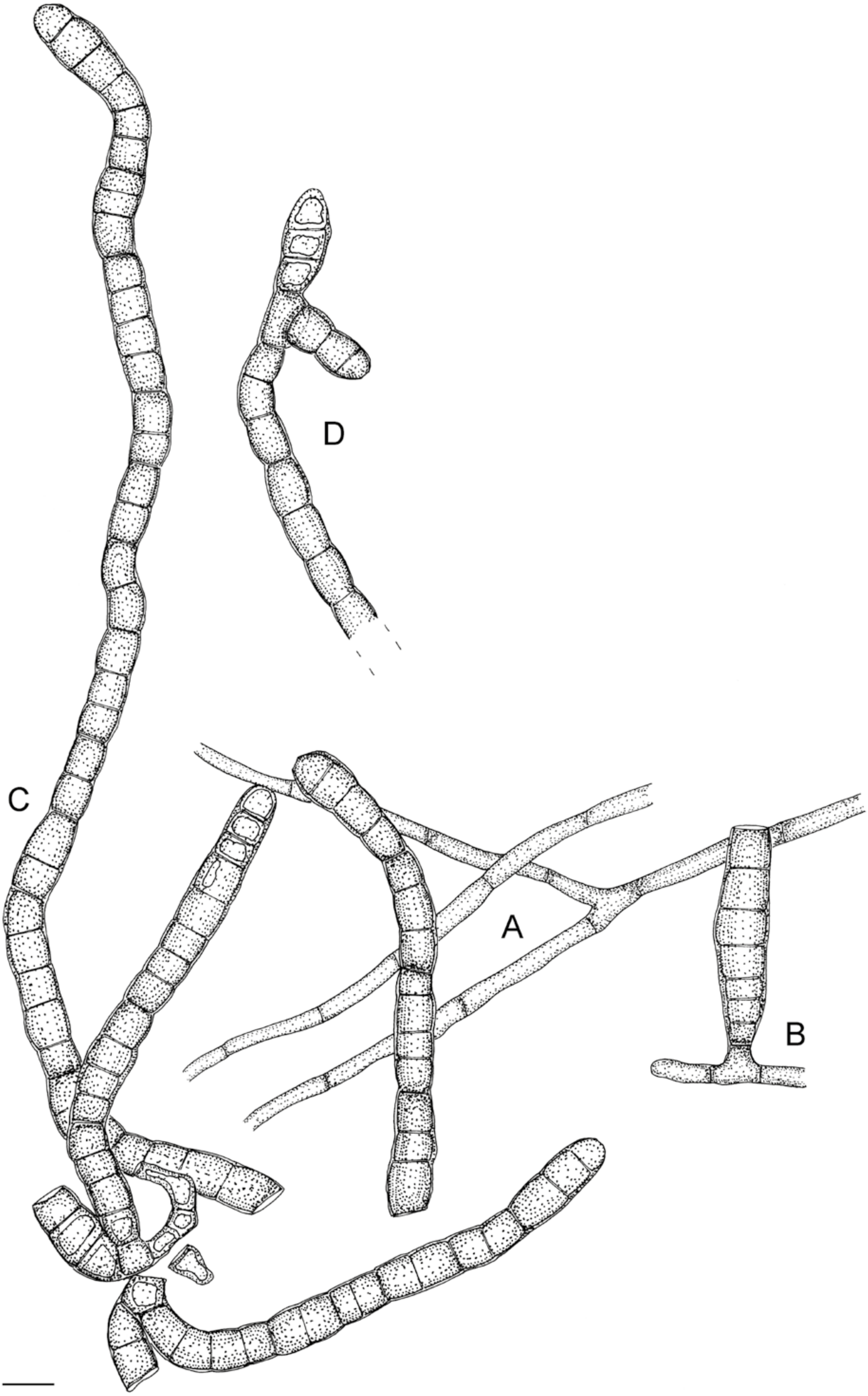

Fig. 94. *Taeniolella plantaginis* [lectotype]. **A.** Hyphae. **B.** Micronematous conidiophore arising from hyphae with adhering conidium. **C.** Conidial chains. **D.** Branched conidial chain. Bar = 10 µm (B. Heuchert *del.*).

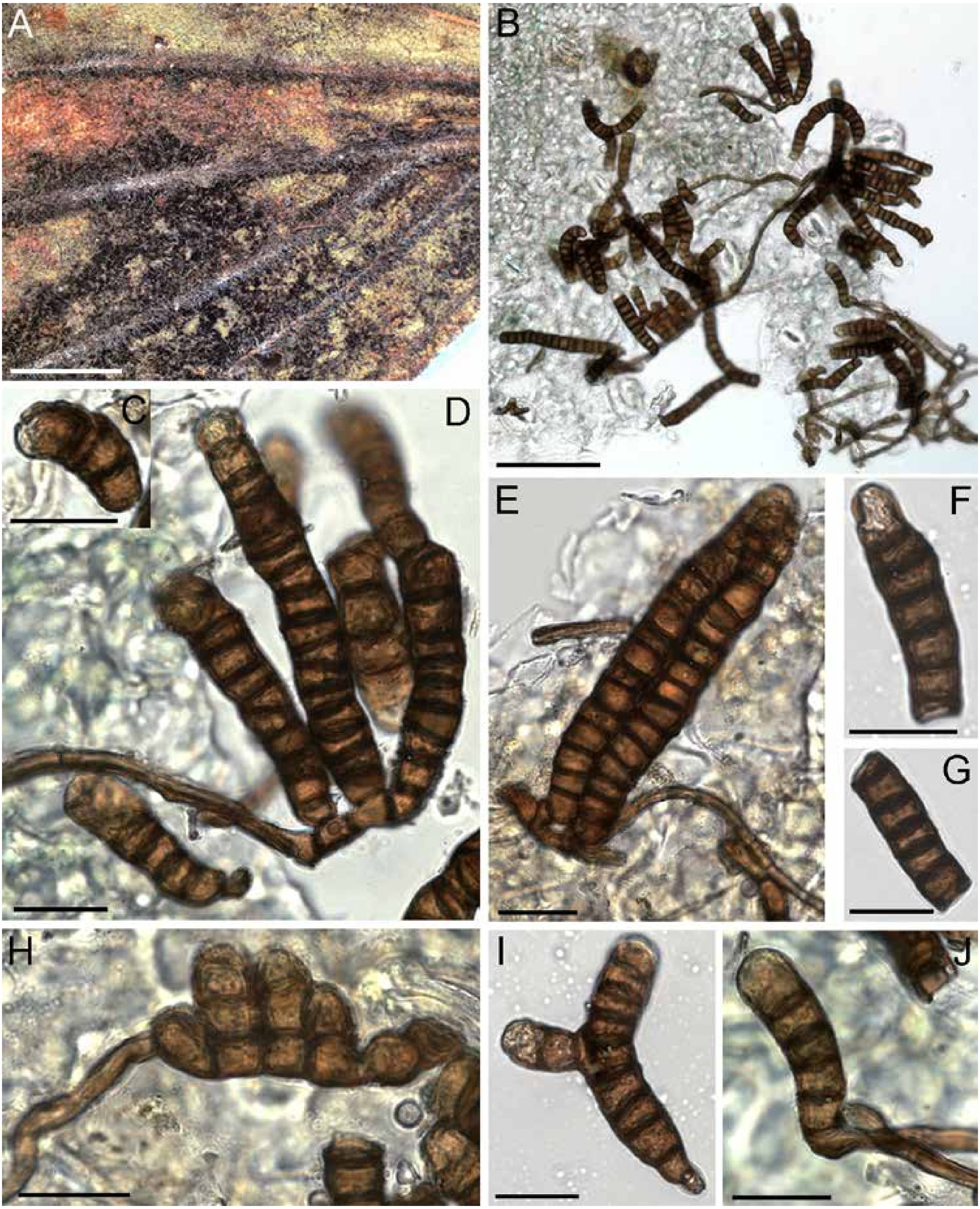

Fig. 95. *Taeniolella plantaginis* [A: lectotype; B, D, F, G, I, J: H, Schnabl 792; C, E, H: H, Schnabl 1398]. **A.** Macroscopic overview of colony. **B.** Microscopic overview.. **C, F, G.** Conidia. **D, E, H, J.** Micronematous conidiophores arising from hyphae with adhering conidia. **I.** Branched conidial chain. Bars: 5 mm (A), 50 µm (B), 10 µm (C–J).

Taeniolella pulvillus (Berk. & Broome) M.B. Ellis, *More Dematiaceous Hyphomycetes*: 57. 1976. Figs 96–97.
Basionym: *Torula pulvillus* Berk. & Broome, *Ann. Mag. Nat. Hist*. 2, **5**: 460. 1850.

Literature: Ellis & Ellis (1997: 219), Mel'nik (2000: 309), Bülbül *et al.* (2011: 164).

Illustrations: Ellis (1976: 58, fig. 40, B), Ellis & Ellis (1997: pl. 94, fig. 988), Mel'nik (2000: 307, fig. 215).

Description: On bark of a dead stem inhabited by three different lichen thalli belonging to lecanorine and lecideine lichens. *Colonies* primarily on the lichen thalli, often on apothecia, rarely radiating on the surrounding bark, pulvinate, circular, clearly delimited, compact, caespitose-floccose, up to 1 mm diam, dark brown to black. *Mycelium* immersed, rarely superficial; hyphae usually straight, rarely flexuous, branched, 3–6 µm wide, sparingly septate, slightly constricted at the septa, pale brown to brown, smooth, walls slightly thickened, up to 0.25 µm. *Stromata* lacking. *Conidiophores* semi-macronematous to macronematous, mononematous, solitary or in small to densely

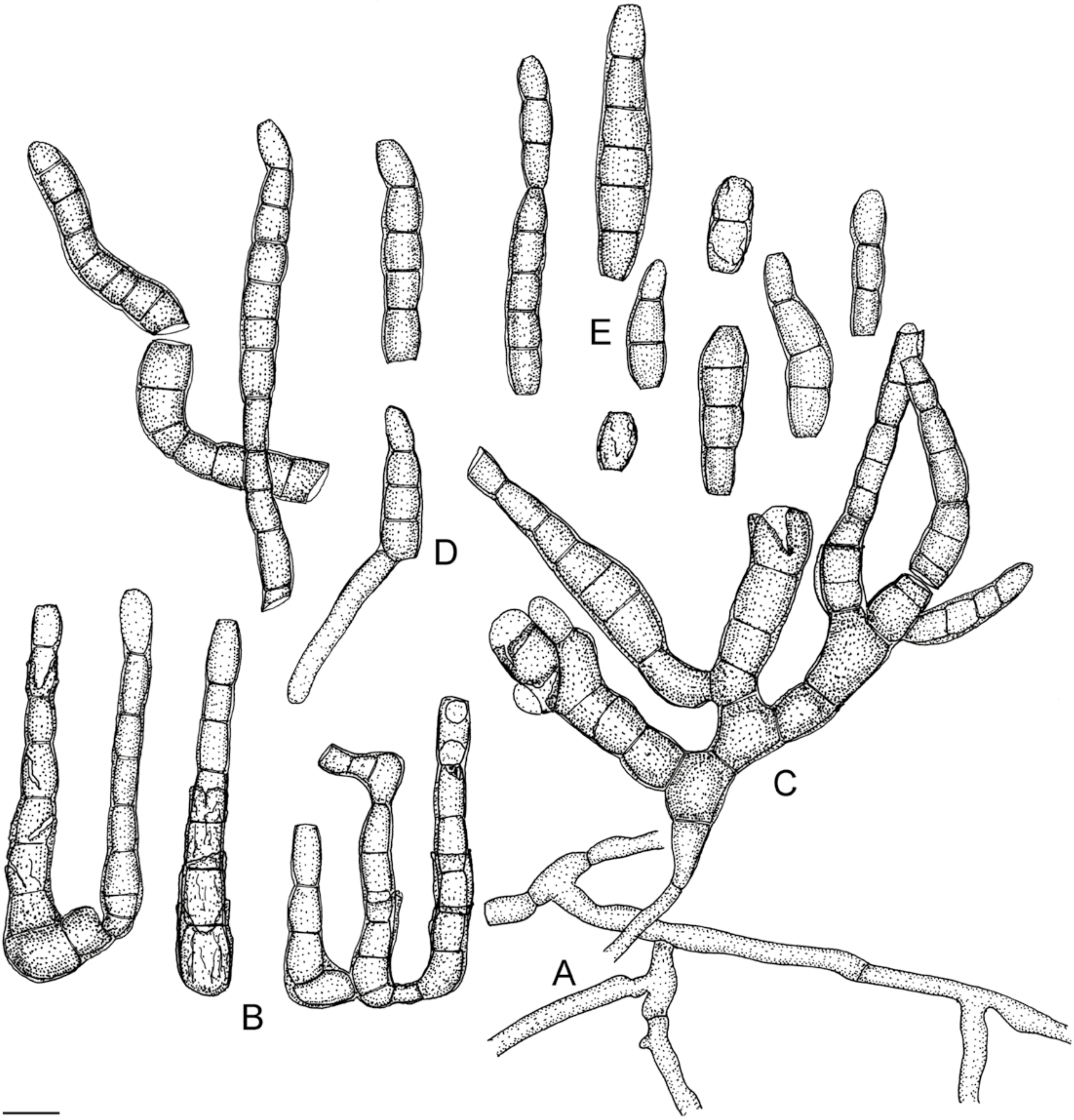

Fig. 96. *Taeniolella pulvillus* [holotype]. **A.** Hyphae. **B.** Conidiophores arising from hyphae. **C.** Conidiophores forming branched complexes in dense tufts. **D.** Germinated conidium. **E.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

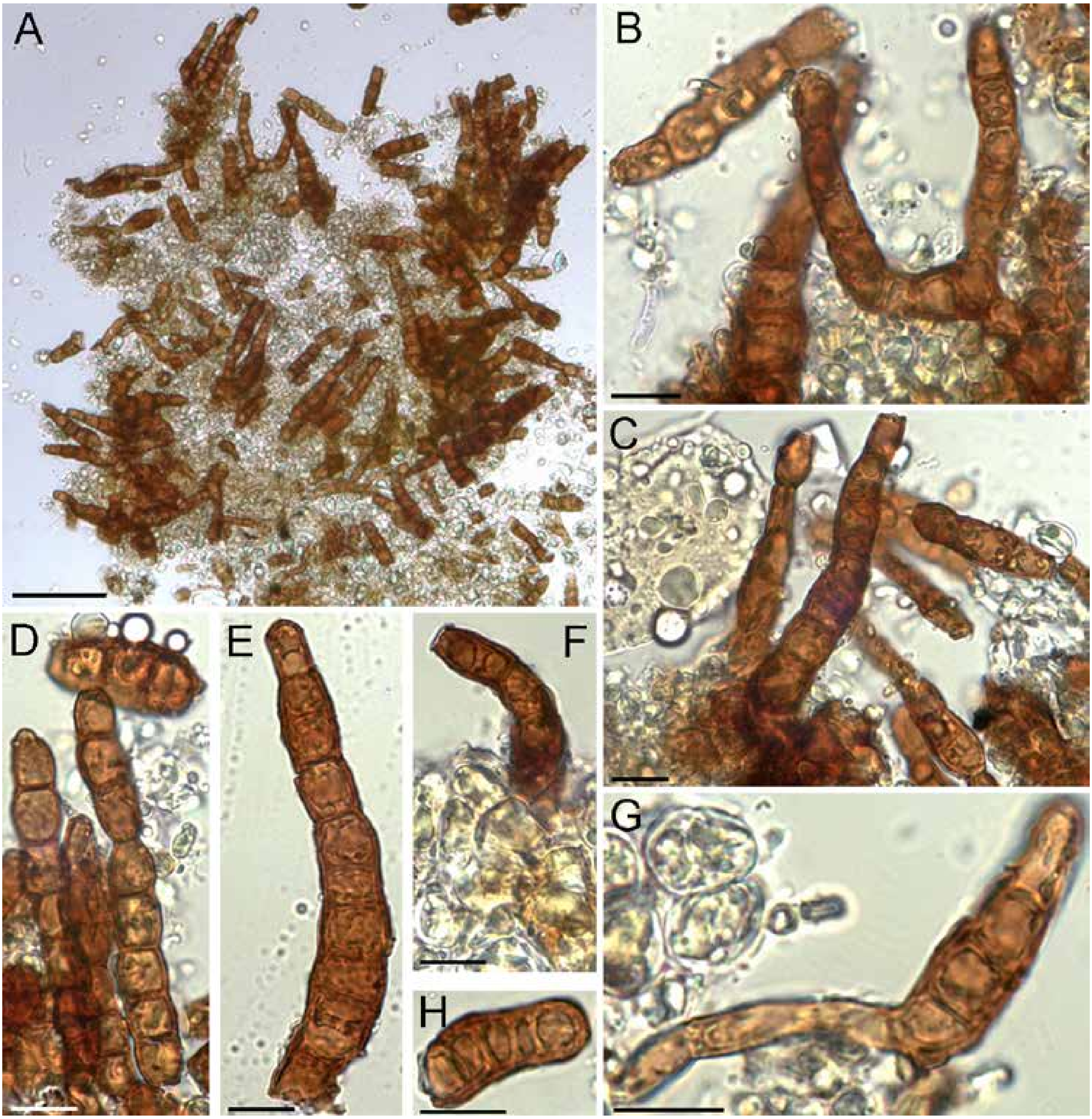

Fig. 97. *Taeniolella pulvillus* [holotype]. **A.** Microscopic overview of colony. **B, C, E, F.** Conidiophores arising from hyphae. **D.** Conidial chains. **G.** Germinated conidium. **H.** Conidia. Bars: 50 µm (A), 10 µm (B–H).

caespitose tufts, arising from hyphae, terminal or lateral, erect, straight to slightly flexuous, subcylindrical, usually distinctly branched, often several times, rarely unbranched, often branched at the base, forming branched complexes in dense tufts, conidiophores 32–99 × 5–8 µm, basal cells enlarged, 8–12 × 8–16 µm, and often darker, narrower towards the apex, swollen or even vesicular at the base of branches in the upper part of conidiophores, up to 10 µm wide and parts of the wall paler and cracked, conidiophores 3–14-septate, not or only slightly constricted at the septa, wall thickened, 0.5–1 µm, brown to dark brown, smooth, sometimes irregularly rugose, verrucose to rimulose near the base or in older portions of conidiophores, frequently enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe, often rimulose. *Conidiogenous* cells integrated, terminal, monoblastic or thalloblastic, monopodial, subcylindrical, narrower at the very apex, 8–12 µm long, little differentiated, loci truncate, unthickened, 2–5 µm diam. *Conidia* solitary or catenate, in unbranched chains, more or less easily disintegrating, forming larger fragments, straight to slightly curved, subcylindrical, ellipsoid, doliiform, (0–)1–4(–5)-septate, aseptate conidia 10 × 7 µm, 1-septate ones 16–17 × 6.5–7 µm, 2-septate ones 23–26 ×

6–8 µm, 3-septate ones 27–32 × 7–9 µm, 4-septate ones 32–40 × 7–9 µm, 5-septate ones 48 × 10 µm, slightly constricted at the septa, brown to dark brown, outer wall smooth to irregularly verrucose, wall thickened, 0.5–1 µm, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate, sometimes slightly obconically truncate, hila truncate, unthickened, not darkened, 2–5 µm diam, one conidium with germ tube observed, up to 4 µm wide.

Holotype: **UK**, Norfolk, King's Cliff, on *Quercus* sp., on bark ["on dead stem"], 29 Mar. 1841, *M.J. Berkeley* (K(M) 166243**!**).

Host range and distribution: On bark of dead stems of *Fraxinus excelsior*, *Quercus pubescens*, *Q. robur*; Hungary (Révay 1998), Russia (Mel'nik 2000), Ukraine (Taran 1992, 2002), UK (Berkeley & Broome 1850).

Notes: The re-examination of the type material showed that the bark of the dead stem is inhabited by three different lichen thalli, which belong to lecanorine and lecideine lichens. The colonies are primarily formed on the lichen thalli and only rarely spread into the surrounding bark, suggesting that *T. pulvillus* is a facultative lichenicolous hyphomycete. Unfortunately, this assumption could not be confirmed by correctly identified additional collections since only the type material was available. Ellis (1976) did not provide any evidence for an association of *T. pulvillus* with lichen thalli in his collections.

A re-examination of the Turkish material (Mycological Collection of the Arts and Sciences Faculty, Ahi Evran University, Kırşehir, Turkey, no. 175), identified and described by Bülbül *et al.* (2011) as *T. pulvillus*, showed that the Turkish fungus on bark of *Sorbus domestica* belongs to *Trimmatostroma* sp.

The colonies of *T. pulvillus* are conspicuously cushion-shaped, clearly limited and compact, which is unique among saprobic *Taeniolella* species. The dimensions of conidiophores and conidia remind one of those of *T. faginea*, described on *Fagus sylvatica*, but in the latter species the outer wall of conidiophores and conidia is clearly verrucose, somewhat irregularly rough-walled and often cracked, but never smooth-walled. In addition, enlarged (8–12 × 8–16 µm) basal cells of branched conidiophores are not formed in *T. faginea*. In contrast to *T. pulvillus*, conidia in *T. faginea* adhere in long, sometimes branched chains, up to 105 µm, with usually one to three subglobose, aseptate conidia at the tip. In *T. pulvillus*, all conidia are slightly obconically truncate at the base and conically truncate at the apex.

The irregularly rugose, verrucose to rimulose conidiophore walls of *T. pulvillus* are reminiscent of those of some lichenicolous *Taeniolella* species. Conidiophores of *T. verrucosa*, described from *Pachnolepia pruinata*, also form a densely branched sporogenous complex, and the distinction between conidiophores and superficial hyphae is difficult. Conidiophores of *T. pulvillus* are somewhat narrower (32–99 × 5–8 µm, 3–14-septate vs. 9–104 × 7–9(–10) µm, 1–12-septate in *T. verrucosa*) and conidia are longer (10–48 × 6–9 µm, (0–)1–4(–5)-septate vs. 6–19 × 6–10 µm, 0–1(–3)-septate in *T. verrucosa*). Colonies of *T. verrucosa* are effuse, caespitose and composed of conidiophores or fertile hyphae forming a dense hyphal network. They are sometimes denser but never cushion-shaped, clearly limited and compact. *T. christiansenii*, another lichenicolous species with smooth or rimulose to verruculose-striate walls of conidiophores, is clearly distinguishable by its colonies, which are spreading widely over the surface as chains of torulose hyphae. Conidiophores are shorter and slightly narrower (5–55 × 4–7(–9) µm, 0-7-septate vs. 32–99 × 5–8 µm, 3–14-septate in *T. pulvillus*) and conidia are shorter and narrower (4–14(–24) × 3–7(–8) µm, 0–2(–3)-septate vs. 10–48 × 6–9 µm, (0–)1–4(–5)-septate in *T. pulvillus*).

Taeniolella ravenelii Heuchert & U. Braun, **sp. nov.** MycoBank MB819310. Figs 98–99.

Etymology: The epithet is dedicated to the American botanist and mycologist Henry William Ravenel, collector of the holotype material.

Literature: Berkeley (1874: 16, as *Septonema multiplex*).

Diagnosis: Distinguishable from *Taeniolella multiplex* by having usually wider conidia (7–14 µm in *T. ravenelii* vs. 5–8(–9) µm) and conspicuous conidial wall ornamentation (vs. light microscopically smooth conidia in *T. multiplex*).

Description: *Colonies* scattered over the substrate, effuse, dense, up to 1 × 2 cm, dark brown to black, long chains of conidia often visible even by stereomicroscopy, rarely subglobose, up to 1 mm diam, slightly shiny, dark brown to black sclerotium-like hyphal aggregations. *Mycelium* immersed; hyphae straight to flexuous, branched, 3–5 µm wide, septate, not or only slightly constricted at the septa, pale brown to brown, smooth, wall slightly thickened, up to 0.25 µm. *Stromata* lacking. *Conidiophores* (rarely observed) micronematous to semi-macronematous, sometimes reduced to conidiogenous cells, distinction between conidiophores and adhering conidia difficult, transition gradual, mononematous, arising from hyphae, terminal, or arising from subglobose hyphal cells, solitary, unbranched, erect, straight, subcylindrical, doliiform, 6–17 × 5–7 µm, 0–3-septate, usually irregularly verrucose, rarely smooth, brown, wall thickened, up to 0.5 µm. *Conidiogenous cells* integrated, terminal or conidiophores often reduced to conidiogenous cells, monoblastic, subcylindrical or doliiform, 5–7 µm long, conidiogenous loci truncate, unthickened, 3.5–5 µm diam. *Conidia* in unbranched chains, not easily disintegrating, adhering for a long time, distinction between individual conidia within the chain sometimes difficult or even impossible, chains probably only breaking off during gross preparations or in nature by violent mechanic impacts, forming fragments of different sizes, conidia or conidial chains straight or slightly flexuous, chains subcylindrical, sometimes somewhat attenuated at the tip, 55–170 × 7–14 µm, 4–22-septate, single conidia subcylindrical, doliiform, ellipsoid, 10–21 × 7–11 µm, 0–1-septate, slightly to distinctly constricted at the septa, dark brown, sometimes paler at the tip, wall thickened, up to 0.5 µm, wall of young conidia sometimes smooth, later usually with conspicuous ornamentation, very variable, irregularly verrucose or coarsely verrucose, verrucae up to 1 µm high and wide, hemispherical with rounded apex to conical and pointed, sometimes with elongated projections, linear or rod-shaped, projections and verrucae hyaline, older walls sometimes cracked, rimulose, cell plasma often reduced, with one or two vacuole-like cavities, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate, sometimes slightly obconically truncate, hila truncate, unthickened, not darkened, 3.5–6 µm diam.

Holotype: **USA**, South Carolina, on *Quercus* sp. ("on fallen oak limbs"), *H.W. Ravenel 1563* [ex herb. *M.J. Berkeley*] (K(M) 187573**!)**. *Isotypes*: K(M) 187574, K(M) 187575, K(M) 187578, K(M) 187579.

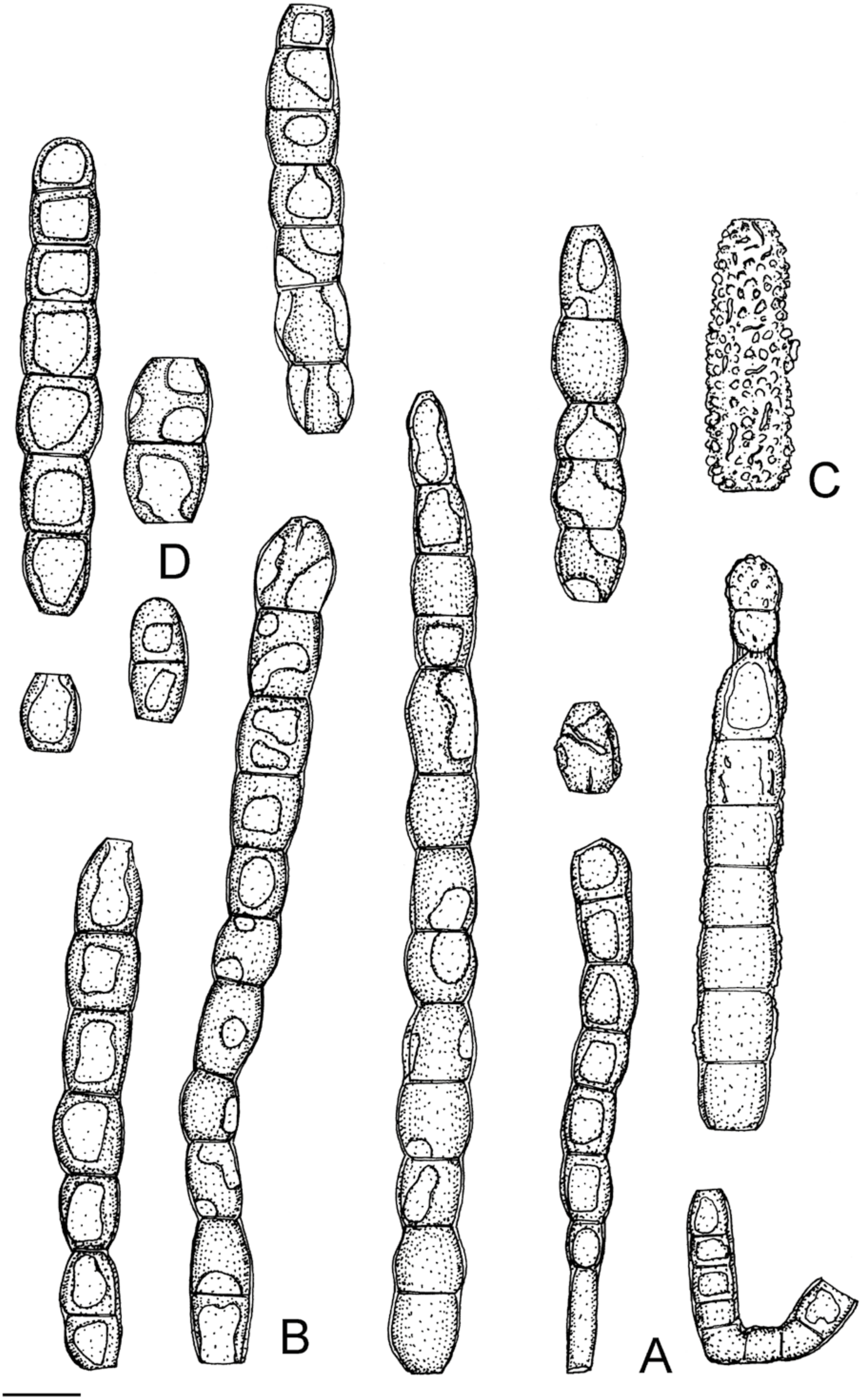

Fig. 98. *Taeniolella ravenelii* [holotype]. **A.** Conidiophores. **B.** Conidial chain. **C.** Conspicuous ornamentation of conidia. **D.** Conidia and fragments of conidial chains. Bar = 10 µm (B. Heuchert *del.*).

Fig. 99. *Taeniolella ravenelii* [A: K(M) 187575; B–H: holotype]. **A.** Macroscopic overview of colony. **B–I.** Conidial chains, fragments of conidial chains and conidia. Bars: 1 cm (A), 20 µm (B), 10 µm (C–H).

Host range and distribution: On *Quercus* sp.; USA (Berkeley 1874).

Notes: The re-examination of the three syntype collections of *Taeniolella multiplex* showed that they are heterogeneous. The description of *T. multiplex* by Berkeley and Curtis (in Berkeley 1874) is very meagre and without any information about the dimensions of conidiophores and conidia as well as the wall surface ornamentation. One syntype (H.W. Ravenel 1563) is easily distinguishable from the other two syntype collections (*Curtis 2751, 4033*) by the dimensions of conidia in chains (55–170 × 7–14 µm vs. 35–135(–215) × 5–8(–9) µm, 6–26(–40)-septate) and the surface ornamentation of conidia. The wall of conidia in the specimens collected by Curtis (2751, 4033) is usually light microscopically smooth, whereas in Ravenel's specimen (1563) the wall of conidia is characterised by a very variable conspicuous ornamentation (detailed description see above). Due to its characteristic conidial wall ornamentation, this specimen (*H.W. Ravenel 1563*) is easily distinguishable from other saprobic *Taeniolella* species, except for *T. muricata*, which has a similar wall structure, characterised by having irregularly arranged, coarse verrucae, often vesicle-like, rather large, 0.5–4 µm diam, up to 1.5(–2) µm high, and thick walls. Linear or rod-shaped elongated projections as in Ravenel's specimen (1563) are, however, not formed in *T. muricata*. For these reasons, we introduce the new name *Taeniolella ravenelii* for the specimen collected by H.W. Ravenel (1563).

Taeniolella stilbospora (Corda) S. Hughes, *Canad. J. Bot.* **36**: 817. 1958. Figs 100–102.
Basionym: *Torula stilbospora* Corda, *Deuschl. Fl.*, Abt. III (*Pilze Deutschl.*) **2**: 99. 1829.
Synonyms: *Taeniola stilbospora* (Corda) Bonord., *Handb. Mykol.*: 36. 1851.
Torula salicis Fuckel, *Fungi Rhen. Exs.* 1622. 1866 and *Hedwigia* **5**(2): 30. 1866 [*lectotype* (designated here, MycoBank MBT373915): **Germany**, Oestrich-Winkel, on *Salix caprea* [Fuckel, Fungi Rhen. Exs. 1622, "Ad Salicis Capreae ramulos aridos, raro. Vere. In sylva Hostrichiensi"] (HAL**!**). *Isolectotypes*: Fuckel, Fungi Rhen. Exs. 1622, *e.g.*, FH, G, L, ILLS 915, 916, S-F267609.].
Septonema atrum Sacc., *Michelia* **2**: 559. 1882 [*holotype*: **Italy**, Selva (Treviso), in ligno salicino putri, Oct. 1874 (PAD)].
Hormiscium stilbosporum (Corda) Sacc., *Syll. fung.* (Abellini) **4**: 264. 1886.
Cheirospora stilbospora (Corda) Kuntze, *Revis. gen. pl.* (Leipzig) **3**(2): 457. 1898.

Literature: Saccardo (1886: 398, as *Septonema atrum*), Lindau (1910: 27, as *Septonema atrum*), Migula (1934: 324, as *Septonema atrum*), Ellis (1971: 94), Ellis & Ellis (1997: 65, 252), de Hoog *et al.* (2000: 934), Mel'nik (2000: 309), Wang (2010: 191).

Illustrations: Corda (1842: 50, tab. 2, fig. 13, as *Torula stilbospora*), Saccardo (1881: tab. 926, as *Septonema atrum*), Lindau (1910: 27, fig. 2, as *Septonema atrum*), Migula (1934: tab. 140, fig. 7, as *Septonema atrum*), Ellis (1971: 93, fig. 56 A), Ellis & Ellis (1997: pl. 108, fig. 1139), de Hoog *et al.* (2000: 934, 937), Mel'nik (2000: 310, fig. 217).

Exsiccatum: Fuckel, Fungi Rhen. Exs. 1622.

Description: *Colonies* scattered on bark, effuse, caespitose, fuliginous, dark brown to black. *Mycelium* immersed, sometimes superficial; hyphae flexuous, branched, 3–5 µm, septate, slightly constricted at the septa, subhyaline to pale brown, smooth, cell plasma slightly reduced, *i.e.*, with a central cavity, wall barely thickened, up to 0.25 µm. True *stromata* lacking, but sometimes with densely aggregated hyphal cells just below arising conidial chains, elongated, subcylindrical to subglobose, 3–11 × 3–5 µm, pale brown to brown, smooth, wall slightly thickened, up to 0.5 µm. *Conidiophores* micronematous to semi-macronematous, reduced to conidiogenous cells, distinction between

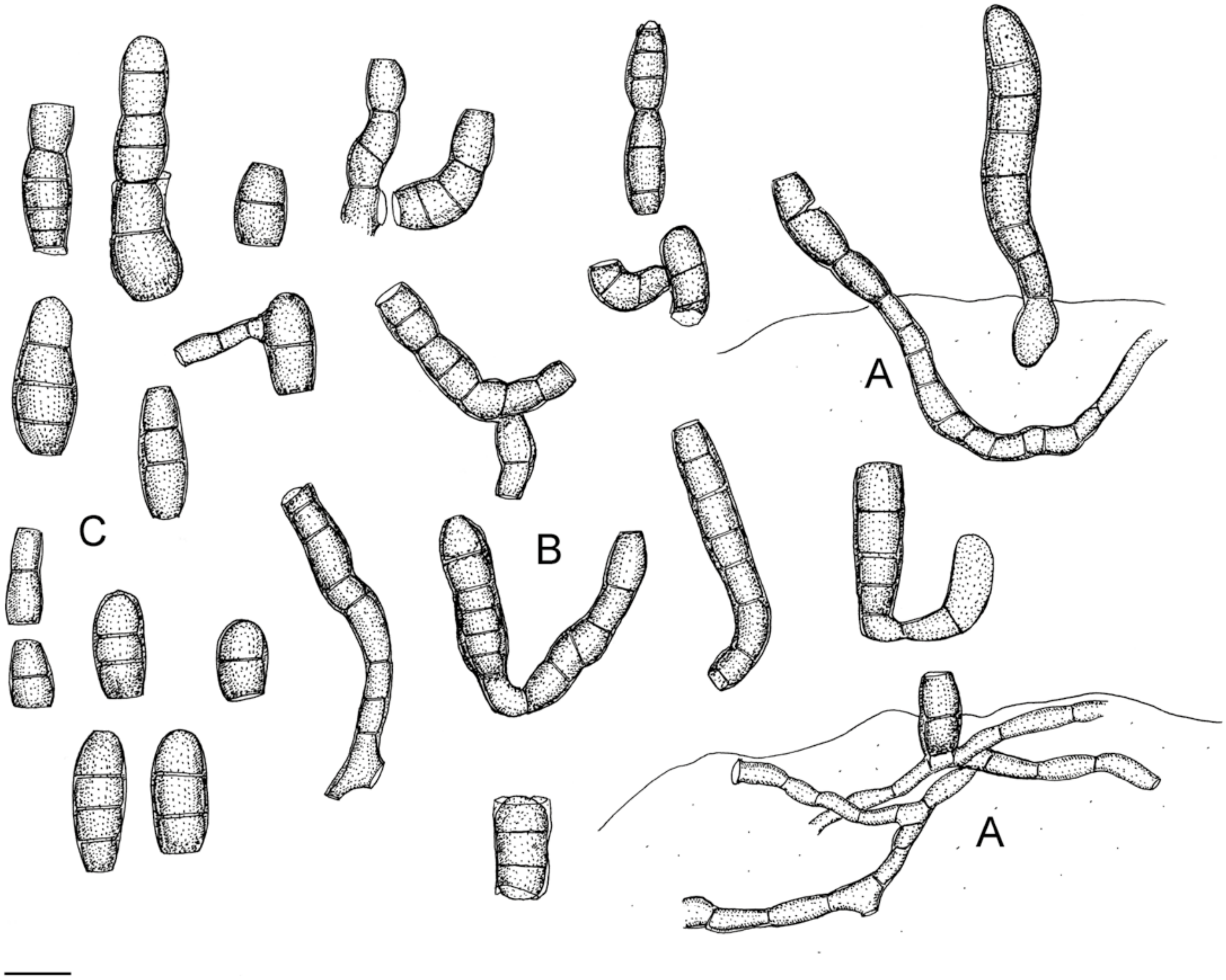

Fig. 100. *Taeniolella stilbospora* [PRM 155698 – *typ. cons.*]. **A.** Hyphae with micronematous or semi-macronematous conidiophores. **B.** Fragments of conidiophores and conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

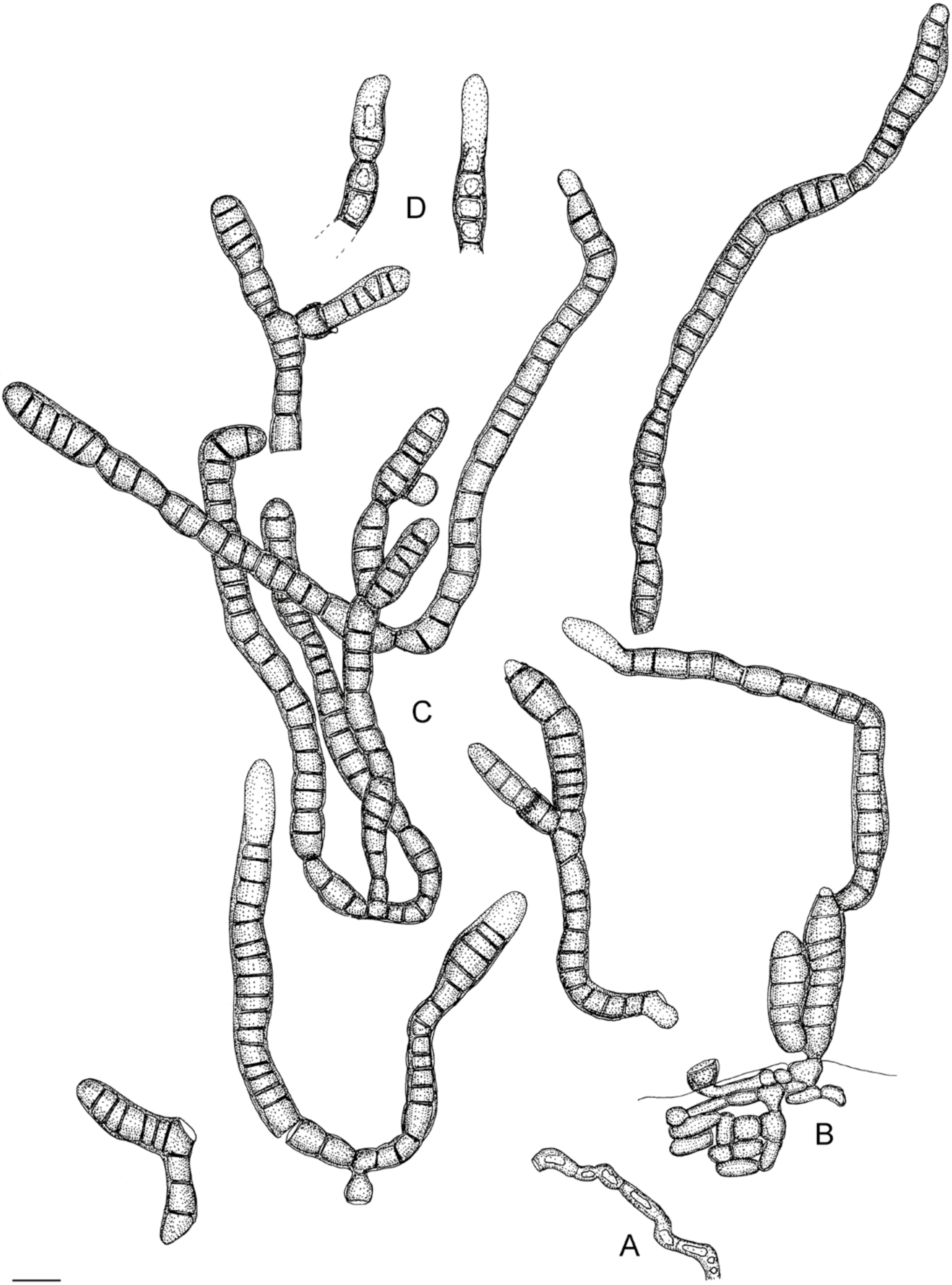

Fig. 101. *Taeniolella stilbospora* [lectotype of *Torula salicis*]. **A.** Hyphae. **B.** Densely aggregated hyphal cells and micronematous conidiophores with adhering branched conidial chain. **C.** Frequently branched conidial chains forming propagules. **D.** Tip of conidial chains. Bar = 10 µm (B. Heuchert *del.*).

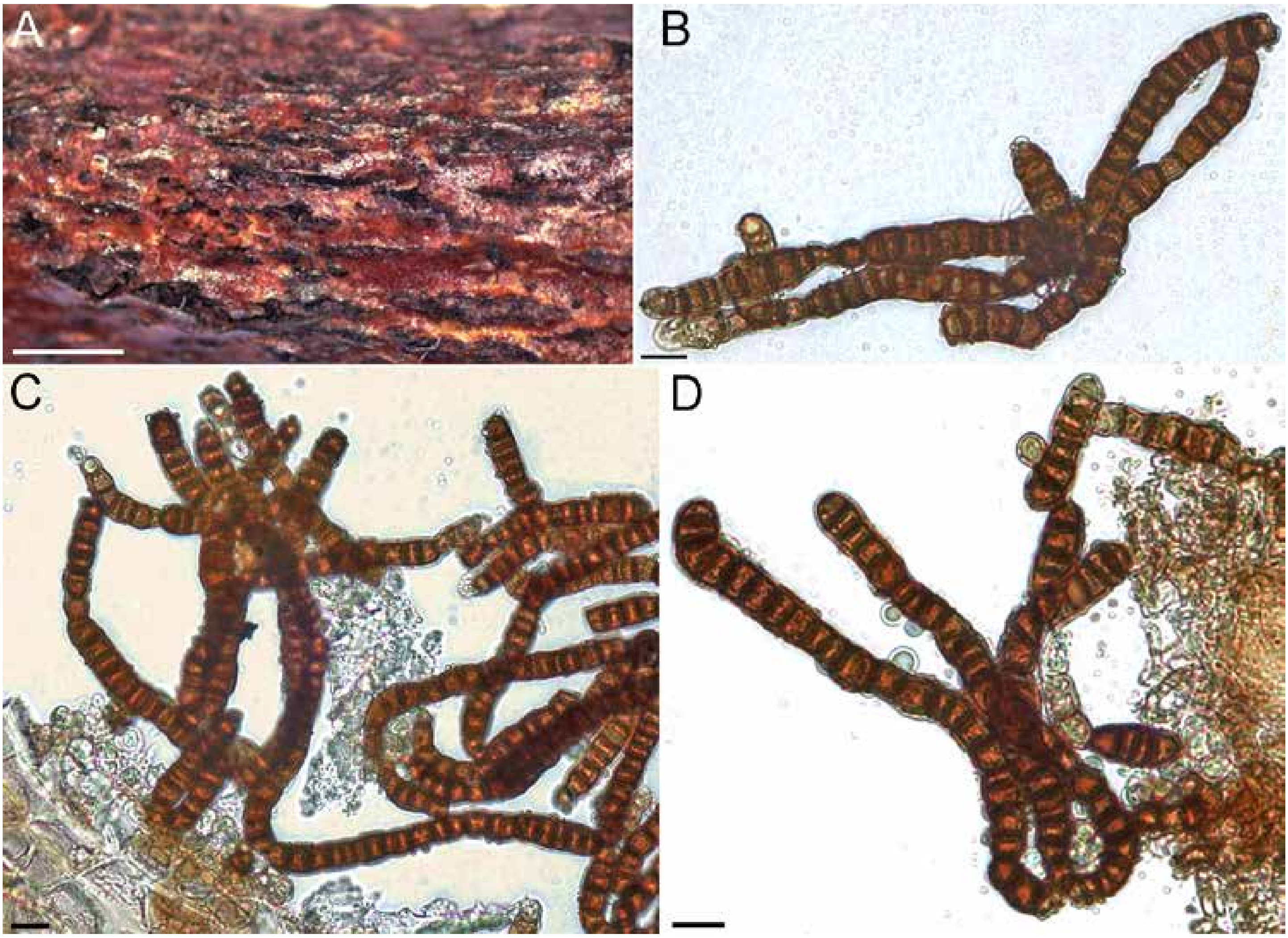

Fig. 102. *Taeniolella stilbospora* [A: PRM 155698 – *typ. cons.*; B–D: lectotype of *Torula salicis*]. **A.** Macroscopic overview of colony. **B–D.** Micronematous to semi-macronematous conidiophores with adhering frequently branched conidial chains. Bars: 1 mm (A), 10 µm (B–D).

conidiophores and adhering conidia difficult, transition gradual, solitary or usually aggregated in small caespitose tufts, arising from hyphae, lateral or terminal, erect, straight, unbranched, doliiform, subcylindrical, sometimes peg-like, 5–12 × 5–6 µm, 0–1-septate, not constricted at the septa, brown, smooth, wall barely thickened, up to 0.25 µm, monoblastic or thalloblastic, loci truncate, unthickened, 3–5 µm diam. *Conidia* in branched chains, usually branched at the base, frequently with up to three long branches, often also branched in the upper part, conidia adhering for a long time, forming branched complexes (propagules), distinction between individual conidia within the chain sometimes difficult or even impossible, straight to flexuous, erect, subcylindrical, 25–160 × 6–10 µm, multiseptate, to 40 septa, slightly to distinctly constricted at the septa, septa dark brown, to 2 µm wide, conidia brown to dark brown, paler towards the apex, subhyaline to pale brown, smooth when young, sometimes irregularly verrucose or rimulous when mature, wall thickened, wall at the tip often only slightly thickened, one- to distinctly two-layered, outer layer subhyaline to pale brown, 0.5–1 µm wide, inner layer darker, combined two-layered wall up to 2 µm thick, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, disintegrating chains forming fragments of different sizes, doliiform, subcylindrical, broad ellipsoid, 10–43 × 6–10 µm, 1–6-septate, wall usually smooth, sometimes irregularly verrucose or rimulous, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila 3–7 µm diam.

Type (*typ. cons.*, May 2017a, b): **Central Europe** [country unclear], Neustadtel, on *Salix* sp., *A.C.J. Corda* (PRM 155698**!**).

Host range and distribution: On bark of *Alnus incana*, *Alnus* sp., *Corylus* sp., *Nothofagus dombeyi*, *Padus avium*, *Pinus mungo*, *P. sylvestris*, *Populus* sp., *Protea burchellii*, *Salix caprea*, *Salix* sp.; Canada (Conners 1967, Ginns 1986), Chile (www.cybertruffle.org.uk), Czech Republic (Corda 1842), Finland (first report, see specimens examined), Germany (Fuckel 1866), Lithuania (Butkus *et al.* 2007, Treigien & Markovskaja 2007), Russia (Mel'nik & Popushoj 1992, Karatygin *et al.* 1999, Mel'nik 2000), South Africa (Lee *et al.* 2004), Tajikistan (Mel'nik 2000), Ukraine (Zhdanova *et al.* 1990, www.cybertruffle.org. as *Septonema atrum*), USA (Wang 2010), North America (Shaw 1973, Glawe 2014), Central Europe [country unknown] (Corda 1842).

Additional specimens examined: **Finland**, Nylandia, Borgå, Grid 27° E, on *Salix* sp., 2 Nov. 1930, *W. Nyberg* (H, herb. W. Nyberg); Regio Aboensis, Karjalohja, Tammisto, on cf. *Pinus mungo* [host cultivated in the Arboretum founded by Prof. G. Komppa], 2 Sep. 1975, *P. Alanko* (H 28572). **South Africa**, Western Cape Province, Helderberg Nature

Reserve, on dead twigs of *Protea burchellii*, 14 Aug. 2000, *S. Lee SL216* (PREM 58102).

Notes: The name *Torula stilbospora* (Corda in Sturm 1829) was confused with a fungus nowadays known as "*Taeniolella stilbospora*". Corda's (1842) illustration of "*T. stilbospora*" is quite distinct from his original drawing, which was already stated by Saccardo (1886: 264, as *Hormiscium stilbosporum*). Corda's (in Sturm 1829) original drawing shows a fungus with a more granular conidial structure quite distinct from *Taeniolella*. Among original collections deposited in Corda's herbarium (PRM) as *Torula stilbospora*, there is a single collection without any location and date but with a small pencil drawing on the envelop agreeing with the original illustration [on wood, *A.C.J. Corda* (PRM 155699)]. This specimen represents true type material, was designated as lectotype in Braun & Heuchert (2013), and a re-examination proved its identity with *Trimmatostroma betulinum*. Hence, *Torula stilbospora* is conspecific with the latter species, *i.e.*, it is an older heterotypic synonym of *Trimmatostroma betulinum*. However, *Torula stilbospora* is older than *Coniothecium betulinum*, the basionym of *Trimmatostroma betulinum*, and would pose a threat to the latter well established name. Therefore, Braun & Heuchert (2013) proposed to conserve the name *Coniothecium betulinum* against *Torula stilbospora.* All combinations and treatments based on *Torula stilbospora*, *e.g.*, Bonorden (1851: 36, as *Taeniola stilbospora*), Saccardo (1886: 264, as *Hormiscium stilbosporum*) and Kuntze (1898: 457, as *Cheirospora stilbospora*), seem to relate to the description and illustration in Corda (1842) and hence to the true *Taeniolella* which is now referred to as *T. stilbospora*.

Corda (1842) cited collections from Neustadtel [locality unclear as at least four towns with this German name are known, two in the Czech Republic (now Dolny Bělá and Jezvé, part of Stružnice), one in Poland (now Nowe Miasteczko) and one in Germany (Saxony)], Senftenberg (Germany) and Prague (Czech Republic). The original material from "Neustadtel" collected by Corda (PRM 155698) is preserved and was also re-examined. This material is very sparse, but quite different from the lectotype of *Torula stilbospora* (Corda in Sturm 1829). Maintained fragments of conidial chains agree well with Corda's (1842) illustration which represents a genuine *Taeniolella*. On the basis of its lectotype, *T. stilbospora* has to be considered a misapplied name, *i.e.*, the true *Taeniolella* would need another name. However, *T. stilbospora* remains a name in current use based on Corda's (1842) later misapplication of his original *Torula stilbospora*. However, a renaming of the widely used name *T. stilbospora* would not be desirable. Therefore, the original proposal submitted by Braun & Heuchert (2013) was altered in agreement between the proposers and the Nomenclature Committee for Fungi to conserve *T. stilbospora* with a conserved type that locks in the interpretation of this name in the sense of Corda (1842) and removes it from the synonymy of *Coniothecium betulinum*, thus rendering both *Trimmatostroma betulinum* and *Taeniolella stilbospora* available. The altered proposal was supported by the Nomenclature Committee for Fungi (May 2017a, b). The original collection of *Torula stilbospora* sensu Corda (1842) from "Neustadtel" (PRM 155698), now designated as conserved type of this species (May 2017a, b), is very sparse and represents possibly young material. Branched conidial chains with conidia adhering for a long time, forming branched complexes (propagules), are missing in the material of Corda. The chains are disintegrated in fragments and conidia of various sizes. Oil-like drops in each conidial cell, as described by Corda (1842), were not observed.

Hughes (1958) cited *Torula salicis* Fuckel as a heterotypic synonym of *Taeniolella stilbospora*. The re-examination of type material of *T. salicis*, deposited in HAL, confirmed that this species agrees well with the fungus illustrated in Corda (1842), which represents a true *Taeniolella*.

Fuckel (1870: 302) introduced the illegitimate name *Tapesia torulae* (*nom. superfl.*, Art. 52.1, based on *Peziza torulicola* Fuckel, *Fungi Rhen Exs.*, Fasc. 15–16, no. 1596, 1865) and cited *Torula stilbospora* as asexual morph. However, the relation between *P. torulicola* and *T. stilbospora* is quite unclear, unconfirmed, and a conspecificity of the two morphs and taxa is very doubtful. The name *P. torulicola* is currently quite unresolved.

Hughes (1958) cited *Septonema atrum* Sacc. as an additional heterotypic synonym of "*T. stilbospora*". The type material, deposit in PAD, is currently not available for re-examination. Based on the description (Saccardo 1882) and illustration (Saccardo 1881, Lindau 1910), it is not possible to prove the taxonomic position of *S. atrum*. At present we can only follow Hughes' (1958) conclusion, who had probably examined type material of this species. *Septonema atrum* has been recorded from various European countries, *e.g.*, Italy (Saccardo 1882, Carestia 1897–98), Denmark (Rostrup 1916) and Austria (Straßer 1916), but these records are unconfirmed as well.

All combinations and treatments based on *Torula stilbospora*, *e.g.*, Bonorden (1851), Saccardo (1886) and Kuntze (1898), are undoubtedly to be ascribable to the description and illustration in Corda (1842) and hence refer to the *Taeniolella stilbospora*.

Ellis (1971) described and illustrated *Taeniolella stilbospora*, but his drawings show a wider range of morphological types indicating that possibly various taxa were involved. Unfortunately, it is not known which collections Ellis had examined. The illustration on the right below corresponds to *Taeniolella stilbospora*, whereas the drawing on the right above is similar to the new species *Taeniolella stilbosporoides*. The illustration on the left can be interpreted to represent the new species *Taeniolella filamentosa*, which is based on several collections originally deposited as *T. stilbospora*, but easily distinguishable from all other *Taeniolella* species by the formation of well-developed, conspicuous, superficial, filiform, often unbranched hyphae that are even visible by stereomicroscopy.

Numerous collections deposited in H (Herbarium University of Helsinki) as *Hormiscium stilbosporum* from Finland and Russia have been examined and proved to be *Trimmatostroma betulinum*, which underlines apparent difficulties to distinguishing *Taeniolella stilbospora* and *Trimmatostroma betulinum*, although the latter species forms sporodochial conidiomata, and conidia are formed in basipetal chains. *Taeniolella stilbospora* does not form any sporodochial conidiomata, and conidia develop in acropetal chains. Oblique to vertical septa are often present in *Trimmatostroma*, but very rare in *Taeniolella*.

Rippon (1987) cited *T. stilbospora* under phaeomycotic dermatomycosis, and de Hoog *et al.* (2000) listed an isolate from a cutaneous skin lesion of a human patient, determined as *Taeniolella stilbospora*, with the lowest biosafety level (BSL-1). The description and illustrations in de Hoog *et al.* (2000: 934, 937) are similar to *Taeniolella stilbospora*. The identity of material listed in Lee *et al.* (2004) on *Protea burchellii* in

South Africa as *Taeniolella stilbospora* could be confirmed. Re-examined collections of "*T. stilbospora*" from Hungary (Révay 1998) belong to the *Sporidesmium* complex.

The saprobic *Taeniolella stricta* resembles *T. stilbospora*, but the long, multiseptate conidia or conidial chains in *T. stricta* are wider [(12–)25–277 × 7–13 µm vs. 25–160 × 6–10 µm], always unbranched, the walls are usually smooth, thick, but never with a characteristically two-layered wall structure as in *T. stilbospora*. Furthermore, the combined two-layered wall is to 2 µm thick, the cell plasma is mostly reduced, with a central vacuole-like cavity surrounded by plasma giving the impression of very thick, three-layered walls.

Numerous records of *T. stilbospora* refer to cultures based on isolates from soil, litter and other substrates (*e.g.*, Cwalina-Ambroziak & Bowszys 2009, isolated from soil; Mačkinaitė 2010, isolated from seeds of *Carum carvi*; Dynowska *et al.* 2013, isolated from *Anas platyrhynchos*; Sizonenko *et al.* 2009, isolated from litter). They are unconfirmed and doubtful. A record from Brazil (Batista *et al.* 1967, on lime mortar) is also unclear and very doubtful.

Taeniolella stilbosporoides Heuchert & U. Braun, **sp. nov.** MycoBank MB819313. Figs 103–104.

Etymology: The epithet refers to the similarity of the new species to *Taeniolella stilbospora*.

Literature: Ellis (1971: 94, as *T. stilbospora*), Ellis & Ellis (1997: 65, 252, as *T. stilbospora*), Muntañola-Cvetković *et al.* (1997: 206, as *T. stilbospora*).

Illustrations: Ellis (1971: 93, fig. 56 A), Muntañola-Cvetković *et al.* (1997: 207, fig. 20).

Diagnosis: Differs from *Taeniolella stilbospora* in having much shorter conidia and conidial chains, respectively, 15–70 × 8–10 µm, conidia formed singly or only in very short chains, mostly unbranched, wall less differentiated.

Description: *Colonies* scattered on bark, effuse, caespitose-floccose, fuliginous, dark brown to black. *Mycelium* superficial, sometimes immersed; hyphae flexuous, branched, 2–4 µm,

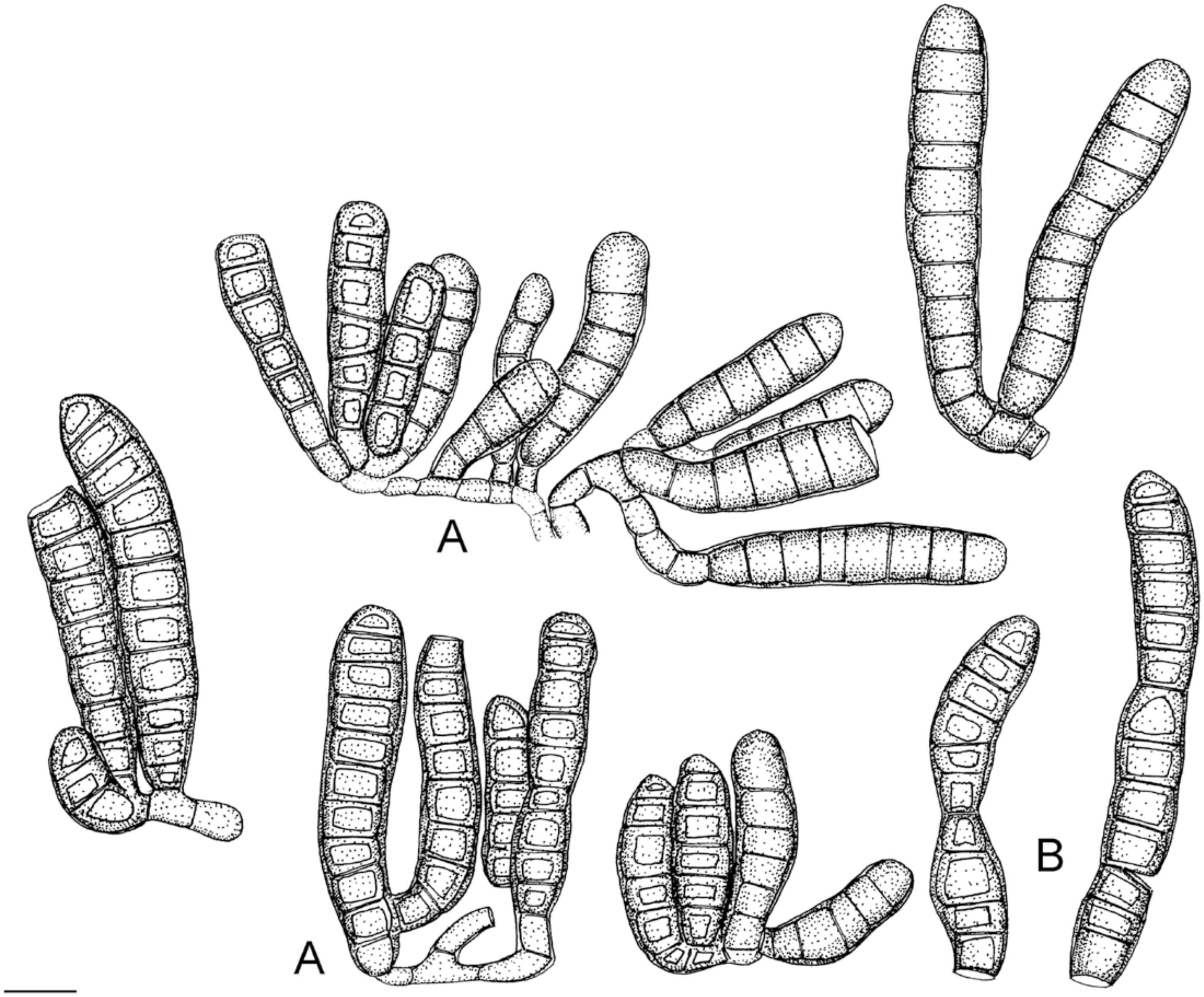

Fig. 103. *Taeniolella stilbosporoides* [holotype]. **A.** Micronematous conidiophores with adhering conidia. **B.** Short chains of two conidia. Bar = 10 µm (B. Heuchert *del.*).

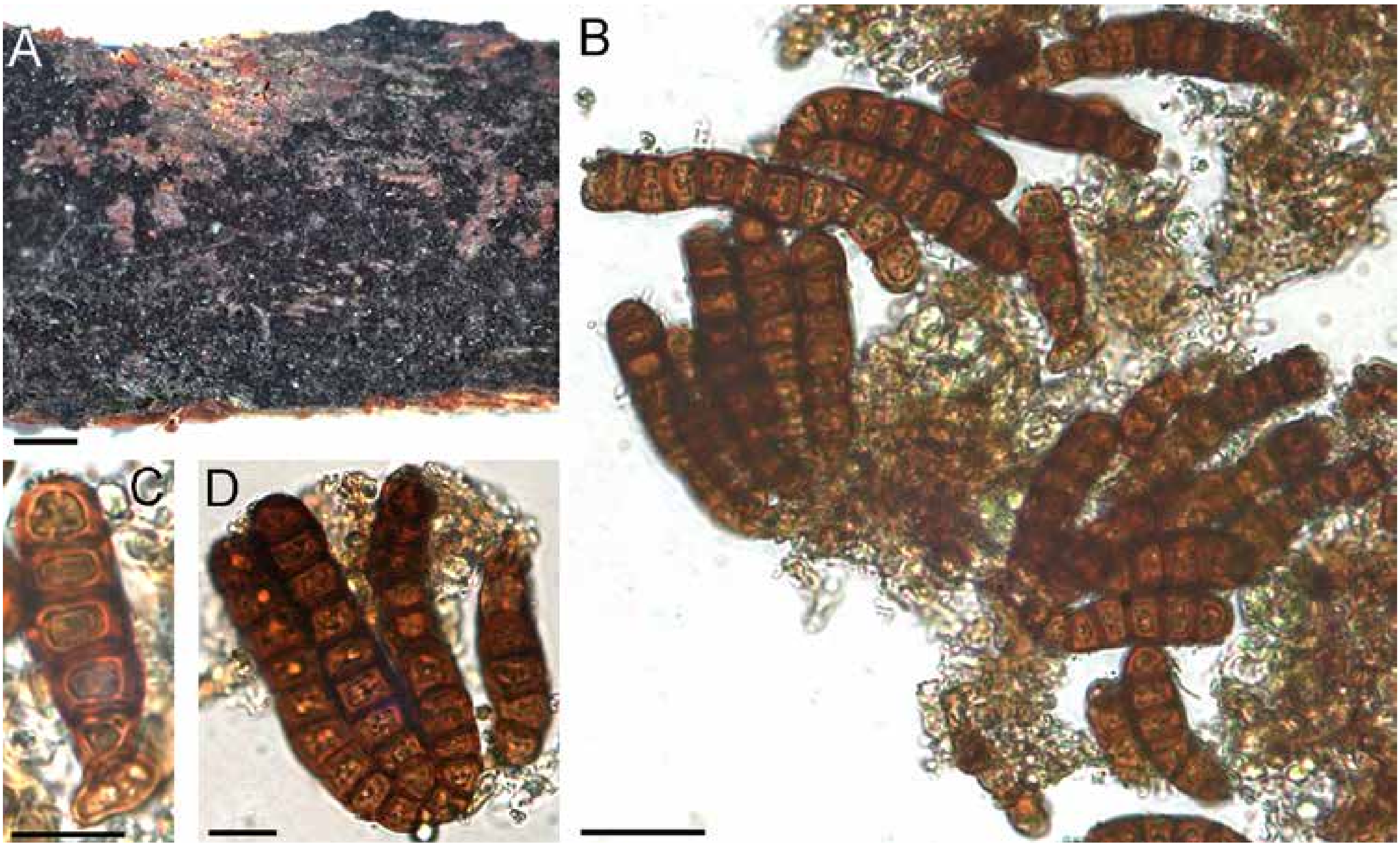

Fig. 104. *Taeniolella stilbosporoides* [holotype]. **A.** Macroscopic overview of colony. **B–D.** Micronematous conidiophores with adhering conidia. Bars: 5 mm (A), 20 µm (B), 10 µm (C, D).

septate, slightly constricted at the septa, subhyaline to pale brown, smooth, unthickened or only slightly thickened, to 0.5 µm. *Stromata* lacking. *Conidiophores* micronematous, reduced to conidiogenous cells, distinction between conidiophores and adhering conidia difficult, transition gradual, solitary or usually aggregated in small caespitose tufts, arising from hyphae, lateral or terminal, erect, straight, unbranched, doliiform, subcylindrical, sometimes peg-like, 4–7 × 5–6 µm, aseptate, pale brown to brown, smooth, wall slightly thickened, to 1 µm, cell plasma reduced, with a central vacuole-like cavity, giving the impression of thicker walls, up to 1.5 µm, monoblastic or thalloblastic, loci truncate, unthickened, 5–7 µm diam. *Conidia* solitary, sometimes in short chain of two conidia, rarely unbranched, and then densely aggregated, but usually with 2–4 basal branches, forming branched complexes (propagules), adhering for a long time, single branches or individual conidia straight, rarely slightly flexuous, broad ellipsoid, subcylindrical, 2–11-euseptate, not or slightly constricted at the septa, 15–70 × 8–10 µm, brown to dark brown, basal cell sometimes somewhat paler, wall smooth, thickened, to 1 µm, cell plasma reduced, with a central vacuole-like cavity, giving the impression of thicker, two-layered walls, to 1.5 µm thick, apex rounded in primary conidia, sometimes ruptured at the apex, possibly due to mechanical impacts, 5–8 µm diam.

Holotype: **UK**, Somerset, on wood, s. d., *C.E. Broome* (H, herb. Nylander**!**).

Host range and distribution: On wood of *Salix caprea*; UK (see type collection), Spain (Muntañola-Cvetković *et al.* 1997, as *T. stilbospora*).

Notes: The illustration of *T. stilbospora s. lat.* in Ellis (1971, fig. 56 A) was undoubtedly based on heterogeneous elements, but, unfortunately, it is unknown which collections had been used by Ellis. The illustration on the right below agrees with *Taeniolella stilbospora* (for more details see discussion under *T. stilbospora*). The illustration on the right above is similar to the taxon here described as *T. stilbosporoides*, which is distinguished from *T. stilbospora* by its usually short, mostly unbranched conidia or conidial chains (15–70 × 8–10 µm in *T. stilbosporoides* vs. 25–160 × 6–10 µm in *T. stilbospora*). The conidial chains in *T. stilbospora* are often branched and have numerous long branchlets adhering for a long time, whereas conidial chains in *T. stilbosporoides* are usually unbranched or only branched at the base. The conidial walls of *T. stilbospora* are one- to distinctly two-layered, outer layer subhyaline to pale brown, 0.5–1 µm wide, inner layer darker, combined two-layered wall up to 2 µm thick, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls. Such conspicuous wall structures are not formed in *T. stilbosporoides*. The description and illustration of *T. stilbospora* in Muntañola-Cvetković *et al.* (1997) agree well with the new species.

Taeniolella stricta (Corda) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 105–107.
Basionym: *Septonema strictum* Corda, *Icon. fung*. **6**: 6, pl. 1, fig. 22. 1854.

Literature: Schulzer v. Müggenburg (1872: 406, as *Septonema strictum*), Schulzer v. Müggenburg & Saccardo (1884: 127, as

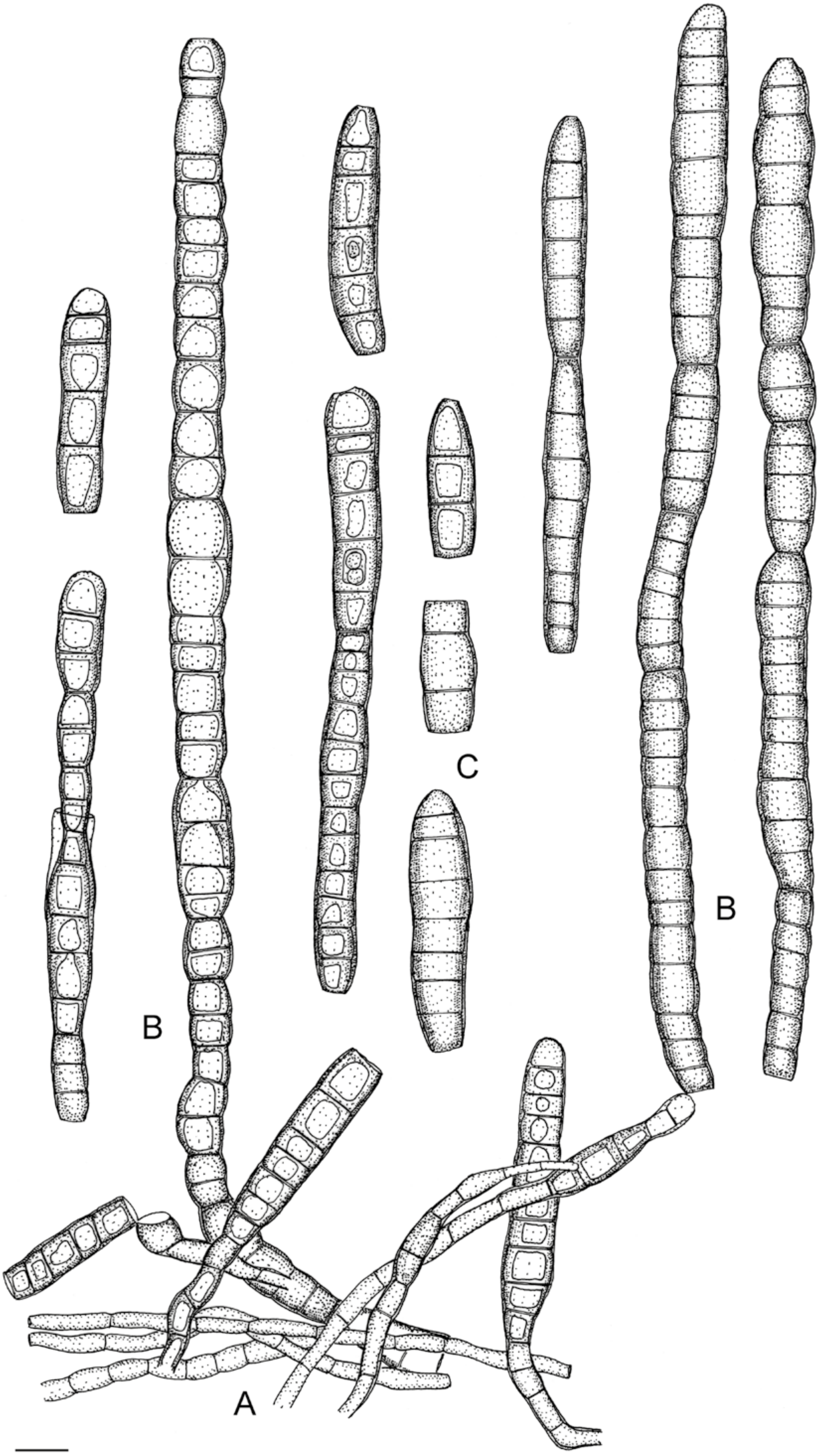

Fig. 105. *Taeniolella stricta* [lectotype]. **A.** Hyphae with micronematous to semi-macronematous conidiophores. **B.** Conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

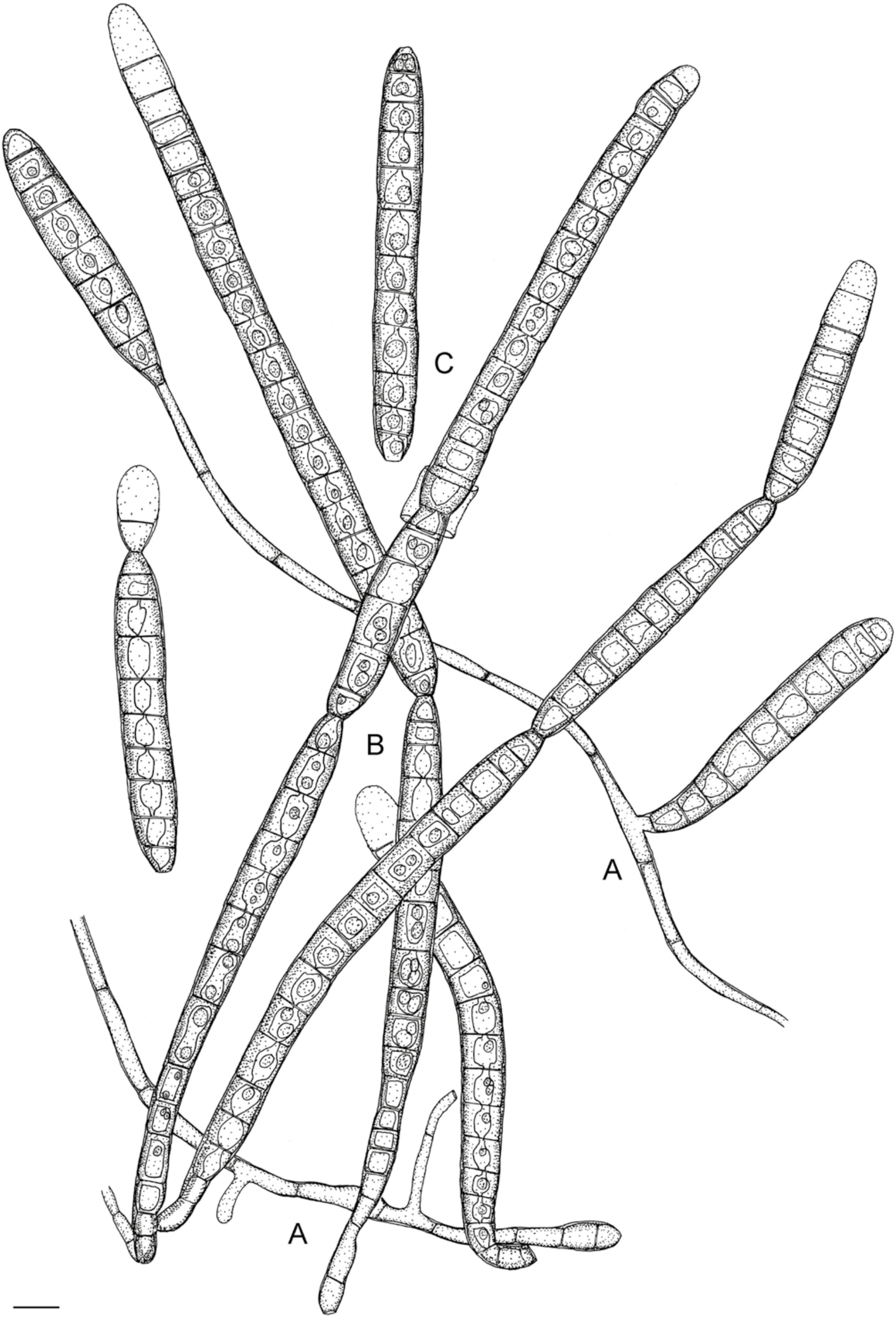

Fig. 106. *Taeniolella stricta* [BP 103708]. **A.** Hyphae with micronematous to semi-macronematous conidiophores. **B.** Conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

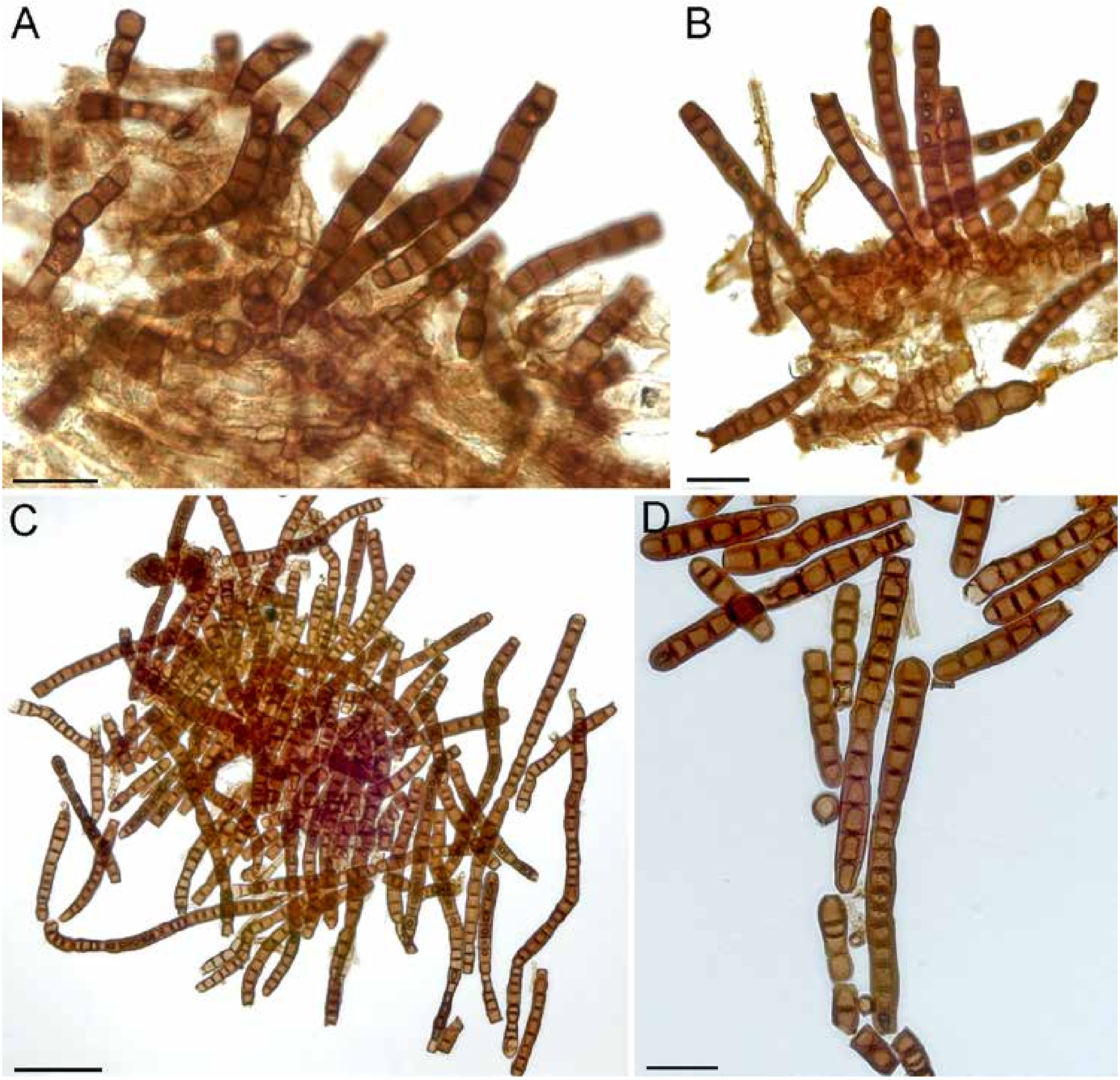

Fig. 107 *Taeniolella stricta* [lectotype]. **A, B.** Semi-macronematous conidiophores arising from hyphae. **C, D.** Conidia and conidial chains. Bars: 50 µm (C), 20 µm (A, B, D).

Septonema strictum), Ellis (1976: 57), Butin (1991: 236), Mel'nik (2000: 309).

Illustrations: Corda (1854: pl. 1, fig. 22, as *Septonema strictum*), Ellis (1976: 59, fig. 41), Butin (1991: 237, fig. 2), Mel'nik (2000: 311, fig. 218).

Description: *Colonies* on dead wood, scattered, loosely to densely caespitose, slightly shiny, black, long chains of conidia often visible even by stereomicroscopy. *Mycelium* superficial and immersed; hyphae straight to flexuous, branched, 2.5–5 µm wide, septate, not constricted or slightly to distinctly constricted at the septa, pale brown, smooth, slightly thickened, 0.25–0.5 µm. *Stromata* lacking. *Conidiophores* micronematous to semi-macronematous, usually reduced to conidiogenous cells, terminal or lateral, solitary, unbranched, straight, doliiform, subcylindrical, sometimes peg-like, 5–14 × 4–7 µm, 0–1-septate, pale brown, slightly darker than hyphae, smooth, wall slightly thickened, up to 0.5 µm, monoblastic to thalloblastic, loci truncate, unthickened, up to 5 µm diam. *Conidia* in unbranched chains, adhering for a long time, distinction between individual conidia within the chain sometimes difficult or even impossible, 2–6 µm wide in constricted or narrow segments between individual conidia, chains probably only breaking off during gross preparations, straight, rarely slightly flexuous, subcylindrical, sometimes somewhat attenuated at the tip, (12–)25–277 × 7–13 µm, 2–40-septate, not or only slightly constricted to distinctly constricted at the septa, brown, reddish brown, sometimes olivaceous brown or greenish brown, paler at the tip, smooth, wall thickened, up to 0.5 µm, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of very thick, three-layered walls, up to 1–2 µm thick, often with one to two internal oil-like droplets, the wall at the apex often unthickened and the cell plasma then not reduced, apex rounded in primary conidia, slightly conically truncate in secondary ones, base truncate, sometimes slightly obconically truncate, hila truncate, unthickened, not darkened, (1.5–)2–5(–9) µm diam.

Lectotype (designated here, MycoBank MBT373916): On wood, *A.C.J. Corda*, herb. Corda ["Lubkowitz'scher Garten 1844"] (PRM 155626**!**).

Host range and distribution: On wood of *Bruguiera gymnorrhiza*, *Palmae* sp., *Rhizophora mucronata*; Austria (Butin 1991), Cuba (www.cybertruffle.org.uk), Czech Republic (Corda 1854), Hungary (first report, see specimens examined), India (Maria & Sridhar 2003, Sridhar 2009), Russia (Mel'nik 2000).

Additional specimens examined: **Hungary**, ad ripam rivuli Nagyvasfazék-patak, pr. pag. Királyrét, on dead wood, 12 Oct. 2005, *Á. Révay & J. Gönczöl* (BP 99300); Kismaros, in the steam Morgó-patak, 26 Sep. 2012, *Á. Révay & J. Gönczöl* (BP 103708).

Notes: This fungus was described by Corda (1854) as *Septonema strictum* from wood collected in the Czech Republic. Records about distribution and substrates outside of Europe are very diverse. Maria & Sridhar (2003) described *T. stricta* on mangrove trees (*Rhizophora mucronata* and *Bruguiera gymnorrhiza*), and in Cuba the fungus was detected on an unidentified palm. However, these records and substrates are unusual and require verification by re-examinations of the collections concerned. The record from South Africa (Lee *et al.* 2004) on *Leucadendron* sp. is wrong. The re-examination of this material showed that a dematiaceous hyphomycete with pigmented monilioid hyphae and dictyosporous conidia was involved. It is even not certain whether the conidia belong to the hyphae. The identity of the fungus concerned is quite unclear.

Schulzer v. Müggenburg (1872) and Schulzer v. Müggenburg & Saccardo (1884) described the co-occurrence of *Septonema strictum* and *Stysanus strictus*. Schulzer v. Müggenburg (1872) supposed that both species are two different morphs of a single fungus, but there is no evidence or experimental proof for a true connection, which is quite doubtful.

The re-examined material from PRM (Prague, herb. Corda) agrees well with the description and illustration in Ellis (1976). The conidia are formed in chains adhering for a long time and more or less constricted at points of attachment between individual conidia (3–5 µm). The illustration of Corda (1854) shows chains of conidia with evident constrictions at points of attachment between individual conidia, and he described conidial chains composed of conidia of very unequal length. Corresponding features have been particularly observed in the material from Hungary. The constrictions at points of attachment between the individual conidia are here much stronger (up to 2 µm) and in the collection BP 99300 conidia are (12–)15–226 × 7–10 µm. The re-examined collections of *T. stricta* are very variable in pigmentation, ranging from reddish brown, sometimes olivaceous brown to greenish brown. The youngest conidia at the tip of the chain are often paler brown or even subhyaline, the wall is unthickened and the cell plasma is obviously less reduced (especially in BP 103708).

Butin (1991) detected this species during an investigation of grey discolorations of wood surfaces and stated that *T. stricta* has peroxidase activity and is thus able to degrade lignin.

Taeniolella hunanensis, a Chinese species isolated from soil, is very similar to *T. strica*. The conidia and conidial chains in both species are very long and multiseptate (2–40-septate, (12–)25–277 × 7–13 µm in *T. stricta* vs. 2–42-septate, 27–296 × 9–14 µm in *T. hunanensis*), but the conidiophores of *T. hunanensis*, compared to *T. stricta*, are described as macronematous, 19–78 × 6–8 µm. However, the illustration in Zhang & Zhang (2007: 193, fig. 1) shows that the distinction between hyphae and conidiophores is rather difficult. Unfortunately, type material of *T. hunanensis* could not be examined. Therefore, the status of *T. hunanensis* and its relation to *T. stricta* remain unclear.

Taeniolella alta, another similar saprobic species mainly occurring on *Alnus*, is easily distinguishable from *T. stricta* by its often somewhat rough-walled to even verrucose conidia, semi-macronematous conidiophores sometimes with a basal branchlet and usually monoblastic but occasionally also polyblastic conidiogenous cells with two loci.

Taeniolella subsessilis (Ellis & Everh.) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958. Figs 108–109.
Basionym: *Dendryphion* [as '*Dendryphium*'] *subsessile* Ellis & Everh., *J. Mycol*. **3**: 128. 1887.

Literature: Saccardo (1892: 664, as *Dendryphion subsessile*), Ellis (1976: 56), Heredia Abarca & Mercado Sierra (1998: 141), Gharizadeh *et al*. (2007: 107).

Illustrations: Ellis (1976: 58, fig. 40C), Gharizadeh *et al.* (2007: 107, fig. 11).

Exsiccatae: Ellis & Everhart, N. Amer. Fungi. Ser. II 2191; Kellerman & Swingle, Kansas Fungi *s.n.*, 37.

Description: *Colonies* on dead stems, irregularly breaking through the bark, punctiform, spread around stems, effuse, confluent, densely caespitose, covering the entire stem, dark brown to black, slightly shiny. *Mycelium* immersed; hyphae straight to flexuous, branched, 1–5 µm wide, septate, not or only slightly constricted at the septa, pale brown to brown, smooth, wall to 0.5 µm thick; at the base of conidiophores often with stromatically aggregated cells, subglobose, square or irregularly shaped, 5–7 × 5–10 µm, brown, smooth, wall thickened, to 0.5 µm. *Conidiophores* semi-macronematous, sometimes reduced to conidiogenous cells, solitary or usually aggregated in caespitose tufts, arising from hyphae, lateral or terminal, or arising from stromatic cells, erect, straight, unbranched, doliiform, subcylindrical, 8–28 × 6–8 µm, 0–2-septate, not constricted at the septa, brown to dark brown, smooth, wall thickened, 0.25–0.75 µm, cells usually filled with up to 3 small oil-like droplets or with one larger oil-like droplet filling the whole cell, cells sometimes with less structured cell lumen, not enteroblastically proliferating. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, little differentiated, doliiform, 7–11 µm long, loci truncate, unthickened, 3.5–5(–6) µm diam. *Conidia* catenate, in unbranched chains, usually easily disintegrating, not adhering for a long time, often up to three conidia adhering in a chain, chains to 90 µm long, distinction

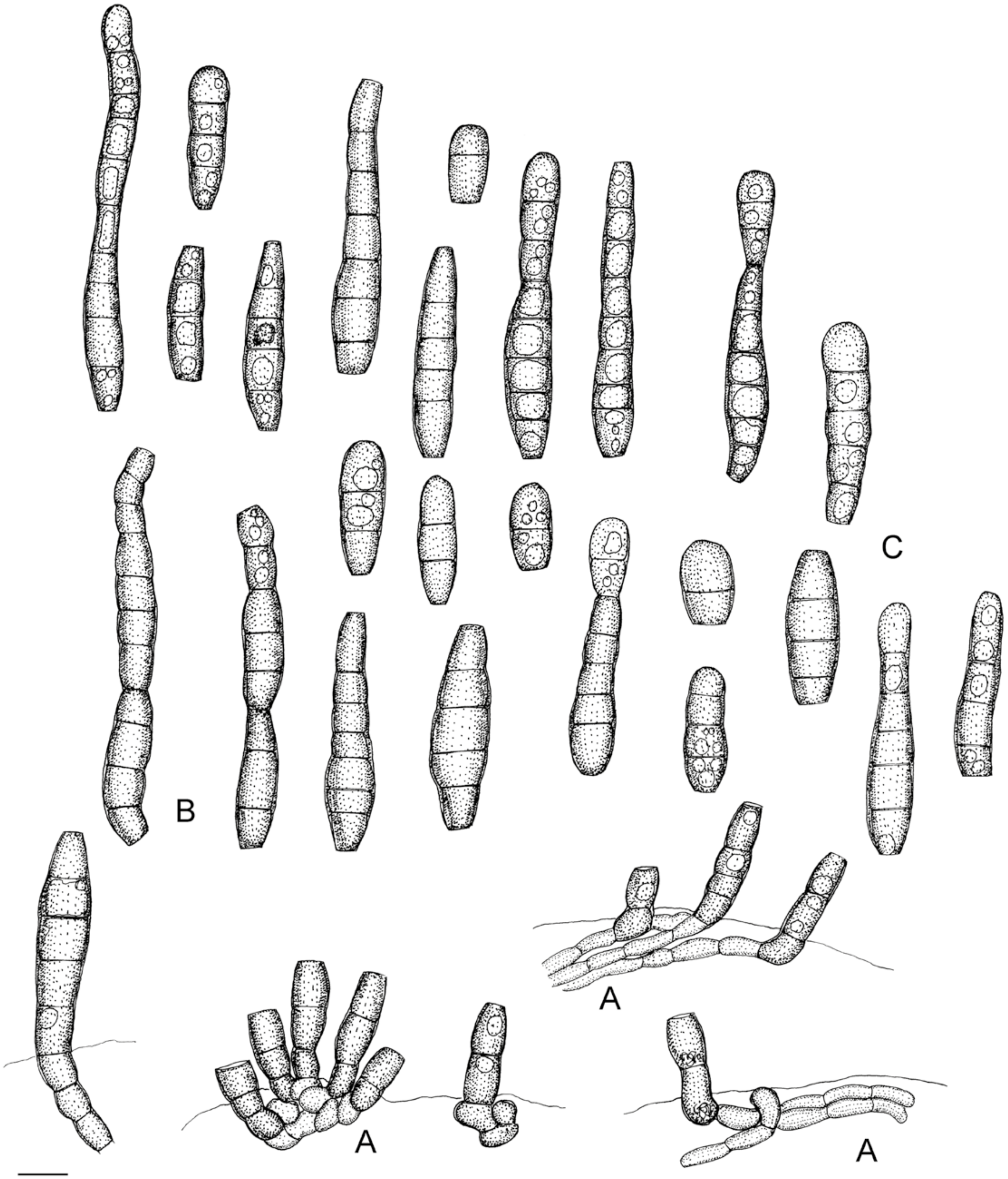

Fig. 108. *Taeniolella subsessilis* [NY 03021306]. **A.** Hyphae with semi-macronematous conidiophores. **B.** Short conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

between individual conidia within the chain sometimes difficult, usually straight, sometimes flexuous, obclavate, subcylindrical, obovoid, 1–7-septate, not or slightly constricted at the septa, 1-septate ones 15–19 × 7–10 µm, 2–4-septate ones 25–45 × 7–11 µm, 5–7-septate ones 47–60 × 7–10 µm, often narrowed at the apex, 5 µm wide, brown to dark brown, young conidia at the tip of conidial chains distinctly paler, subhyaline to pale brown, smooth, thickened, 0.5–0.75 µm, wall of younger conidia at the tip usually unthickened, cells with oil-like droplets just like in conidiophores, apex rounded in primary conidia, truncate in

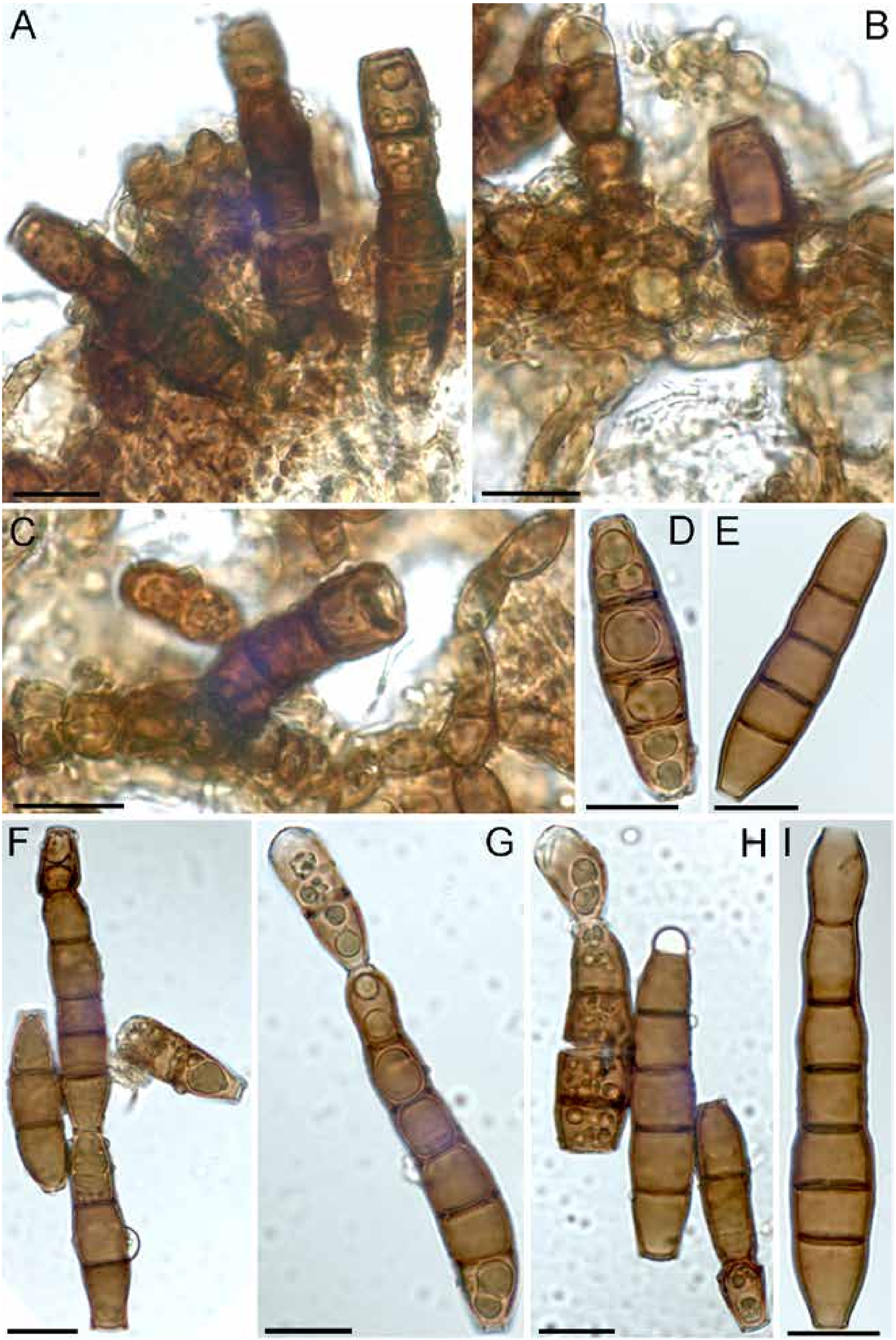

Fig. 109. *Taeniolella subsessilis* [NY 03021306]. **A–C.** Semi-macronematous conidiophores arising from hyphae. **D, E, H, I.** Conidia. **F, G.** Conidial chains. Bars: 10 µm (A–I).

secondary ones, base truncate, hila truncate, unthickened, not darkened, 3–5(–6) µm diam.

Holotype: **USA**, Kansas, Manhattan, on dead stems of *Smilax hispida*, Jul. 1887, *W.T. Swingle 947* [NY 883704 (slide ex holotype NY 883703**!**)].

Host range and distribution: On dead stems of *Mespilus* sp., *Rubus* sp., *Salix havanensis*, *Smilax hispida*, *Smilax* sp.; Cuba (Mercado Sierra & Mena-Portales 1995), India (Sharma & Munjal 1979, Bilgrami *et al.* 1991), Iran (Gharizadeh *et al*. 2007), Mexico (Heredia Abarca & Mercado Sierra 1998), USA (Ellis & Everhart 1887).

Additional specimens examined: **USA**, Florida, Monroe County, Layton Trail, Layton, UTM Zone 17, on stems of *Salix havanensis*, 18 May 1998, *J.L. Crane & J.D. Schoknecht 98-467, accession no. 54462* (NY 461477); Kansas, Manhattan, on dead stems of *Smilax hispida*, Sep. 1887, *W.T. Swingle* [Ellis & Everhart, N. Amer. Fungi. Ser. II 2191] (NY 3021302, 3021303, 3021309); Manhattan, Riley Co., 4 Aug. 1887, *Kellerman, & Swingle* [Kansas Fungi *s.n.*] (NY 3021307); Manhattan, 14 Aug. 1887, *Kellerman, & Swingle* [Kansas Fungi 37] (NY 3021304); Oklahoma, Ripley Bliffs, 1 mi. N. of Ripley Payne Co., on *Smilax* sp., 16 Aug. 1979, *M.E. Barr*, *Bigelow M.E.B.B. 6731* (with *Kalmusia* cf. 6730) (NY 3021305); Payne County, Ripley Bluffs along Cimarron River, 1 mile north of Ripley, on *Smilax* sp., 16 Aug. 1979, *C.T. Rogerson* (NY 3021306).

Notes: The re-examination of the type material showed that this species is morphologically a typical member of the genus *Taeniolella*. Various descriptions and illustrations of *T. subsessilis*, *e.g.*, in Ellis (1976), Heredia Abarca & Mercado Sierra (1998) and Gharizadeh *et al*. (2007), are rather uniform and in agreement with the type material.

It is one of the smooth-walled *Taeniolella* species. The European *T. stricta* is another smooth-walled species, but readily distinguishable by having much longer, pluriseptate and usually wider conidia [(12–)25–277 × 7–13 µm, 2–40-septate].

Taeniolella vermicularis (Corda) S. Hughes, *Canad. J. Bot*. **36**: 818. 1958. Figs 110–111.
Basionym: *Torula vermicularis* Corda, *Icon. Fung*. **1**: 8. 1837.
Synonyms: *Taeniola lata* Bonord., *Handb. Allgem. Mykol*. 36. 1851, *nom. illeg*. (Art. 52.1).
Hormiscium vermiculare (Corda) Sacc., *Syll. Fung*. **4**: 264. 1886.

Illustration: Corda (1837: pl. 2, fig. 138).

Description: *Colonies* on dead wood, effuse, velvety-tomentose, conidiophores decumbent, forming a dense, filamentous network, slightly shiny, dark brown to black. *Mycelium* immersed; hyphae penetrating the substrate, within tracheas and tracheids, straight to flexuous, branched, hyphal cells long, straight or subglobose, monilioid, 2–7 µm wide, septate, slightly to distinctly constricted at the septa, pale brown, smooth, wall sometimes thin, but usually slightly thickened, 0.25–0.5 µm. Stromata lacking. *Conidiophores* micronematous to semi-macronematous, sometimes reduced to conidiogenous cells, distinction between conidiophores and adhering conidia often difficult, transition gradual, integrated in or arising from hyphae, terminal and intercalary, solitary, erumpent through the substrate, decumbent, straight, doliiform, subcylindrical, subglobose, sometimes peg-like, 5–10 × 5 µm, aseptate, pale brown, smooth, wall slightly thickened, up to 0.5 µm, monoblastic or thalloblastic, loci (rarely observed) truncate, unthickened, 3–6 µm diam. *Conidia* catenate, in simple or branched chains, up to 285 µm long, adhering for a long time, chains probably only breaking off during gross preparations, chain fragments often persistent, distinction between individual conidia within the chain sometimes difficult or even impossible, conidia straight, filiform, subcylindrical, decumbent, rarely 1-septate, subcylindrical or doliiform, 13–15 × 6–10 µm, young conidia, adhering on conidiophores, 14–22 × 6–7 µm, 1–2-septate, not constricted at the septa, pale brown to brown, smooth, wall slightly thickened, cell plasma mostly reduced, with a central vacuole-like cavity, surrounding plasma giving the impression of thick, three-layered walls, older conidial chains long, 55–285 × 6–10(–12) µm, multiseptate, up to 40, rarely with additionally distosepta, not or slightly constricted at the septa, brown to dark brown, paler at the tip, smooth, outer wall thickened, 1–2 µm, cell plasma mostly reduced, with a central vacuole-like cavity, irregularly structured, surrounding plasma giving the impression of thick, three-layered walls, up to 3 µm thick, tips of conidiophores wider, up to 13.5 µm, outer wall thin, up to about 0.25 µm, seemingly dissolving, smooth, sometimes somewhat cracked at the very tip, older parts of conidial chains with internal hyphal structures of unknown and unclear origin and genesis, straight to flexuous, sometimes monilioid, usually unbranched, rarely branched, 1–6 µm wide, septate, mostly constricted at the septa, pale brown to brown, smooth, thin walled, cell plasma reduced, wall seemingly thickened, up to 1 µm, wall of the conidia becoming thinner when such internal hyphal structures are formed, 0.75–2 µm, apex rounded in primary conidia, truncate in secondary ones, base truncate, hila 5–7 µm diam.

Lectotype (designated here, MycoBank MBT373917): **Czech Republic**, Liberec (Reichenberg), on wood of *Rosa canina*, *A.C.J. Corda* [herb. Corda] (PRM 155702**!**).

Host range and distribution: On wood of *Rosa canina*; Czech Republic (Corda 1837).

Notes: The type locality of this species is not quite clear. “Reichenberg” [today Czech Republic, Liberec] is cited on the label of the type specimen and in the original description, but later someone had deleted “Reichenberg” on the label and added “Prague” with a question mark.

Unfortunately this species is known only from the type collection. Therefore, it was not possible to clarify origin and genesis of the unusual formation of distinct internal hyphal structures in the conidia of *T. vermicularis* and if these structures are common, a singularity or an artefact. In any case they may break through the conidial apex and leave the conidium, but it remains unclear if these hyphal structures are an unusual kind of “internal germination” or inner development of secondary hyphae, and it can even not be excluded that hyphae of another, possibly hyperparasitic fungus are involved. This phenomenon has been discussed with several leading mycologists with comprehensive experiences around hyphomycetes, but nobody had observed similar structures.

Taeniolella stricta, a European saprobic *Taeniolella* species known from wood, is comparable with *T. vermicularis*. The conidia or conidial chains, composed of conidia adhering for

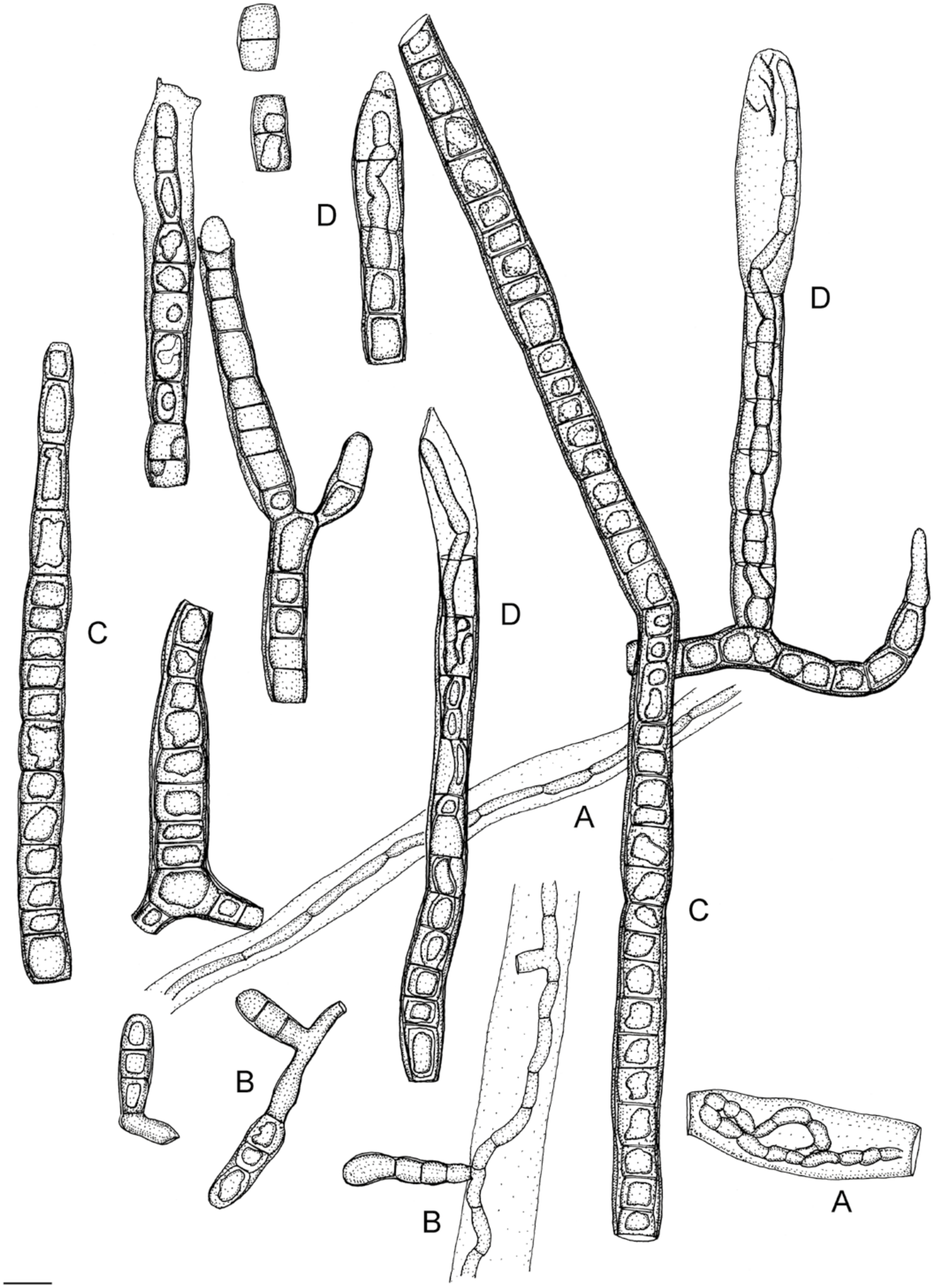

Fig. 110. *Taeniolella vermicularis* [lectotype]. **A.** Hyphae penetrating the host substrate. **B.** Hyphae with micronematous to semi-macronematous conidiophores. **C.** Conidial chains. **D.** Conidial chains with unusual distinct internal hyphal structures. Bar = 10 µm (B. Heuchert *del.*).

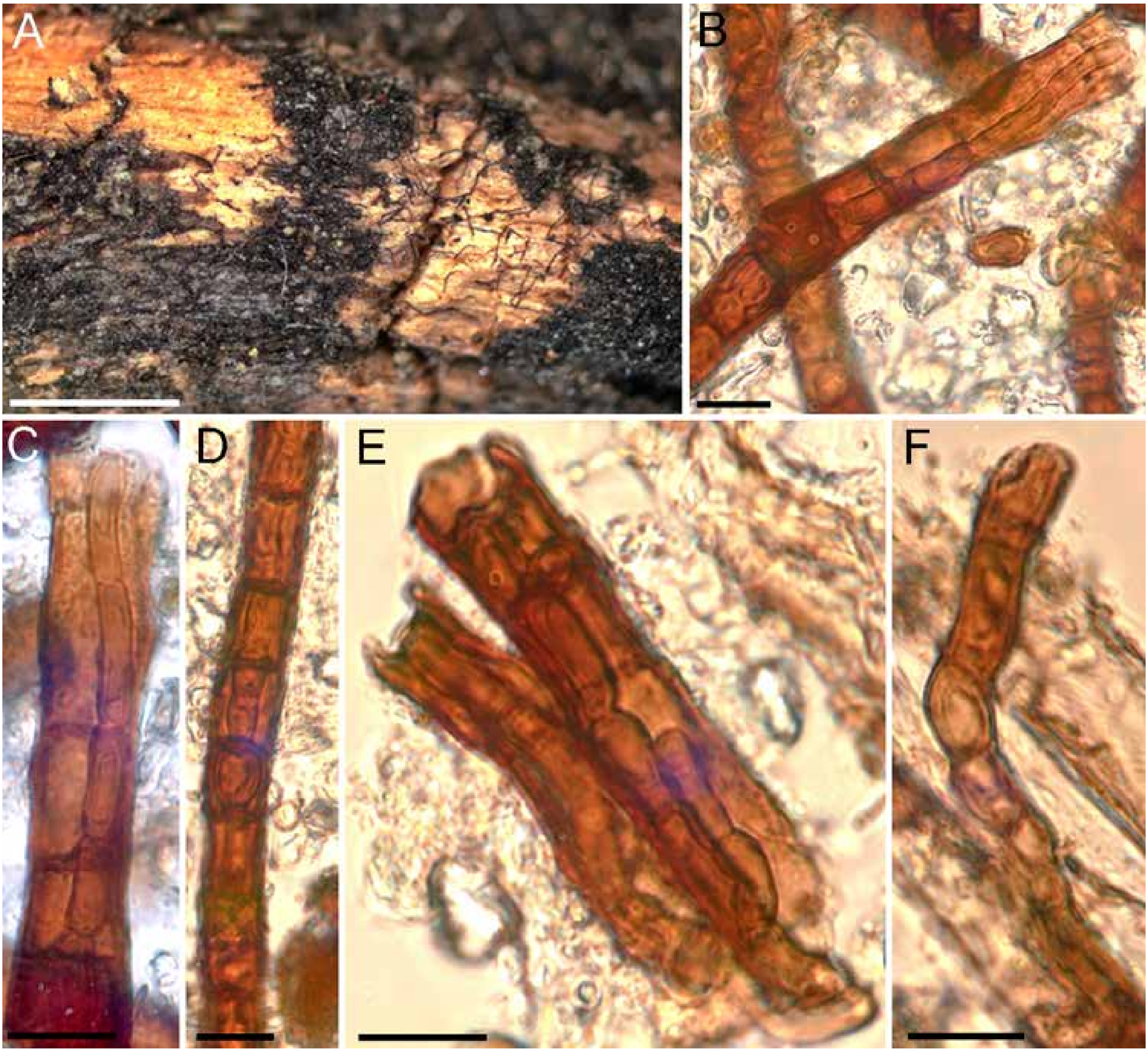

Fig. 111. *Taeniolella vermicularis* [lectotype]. **A.** Macroscopic overview of colony. **B–E.** Conidial chains with unusual distinct internal hyphal structures. **F.** Hyphae with micronematous to semi-macronematous conidiophore. Bars: 1 mm (A), 10 µm (B–F).

a long time, are in both species very long and multiseptate (2–40-septate, (12–)25–277 × 7–13 µm in *T. stricta* vs. up to 40-septate, 55–285 × 6–10(–12) µm in *T. vermicularis*) but in *T. stricta* conidial chains are unbranched. The distinction between individual conidia within the chain is sometimes difficult or even impossible in *T. stricta* and nearly always so in *T. vermicularis* in which constrictions at points of attachments between individual conidia are absent or almost so.

The differentiation between the similar species *T. plantaginis* and *T. vermicularis* is difficult, morphologically barely possible and mainly based on different host preferences. *T. plantaginis* grows on the lower surface of senescent leaves of *Plantago* ssp. and *T. vermicularis* is only known from the type specimen on wood of *Rosa canina*.

Doubtful, excluded and insufficiently known species of Taeniolella s. lat.

The following list encompasses species assigned to *Taeniolella s. lat.* with unknown or unclear generic affinity. The affinity and identity of some species could not be verified since the type material could not be traced and any other collections were also not available. However, re-examination of the types and other specimens, cultures and phylogenetic data of the species concerned are usually needed for reliable generic reallocations. In these cases, original descriptions are reproduced. Other cases refer to examined species that proved to be non-congeneric with *Taeniolella s. lat.* They are comprehensively described conforming to the pattern and structure used for lichenicolous and saprobic *Taeniolella* species. As far as known, the currently accepted names are specified and highlighted in bold. Some reallocations (new combinations) are made to reflect proper affinities of the species concerned. Examined type collections are highlighted by adding an exclamation mark as in the lists of lichenicolous and saprobic *Taeniolella* species.

Taeniolella americana J.L. Crane & Schokn., *Canad. J. Bot*. **60**: 372. 1982.

Illustration: Crane & Schoknecht (1982: 375, figs 5–10).

Original description (Crane & Schoknecht 1982): *Colonies* on natural substrate appressed, effuse. *Mycelium* immersed, composed of branched, septate, subhyaline to light brown hyphae. *Conidiophores* semi-macronematous, mononematous, short, caespitose or scattered, simple, brown, septate, smooth, 7–9 µm wide. *Conidiogenous cells* monoblastic, rarely polyblastic, integrated, terminal, determinate, cylindrical. *Conidia* in long, simple or branched acropetal chains, cylindrical, 7–15-septate, uniformly brown, slightly roughened, 134–230 µm long, 15–20(–25) µm wide at median, tapering to 8–13(–15) µm wide at end cells.

Holotype: **USA**, Illinois, Johnson County, Goose Pond, on submerged, decayed ament of *Liquidambar styraciflua*, 28 Jan. 1974, *J.L. Crane* (ILLS 41016).

Host range and distribution: On decaying catkins of *Liquidambar styraciflua*; USA (Crane & Schoknecht 1982), known only from the type collection.

Notes: The type material of *T. americana* was not available. Crane & Schoknecht (1982) compared the species with *Taeniolella dichotoma* and *T. lignicola*. Based on dichotomously branched conidia, Descals & Sutton (1976) reduced *T. dichotoma* to synonymy with *Anavirga laxa*. The type material of *T. lignicola* has been re-examined. The morphological characters of this species, especially the formation of micronematous conidiophores, conidia formed singly or in short chains, and the vesicle-like apices of the conidia, which are thinner and paler than the conidial body, support the affinity to the genus *Stanjehughesia*.

Taeniolella americana is similar to the saprobic *T. stricta*. The conidia or conidial chains in both species are very long and multiseptate (2–40-septate, (12–)25–277 × 7–13 µm in *T. stricta* vs. *T. americana* with conidia 7–15-septate, 134–230 × 15–20(–25) µm), but the conidial chains in *T. stricta* are unbranched and the walls of the conidia are smooth. Conidia up to 25 µm wide, as described for *T. americana*, are unusual for *Taeniolella*. The illustration of the conidia in Crane & Schoknecht (1982) with a kind of remnants at the base suggests a rhexolytic secession of conidia, which would be in conflict with the concept of the schizolytic genus *Taeniolella*. *Taeniolella americana* is probably not a member of the genus *Taeniolella*, but a final conclusion is only possible on the basis of a re-examination of type material.

Taeniolella americana is one of the five known *Taeniolella* species with aquatic habitat. The affinity of all aquatic species to the genus *Taeniolella* is either unclear or uncertain, or the species concerned are excluded and reallocated, *e.g.*, *T. longissima* and *T. rudis.* Molecular data (Réblová *et al*. 2012) and morphological peculiarities of a synasexual morph justify the reallocation of *T. rudis* to the genus *Sterigmatobotrys* (Ertz *et al*. 2016) [further details and discussion see under *T. rudis* and *T. longissima*]. A comparison of *T. americana* with similar dematiaceous aquatic genera suggests that *T. americana* is possibly a member of an undescribed aquatic hyphomycete genus.

Taeniolella andropogonis Yadav & Lal, *J. Indian Bot. Soc*. **44**: 405. "1965" 1966. Figs 112–113.

Literature: Varghese & Rao (1980: 51).

Illustration: Lal & Yadav (1966: 405, fig. 2).

Description: *Colonies* scattered, effuse, sooty, crumbly, in small tufts, dark brown. *Mycelium* immersed, sometimes superficial; hyphae straight to flexuous, branched, 2–5 µm wide, septate, not or slightly constricted at the septa, pale brown, smooth, wall to 0.25 µm thick. *Stromata* within the substrate effuse to strand-like, monilioid, stroma cells subglobose, 4–6 µm diam, brown to dark brown, smooth, wall slightly thickened, to 0.5 µm. *Conidiophores* micronematous, integrated in hyphae, distinction between hyphae or stroma cell and conidiogenous cells barely possible. *Conidia* single or rarely in short acropetal chains, usually unbranched, almost sessile, *i.e.*, arising terminally or laterally from hyphae or stroma cells, usually flexuous, variously curved, rarely straight, very variable in shape and size, vermicular, subcylindrical, ellipsoid, doliiform, 11–53 × 6–11 µm, 2–13-sepate, often dictyosporous, sometimes slightly constricted at the septa, brown to dark brown, usually paler at the elongating apex, smooth, wall thickened, 0.5–1 µm, wall at the apex often less thickened, apex rounded, base truncate, hila 4–5 µm diam.

Holotype: **India**, Bihar, Patna, on decaying stems of *Sorghum bicolor* (= *Andropogon sorghum*), 7 Jan. 1963, *S.P. Lal* & *A.S. Yadav* (K(M) IMI 100044**!**).

Host range and distribution: On *Sorghum bicolor*; India (Lal & Yadav 1964, 1966; Bilgrami *et al.* 1991).

Notes: The original description and the illustration in Lal & Yadav (1966) reflect a realistic impression of this species. The morphological features, *e.g.*, the frequently dictyosporous and extremely variable conidia suggest that *T. andropogonis* is very probably not a genuine member of the genus *Taeniolella*. At first glance *T. andropogonis* looks like a species of *Trimmatostroma*, but the formation of conidia in acropetal chains is not in agreement with the latter genus which is, as already pointed out by Ellis (1976), characterised by the formation of conidia in basipetal chains. The conidia are somewhat reminiscent of those of some *Sirosporium* species, which are, however, quite distinct by forming pigmented, thickened conidiogenous loci and conidial hila. In short it can be said that *T. andropogonis* is characterised by having trimmatosporioid conidia, but formed singly or in acropetal chains as in *Taeniolella*. An appropriate genus with this combination of traits is not available. Cultures and phylogenetic information about this fungus are needed for a reliable generic reallocation.

Varghese & Rao (1980) compared this species in a table with different published and non-effectively published Indian species.

Taeniolella aquatilis (Woron.) Milko, *Novosti Sist. Nizsh. Rast*. **22**: 132. 1985.
Basionym: *Septonema aquatile* Woron., *Trudy Saratovsk. Obshch. Estestvoisp*. **10**: 62. 1925 [*Raboty Volzhsk. Biol. Stantsii* **8**: 62. 1925].

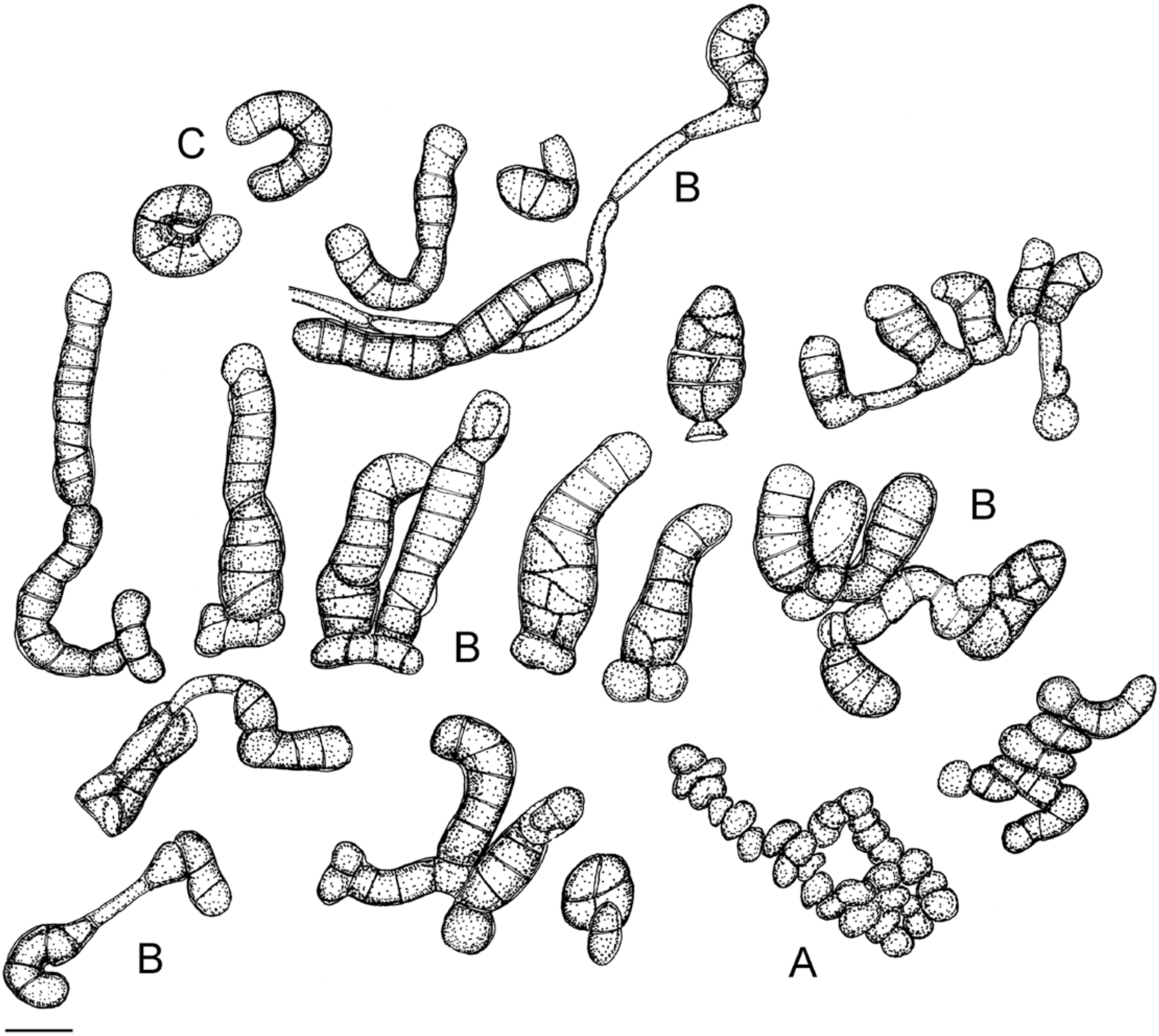

Fig. 112. *Taeniolella andropogonis* [holotype]. **A.** Stromata. **B.** Micronematous conidiophores arising from hyphae or stroma cell with adhering conidia. **C.** Curved conidia. Bar = 10 µm (B. Heuchert *del.*).

Illustrations: Woronichin (1925: 62, fig. 4), Milko (1985: 132, fig.).

Original description (Woronichin 1925): Mycelio nullo, conidiophoris brevissimis, 1–2-septatis, pallide brunneis, 4.8 µm cassis, conidiis obscure-brunneis, oblongis, utrinque leviter angustatis, interdum sursum valde attenuates, 50–100 × 8–12 µm, 8–20-septatis, saepe catenulas breves formantibus.

Description (Milko 1985): *Colonies* on wort agar at 18–20°C, slow-growing, dark or black-olivaceous, velvety, velvety-caespitose, about 0.2 cm high, well sporulating. *Hyphae* filamentous, 2.5–3.5 µm diam, branched, smooth, uncoloured or pale olivaceous. *Conidiophores* solitary, 10–20 × 3–5 µm, single-celled or 1–2(–3)-septate, constricted at the septa, usually unbranched, pale olivaceous, smooth; conidiogenous cells monoblastic. *Conidia* filamentous or cylindrical-fusiform, at the apex truncate or rounded, at the base often with papilla, (40–)50–100(–180) × 8–10(–12) µm, straight, oblique or slightly curved, (3–)6–14(–20)-septate, smooth, olivaceous, often with oil-like drops, holoblastic, catenate, 3–5(–7) usually in simple apical chains, formed at the tip of conidiophores, rarely on hyphae or sessile.

Type: **Russia**, in stratis *Phormidii mollis* [*Phormidium molle*] in radiis rotae navis "Petrus Czaikowski", qui in flumine Wolga navigat, 25 Jul. 1924, *F. Djakonoff* (not preserved). *Neotype* (designated by Milko 1985): **Russia**, Yaroslavl Oblast, Volga (shallow waters of the Rybinsk Reservoir), water, undated, *A.A. Milko* [IIWB 4590] (VKM No.F-2212).

Host range and distribution: In water; Russia (Milko 1985).

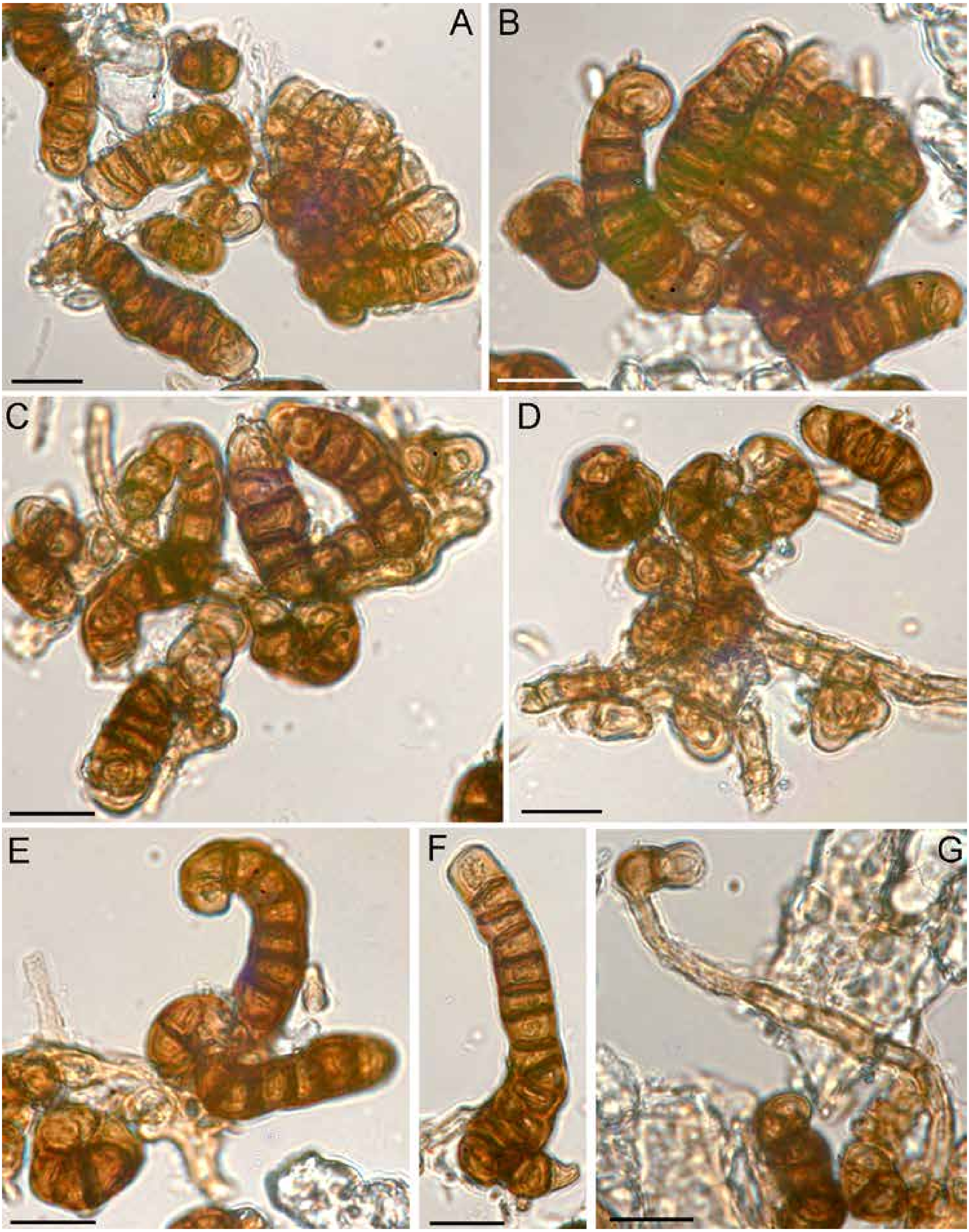

Fig. 113. *Taeniolella andropogonis* [holotype]. **A–G.** Micronematous conidiophores arising from hyphae or stroma cell with adhering conidia. Bars: 10 µm (A–G).

Notes: According to Milko (1985), the neotype of *Septonema aquatile* has been deposited at VKM under VKMF-2528, but this is undoubtedly a mistake as a culture of *Scopulariopsis brevicaulis* is stored under this number whereas the neotype of *Septonema aquatile* has the accession number VKMF-2212 (see http://www.vkm.ru/). A subculture was available, has been deposited at the Westerdijk Institute, Utrecht, and recently sequenced. Both ITS and LSU sequences of *Taeniolella aquatilis* clustered close to species of *Articulospora*, *Tricladium*, and *Varicosporium*, which are also aquatic hyphomycete genera, but they are morphologically quite distinct from *Taeniolella aquatilis* by having hyaline stauroconidia (Seifert *et al.* 2011). A comparison of *T. aquatilis* with other pigmented aquatic hyphomycete genera and species suggests that this species possibly belongs to an undescribed genus of aquatic hyphomycetes. Further morphological and molecular studies are needed to clarify possible connections between *T. aquatilis* and other aquatic *Taeniolella* species, which are undoubtedly not congeneric with *Taeniolella s. lat*. Further discussions and comparisons are given under *T. americana*, *T. caffra*, *T. longissima* and *T. typhoides*, and also under the excluded aquatic species *T. rudis*.

Taeniolella atra Varghese & V.G. Rao, *J. Univ. Bombay* **48**–**49**: 50. “1979/80” 1980.

Illustration: Varghese & Rao (1980: 55, fig. 4).

Original description (Varghese & Rao 1980): *Colonies* effuse, dark brown to blackish brown. *Mycelium* mostly immersed in the substratum. *Conidiophores* semi-macronematous, mononematous, scattered, short, pale olivaceous brown, smooth, rarely branched, up to 35 µm long, 4.5–7 µm thick. *Conidia* dry, catenate, mostly branched, septate, cylindrical, rounded at the apex, often truncate at the base, smooth, dark brown to blackish brown, 5–14-septate (usually 10-septate), measure 30–76.5 µm long, 15–17 µm thick.

Holotype: **India**, Kerala, Devikulam, on fallen twigs of *Mimusops elengi*, 23 Jan. 1976, *K.I.M. Varghese* (AMH 3904).

Host range and distribution: *Microcos paniculata* [*Grewia microcos*], *Mimusops elengi*; India (Varghese & Rao 1980, Patil & Rao 1981).

Notes: The type material deposited at AMH was not available. Varghese & Rao (1980) compared this species in a table with different published and non-effectively published Indian species, *viz.*, *T. andropogonis*, *T. lignicola* and *T. indica*. The description and illustration of conidiophores and conidia of *T. atra* remind one of *T. lignicola* which has been reallocated to *Stanjehughesia.* For further discussion see under *T. lignicola*. A final clarification of the position of this species is only possible on the basis of a re-examination of type material.

Talpapellis beschiana (Diederich) Zhurb., U. Braun, Diederich & Heuchert, **comb. nov.** Figs 114–115.
MycoBank MB819315.

Basionym: *Taeniolella beschiana* Diederich, *Bull. Soc. Naturalistes Luxemb*. **93**: 156. 1992.
Synonym: *Ameroconium cladoniae* U. Braun & Zhurb., *Lichenologist* **45**: 584. 2013 [*holotype*: **Russia**, Irkutsk Region, Siberia, near Erbogachen, 60°59'15. 40" N, 108°28'55.×30” E, on *Cladonia rangiferina*, 10 Sep. 2008, *K.E. Vershinin* (LE 260838**!**)].

Literature: Jando *et al*. (2000: 530), Kocourková (2000: 127), Montijūnaitė & Andersson (2003: 82), Zhurbenko & Alstrup (2004: 489), Suija (2005: 360), Ihlen & Wedin (2006: 39), Tsurykau *et al.* (2013: 4).

Illustrations: Diederich (1992: 156–157, figs 1–2), Diederich *et al.* (2017a), Tsurykau *et al.* (2013: 3, figs E–F), Zhurbenko & Braun (2013: 584, fig. 1, as *Ameroconium cladoniae*).

Description: *Colonies* effuse, dark brown to black, on podetia and on both sides of squamules, mainly marginal, densely short caespitose, aggregated or effuse, thallus usually without discolorations. *Mycelium* immersed; hyphae flexuous, branched, 2-5 µm wide, septate, sometimes constricted at the septa, hyaline to brown, smooth, walls unthickened to slightly thickened. *Stromata* lacking, but with solitary swollen, brown hyphal cells, aggregated below conidiophores, subglobose or isodiametric, 3–7 µm diam. *Conidiophores* macronematous, mononematous, solitary or in small aggregations, solitary conidiophores densely caespitose, arising from hyphae or basal hyphal cells, lateral and terminal, erect, straight to slightly flexuous, mostly unbranched or occasionally branched, mostly in the lower part or a few conidiophores arising from a single basal cell, subcylindrical, 11–70 × 3–6 µm, narrowed towards the apex, (0–)1–8-septate, slightly constricted at the septa, brown to dark brown, paler towards the apex, wall smooth to irregularly verruculose, rarely slightly rhagadiose, walls thickened, up to 1.5 µm, several times enteroblastically proliferating with obvious sheath-like wall remnants visible as irregular fringe. *Conidiogenous cell* integrated, terminal, monoblastic, monopodial, rarely sympodial, proliferation enteroblastic, percurrent, with several conspicuous, coarse, often flaring annellations, subcylindrical, (3.5–)4–)18(–)21) µm wide, conidiogenesis holoblastic, loci truncate, unthickened, 1.5–3(–3.5) µm diam. *Conidia* catenate, mostly in unbranched, very rarely in branched chains, easily disintegrating into mostly solitary conidia, occasionally two conidia permanently adhering, straight, rarely slightly curved, ellipsoid, subcylindrical, doliiform to lemon-shaped, 0(–1)-septate, aseptate conidia 4–13(–15) × 2–5(–5.5) µm, rarely 1-septate ones 7.5–11 × 3–5 µm, non-constricted at the septa, pale brown to brown, smooth to irregularly verruculose, wall up to 0.5 µm thick, apex rounded to attenuated in primary conidia, truncate in secondary ones, base truncate, sometimes narrowed, hila truncate, unthickened, not darkened, (0.75–)1–3 µm diam.

Holotype: **Luxembourg**, Fischbach, route vers Plankenhof, près des étangs, on *Cladonia cyathomorpha*, 15 Nov. 1980, *P. Diederich 3480* (LG!). *Isotype*: herb. Diederich!

Host range and distribution: On *Cladonia arbuscula*, *C. botrytes*, *C. cariosa*, *C. cenotea*, *C. cervicornis*, *C. chlorophaea*, *C. coccifera*, *C. coniocraea*, *C. cornuta*, *C. cryptochlorophaea*, *C. cyathomorpha*, *C. digitata*, *C. fimbriata*, *C. floerkeana*, *C. foliacea*, *C. grayi*, *C. humilis*, *C. incrassata, C. merochlorophaea*, *C. monomorpha*, *C. novochlorophaea*, *C. ochrochlora*, *C. phyllophora*, *C. pleurota*, *C. pocillum*, *C. polydactyla*, *C. pyxidata*, *C. rangiferina*, *C. rei*, *C. scabriuscula*, *C. stricta*, *C. subturgida*, *C. subulata*, *C. symphycarpia*, *C. trassii*, *C. uncialis*, *C. zopfii*, *Cladonia* sp.;

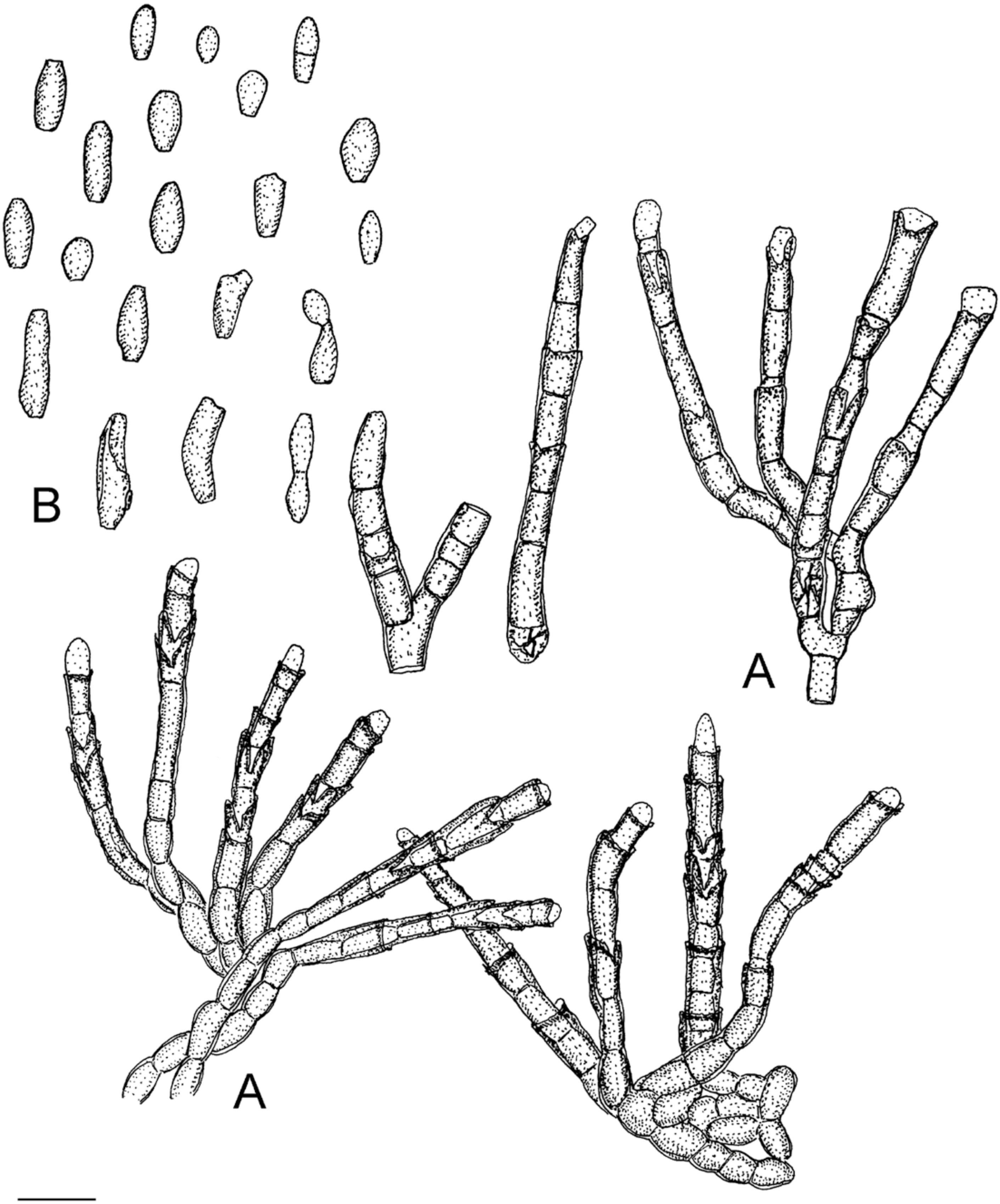

Fig. 114. *Talpapellis beschiana* [isotype]. **A.** Conidiophores with several conspicuous, flaring annellations. **B.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

Austria (Berger & Türk 1993, 1995, Türk & Berger 1999), Belarus (Tsurykau *et al.* 2013), Belgium (Sérusiaux *et al*. 2003), Canada (Zhurbenko & Braun 2013), Czech Republic (Kocourková 2000), Denmark (Alstrup 1993b), Estonia (Randlane & Saag 2004, Suija 2005, Aptroot *et al*. 2005, Suija *et al*. 2007b, 2008, 2010), France (Roux *et al*. 2017, Diederich *et al.* 2017a), Germany (Kocourková & Brackel 2005, Brackel 2007, 2009, 2010a, Cezanne & Eichler 2015, Schiefelbein *et al*. 2017), Ireland (Fox 2001), Italy (Brackel 2008a, b, 2015), Lithuania (Montijūnaitė & Andersson 2003, Montijūnaitė 2009), Luxembourg (Diederich 1992, Diederich

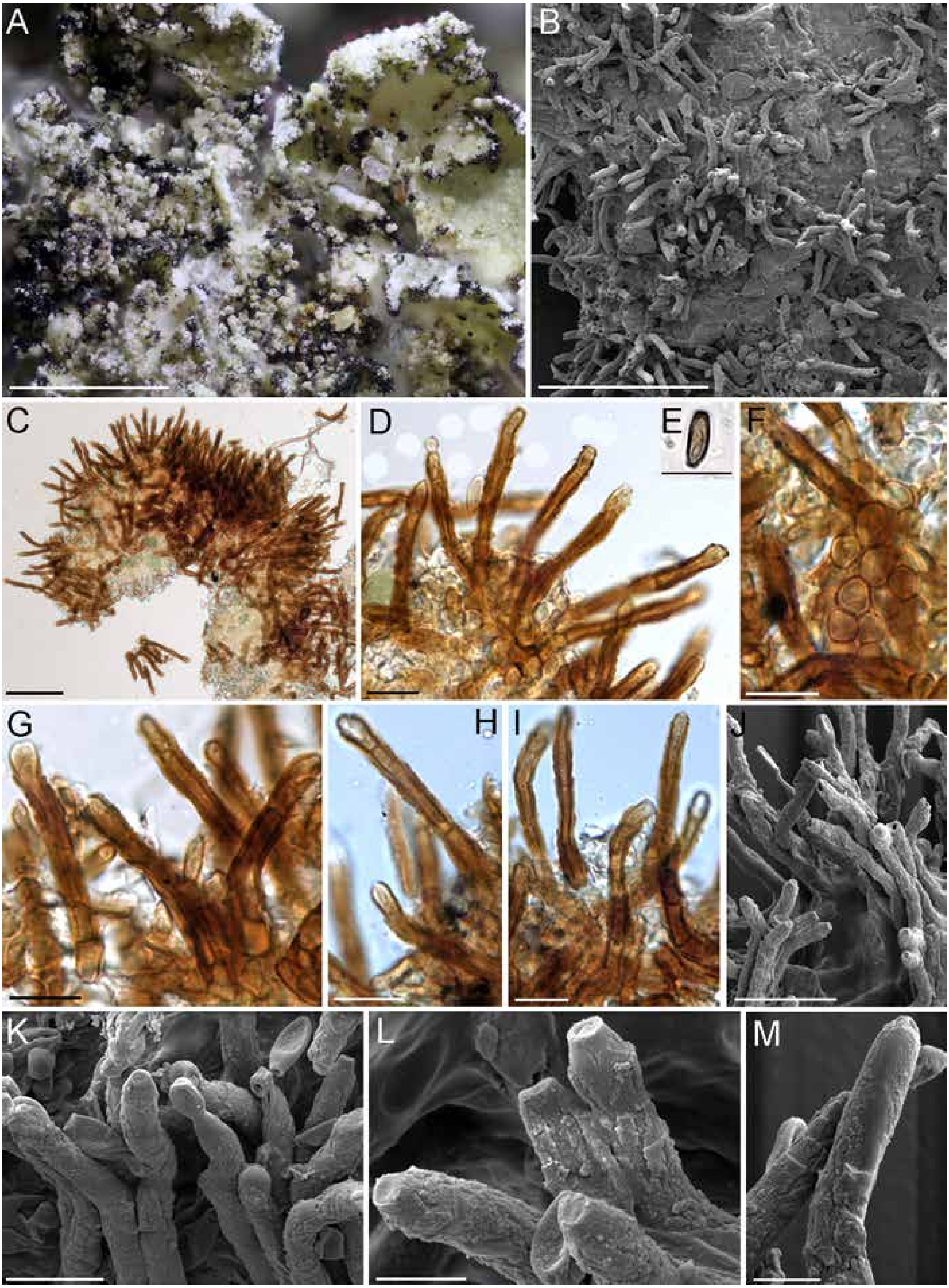

Fig. 115. *Talpapellis beschiana* [A: Diederich 16058; B–M: isotype]. **A.** Macroscopic overview of colonies. **B.** SEM overview of colony. **C, D, G–K.** Conidiophores with several conspicuous, flaring annellations and verruculose or slightly rhagadiose surface. **E.** Conidia. **F.** Stromatically aggregated hyphal cells. **L.** Conidiogenous cells with truncate loci. **M.** Tips of conidiophores. Bars: 1 mm (A) [photo taken by Paul Diederich], 70 µm (B), 50 µm (C), 20 µm (J), 10 µm (D, I), 9 µm (K), 4 µm (L, M).

& Sérusiaux 2000), Norway (Ihlen & Wedin 2006, Nordin *et al*. 2010), Poland (Jando *et al*. 2000, Kukwa *et al*. 2002, Fałtynowicz 2003, Czyżewska 2003a, b, Kukwa 2004, Kukwa & Czarnota 2006, Kukwa & Kowalewska 2007, Kukwa & Jabłońska 2008, Czyżewska *et al*. 2008, Kukwa & Flakus 2009, Kukwa *et al*. 2010), Russia [Franz Josef Land, Kola Peninsula, Murmansk area, Siberia, Taimyr Peninsula, Wrangel Island] (Andreev *et al*. 1996, Karatygin *et al*. 1999, Zhurbenko 1998, 2001, 2007, Zhurbenko & Alstrup 2004, Zhurbenko & Himelbrant 2002, Zhurbenko & Santesson 1996, Zhurbenko & Otnyukova 2001, Kristinsson *et al*. 2006, 2010, Zhurbenko & Braun 2013, Zhurbenko & Kobzeva 2014), Spain (Etayo 2002, van den Boom & Etayo 2014), Svalbard (Zhurbenko & Alstrup 2004, Kristinsson *et al*. 2006, Zhurbenko & Brackel 2013), Sweden (Santesson 1993, Alstrup 2004, Nordin *et al*. 2010), Turkey, UK (Lambley 2000), USA [Alaska] (Zhurbenko & Alstrup 2004, Kristinsson *et al*. 2006, Spribille *et al.* 2010).

Additional specimens examined: **Belgium**: ENE of Zonhoven, nature reserve 'De Teut', on *Cladonia chlorophaea*, 9 Nov. 2001, terricolous in heathland, *P. Diederich* 15020 (herb. Diederich). **Canada**, British Columbia, Mount Revelstocke National Park, Giant Cedars trail, Interior Cedar-Hemlock Zone, 51°05' N, 117°55' W, alt. 900 m, corticolous on branch of *Pseudotsuga menziesii* in open oldgrowth forests, on *Cladonia* sp., 18 Jul. 2002, *T. Goward 02-508* (UBC) & *M. Zhurbenko* (herb. Diederich). **Estonia**, Ida-Viru county, Agusalu Landscape Reserve, Kivinõmme forestry, forest square 164/3 & 6, 59°07'42" N, 27°36'22" E, *Oxalis-Myrtillus* site type spruce forest, on *Cladonia* sp., on *Betula pendula*, 2 Aug. 2006, *A. Suija 22* (TU-45016); Remniku forest, forest square 117/14, 59°02'20" N, 27°30'26" E, drained swamp spruce forest, on *Cladonia* sp., growing on stump, 3 Aug. 2006, *A. Suija 53* (TU-45017). **France**, Deville, bord de la route au nord du village, sur la rive gauche de la Meuse, on *C. cyathomorpha*, 1 May 1999, *P. Diederich 16110* (herb. Diederich); ibid., on *C. scabriuscula*, 1 May 1999, *P. Diederich 16106* (herb. Diederich). **Germany**, Bavaria, Oberpfalz, Koppeter Brühl, Schwarzenbach/Pessarth, Rohhumus an sandiger Böschung im lichten Kiefernwald, 6238/3, alt. 440 m, on *C. chlorophaea*, 12 Dec. 2004, *W. v. Brackel* (herb. Brackel 2845); Baden-Württemberg, Odenwald, Sandsteinodenwald, TK 6420-1, Friedhof von Schöllenbach, alt. 290 m, on *C. pyxidata s. lat.*, 13 Jun. 2006, *R. Cezanne 7382* (herb. Cezanne-Eichler); Baden-Württemberg, Odenwald, Sandsteinodenwald, TK 6420-1, Friedhof von Schöllenbach, alt. 290 m, on *C. pyxidata s. lat.*, 13 Jun. 2006, *R. Cezanne 7382* (herb. Cezanne-Eichler); Baden-Württemberg, Odenwald, NSG "Morsklinge" N von Moosbrunn, alt. 300 m, Sandstein-Odenwald, on *C. uncialis*, 18 Sep. 1998, *R. Cezanne & M. Eichler 7177* (herb. Cezanne-Eichler). **Luxembourg**, same locality as type, 13 Apr. 2005, *P. Diederich 16058* (herb. Diederich); Moulin de Bigonville, Hochfels, sur des rochers siliceux, on *C. floerkeana*, 8 May 2007, *F. Kuborn* (herb. Diederich); Bockholtz (près de Goesdorf), crête rocheuse au nord du village, alt. 400 m, sur de la terre siliceuse, sur une crête, on *C. pyxidata* ssp. *pyxidata*, 24 May 1995, *P. Diederich 12265* (herb. Diederich); Berdorf, Binzeltschlëff, alt. 340 m, sur un rocher en grès, on *Cladonia* sp., 30 Apr. 1992, *P. Diederich 4801* (herb. Diederich). **Russia**, Murmansk Region, Kola Peninsula, Khibiny Mts., Kukisvumchorr Mt., 67°40' N, 33°41' E, alt. 350 m, sparse birch forest, on *C. coccifera*, 15 Aug. 1997, *M. Zhurbenko 9718* (LE 207578); Karelia Keretina, Kandalaksha Gulf, Medyanka Is., 66°18' N, 33°51' E, elev. 5 m, open tundra-like vegetation (luda), on *C. coccifera*, 7 Nov. 2000, *D. Himelbrant* (LE); Tuva Republic, Todzhinskaya Depression, Akademika Obrucheva Range, Big Yenisey River basin, upper stream of Dugdu River, 52°07' N, 98°02' E, alt. 1880 m, mountain tundra, on *C. pleurota*, 23 Jul. 1999, *N.I. Molokova* (LE 210260); Arkhangel'sk Region, Franz Josef Land, Hooker Is., Cape Sedov, ca. 80°20' N, 53°00' E, alt. 100 m, on *C. stricta*, 2 Aug. 1930, *V.P. Savicz 6 b* (LE 207577); Krasnoyarsk Territory, north of Central Siberia, Taimyr Peninsula, near NW shore of Pyasino Lake, Nyapan hills, 70°05' N, 87°40' E, alt. 80 m, slope of Ladanakh Lake depression, stone field with dwarf shrub-lichen-moss tundra patches, on *Cladonia* sp., 24 Jul. 1983, *M. Zhurbenko 83143* (LE 207575). **Sweden**, Härjedalen, Tännäs par., Mt. Ramundberget, eastern slope, ca. 1 km S of hotel Ramundberget, alt. 800–900 m, on a decaying stump in the subalpine birch forest, on *C. digitata*, 4 Sep. 1970, *R. Santesson 22688* (UPS). **Spain**, País Vasco, Gipuzkoa, Leitzaran, frontiera Leiza-Berasategi, área recreativa Urtoko Zubieta, vallonata con alisos, fresnos, Robinia y viejos y decorticados castaños, 43°05'54" N, 1°56'56" W, alt. 410 m, on *C. parasitica*, on *Castanea*, 30 May 2010, *J. Etayo 26043* (herb. Etayo); Cáceres, near Losar de la Vera, 40°5'40.40" N, 5°33'13.8" O, *Cistus ladanifer*, on *C. subturgida*, 14 Dec. 2014, *R. Pino Bodas* (H 7032438); Toledo, road between Sevilleja de la Jara and Puerto Rey, 100 m before deviation from Minas de Santa Quiteria, 39°28'42" N, 5°0'12" E, 900 m alt., *Quercus ilex* ssp. *ballota* and *Quercus suber* with reafforestation of *Pinus pinaster*, quartzite rocks, on *C. humilis s. lat.*, 20 Dec. 2014, *R. Pino Bodas* (H 7032447, 7032470). **Turkey**, Kastamonu, Senpazar, Senpazar'ın güeydoğusu, 41°49'493"N, 33°14'999"E, 460 m alt., *Pinus nigra*, on *Cladonia* sp., *M. Kocakaya 807b* (H 7032264). **UK**, East Sutherland, ca. 6 km WSW of Dornoch, Cuthill Links, on *C. uncialis*, 21 Aug. 1983, *B.J. Coppins et al. 9850* (E); ca. 6 km WSW of Dornoch, Cuthill Links, on *C. zopfii*, 21 Aug. 1983, *B.J. Coppins et al. 9851* (E). **USA**, California, SW of Monterey, 17-Mile Drive, Crocker Grove, alt. 15 m, 36°34'40" N, 121°58'20" E, on *Cladonia* sp., on *Cupressus macrocarpa*, 19 Jul. 2008, *P. Diederich 16793 & D. Ertz* (herb. Diederich).

Notes: Already in the original description of *Taeniolella beschiana*, Diederich (1992) raised doubts about the true affinity of this species to the genus *Taeniolella*, but placed it nevertheless in the latter genus in the absence of an alternative genus. Re-examinations of numerous collections and recent reassessments of the genera *Ameroconium* (Zhurbenko & Braun 2013) as well as *Talpapellis* (Alstrup & Cole 1998) led to the conclusion that *Ameroconium cladoniae* and *Taeniolella beschiana* are conspecific, and that this species has to be reallocated to *Talpapellis* in its current, revised sense. *Ameroconium* was introduced for a dematiaceous hyphomycete characterised by having conidiophores with numerous, conspicuous annellations connected with the formation of conidiogenous cells and conidia. These features clearly distinguish *Ameroconium* from *Taeniolella* and justify two separate genera. However, detailed morphological re-examination of type material of *A. cladoniae* and of type material and numerous additional collections of *T. beschiana* revealed that *A. cladoniae* falls within the variation of *T. beschiana* and has to be considered a heterotypic synonym. On the other hand, *Talpapellis* has been a neglected and misinterpreted genus until its recent revision and reassessment by Heuchert *et al*. (2014). Obvious annellations connected with the formation of conidiogenous cells and the conidiation are striking characters of *Talpapellis* that represent significant differences in comparison with *Taeniolella*. But just this type of proliferation and conidiation agrees with the original concept of *Ameroconium*, so that *Ameroconium* is better reduced to synonym with *Talpapellis*, and *T. beschiana* accordingly reallocated to the latter genus.

Taeniolella beschiana is confined to hosts of the genus *Cladonia* (*Lecanorales*), whereas all other species assigned to *Talpapellis* have hosts of other genera (*T. peltigerae* var. *peltigerae*, *T. peltigerae* var. *rossica*, *T. solorinae* on hosts belonging to the *Peltigerales*). *Taeniolella beschiana* and *T. peltigerae* are two similar species, but conidiophores of *T. beschiana* are usually unbranched or only occasionally branched, mostly in the lower part, or a few conidiophores may arise from a single basal cell, conidiogenous cells have usually a single conidiogenous locus, ramoconidia are lacking, and the conidia are usually aseptate, 4–13(–15) × 2–5(–5.5) µm, width on average < 4 µm [vs. conidiophores usually unbranched, conidiogenous cells with a single or up to four conidiogenous loci; ramoconidia present, and aseptate conidia very similar in shape and size, (3–)5.5–7(–8) × (2–)2.5–4(–4.5) µm in *T. peltigerae*].

Annellations may occasionally occur in some lichenicolous species of the genus *Taeniolella*, *e.g.*, *T. diederichiana*, *T. punctata*, and *T. phaeophysciae*, but they are rather results of spontaneous rejuvenations, distantly formed and not connected with formations of conidiogenous cells and conidiation.

The host species in the type collection of *Taeniolella beschiana* is *Cladonia cyathomorpha* and not *C. chlorophaea* as stated in the original paper.

Talpapellis beschiana is rather common and widespread, but possibly often overlooked due to its little size (Kukwa & Czarnota 2006, Kukwa & Kowalewska 2007). According to Montijūnaitė & Andersson (2003), it is one of the most common cladoniicolous fungi, which is confined to *Cladonia* in general, but undoubtedly not to particular species. In a single collection from Estonia, Suija (2005) observed solitary, scattered conidiophores on basidiomata of *Tremella cladoniae* growing on *C. cariosa*. *Tremella cladoniae* causes galls on various *Cladonia* species. Thus, it is likely that *T. beschiana* was able to grow on the *Cladonia* as well as the galls caused by the *Tremella*. In one case, Montijūnaitė & Andersson (2003) found this fungus together with an undescribed pyrenomycete, probably belonging to the genus *Trichosphaeria*. The fungus was found on *Cladonia botrytes* about 1000 m a. s. l. growing on a decaying stump of *Pinus sylvestris* by Ihlen & Wedin (2006) who provided a brief morphological description with dimensions of conidiophores and conidia within the variability of the species. Jando *et al.* (2000) observed only aseptate conidia.

According to Diederich (1992), *T. beschiana* is parasymbiotic or weakly parasitic. The host thallus is usually not discoloured by this fungus, which may develop on podetia as well as mainly marginally on both sides of squamules (Diederich 1992, Diederich & Sérusiaux 2000, Zhurbenko & Otnyukova 2001, Montijūnaitė & Andersson 2003, Zhurbenko & Alstrup 2004, Suija 2005, Brackel 2007), and in the basal part of podetia and their old, nearly destroyed, sorediate portions (Kocourková 2000). The maximum length of conidiophores (up to 70 µm) was observed in a collection from the Czech Republic by Kocourková (2000).

Taeniolella cladinicola is another cladoniicolous species that is also confined to *Cladonia* in general, but undoubtedly not to particular species. *T. cladinicola* and *Talpapellis beschiana* have only *C. uncialis* as common host species. Both species are morphologically very similar (Kocourková 2000). The conidiophores and conidia in *T. beschiana* are often somewhat narrower (conidiophores 11–70 × 3–6 µm vs. 14–72(–103) × 5–7 µm in *Taeniolella cladinicola*; 1-septate conidia 7.5–11 × 3–5 µm vs. 9–19 × 4–6 µm in *T. cladinicola*). Two-septate conidia, which are occasionally formed in *T. cladinicola*, were not observed in *Talpapellis beschiana*. However, the main feature distinguishing *T. cladinicola* and *Talpapellis beschiana*, in addition to the lack of flaring annellations directly connected with the holoblastic conidiogenesis in *Taeniolella cladinicola*, is that the infected parts of *T. cladinicola* turn reddish or purplish brown, and the host surface becomes dark brown and necrotic by the initiated conidial formation. In *Talpapellis beschiana* the thallus is usually not discoloured. In the latter species, the colonies are usually densely caespitose, whereas in *T. cladinicola* the conidiophores are formed singly or the colonies are loosely caespitose.

Taeniolella strictae, known only from the type collection on *Cladonia stricta*, is easily distinguishable from *Talpapellis beschiana* by forming a superficial mycelium, composed of subglobose or globose, monilioid cells with irregularly rough walls, usually with fine net-like cracks or with squamules which are up to 2 µm wide.

Taeniolella bhagavatiense B.S. Reddy *et al.*, *J. Indian Bot. Soc*. **76**: 173. 1997.

Illustrations: Reddy *et al*. (1997: 174, fig. 2).

Original description (Reddy *et al*. 1997): *Colonies* effuse, punctiform, velvety, reddish. *Mycelium* superficial composed of reddish, branched, septate, smooth, 3–4 µm thick hyphae. *Conidiophores* semi-macronematous, mononematous, short, pale brown, sometimes indistinguishable from the hyphae, 1–2-celled, 5–10 µm long, 3–5 µm broad. *Conidiogenous cells* monoblastic, integrated, terminal, pale to dark reddish brown. *Conidia* cylindrical or doliiform, smooth, dark reddish brown, in simple or rarely branched chains, 9–16-septate, euseptate, branches arising from any terminal cell of the conidium. The basal and apical cell sub-hyaline or less pigmented, 30–90 µm long, 7–15 µm broad.

Holotype: **India**, Karnataka, Bhagavati, on unidentified wood, 26 Nov. 1987, *B.S. Reddy* (V.M.R.L. 1130) [according to the original description, type material (isotype) has also been deposited at HCIO].

Host range and distribution: On wood; India (Reddy *et al*. 1997).

Notes: The type material from "V.M.R.L." and HCIO was not available. The description and illustration of conidiophores and conidia of *T. bhagavatiense* in Reddy *et al.* (1997) remind one of *Taeniolella lignicola*, which has been reallocated to *Stanjehughesia.* Type material of *S. lignicola* has been re-examined. The morphological characters of this species, especially the formation of micronematous conidiophores, conidia formed singly or in short chains and the vesicle-like apices of the conidia, which are thinner and paler than the conidial body, support the affinity to the genus *Stanjehughesia*. The original description and illustration of the conidiophores and conidia of *T. bhagavatiense* exclude this species from *Taeniolella* and suggest relations to *Stanjehughesia* as well, but a final clarification of the position of this species is only possible on the basis of a re-examination of type material.

Reddy *et al*. (1997) compared this species with *T. rudis* and *T. pulvillus*. However, *T. rudis* has been reallocated to *Sterigmatobotrys* and is morphologically clearly distinguishable from *T. bhagavatiense* by its synanamorph with penicillately branched heads and colourless conidia, which were not described or illustrated in *T. bhagavatiense. T. pulvillus* is also quite distinct by its semi-macronematous to macronematous conidiophores, often several times branched, forming branched complexes in dense tufts.

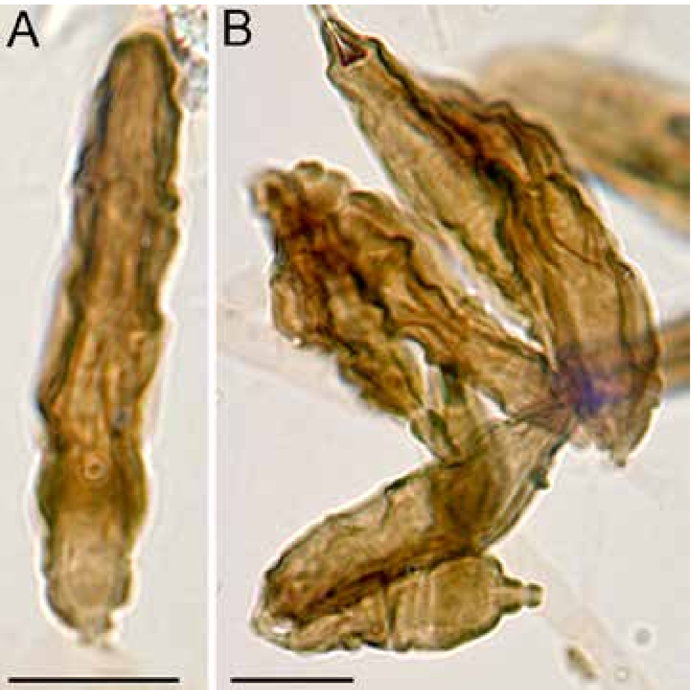

Fig. 116. *Taeniolella bilgramii* [paratype]. **A, B.** Conidia. Bars: 10 µm (A, B).

Taeniolella bilgramii S.S. Reddy & S.M. Reddy, *Mycotaxon* **6**: 508. 1978 = ***Polydesmus elegans*** Durieu & Mont., *Ann. Sci. Nat., Bot.*, sér. 3, **4**: 365. 1845. Fig. 116.

Literature: Shoemaker & Hambleton (2001: 596).

Illustration: Reddy & Reddy (1978: 509, 510, figs 1–2).

Holotype: **India**, Osmansagar, Hyderabad, on phyllodes of *Agave americana*, 23 Oct. 1976, *S.S. Reddy* (in the herbarium of the Botany Department, Kakatiya Univerity, Warangal as KUMH 697).

Material examined: **India**, [“Osmansagar, Hyderabad, on phyllodes of *Agave americana*”], on bark of *Agave americana* 13 Dec. 1976, *S.S. Reddy* H697”] (K(M) 166399**!** = IMI 209947, paratype [as “isotype”]).

Notes: The details on the label of the collection cited by Reddy & Reddy (1978) as ‘isotype’ (IMI 209947) differ from the protologue data given for the holotype collection. Therefore, the designation of this collection as “isotype” was probably a mistake and refers to another specimen that may be considered a paratype.

According to Shoemaker & Hambleton (2001), who examined and re-described *Polydesmus elegans*, *Taeniolella bilgramii* is a heterotypic synonym of the latter species. The morphological characteristics of *T. bilgramii* agree well with those of *P. elegans*, *e.g.*, conidia separated by a thin isthmus (Hernández-Gutiérrez & Sutton 1997), but they do not fit to the features of the genus *Taeniolella*. The synonymy given in Shoemaker & Hambleton (2001) could be fully confirmed on our part on the basis of the examination of authentic material.

Cladophialophora boppii (Borelli) de Hoog *et al.*, *J. Med. Vet. Mycol*. **33**: 345. 1995.

Basionym: *Taeniolella boppii* Borelli [as ‘*boppi*’], *Med. Cutan. Ibero Lat. Amer. Venez*. **11**: 232. 1983.

Literature: de Hoog *et al.* (1995: 345–346), de Hoog *et al.* (2000: 567), Badali *et al*. (2008: 175–191).

Illustration: de Hoog *et al.* (1995: 346, fig. 7), de Hoog *et al.* (2000: 567, ill. 1–2).

Type: from lesions of chromomycosis in the inferior limb of a woman, isolated by Prof. Clovis Bopp (Porto Alegre, Rio Grande do Sul, Brasil) (mycological collection of the medical faculty, Caracas: FMC 292).

Notes: Based on the morphological characteristics (de Hoog *et al.* 1995) and confirmed by molecular phylogeny (Badali *et al*. 2008), the generic affinity of *Taeniolella boppii* to *Cladophialophora* is unequivocal.

Taeniolella caffra Matsush. [as ‘*caffera*’], *Matsushima Mycol. Mem.* **9**: 27. 1996.

Literature: Gulis & Marvanová (1999: 249).

Illustrations: Matsushima (1996: figs F878, F879, P1616, P1617).

Original description (Matsushima 1996): In CMA – Coloniae tarde crescentes, regione centrali fuliginea fertili, circumferentia lata alba leviter breviter floccosa. Hyphae vegetativae non propiae, ramosae, septatae, 1.0–3.5 µm latae, incoloratae, albae in massa. Conidiophora mononematica macronematica, dense dispersa, cylindrica, simplica, 10–65 µm longa 6–8 µm lata, 0–7-septata, distantia inter septa 6–12.5 µm, laevia brunnea, prope apicem non vel leviter angustata, apice truncata, 1–4 conidia in catena blastogena producentia. Cellulae conidiogenae sunt terminales cellulae conidiophorum. Conidia cylindrica, recta vel valde curva, prope basim et prope apicem leviter angustata, 35–155 µm longa, circa medium (parte crassissima) 7–11 µm lata, 3–15-euseptata, distantia inter septa 6–12.5 µm, laevia, brunnea; conidia in catena potius persistentia; liberatio conidialis schizolytica.

Holotype: **South Africa**, Mpumalanga Province, Nelspruit, Sudwala Lodge, wood in Uitsoek hiking trail, on decaying twig in a stream, 18 Sep. 1995, *T. Matsushima* (CMA cultura exsiccata, MFC-5A196).

Host range and distribution: On decaying twig in a stream; South Africa (Matsushima 1996).

Notes: The type material of *T. caffra* was not available. Gulis & Marvanová (1999) compared *T. typhoides* in the discussion of hitherto known aquatic *Taeniolella* species, *viz. T. americana*, *T. aquatilis*, *T. caffra*, and *T. rudis*. *T. longissima* is also known from aquatic habitats, but belongs possibly to the genus *Sterigmatobotrys* (further details and discussion see under *T. longissima*). *Taeniolella caffra* is morphologically very close to *T. typhoides*, since both produce persistent or tardily disintegrating chains of conidia, but the conidia and/or conidial chains of *T. caffra* are more curved (Gulis & Marvanová 1999) and the conidial wall is always smooth.

The saprobic *Taeniolella curvata* is also very similar to *T. caffra*. The conidial chains in both species are falcate to sigmoid but the smooth conidia in *T. caffra* are usually wider than the conspicuously verrucose conidia in *T. curvata* (10–210 × 5–7 µm in *T. curvata* vs. 35–155 × 7–11 µm in *T. caffra*). Additionally, both species differ in their habitats.

According to the drawings and illustrations of conidiophores and conidia in Matsushima (1996), it is assumed that *T. caffra* is a genuine species of *Taeniolella s. lat.*, but a final clarification of the position of this species is only possible on the basis of a re-examination of type material.

Taeniolella dichotoma Borowska, *Acta Mycol*. **11**: 63. 1975.
= ***Anavirga laxa*** B. Sutton, *Trans. Brit. Mycol. Soc.* **64**: 407. 1975.

Literature: Descals & Sutton (1976: 272), Hughes (1980a: 2).

Illustration: Borowska (1975: 64, fig. 4).

Holotype: **Poland**, Kampinoski Park Narodowy, Zamczysko, on *Quercus robur*, *A. Borowska*, 29 Apr. 1971 (WA 20597).

Notes: The dichotomously branched conidia, described by Borowska (1975), are the most striking character of *Taeniolella dichotoma* and are unknown in any other *Taeniolella* species. Triradiate and Y-shape or tetraradiate conidia are typical for the genus *Anavirga* (Sutton 1975) with which *T. dichotoma* is congeneric. However, Descals & Sutton (1976) reduced the latter species to synonymy with *Anavirga laxa*, which was also accepted by Hughes (1980a), although there are some differences in the width of conidia [11–14 µm according to Descals & Sutton (1976), but 7.5–11 µm according to Borowska's (1975) original description].

Taeniolella hunanensis Y.L. Zhang & T.Y. Zhang, *Mycosystema* **26**: 192. 2007.

Illustration: Zhang & Zhang (2007: 193, fig. 1).

Original description (Zhang & Zhang 2007): *Colonies* on PDA at 25 °C in 7 d, effuse, pulvinate, dark brown to black, 5–6 cm diameter. *Mycelium* mostly superficial. *Hyphae* pale brown, smooth, branched, 2–3 µm thick. *Conidiophores* macronematous, mononematous, unbranched, erect or flexuous, pale brown, smooth, 0–7-septate, 19–78 µm long, 6–8 µm thick. *Conidiogenous cells* pale brown, monoblastic, integrated. *Conidia* solitary but more commonly in simple (or rarely branched) acropetal chains, cylindrical, long-fusoidal, ellipsoidal or obclavate, straight or flexuous, brown to dark brown, smooth, with 2–42 transverse septa which are relatively thick and dark, often truncate at the ends, 27–296 × 9–14 µm, often seceding with difficulty.

Holotype: **China**, Hunan Province, Zhangjiajie National Silvan Park, isolated from soil, 1 Dec. 2004, *Y. L. Zhang*, (HSAUP051799).

Host range and distribution: Isolated from soil; China (Zhang & Zhang 2007).

Notes: The type material from HSAUP was not available. The description and illustration of conidiophores and conidia of *T. hunanensis* in Zhang & Zhang (2007) remind one of other saprobic *Taeniolella* species, especially *T. stricta*. The conidiophores of the latter species are micronematous to semi-macronematous and reduced to conidiogenous cells. The conidiophores of *T. hunanensis* seem to be macronematous, 19–78 × 6–8 µm. The distinction between hyphae and conidiophores is probably difficult, as suggested by the illustration. The long conidia or conidial chains resemble those of *T. stricta* (2–40-septate, 26–277 × 8–13 µm in *T. stricta* vs. 2–42-septate, 27–296 × 9–14 µm in *T. hunanensis*). Information about the wall thickness and the structure of the cell lumen in conidia are not given in Zhang & Zhang (2007). Both species are distinguishable by substrate and distribution. *T. hunanensis* was isolated from soil in China, and *T. strica* was described from wood collected in the Czech Republic.

The illustration of the basal part of the conidial chain is reminiscent of *T. alta*, another similar saprophytic *Taeniolella* species mainly occurring on *Alnus*. It seems that semi-macronematous conidiophores of *T. hunanensis* are sometimes possibly polyblastic as in *T. alta*. The longest conidia in *T. hunanensis* are up to 296 µm [vs. 120 µm in *T. alta*, see Yurchenko (2001)], but a comparison is difficult as *T. hunanensis* is known only *in vitro* on potato dextrose agar, and under these conditions conidiophores and conidia of hyphomycetes are often longer than *in vivo* (*e.g.*, in *Cladosporium*, see Morgan-Jones & McKemy 1990, Bensch *et al.* 2012). *T. alta* is easily distinguishable from *T. hunanensis* by its often rough-walled, sometimes even verrucose conidiophores and conidia.

Taeniolella hunanensis is probably a genuine saprobic species of *Taeniolella s. lat.*, but a final clarification of the generic affinity of this species is only possible on the basis of a re-examination of type material.

Taeniolella indica Desai, *Doctoral Thesis, University of Poona.* 1974 (not effectively published).

Literature: Varghese & Rao (1980: 51).

Type: unclear.

Notes: The name *Taeniolella indica* was cited by Varghese & Rao (1980) within a table comparing Indian *Taeniolella* species. As literature reference they cited "Desai, Doctoral Thesis, University of Poona, 1974", which refers to an unpublished thesis. The name is, according ICN Art. 29, not effectively published. Desai's thesis was not available and has never been published.

According to Varghese & Rao (1980), the conidiophores of *T. indica* are 4–10.5 × 3–5 µm, and the conidia are unbranched, 40–71.5 × 15–21 µm, and 4–11-septate.

Taeniolella jasminicola Subhedar & V.G. Rao, *Biovigyanam* **1**: 195. 1975, *nom. nud.*

Literature: Varghese & Rao (1980: 51).

Holotype: **India**, Maharashtra, Bhimashankar, on stems of *Jasminum malabaricum*, 2 Dec. 1973, *A.W. Subhedar* (AMH 2742).

Host range and distribution: On *Jasminium malabaricum*; India (Bilgrami *et al*. 1991).

Notes: Subhedar & Rao (1975) listed the results of a mycological survey, undertaken between 1971 and 1974 at various localities in Maharashtra and Karnataka, in an annotated list. However, Latin diagnoses for all new species are missing in this publication, while the authors mentioned that they should be provided elsewhere, possibly referring to Subhedar (1977) [unpublished doctoral thesis], which, according to ICN Art. 29, does not constitute an effective publication. The type material of *T. jasminicola* was not available.

Varghese & Rao (1980) listed the fungus within a table and compared it with other Indian *Taeniolella* species. The conidiophores were described to be 8–16 × 4–6 µm, and the conidia 24–68 × 12–16 µm and 1–13-septate. In comparison with other genuine *Taeniolella* species, the very broad conidia of *T. jasminicola* are unusual. In *Taeniolella* the conidia are usually up to 10 µm wide, only in the saprobic species *T. plantaginis* and *T. stricta* conidia may be up to 13 µm wide, suggesting that *T. jasminicola* is not a true member of the genus *Taeniolella*, but a final clarification of the generic affinity of this species is only possible on the basis of a re-examination of type material.

Corynespora laevistipitata (M.S. Cole & D. Hawksw.) Heuchert & U. Braun, *Herzogia* **19**: 13. 2006.
Basionym: *Taeniolella laevistipitata* M.S. Cole & D. Hawksw., *Mycotaxon* **77**: 334. 2001.

Literature: Zhurbenko *et al*. (2015: 587).

Illustrations: Cole & Hawksworth (2001: 335, fig. 10), Heuchert & Braun (2006: 14, fig. 2; 18, fig. 5G–J), Zhurbenko *et al*. (2015: 588–589, fig. 3–4).

Holotype: **USA**, Minnesota, St. Louis Co., Voyageurs National Park, N side of small bay S of Mukooda lake, Sand point Lake area, on *Pertusaria ophthalmiza*, on *Acer rubrum*, 15 Jul. 1997, *C.M. Wetmore 40239B* (MIN**!**).

Host range and distribution: On *Amandinea punctata*, *Graphis scripta*, *Lecanora chlarotera*, *Lecanora* sp., *Lepra ophthalmiza*, *Pertusaria pertusa*, *Phaeophyscia orbicularis*, *Variolaria hemisphaerica*; Germany (Brackel 2007, 2009, Cezanne *et al*. 2008, Eichler *et al*. 2010, www.flechten-deutschland.de), Japan (Zhurbenko *et al*. 2015), Spain (first report, see specimens examined), USA (Cole & Hawksworth 2001 as *Taeniolella laevistipitata*).

Additional specimens examined: **Germany**, Bavaria, Unterfranken, Kreis Aschaffenburg, E Rohrbrunn im Spessart, NSG Rohrberg, an alter Buche im Buchen-Eichen-Wald, alt. 520 m, 49°53'39.1" N, 09°25'28.0" E, on *Graphis scripta*, 17 Jun. 2006, *W. v. Brackel* (herb. Brackel 4211); Bavaria, Oberpfalz, Hohenfels, Training Area, Wüstung Phillipshof, alt. 430 m, on *Lecanora chlarotera*, on *Juglans regia*, 12 Mai 2004, *W. v. Brackel* (herb. Brackel 2790); *Baden-Württemberg*, Odenwald, Bannwald "Schnapsried" im Röderwald, alt. 260 m, Sandsteinodenwald, on *Carpinus betulus*, 15 Feb. 2002, *R. Cezanne & M. Eichler 6153* (herb. Cezanne-Eichler); Hessen, Südlicher Sandstein-Spessart, Laubwald am Happels-Graben nordöstlich vom Happel, westlich von Seidenroth, alt. 230 m, on *Pertusaria pertusa*, 19 Aug. 2003, *R. Cezanne & M. Eichler 7178* (herb. Cezanne-Eichler); Bavaria, Oberfranken, Kreis Bamberg, NSG Sandgrasheide Pettstadt, alt. 240 m, 49°50'02,0" N. 10°56'52,8" E, on *Phaeophyscia orbicularis*, on *Prunus spinosa*, 1 May 2005, *W. v. Brackel* (herb. Brackel 4210); ibid., on *Phaeophyscia orbicularis*, on *Prunus padus*, 1 May 2005, *W. v. Brackel* (herb. Brackel 2882); Baden-Württemberg, Odenwald, Park von Schloss Waldleiningen, alt. 390 m, Sandsteinodenwald, on *Variolaria hemisphaerica*, 15 Aug. 2004, *R. Cezanne & M. Eichler* 6696 (herb. Cezanne-Eichler). **Spain**, Cataluna, Tarragona, Baix Camp, Mola de Valls, alt. 280 m, on *Amandinea punctata*, on *Quercus coccifera*, 13 Nov. 1987, *M. Guzalt* (K(M) IMI 328720).

Stanjehughesia lignicola (Panwar & Chouhan) Heuchert & U. Braun, **comb. nov.** MycoBank MB819316. Figs 117–118.
Basionym: *Taeniolella lignicola* Panwar & Chouhan, *Curr. Sci*. **46**: 786. 1977.

Illustration: Panwar & Chouhan (1977: 786, fig. 2).

Colonies on dead wood, scattered, conidiophores solitary, inconspicuous, dark brown to black. *Mycelium* superficial and immersed; hyphae flexuous, branched, 2–7 µm wide, septate, slightly constricted at the septa, yellowish brown to brown, smooth, slightly to conspicuously thickened, 0.25–0.5(–0.75) µm. *Stromata* lacking. *Conidiophores* micronematous, reduced to conidiogenous cells, integrated in hyphae, solitary, unbranched, straight, broad ellipsoid, doliiform, subcylindrical, 2–8 × 4–6 µm, aseptate, brown, smooth, wall slightly thickened, to 0.5 µm, monoblastic, mostly with peg-like protuberances giving rise to conidia, loci truncate, unthickened, 2–3 µm diam. *Conidia* usually solitary, seldom in short, unbranched chain of two conidia, straight, rarely slightly flexuous, broad ellipsoid, subcylindrical, broad obclavate, sometimes somewhat attenuated at the tip, 6–11-euseptate, not constricted at the septa, 35–62 × (10–)13.5–18 µm, yellowish brown to dark brown, paler at the apex, smooth, wall thickened, distinctly multilayered, 1–2.5 µm thick, apex rounded to slightly narrowed, frequently vesicle-like, sometimes inconspicuous, but often very evident, thin-walled, pale brown to subhyaline, 5–7 × 6–7 µm, at the base of the vesicle-like structures outer wall seemingly cracked and with obvious sheath-like wall remnants visible as irregular fringe, vesicles may collapse, base of conidia truncate, slightly narrowed, hila truncate, unthickened, not darkened, 5–8(–10) µm diam.

Holotype: **India**, Rajasthan, Mount Abu, on dead wood, Sep. 1974, K.S. Panwar & J.S. Chouhan JU/Bot/427 (K(M) 166407 = IMI 189377**!)**. *Isotype*: University of Jodhpur, Dept. of Botany, Herbarium.

Host range and distribution: On dead wood; India (Panwar & Chouhan 1977, Varghese & Rao 1980, Bilgrami *et al.* 1991); known only from the type specimen.

Notes: Panwar & Chouhan (1977) described conidia with up to 22 transverse septa, formed in short simple or branched chains and placed this species in *Taeniolella*. The latter genus is characterised by its semi-macronematous to macronematous, seldom semi-micronematous conidiophores (*e.g.*, in *Taeniolella friesii*). Micronematous conidiophores reduced to conidiogenous cells, integrated in plagiotropous hyphae with peg-like conidiogenous protuberances are unknown in *Taeniolella* species. However, such micronematous conidiophores are known from species of several other genera, *e.g.*, *Lylea*, *Linkosia* and also *Henicospora*, but in these genera the conidia are distoseptate (Seifert *et al.* 2011). Conidia of the present species are, however, euseptate and usually formed singly, only occasionally in short, unbranched chains. Absent or reduced conidiophores and euseptate conidia are characteristic for species of the genus *Stanjehughesia*, in which ‘discrete’ conidiogenous cells are mostly lageniform,

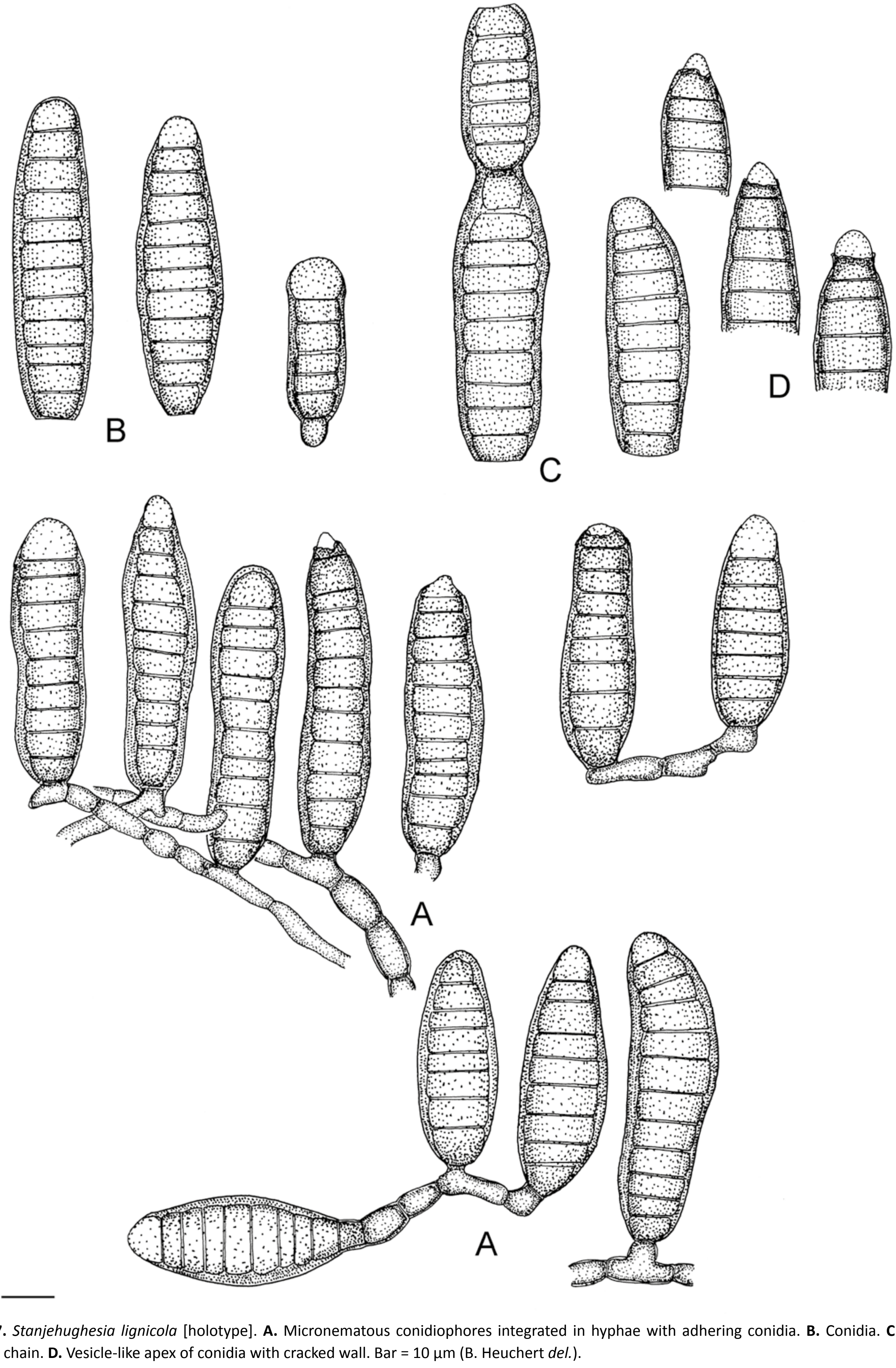

Fig. 117. *Stanjehughesia lignicola* [holotype]. **A.** Micronematous conidiophores integrated in hyphae with adhering conidia. **B.** Conidia. **C.** Short conidial chain. **D.** Vesicle-like apex of conidia with cracked wall. Bar = 10 µm (B. Heuchert *del.*).

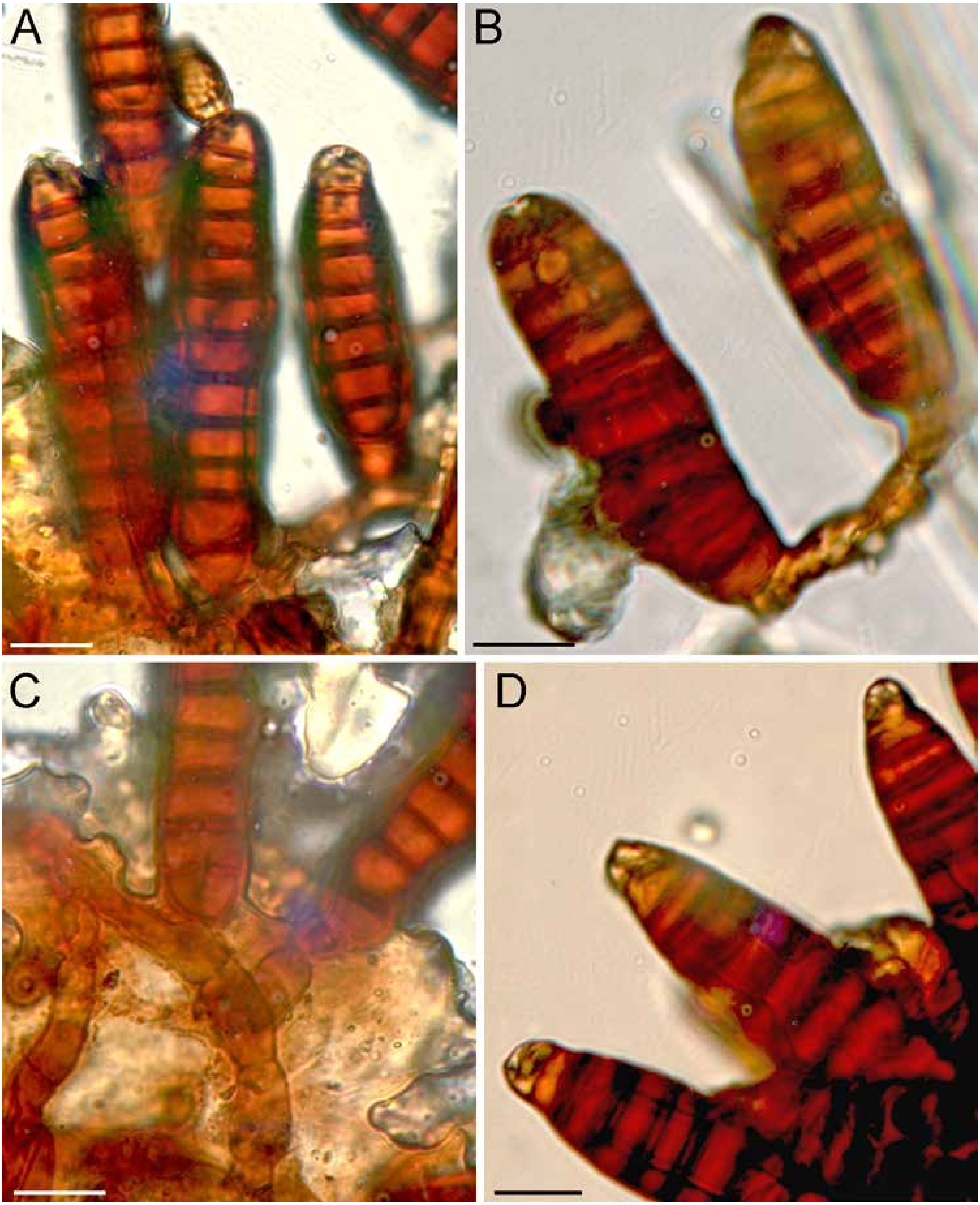

Fig. 118. *Stanjehughesia lignicola* [holotype]. **A–C.** Micronematous conidiophores integrated in hyphae with adhering conidia. **D.** Vesicle-like apex of conidia. Bars: 10 µm (A–D).

ampulliform, doliiform or cylindrical. Conidiogenous cells in *T. lignicola* are integrated (intercalary) in plagiotropous hyphae with peg-like protuberances giving rise to conidia. Similar structures have been illustrated for *Stanjehughesia minima* (Wu

& Zhuang 2005). Very similar intercalary conidiogenous cells have been described in the recently introduced genus *Houjia* (Yang *et al.* 2010). However, the latter genus is characterised by having variable conidiogenesis, holoblastic to phialidic, and conidia with dark brown hila. *Stanjehughesia* is characterised by conidia formed singly. Panwar & Chouhan (1977) described the conidia of *T. lignicola* to be formed in short, simple or occasionally branched chains. However, re-examination of type material showed that conidia of this species are usually formed singly and only very rarely in short (up to two conidia) unbranched chains. The description of usually catenate conidia in Panwar & Chouhan (1977) may be influenced by their assumption that the species concerned might belong in *Taeniolella*, a genus characterised by forming conidia in acropetal chains. Conidia occasionally formed in short chains in species with usually solitary conidia or particular species with catenate conidia in genera characterised by species with predominantly solitary conidia are not uncommon, *e.g.*, in *Corynespora* and *Exosporium* (Ellis 1971) or in several cercosporoid genera such as *Cercospora* and *Pseudocercospora* (Braun 1995, Crous *et al.* 2012). The conidial shape in *Stanjehughesia* spp. is variable, ranging from cylindrical to subcylindrical in *St. larvata*, fusiform to ellipsoidal in *St. minima*, to obclavate-rostrate in *St. vermiculata* (see Wu & Zhuang 2005). The apex of the conidia in *T. lignicola* shows a peculiarity. Conidia have frequently a vesicle-like apex, 5–7 × 6–7 µm, thinner and paler than the conidial body. These structures are sometimes inconspicuous, but mostly evident. At the base of vesicle-like structures the outer wall seems to be cracked, with obvious sheath-like wall remnants visible as irregular fringe, and the vesicles may collapse. Similar vesicle-like structures at the apex of conidia are also known in *Stanjehughesia hormiscioides*, the type species of the genus, and illustrated in Seifert *et al*. (2011: 722, pl. 240D). In other species of the genus, such structures at the conidial apex are not formed, but the tips may be more or less pronounced, often with sometimes paler terminal cell, as for instance in *St. floridensis* (Delgado 2008) and *St. larvata* (Hughes 1974, Wu & Zhuang 2005). Hence, the differences discussed do not constitute any sound basis for a separation of *T. lignicola* and *Stanjehughesia* species at generic rank. *Taeniolella lignicola* does not perfectly fit in the latter genus, but less integrated (intercalary) conidiogenous cells and conidia occasionally formed in very short chains are not in serious conflict with an allocation of this species to *Stanjehughesia.*

Two *Stanjehughesia* species are similar to *St. lignicola*. The ampulliform to obclavate, (0–)1–3(–4)-septate conidiophores of *St. larvata* are often crowded in clusters of up to 25, and they are usually longer and wider than in *St. lignicola* (according to Hughes 1974: 5–25 × 7–9 µm vs. Wu & Zhuang 2005: 8–12.5 × 2.5–3.5 µm). The conidia are similar to those of *St. lignicola*, but somewhat longer, usually slightly narrower and have more septa [(7–)12–21-septate, (35–)60–110 × (9–)11–12(–15) µm vs. 6–11-septate, 35–62 × (10–)13.5–17(–18) µm in *St. lignicola*]. *Stanjehughesia minima* is another similar species, with ampulliform conidiogenous cells, 8–11 × 2–3.5 µm (6–8 µm wide at the base), *i.e.*, somewhat longer and wider at the base than in *St. lignicola* (2–8 × 4–6 µm). The fusiform or ellipsoid conidia are usually narrower (34–48 × 8.5–10 µm) (see Wu & Zhuang 2005). Only three *Stanjehughesia* species have conidia to 17(–20) µm wide, *viz. St. caespitulosa* with cylindrical to subfusiform, to 150 µm long conidia, *St. decorosa* with obclavate, 170–200 µm long conidia, and *St. ventricosa* with obclavate, 108–117(–132.5) µm long conidia (see Delgado 2008 and Marincowitz *et al.* 2008).

The generic concept of *Sporidesmium* and segregated genera has been controversially discussed by Réblová (1999), who preferred to reduce *Stanjehughesia* to a synonym of the latter genus. Wu & Zhuang (2005) and Seifert *et al.* (2011) accepted all segregated genera, including *Stanjehughesia*, which are useful for identification purposes, although Shenoy *et al.* (2006) and Yang *et al.* (2010) showed with molecular analyses that *Sporidesmium s. lat*. and most of these segregated genera are phylogenetically heterogeneous. We prefer to follow the concept of Wu & Zhuang (2005) and Seifert *et al.* (2011) until a more satisfying taxonomic and phylogenetic concept will be available.

Taeniolella longissima R.A. Eaton & E.B.G. Jones, *Mycoscience* **43**: 202. 2002.

Illustration: Jones *et al.* (2002: 203, figs 5–8; 204, figs 11–19).

Original description: *Colonies* on wood forming black shining patches. Acropetal chains of conidia 151–238 µm in length, 4–4.5 µm wide in the constricted region, 9–11.5 µm wide in the broadest region, simple, erect, straight or slightly curved, dark brown, thick-walled, smooth, composed of 3–5 fusoid segments. *Macroconidia* initially aseptate, forming 3–5 fusoid segments but later becoming septate. Macroconidia born in a single, simple, acropetal chain, fusoid, 6–11-septate, dark brown, 42–59 × 4–11.5 µm. "Metulae" are produced at the tip of the macroconidia, hyaline, 9–11 µm long. *Conidiogenous cells* subtended by the "metulae", 20–32 × 2 µm. *Conidia* 42–60 × 2.5–4 µm, hyaline, falcate, fusiform, 2-septate, not constricted at the septa, thin-walled, smooth, apically rounded, basally truncate, forming slimy heads when incubated in damp chambers.

Colonies (from *T. longissima* conidia) on corn meal agar growing slowly, dark gray to brown, forming dark brown chains of macroconidia (Jones *et al.* 2002).

Holotype: **UK**, North Wales, on *Pinus sylvestris* (scots pine) test block exposed for 64 weeks in the pond of a water-cooling tower at Connah's Quay power station, 1963, *R.E. Eaton* (K(M) 166309 = IMI 386835**!**).

Host range and distribution: On *Pinus sylvestris*; UK (Jones *et al.* 2002).

Notes: Holotype material of *Taeniolella longissima* deposited at K (Kew) has been examined but proved to be morphologically indistinguishable from *Sterigmatobotrys rudis*, which is a reallocation of *Taeniolella rudis* proposed by Ertz *et al*. (2016). Additional material of *T. longissima* was unfortunately not available. The problems around the type material of *T. longissima* are unresolved and unclear. On the other hand, the description, drawing and original micrographs of this species in Jones *et al*. (2002) are detailed and clearly support that a separate species was involved. The macroconidia of *St. rudis* and *T. longissima* are hardly distinguishable, except for narrower constricted regions of conidial chains in *T. longissima* (4–6 µm in *St. rudis* vs. 4–4.5 µm in *T. longissima*). However, the two species can easily be discriminated by differences in the sterigmatobotrys-like synanamorphs, which are also formed in *St. rudis*. Conidiophores of this morph in *St. rudis* are shorter and wider (8–15 × 4–5 µm, vs. 20–32 × 2 µm in *T. longissima*) and conidia in *T. longissima* are significantly longer and narrower (42–60 × 2.5–4 µm, vs. 15–25 × 4–5(–6.5) µm in *St. rudis*). Therefore, we prefer to maintain *T. longissima* tentatively as a separate species. It can be assumed that the species originally described as *Taeniolella longissima* also belongs to *Sterigmatobotrys*. However, *T. longissimima* is in need of being verified as existing species by new specimens that could serve as basis for a neotypification. For the interim, a reallocation of *T. longissima* to *Sterigmatobotrys* is not possible and not justified, so that this species is tentatively listed as doubtful and unclear.

Taeniolella phialosperma Ts. Watan., *Mycologia* **84**: 478. 1992.

Literature: Watanabe (2002: 420; 2010: 216).

Illustrations: Watanabe (1992: 479, fig. 1; 480, figs 2–8; 482, figs 9–16; 2002: 420, figs; 2010: 360, figs DT1 a–h; 368, fig. DT9 a).

Original description (Watanabe 1992): Colony diam on PDA after incubation for 2 d at 34 °C, 66–70 mm; at 25 °C, 48–55 mm, at first dark yellowish green, soon becoming dark grey, often covered with golden yellow aerial hyphae, reverse dark green to black. Mycelium superficial or immersed, composed of branched, septate, pale brown or brown, smooth, rough, often verrucose, 3.7–8 µm hyphae.

Taeniolella morph: Conidiophores semi-macronematous, solitary, hyaline, subhyaline to brown, erect, simple, up to 375 µm tall, sometimes proliferating percurrently. Phragmospores produced holoblastically, brown to dark brown, clavate, ellipsoidal, or cylindrical, often with an apical hyaline or subhyaline papillate or blastic cell, truncate basally occasionally pedicellate, 1- to 32-septate transversely but very rarely 1-septate longitudinally, 35–315 × 9–26 µm, single or catenulate, extruded in long chains of up to nine conidia, simple or branched, often surrounded with hyaline or subhyaline membranous sheath-like structure which is complete, partially broken or lacking.

Phialophora morph: Conidiophores simple or branched, often verticillate, hyaline or subhyaline, up to 97.2 µm tall, produced directly from hyphae or phragmospores, terminating in a phialide with spore masses; phialides constricting of cylindrical venter and tapering apex, 6.2–17.5 × 2–3.8 µm; collarette conspicuous, obconical, 0.2–1.3 µm deep, 2–4.5 µm wide at margin, occasionally proliferated percurrently. Phialoconidia hyaline or subhyaline, globose, smooth, 1-celled, often apiculate, usually 1-guttulate, 2–3 µm in diam.

Holotype: **Japan**, Kurayoshi, Tottori, culture from rhizosphere soil of *Fragaria ×ananassas* (≡ *F. chiloensis* var. *ananassa*), 1 Nov. 1973, *T. Watanabe* [TW 73-466] (TFM).

Host range and distribution: Japan.

Notes: Watanabe (2010) listed an additional collection [Japan, Hachijo-jima, Tokyo, culture from paddy field soil, 12 Nov. 1970, T. Watanabe, TW 70-1070 (TFM)] as *Taeniolella* sp., *i.e.*, it was no longer referred to as *T. phialosperma*.

Ertz *et al*. (2016) mentioned that *Taeniolella phialosperma* was isolated from strawberry rhizosphere soil in Japan (Watanabe 1992), but the nuLSU sequence does not seem to have been included in a phylogenetic analysis in the past. The species was included in the *Sordariales* based on an ITS sequence in the framework of a phylogenetic study of thermotolerant fungi (Liang *et al*. 2011). It was placed in a polytomy with *Sordaria fimicola*, *Thielavia intermedia* and a clade including *Corynascus* div. spp., *Chaetomium* div. spp., *Thielavia* div. spp. and *Humicola fuscoatra*. A similar ITS sequence was obtained from an isolate of orchid roots in southwestern China (Huang & Zhang 2015).

The descriptions and illustrations in Watanabe (2002, 2010) are consistent with the original description in Watanabe (1992). The type material from TFM (Watanabe TW 73-466, culture) was not available for a re-examination. The combination of morphological features (*e.g.*, phialophora-like synasexual morph; clavate, ellipsoidal or cylindrical large phragmospores often with an apical hyaline papillate or blastic cell) is unusual for *Taeniolella s. str.* and, along with the phylogenetic results, justifies the exclusion of this species from *Taeniolella*. However, the true generic affinity remains unclear and a re-examination of type material with more detailed molecular analyses and using a larger dataset of taxa of the *Sordariales* is required.

Taeniolella ramagiriensis V.G. Rao (unpublished?)

Type: unknown.

Notes: The name *T. ramagiriensis* is listed in Global Names Index (http://gni.globalnames.org), but without any further information.

Taeniolella robusta Mercado, *Acta Bot. Cub*. **21**: 5. 1984.

Literature: Mercado Sierra (1984b: 37), Holubová-Jechová & Mercado Sierra (1984: 118), Heredia Abarca *et al.* (2013: 79).

Illustrations: Mercado Sierra (1984a: 7, fig. 4; 1984b: fig. 3), Heredia Abarca *et al.* (2013: 78, figs 15, 15a).

Original description (Mercado Sierra 1984a): Coloniae effusae, atro-brunneae, velutinae. Mycelium in substrato immersum. Conidiophora semi-magnifilamentosa, unifilamentosa, caespitosa vel solitaria, simplicia, brevia, crassa, atro-brunnea, laevia, 9–15.5 µm ad basim crassa. Cellulae conidiogenae monoblasticae, integrae, terminales, cylindricae vel doliiformia. Conidia catenulata (2–4), recta vel flexuosa, cylindrica, cum apice rotundato, ad basim truncata, ellipsoidea vel obclaviformia, atro-brunnea, laevia; cellulis extremis pallidioribus, 3–12 septatis cum septis transversalibus fuscatis et constrictis, 20–88 (31–56) × 7.5–12.7 (9–11) µm.

Holotype: **Cuba**, Pinar del Rio, Loma El Salón, Sierra del Rosario, on dead branches, 18 Mai 1977, *A. Mercado 2498* (HAC).

Host range and distribution: On dead branches; Cuba (Holubová-Jechová & Mercado Sierra 1984, Mercado Sierra 1984a, b, Mercado Sierra & Mena Portales 1995, www.cybertruffle.org.uk), Mexico (Heredia Abarca *et al.* 2013).

Notes: The type material of *T. robusta* was not available. The original description and illustration of the conidiophores and conidia in Mercado Sierra (1984a) and the description of material from Mexico in Heredia Abarca *et al.* (2013) exclude this species from *Taeniolella* and rather suggest a relation to the *Sporidesmium* complex, but a final conclusion requires a re-examination of the type material.

Sterigmatobotrys rudis (Sacc.) Heuchert *et al.*, *Fungal Biology* **120**: 1423. 2016. Figs 119–120.
Basionym: *Septonema rude* Sacc., *Michelia* **1**: 270. 1878.
Synonyms: *Dendryphion curtipes* Ellis & Barthol., *Erythea* **4**: 82. 1896, as '*Dendryphium*' [*syntypes*: **USA**, Kansas, Rooks Co., on the underside of an old hog trough, 20 Dec. 1894, *E. Bartholomew 1612* (NY 313420, 883692, 883693, 883694; ILLS 34804)].
Brachycladium curtipes (Ell. & Barth.) A.L. Smith, *J. Bot.* **41**: 259. 1903.
Taeniolella rudis (Sacc.) S. Hughes, *Canad. J. Bot*. **36**: 817. 1958.

Misapplied name: *Septonema hormiscium* Sacc. *sensu* Hughes (1952).

Literature: Hughes (1952: 11, 1980c: 1–2), Matsushima (1975: 132 as *Septonema hormiscium*), Ellis (1976: 60), Révay (1988: 98), Ellis & Ellis (1997: 64), Kalgutkar (1997: 304), Mel'nik (2000: 309), Jones *et al.* (2002: 201), Catania & Romero (2009: 46), Wang (2010: 191), Simón (2011: 326).

Illustrations: Saccardo (1881: tab. 921), Hughes (1952: 11, fig. 3), Matsushima (1975: F837, P1317 as *Septonema hormiscium*), Ellis (1976: 60, fig. 42C), Hughes (1980c: 1, figs 1–7), Révay (1988: pl. 3, fig. 2), Caretta *et al.* (1992: 337, fig. 17), Ellis & Ellis (1997, fig. 225), Kalgutkar (1997: 208, pl. 2, fig. 9), Mel'nik (2000: 308, fig. 216), Jones *et al.* (2002: 202, figs 1–4; 204, figs 9–15), Catania & Romero (2009: 46, fig. 2A), Esquivel (2009: figs 1–2), Chavarria *et al.* (2010: 737, figs 11–12), Simón (2011: 327, fig. 116 A–C), Ertz *et al*. (2016: 1425; fig. 3, 1426, fig. 4).

Description: *Colonies* scattered over the substrate, thin to densely caespitose, effuse, black, slightly shiny, long chains of conidia visible when using a stereomicroscope, erect, in small tufts or procumbent on the substrate. *Mycelium* immersed, sometimes superficial; hyphae straight to flexuous, branched, 1–4.5 µm wide, rarely septate, not constricted at the septa, subhyaline to pale brown, smooth, wall unthickened. *Stromata* lacking. *Conidiophores* macronematous, mononematous, solitary or aggregated in groups of up to 14, arising from hyphae, terminal or lateral, or from more or less isodiametric hyphal cells, often not very evident, erect, straight, ovoid, obclavate to ellipsoidal with a bulbous or rounded base, unbranched, (27–)30–45 × (8–)10–13 µm, 4–6(–8)-septate, not constricted at the septa, smooth, wall thickened, up to 1 µm, dark brown, not enteroblastically proliferating, in morphology and pigmentation the conidiophores are almost indistinguishable from conidia but the conidiophores are usually attached to the substrate and only rarely detached. *Conidiogenous cells* integrated, terminal, monoblastic, monopodial, subcylindrical or doliiform, 4–10 µm long, little differentiated; loci truncate, 4–5(–6) µm diam. *Conidia* catenate, in unbranched chains, not easily disintegrating, conidia long-adhering, up to five, chains at least up to 250 µm long, 4–6 µm wide in constricted or narrow segments between single conidia, maximum width (6–)7–13 µm, straight or slightly flexuous, individual conidia obclavate, ellipsoid, fusiform, 28–61 × 7–12(–14.4) µm, 3–12-septate, non-constricted at the septa, septa conspicuously thickened, 1–2.5 µm, distinctly multilayered, (rarely with a longitudinal septum in one of the cells [Hughes 1980c]), dark brown, somewhat paler at the apex, smooth, wall thickened, 1–1.5 µm, apex rounded in primary conidia, conically truncate in secondary ones, base obconically truncate, hila truncate, unthickened, not darkened, 4–6 µm diam.

Synasexual morph: Terminal conidium frequently extended, long, becoming dichotomously branched at the tip, forming hyaline "metulae" in a penicillate head on which conidiogenous cells are formed; "metulae" erect, straight, subcylindrical, 8–15 × 4–5 µm, aseptate, paler brown than the tips of the conidia, smooth, wall slightly thickened, 2–3 conidiophores at the tip of "metulae", doliiform, subcylindrical, 5–13 × (1.5–)2–4.5 µm, aseptate, subhyaline or hyaline, smooth, wall unthickened. *Conidia* solitary, straight, subcylindrical, ellipsoid, 15–25 × 4–5(–6.5) µm, 0–2(–3)-septate, not constricted at the septum, subhyaline, smooth, wall unthickened, plasma slightly granulose, apex rounded, base rounded or slightly truncate, hila neither thickened nor darkened.

Holotype: **Italy**, hab. in lingo putrescente pyrino a Selva, Sep. 1874 (PAD).

Host range and distribution: On *Abies balsamea*, *Bambusa vulgaris*, *Chamaecyparis lawsoniana 'Ellwoodii'*, *Comarum palustre*, *Phragmites australis*, *Picea glauca*, *Podocarpus parlatorei*, *Thuja occidentalis*, on wood of unidentified conifers and on rotten wood; Argentina (Catania & Romero 2009), Canada (Hughes 1980c, Ginns 1986), China (Luo *et al.* 2004), Estonia (Voronin 1992), Hungary (Révay 1988, 1993), Italy (Caretta *et al.* 1992), Kazakhstan (Mel'nik 2000), Mexico (Chavarria *et al.* 2010), Panama (Esquivel 2009), Spain (Simón 2011), UK (Ellis 1976, Jones *et al.* 2002), USA (Hughes 1980c, Wang 2010).

Additional specimens examined: **Hungary**, Comit. Pest, pr. pag. Kismaros, ad ripam rivulis Morgó-patak, on rotten wood, 14 Jan. 1991, *Á. Révay & J. Gönczöl* (BP 85790); Comit. Borsod-Abauj-Zemplén, pr. pag. Trizs in valley Hidegviz-völgy, on rotten wood, 19 Mar. 1991, *Á. Révay* (BP 87662); Comit. Borsod-Abauj-Zemplén, pr. pag. Perkupa in valley Henc-völgy, on rotten wood, 20 Mar. 1991, *Á. Révay* (BP 87663); montes Börzsöny-hegység, ad ripam rivulis Morgó-patak, on rotten wood, 26 Jun. 1991, *Á. Révay* (BP 87661); Comit. Zala, pr. pag. Budafa, on rotten wood, 25 Jul. 2001, *Á. Révay* (BP 96761); Comit. Pest, in opp. Gödöllő/Hortus Botanicus Univ. Sci. Agr., on a pine board lying on the ground, 28 Dec. 1993, *S. Tóth* (BP 90896). **UK**, Cambridgeshire, Cambridge (Botany Field Station), on conifer plank (on the ground), 16 Jul. 1948, *S.J. Hughes* (K(M): 180130 = IMI 31196) (as *Septonema hormiscium*); East Kent, Dungeness, on hardwood plank, 8 Oct. 1963*, B. Sutton & K. Pirozynski* (K(M): 180132 = IMI 102586) (as *S. hormiscium*); South-west Yorkshire, Sheffield, Taptonville Road [illegible], on wood, 7 Feb. 1957, *J. Webster* [ex herb. Sheffield 1918] (K(M): 180131 = IMI 69401) (as *S. hormiscium*); South Hampshire, Portsmouth, Dep. Biological Sciences, on wood, 28 Jan. 1966, *G. Jones* (K(M): 180135 = IMI 117214) (as *S. hormiscium*); South Hampshire, Portsmouth, Dep. Biological Sciences, on wood, 28 Jan. 1966, *G. Jones* (K(M): 180133 = IMI 117213) (as *S. hormiscium*); Cambridgeshire, Cambridge MAFF, on *Chamaecyparis lawsoniana 'Ellwoodii'*, Mar. 1978, *P. Gladders* PC78/0225 (K(M): 180129 = IMI 225745b); Bedfordshire-Cambridgeshire, Little Barford cooling water power station, on test block (*Pinus sylvestris*), 24 Jan. 1962, *R.A. Eaton* (K(M): 180128 = IMI 386834).

Notes: *Taeniolella rudis* and *Septonema hormiscium* are two previously confused names, *e.g.*, by Hughes (1952) and Matsushima (1975). Later, Hughes (1958) reallocated *Septonema rude* to *Taeniolella*, and Hughes (1980c) reported that an examination of the type collection of *S. hormiscium* in herb. PAD proved that this species belongs to *Sporidesmium*.

Even though descriptions and illustrations of conidia of *T. rudis* in Matsushima (1975), Ellis (1976), Ellis & Ellis (1997),

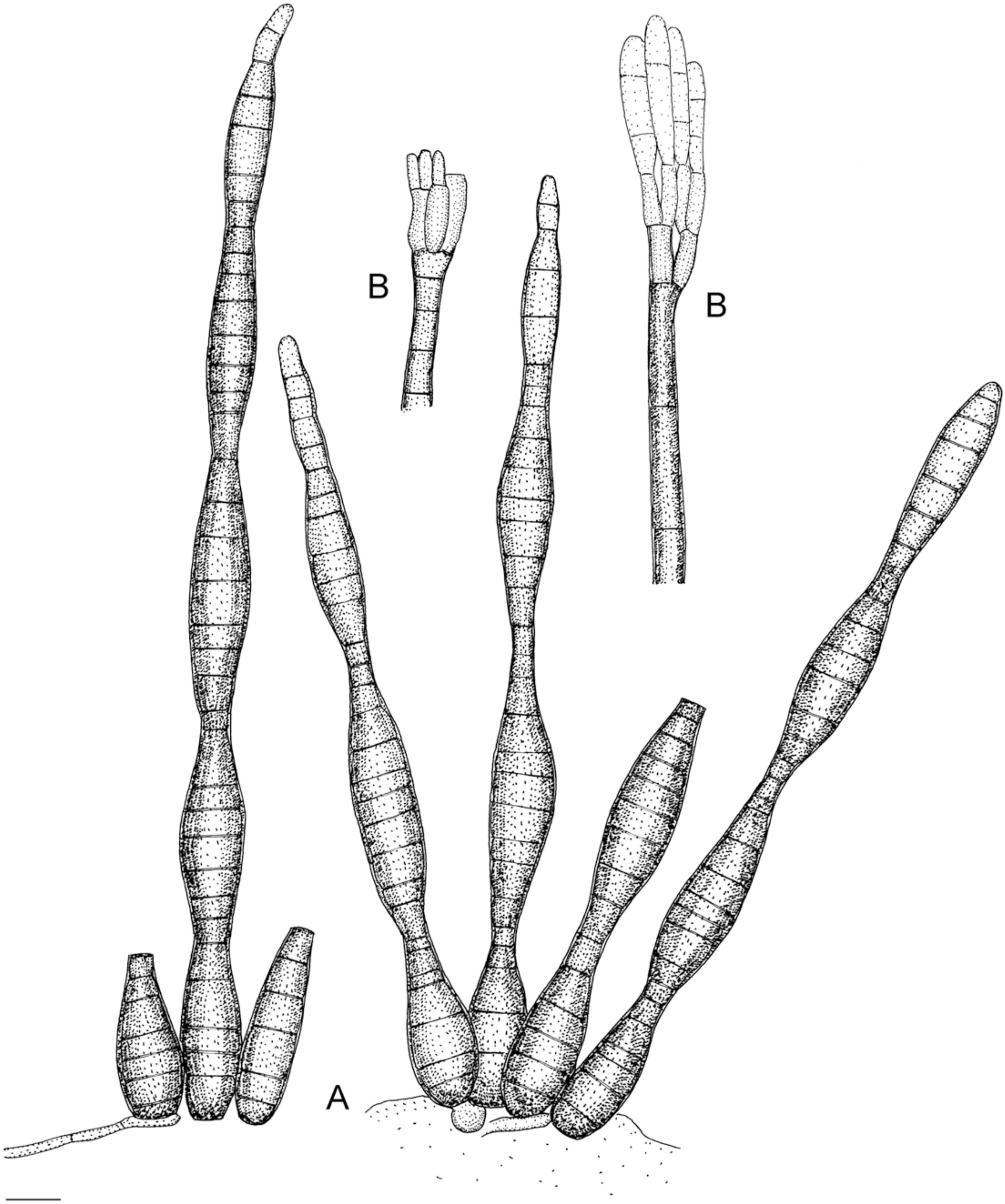

Fig. 119. *Sterigmatobotrys rudis* [BP 96761; BP 87661]. **A.** Conidiophores with adhering conidia. **B.** Synanamorph on extension of conidium. Bar = 10 µm (B. Heuchert *del.*).

Révay (1988), Caretta *et al.* (1992), Jones *et al.* (2002), Catania & Romero (2009), Esquivel (2009) and Chavarria *et al.* (2010) are in agreement with the original description of Saccardo (1878), conidiophores have been described differently. The illustration of conidiophores in Matsushima (1975) shows the base of conidiophores with short branches, which is, however, barely interpretable since the base of conidiophores is usually attached to the substrate and not easily discernible. Detached

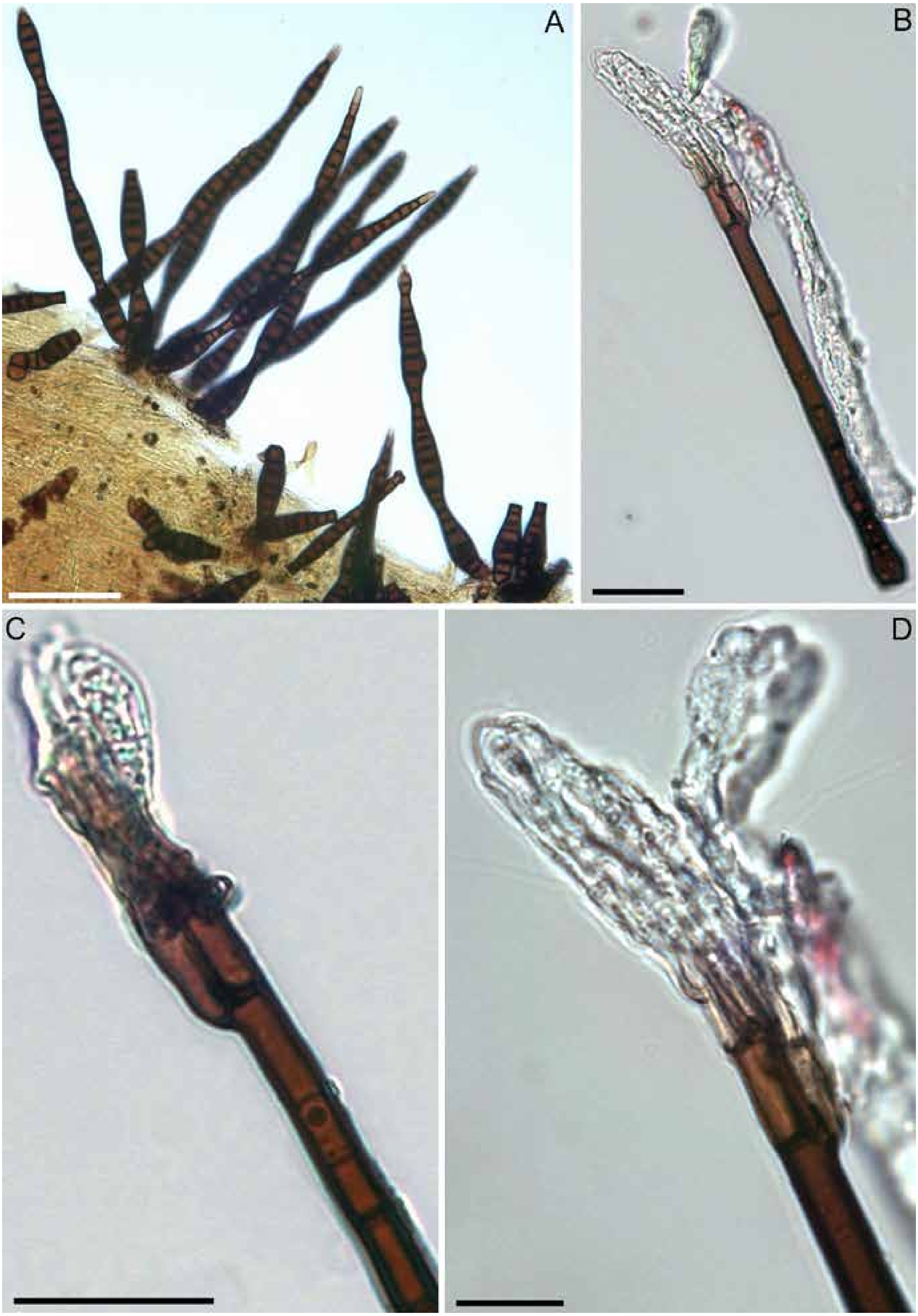

Fig. 120. *Sterigmatobotrys rudis* [A: BP 96761; B–D: BP 87661]. **A.** Conidiophores with adhering conidia. **B–D.** Synasexual morph on extension of conidium. Bars: 50 µm (A), 20 µm (B, C), 10 µm (D).

conidiophores have usually a rounded base. Ellis (1976), Mel'nik (2000) and Simón (2011) described the conidiophores as short, pale to mid brown and 1–5 µm thick, which may be interpreted as micronematous, whereas Catania & Romero (2009) described them as macronematous, usually short, unbranched, dark brown, thick-walled, smooth, 30–40 × 3–5.5 µm, but the given width disagrees with the associated illustration. Re-examinations of several collections confirmed that the conidiophores are indeed macronematous as described in Matsushima (1975), Hughes (1980c) and Jones *et al.* (2002).

Kalgutkar (1997) described the fossil taxon *Diporicellaesporites taeniolelloides* with taeniolella-like, catenate conidia but generally with coarsely rough wall. Type material of this taxon could not be examined, and its identity and affinity remain unclear.

The occurrence of a synasexual morph with penicillately branched heads and colourless conidia was first described and illustrated by Hughes (1980c). Strangely, numerous authors who dealt with this species in the following 30 years failed to observe this feature. More recently, however, Jones *et al.* (2002) provided a second detailed description, drawing and micrograph of the synasexual morphs that they had frequently observed in the material from England and Hungary (including specimens that were re-examined in the course of the present study). The authors discussed the similarity between the synasexual morphs of *T. rudis* and *Sterigmatobotrys macrocarpa*. Both *S. macrocarpa* and *T. rudis* grow in ecologically similar circumstances, on often water-logged wood, and in rather cool temperatures (K. Seifert, pers. comm.). Based on the features and dimensions of metulae, conidiogenous cells and conidia (Réblová & Seifert 2011), there are hardly any differences between the two taxa. *Taeniolella rudis* has somewhat wider metulae (8–15 × 4–5 µm, compared to 6.5–13.5 × (2.5–)3 µm) and conidiogenous cells (5–13 × (1.5–)2–4.5 µm, compared to 5–22 × 1.5–3.5 µm), whereas *Sterigmatobotrys macrocarpa* has somewhat shorter conidia (17–20.5 × 4.5–5.5, compared to 15–25 × 4–5(–6.5) µm). Distinctly fusiform macroconidia in long-adhering chains, characteristic for *T. rudis*, are absent in *S. macrocarpa*, and the conidiophores are straight, stout, up to 325 µm long and 10–13 µm wide. Both species have been included in molecular analyses of *Pleurothecium* and *Pleurotheciella*, based on nuclear ribosomal and protein-coding genes (Réblová *et al.* 2012), in which *Pleurotheciella* was shown to be sister of a clade containing *Sterigmatobotrys*, including *T. rudis*. *Pleurotheciella*, *Pleurothecium*, *Sterigmatobotrys* and *T. rudis* grouped in phylogenetic trees as a sister clade to the *Savoryellales* (Réblová *et al.* 2012). *Taeniolella exilis*, the type species of *Taeniolella*, and *T. rudis* do not cluster together within the available nuLSU phylogenetic tree (Ertz *et al*. 2016: 1424, fig. 2). They are not closely allied and in any case not congeneric, *i.e.*, the latter species must be excluded from *Taeniolella*. The molecular data and morphological peculiarities of the synanamorph justify the reallocation of *T. rudis* to the genus *Sterigmatobotrys*. Following the new rules of Art. F.8.1 of the ICN (one name for one fungus, *i.e.*, one name for all morphs of a single fungus), *T. rudis* has been assigned to the genus *Sterigmatobotrys* in Ertz *et al*. (2016).

Taeniolella sabalicola G. Delgado & A.N. Mill., *Nova Hedwigia* **105**: 4. 2017.

Illustration: Delgado & Miller (2017: 6, fig. 2).

Original description (Delgado & Miller 2017): Colonies on natural substrate effuse, black, forming a cottony, dense, grey aerial mycelium after incubation in moist chamber. Mycelium partly immersed and partly superficial, composed of smooth or finely roughened, septate, cylindrical or inflated, subhyaline to light brown or brown, branched hyphae, 2–4(–7) µm wide. Conidiophores semi-macronematous or micronematous, mononematous, arising terminally or laterally from the hyphae, solitary or caespitose, erect or ascending, straight or flexuous, cylindrical, unbranched, septate, smooth or finely roughened, light brown to brown, up to 530 mm long, 2–3(–5) µm wide. Conidiogenous cells monoblastic, integrated, terminal, determinate, cylindrical or subcylindrical, sometimes inflated or doliiform, 5–11(–15) × 2.5–6 µm, often arising directly on the hyphae. Conidia holoblastic, acrogenous, narrowly clavate to clavate or long clavate, ellipsoidal, narrowly cylindrical, cylindrical to subcylindrical or long cylindrical, straight to flexuous, euseptate, with 4–23(–29) transverse septa, 0–4 longitudinal septa and 0–3 oblique septa, sometimes slightly constricted at 1–2 transverse septa, smooth or verruculose, brown to blackish brown, sometimes reddish brown, often partially surrounded by a subhyaline mucilaginous sheath, solitary or catenate and forming simple, acropetal chains of 2–3(–5) conidia or branching laterally, each branch producing also short conidial chains, occasionally also bifurcating 1–2 times, 31–164(–185) × 6–11(–14) µm; apex often rounded, truncate or spatulate and paler, base truncate.

In vitro: Colonies on MEA slow growing, reaching 6–11 mm diam after 28 d at 25 °C, black, compact, raised at centre 1–3 mm, sometimes slightly sulcate, often with a small amount of grey aerial mycelium in the centre, margin entire, submerged and cracking the medium or more or less irregular and diffuse, reverse black. Colonies on PDA similar to MEA, slow growing, reaching 9–11 mm diam after 28 d at 25 °C, black, circular, flat or slightly raising in the centre, also with a small amount of grey or black aerial mycelium, margin diffuse, reverse black. Colonies on MCA reaching 25–48 mm diam after 2 mo at 25 °C, irregular, loosely cottony, grey, reverse not visible. Conidiophores similar to those on natural substrate, subhyaline to light brown or brown, up to 190 µm long on MEA and PDA, up to 780 µm long on MCA, 1–3(–4) µm wide. Conidia also similar to those on natural substrate, brown to dark brown on MEA and PDA, brown to blackish brown on MCA, 21–128(–140) × 5–11(–14) µm, (3–)6–21(–25) transverse septa, 0–2 longitudinal septa, 0–1(–3) oblique septa, forming longer chains of up to 10 conidia, also surrounded by a subhyaline to brown mucilaginous sheath more often as a spherical blob up to 45 µm diam. Sclerotial bodies produced on MEA and MCA cultures 2 mo or older, consisting of compact masses of hyphae, spherical, light brown to blackish brown, 36–103 µm diam.

Holotype: **USA**, Florida, Broward County, Fort Lauderdale, 26°12'20.5"N, 80°09'50.6"W, 2.9 m alt, on petioles of a dead leaf of *Sabal palmetto*, 25 Jan. 2014, *J.M. Perez* (BPI 892972A). *Isotype*: ILLS 80642. *Ex-type culture*: CBS 140346. *Ex-type sequences*: KX828179 (ITS), KX828178 (LSU).

Host range and distribution: On *Sabal palmetto*; USA (Delgado & Miller 2017).

Notes: *Taeniolella sabalicola* has recently been assigned to *Taeniolella sensu latissimo* due to a rough morphological match with other *Taeniolella* species. However, results of sequence analyses revealed a phylogenetic position of this species within *Sordariomycetidae* (*incertae sedis*). Furthermore, *T. sabalicola* does ecologically and morphologically not agree with saprobic xylophilous core species of *Taeniolella*. It differs above all in having conidia with mucilaginous sheaths or spherical blobs, often formed in branched chains, and often "subsessile", *i.e.*, arising from micronematous conidiophores ("formed directly on hyphae"). These morphological traits rather point to certain sordariomycete genera and species, including the *Sporidesmium* complex (Wu & Zhuang 2005). Conidia with mucilaginous sheaths or capped with slimy blobs are not uncommon within the *Sporidesmium* complex. Subsessile conidia arising from very short micronematous conidiophores are characteristic for the sporidesmioid genus *Stanjehughesia*, including *Stanjehughesia lignicola* (≡ *Taeniolella lignicola*). *Taeniolella laevistipitata*, now *Corynespora laevistipitata*, is another hyphomycete reallocated to a sordariomycete genus. Owing to its phylogenetic affiliation and clear ecological and morphological differences, we prefer to exclude *T. sabalicola* from *Taeniolella* in its current circumscription, although polyphyletic, and treat this species under "Doubtful, excluded and insufficiently known species of *Taeniolella s. lat*." It cannot be excluded that *T. sabalicola* requires a genus of its own, but it might also pertain to one of the numerous *Sordariomycetes* genera which have not yet been phylogenetically analysed, including the whole complex of sporidemium-like genera. Therefore, this species is tentatively retained under *Taeniolella sensu latissimo*, pending sufficient phylogenetic data of genera belonging to *Sordariomycetidae*.

Taeniolella sapindi Sh. Kumar *et al*., *Indian Phytopathol.* **60**: 535. 2007.

Illustration: Kumar *et al*. (2007: 354, fig. 3).

Original description (Kumar *et al*. 2007): Infection spots hyphogenous, effuse, irregular, spreading on entire leaf surface. Colonies hyphophyllous, brown to black. Mycelium external to internal, unbranched, septate, brown. Stromata absent. Conidiophores singular, erect, straight, macronematous to semi-macronematous, mononematous, unbranched, 1–3 transversely septa, smooth, olivaceous brown, 25–55 µm long and 3–7 µm wide. Conidiogenous cells integrated, terminal, monoblastic, unthickened. Conidia solitary to catenate, dry, erect, flexuous, smooth, 0–10 transversely septate, circular, cylindrical to vermiform, olivaceous brown, apex obtuse to rounded, base rounded, 5–50 × 5–10 µm. Germinating conidium present.

Holotype: **India**, Uttar Pradesh, Gorakhur, University Botanical Garden, on leaves of *Sapindus emarginatus*, 24 Sep. 2007, *Shambhu Kumar* (GPU Herb. No. KSR 110). *Isotype*: HCIO 47980.

Host range and distribution: On *Sapindus emarginatus*; India (Kumar *et al*. 2007).

Notes: Type material of *Taeniolella sapindi* was not available, but based on the description and drawing in Kumar *et al*. (2007) it is very probable that this species must be excluded from *Taeniolella*. Kumar *et al*. (2007) compared this species with *Taeniolella scripta*, which was placed by Kirk (1981) in the genus *Taeniolina*. The illustration of strongly branched chains of conidia (Kumar *et al*. 2007: 354, fig. 3) suggests a possible affinity of *T. sapindi* to the genus *Taeniolina*, introduced by Ellis (1976) for taeniolella-like hyphomycetes characterised by semi-macronematous conidiophores producing much-branched, septate conidia. However, a reallocation of this species has to be based on re-examination of type material.

Taeniolina scripta (P. Karst.) P.M. Kirk, *Trans. Brit. Mycol. Soc*. **76**: 84. 1981. Figs 121–122.
Basionym: *Hormiscium scriptum* P. Karst., *Meddeland. Soc. Fauna Fl. Fenn*. **14**: 90. 1887.
Synonyms: *Hormiscium curvatum* var. *betulinum* P. Karst., *Meddeland. Soc. Fauna Fl. Fenn*. **14**: 97. 1887 [*type*: **Russia**, in cortice vetusto Betularum ad Mustiala et lumen Lapponiae Rossicae, Tuloma, m. Jan. et Jul. (H)].
Hormiscium septonema var. *betulinum* (P. Karst.) P. Karst., *Meddeland. Soc. Fauna Fl. Fenn*. **16**: 25. 1888.
Taeniolella scripta (P. Karst.) Hughes, *Canad. J. Bot*. **36**: 817. 1958.

Literature: Saccardo (1892: 576), Ellis (1976: 55), Rèvay (1988: 98), Mel'nik & Popushoj (1992: 197), Ellis & Ellis (1997: 65), Mel'nik (2000: 311), Yurchenko (2001: 49), Simón (2011: 327).

Illustrations: Ellis (1976: 56, fig. 38), Kirk (1981: 85, fig. 9), Mel'nik & Popushoj (1992: 198, fig. 148), Ellis & Ellis (1997: pl. 25, fig. 256), Mel'nik (2000: 312, fig. 219), Yurchenko (2001: 50, fig. 17, 18), Simón (2011: 327, fig. 116 D–F).

Description: Saprobic on wood of numerous trees and shrubs, rarely collected of dead herbaceous plants, as well as fungi and lichens on bark. *Colonies* effuse, scattered over the substrate, often covering large areas, pulvinate, sooty, colonies on *Fomes fomentarius* oblong sinuous, black. *Mycelium* immersed, often longitudinally running within wood fibres, sometimes superficial; hyphae straight to slightly flexuous, branched, (1.7–) 2–5(–7) µm wide, septate, distance between septa 5–13.5 µm, mostly constricted at the septa, usually pale brown to brown, sometimes subhyaline, smooth, wall usually thickened, to 1 µm, rarely unthickened. Hyphal cells sometimes stromatically aggregated, subglobose to globose, 6–8 µm diam, smooth, brown to dark brown, wall thickened, to 1 µm. *Conidiophores* micronematous to semi-macronematous, arising from hyphae, terminal or lateral, sometimes arising from stromatic cells, breaking through the substrate, caespitose, densely aggregated, straight, erect, doliiform, subcylindrical, unbranched, (1.7–)5–7(–12.5) × (1.7–)3–5 µm, aseptate, dark brown, wall thickened, to 1.25 µm, conidiophores reduced to conidiogenous cells or integrated, terminal, monoblastic to thalloblastic. *Conidia* catenate, rarely in unbranched chains, mostly strongly branched, not easily disintegrating, adhering for a long time, chains often breaking off at the base and functioning as propagules, individual branches straight to flexuous, subcylindrical, 21–95(–162) × 4.5–6(–7.5) µm, (1–)4–25(–39)-septate, distinctly constricted at the septa, dark brown, paler at the tip, smooth, wall thickened, up to 1 µm, less thickened at the tip, single conidia or chains of different length sometimes detached, subcylindrical, ellipsoid, obovoid, doliiform, aseptate conidia 5 × 5 µm, 1-septate ones 7–10 × 5–6 µm, 2- and 3-septate ones 9–17 × 5–6.5 µm, 4-septate ones 17–23.5 × 5.5–6 µm, 5- to 7-septate ones 23–34 × 5–6.5 µm, constricted at the septa, dark brown, paler at the apex, smooth, wall thickened, up to 1 µm, the wall at the apex often less thickened, apex rounded in primary conidia, truncate

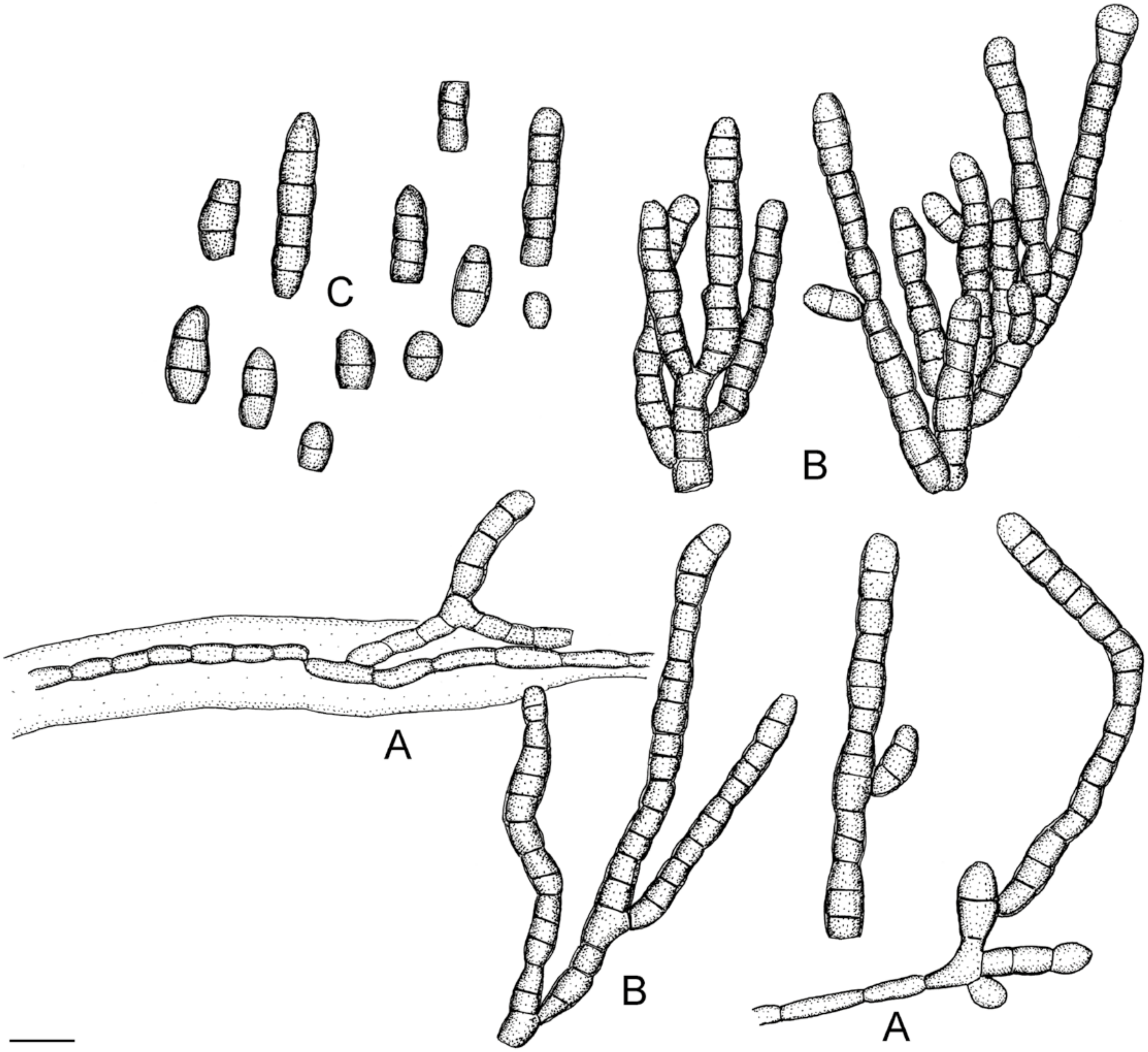

Fig. 121. *Taeniolina scripta* [BP 83048]. **A.** Hyphae with micronematous or semi-macronematous conidiophores and adhering conidial chain. **B.** Conidia in strongly branched conidial chains. **C.** Conidia. Bar = 10 µm (B. Heuchert *del.*).

in secondary ones, sometimes slightly conically truncate, base truncate, often obconically truncate, hila truncate, unthickened, not darkened, 1–5(–6) µm diam.

Lectotype (designated here, MycoBank MBT373918): **Finland**, Tavastia australis, Tammela, Mustiala, [on *Polyporus igniarius*] (annotated by T. Niemelä 1994: "on *Fomes fomentarius*"), 10 Jul. 1865, *P.A. Karsten* (H 1184).

Host range and distribution: On *Acer platanoides*, *A. pseudoplatanus*, *Alnus glutinosa*, *A. incana*, *Amorpha fruticosa*, *Betula pendula*, *Betula* sp., *Carpinus betulus*, *Corylus avellana*, *Crataegus monogyna*, *C. popovii*, *Fagus sylvatica*, *Fomes fomentarius*, *Ilex aquifolium*, *Lepraria incana*, *Phaeophyscia orbicularis*, *Pinus sylvestris*, *Plantago media*, *Populus nigra* var. *italica*, *Quercus robur*, *Rhododendron ponticum*, *Salix* sp., *Sorbus aucuparia*, and on unidentified plants, including conifers; Austria (www.mushroomobserver.org), Belarus (Yurchenko 2001, Tsurykau *et al*. 2016), Finland (Kirk 1981), France (Roux *et al.* 2001, Roux 2012, Roux *et al*. 2017), Germany (John 1990, Triebel & Scholz 2001, Wirth *et al.* 2010, Brackel 2010a), Hungary (Rèvay 1988, 1998), Italy (Brackel 2015), Lithuania (Treigien & Markovskaja 2007), Luxembourg (Diederich 1990a, Diederich *et al.* 1991, Diederich & Sérusiaux 2000), Poland (Chlebicki & Chmiel 2006), Scotland (Farr *et al.* 1996), Russia (Mel'nik & Popushoj 1992, Mel'nik 2000), Spain (Simón 2011), Ukraine (Taran 2002), UK (Clark 1980, Kirk 1981, www.fieldmycology.net).

Additional specimens examined: **Hungary**, montes Bükk-hegység pr. pag. Rejtek, in ligno putrido [rotten wood], 24 Jun. 1987, *Á. Révay & J. Gönczöl* (BP 83048). **Luxembourg**, NW of Dalheim, Kinneksbierg, on *Lepraria incana*, on *Quercus*, 6 Sep. 1987, *Diederich 8968* (herb.

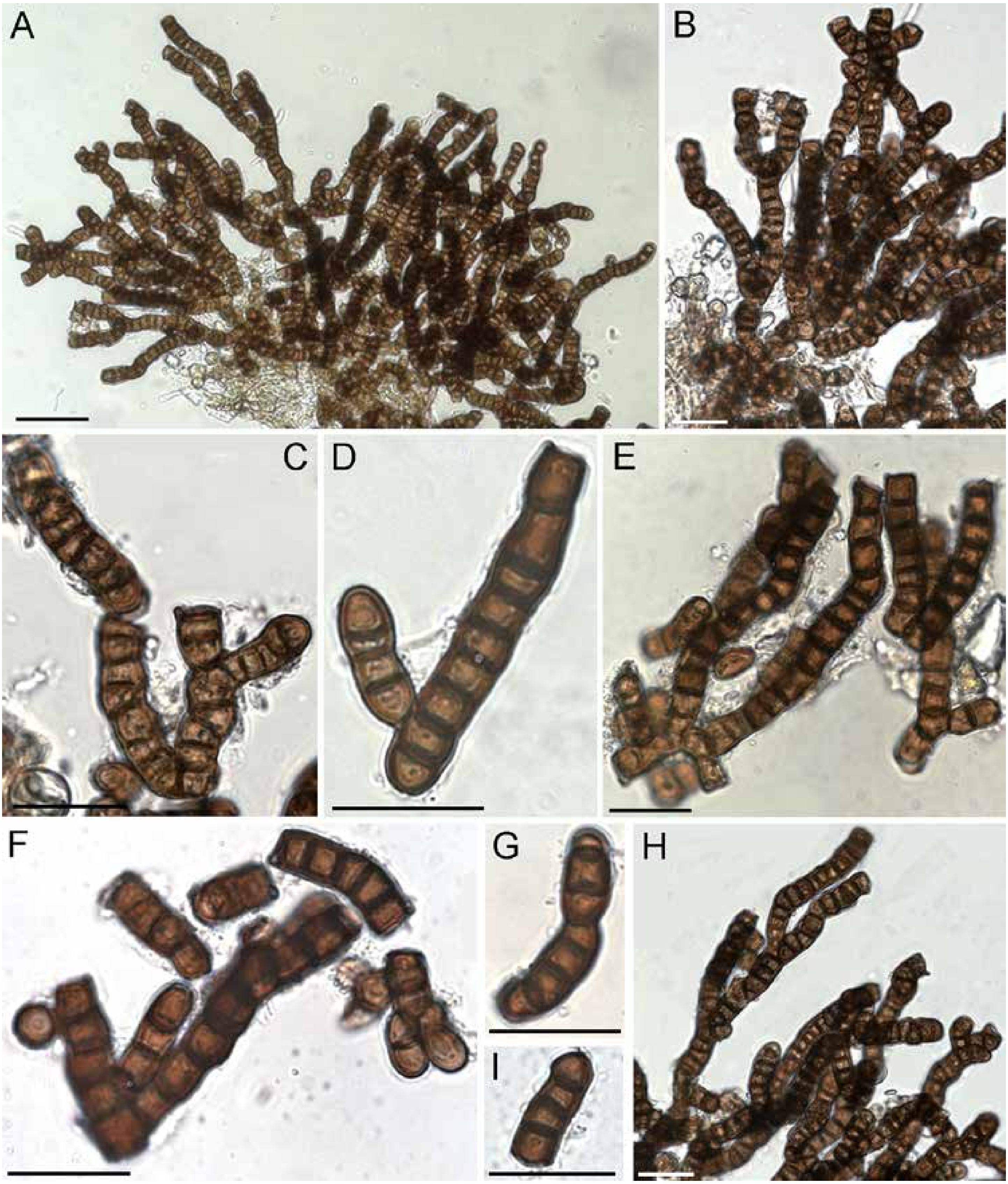

Fig. 122. *Taeniolina scripta* [lectotype]. **A–C, E, F, H.** Micronematous or semi-macronematous conidiophores with adhering strongly branched conidial chains. **D.** Branched conidial chain. **G, I.** Conidia. Bars: 20 µm (A), 10 µm (B–I).

Diederich); E of Welfrange, on *Lepraria incana*, 6 Sep. 1987, *Diederich 8631* (herb. Diederich).

Notes: *Hormiscium scriptum* was placed in the genus *Taeniolella* by Hughes (1958) and later by Kirk (1981) in the genus *Taeniolina*, introduced by Ellis (1976) for taeniolella-like hyphomycetes characterised by semi-macronematous conidiophores producing much-branched, septate conidia.

Taeniolella scripta was found on different substrates, in addition to wood of several trees also on the lichens *Lepraria incana*, *Phaeophyscia orbicularis* and the fungus *Fomes fomentarius*. Morphological descriptions, drawings and measurements in literature [*e.g.*, Rèvay (1988), Mel'nik & Popushoj (1992), Mel'nik (2000), Yurchenko (2001), Simón (2011)] are rather uniform.

In some obligately lichenicolous *Taeniolella* species (*e.g.*, *Taeniolella atricerebrina* or *T. caespitosa*) and in the facultatively lichenicolous species *T. pulvillus*, branched conidiophores or branched conidial chains have occasionally been observed, but never as frequently branched as in *Taeniolina*. Conidiophores and/or conidial chains of most saprobic members of *Taeniolella* (*e.g.*, *T. rudis* and *T. strica*) are usually unbranched. The relationship of both genera has to be studied on the basis of molecular data that are not yet available. In the interim, we prefer to maintain *Taeniolina* as a separate genus.

Taeniolella typhoides Gulis & Marvanová, *Mycotaxon* **72**: 246. 1999.

Literature: Shearer *et al.* (2009: 148, 150–151).

Illustration: Gulis & Marvanová (1999, pl. II. 4–6, figs 3–4).

Original description (Gulis & Marvanová 1999): Mitosporic fungi, dematiaceous hyphomycete. Sexual morph unknown. Colonies (MA 2 %) 23–26 mm diam in 14 d at 15 °C, lavender grey to pale olivaceous grey, aerial mycelium cottony, reverse dark olivaceous grey. After several months incubation under water, minute sclerotial bodies ca. 100 µm diam with radiating hyphae at the margin appear at the bottom of Petri dish. Sporulation underwater, in stationary cultures or after a several-day aeration followed by submerged incubation in standing distilled water. Conidiophores micro- or semi-macronematous, intercalary, lateral or apical and then sometimes extremely long, scattered or aggregate, simple, glabrous or verrucose in the proximal part. Conidiogenous cells integrated with supporting structures, proliferation not seen. Conidia single or sometimes in short acropetal chains, straight or somewhat curved, cylindrical, (35–) 118–243 × 8–11 µm, up to 40-septate (in nature up to 470 × 9–14 µm, up to 60-septate), rounded at the apex, truncate or convex at the base, sometimes with a thinner hilum on one or both ends, rarely with an excentric basal extension. Cells slightly inflated, walls thick, brown, glabrous or sometimes verrucose, few-celled segments occasionally dark brown, the uppermost cell typically paler. Thin secondary (?) septa may be present, but not regularly. Secession schizolytic, tardy in stationary culture, after several months of submergence.

Holotype: **Belarus**, in the slow-flowing river Ptich near the village Voronichi, on submerged decaying leaves of *Nuphar lutea*, 22 Apr. 1997 (K(M) IMI 380382 [ex VG-126a]).

Host range and distribution: *Nuphar lutea*; Belarus (Gulis & Marvanová 1999; Gulis 2001).

Notes: Gulis & Marvanová (1999) introduced the new aquatic species *T. typhoides* and provided a survey of *Taeniolella* species from aquatic habitats. *T. longissima* is an additional species known from an aquatic habitat (further details and discussion see under *T. longissima* and *T. rudis*). *Taeniolella typhoides* is very similar to *T. caffra*. According to the drawings in Gulis & Marvanová (1999) and Matsushima (1996), the conidia or conidial chains of *T. caffra* are, however, more curved and the conidial wall is always smooth. *Taeniolella caffra* is probably a genuine species of *Taeniolella s. lat.*, but the true taxonomic position of this species requires a re-examination of type material. *Taeniolella americana* is also an aquatic species, but its affinity to the genus *Taeniolella* is still unclear. A comparison of *T. typhoides* with other pigmented aquatic hyphomycete genera and species suggests that this species possibly belongs to an undescribed genus of aquatic hyphomycetes.

In molecular studies of freshwater *Dothideomycetes* published by Shearer *et al.* (2009), the aquatic *T. typhoides* clustered within a well-supported clade composed of species of *Lindgomyces* K. Hirayama, Kaz. Tanaka & Shearer (*Lindgomycetaceae*, currently assigned to the *Pleosporales s. lat*.). This relation is undoubtedly reliable since the used sequence was derived from the type culture, and it supports the exclusion of *T. typhoides* from *Taeniolella*.

Zelski *et al.* (2011) described the new freshwater ascomycete *Chaetorostrum quincemilensis* and its taeniolella-like anamorph, which superficially resembles *T. plantaginis* and *T. typhoides*. According to Zelski *et al.* (2011), the cylindrical phragmospores (20–280 × 7–13 µm, 2–40-septate) are unbranched, paler near the apex and produced on terminal ends of hyaline vegetative hyphae. Based on morphological features, Zelski *et al.* (2011) placed *Chaetorostrum quincemilensis* in the *Sordariomycetes*. The genus *Stanjehughesia*, to which *Taeniolella lignicola* has been reallocated in this work, is also a member of the *Sordariomycetes*, suggesting that taeniolelloid asexual morphs may also be formed in the latter ascomycete class, although this has not yet been confirmed by molecular sequence analyses.

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REFERENCES

Agarwal GP, Gupta S, Pandey AK (1993). Saprophytic Fungi from Jabalpur: New Additions. *Journal of Economic and Taxonomic Botany* **17**: 79–87.

AhmadjianV, Hale ME (1973). *The Lichens*. Academic Press, New York.

Ale-Agha N, Jensen M, Koeppen CW, *et al.* (2007). Remarkable microfungi from Oaxaca (Mexico) of *Acacia* species. *Communications in Agricultural and Applied Biological Sciences* **72**: 857–866.

Alstrup V (1993a). Notes on some lichenicolous fungi from Denmark. *Graphis Scripta* **5**: 60–64.

Alstrup V (1993b). News on lichens and lichenicolous fungi from the Nordic countries. *Graphis Scripta* **5**: 96–104.

Alstrup V (2004). New records in distribution of lichens and lichenicolous fungi. *Graphis Scripta* **16**: 46–57.

Alstrup V (2005). *Checklist of the lichenicolous fungi of Greenland, prepared for the NLF excursion to Greenland*. URL: http://www.nhm.uio.no/lichens/nordiclichensociety/excursions/LIFU_Greenland.pdf.

Alstrup V, Cole MS (1998). Lichenicolous fungi of British Columbia. *The Bryologist* **101**: 221–229.

Alstrup V, Hansen ES (2001). New lichens and lichenicolous fungi from Greenland. *Graphis Scripta* **12**: 41–50.

Alstrup V, Hawksworth DL (1990). The lichenicolous fungi of Greenland. Meddelelser om Grønland. *BioScience* **31**: 1–90.

Alstrup V, Svane S, Søchting U (2004). Additions to the lichen flora of Denmark VI. *Graphis Scripta* **15**: 45–50.

Alstrup V, Zavarzin AA, Kocourkova J, *et al.* (2005). Lichens and lichenicolous fungi found in nothern Ladoga region (Karelia Republic) during an international field excursion in August 2004 before V IAL Congress. *Bibliographia Karelii* **7**: 3–16. (in Russian)

Alstrup V, Grube M, Montijūnaitė J, *et al.* (2008). Lichenicolous fungi from the Skibotn area, Troms, Norway. *Graphis Scripta* **20**: 1–8.

Alstrup V, Kocourkova J, Kukwa M, *et al.* (2009). The lichens and lichenicolous fungi of South Greenland. *Folia Cryptogamica Estonica* **46**: 1–24.

Andreev MP, Kotlov Y, Makarova I (1996). Checklist of lichens and lichenicolous fungi of the Russian Arctic. *The Bryologist* **99**: 137–169.

Aptroot A (2009). Keys to the macrolichens and checklist of the lichens and lichenicolous fungi of New Guinea. URL: http://www.bgbm.fu-berlin.de/sipman/Zschackia/png macrokey.pdf

Aptroot A, Diederich P, Sérusiaux E, *et al.* (1997). Lichens and lichenicolous fungi from New Guinea. *Bibliotheca Lichenologica* **64**: 1–230.

Aptroot A, van Herk CM, Sparrius LB, *et al.* (1999). Checklist van de Nederlandse lichenen en lichenicole fungi. *Buxbaumiella* **50**: 4–64.

Aptroot A, van Herk CM, Sparrius LB, *et al.* (2004). Checklist van de Nederlandse Korstmossen en Korstmosparasieten. *Buxbaumiella* **69**: 17–55.

Aptroot A, Czarnota P, Jüriado I, *et al.* (2005). New or interestring lichens and lichenicolous fungi found during the 5th IAL Symposium in Estonia. *Folia Cryptogamica Estonica* **41**: 13–22.

Aptroot A, Saipunkaew W, Sipman HJM, *et al.* (2007). New lichens from Thailand, mainly microlichens from Chiang Mai. *Fungal Diversity* **24**: 75–134.

Aptroot A, van de Vijver B, Lebouvier M, *et al.* (2011). Lichens of Ile Amsterdam and Ile Saint Paul (TAAF, southern Indian Ocean). *Nova Hedwigia* **92**: 343–367.

Arnold FCG (1874). Lichenologische Fragmente XVI. *Flora* **57**(6): 81–89, 97–110, 137–144, 150–155, 173–175.

Badali H, Gueidan C, Najafzedh MJ, *et al.* (2008). Biodiversity of the genus *Cladophialophora*. *Studies in Mycology* **61**: 175–191.

Batista AC, Upadhyay HBP, Barros NSB, *et al.* (1967). Fungos e líquens microscópicos de atividades destrutivas sôbre materiais de construção civil. *Atas, Instituto de Micologia, Universidade Federal de Pernambuco. Recife* **5**: 311–342.

Bensch K, Braun U, Groenewald JZ, *et al.* (2012). The genus *Cladosporium*. *Studies in Mycology* **72**: 1–401.

Berger F, Aptroot A (2002). Further contributions to the flora of lichens and lichenicolous fungi of the Azores. *Arquipélago, Life and Marine Sciences* **19A**: 1–12.

Berger F, Türk R (1993). Neue und seltene Flechten und lichenicole Pilze aus Oberösterreich, Österreich. *Linzer Biologische Beiträge* **25**: 167–204.

Berger F, Türk R (1994). Zur Kenntnis der Flechten und flechtenbewohnenden Pilze von Oberösterreich und Salzburg IV. *Beiträge zur Naturkunde Oberösterreichs* **2**: 161–173.

Berger F, Türk R (1995). Die Flechtenflora im unteren Rannatal (Mühlviertel, Oberösterreich, Österreich). *Beiträge zur Naturkunde Oberösterreichs* **3**: 147–216.

Berkeley MJ, Bromme CE (1850). Notices of British Fungi. *Annals and Magazine of Natural History, including Zoology, Botany, and Geology* **2**: 455–466.

Berkeley MJ (1874). Notices of North American fungi. *Grevillea* **3**: 15.

Bielczyk U, Bylińska E, Czyżewska K, *et al.* (2005). Contribution to the knowledge of lichens and lichenicolous fungi of Western Ukraine. *Polish Botanical Journal* **50**: 39–64.

Bilgrami KS, Jamaluddin S, Rizwi MA (1991). *Fungi of India: list and references*. Today and Tomorrow's Printers & Publishers, New Delhi.

Bilovitz PO, Batič F, Mayrhofer H (2011). Epiphytic lichen mycota of the virgin forest reserve Rajhenavski Rog (Slovenia). *Herzogia* **24**(2): 315–324.

Bisby GR, Buller AHR, Dearness J (1938). *The fungi of Manitoba and Saskatchewan*. National Research Council of Canada. Ottawa.

Bonorden HF (1851). *Handbuch der allgemeinen Mykologie als Anleitung zum Studium derselben, nebst speciellen Beiträgen zur Vervollkommnung dieses Zweiges der Naturkunde*. E. Schweizerbart'sche Verlagshandlung und Druckerei, Stuttgart.

Boonmee S, Ko Ko TW, Chukeatirote E, *et al.* (2012). Two new *Kirschsteiniothelia* species with *Dendrophiopsis* anamorph cluster in *Kirschsteiniotheliaceae* fam. nov. *Mycologia* **104**: 11–89.

Boqueras M (1993). *Flora i vegetació dels lóquens epifítics de les terres meridionals de Gatalunya*. PhD thesis. Universitat de Barcelona.

Boqueras M (2000). *Líquens epífits i fongs liquenícoles del sud de Catalunya: flora i comunitats*. Institut d'Estudis Catalans, Barcelona.

Borelli D (1983). *Taeniolella boppi*, a new species, causative agent of chromomycosis. *Medicina cutánea ibero-latino-americana Venezuela* **11**: 227–232.

Borges PAV, Costa A, Cunha R, *et al.* (Eds.) (2010). *A list of the terrestrial and marine biota from the Azores*. Princípia, Cascais.

Borowska A (1975). New species of *Bactrodesmium*, *Corynespora*, *Septonema* and *Taeniolella*. *Acta Mycologica* **11**: 59–65.

Borowska A (1987). Wood-inhabiting dematiaceous Hyphomycetes in the Kampinos National Park. *Acta Mycologica* **18**: 297–326.

Brackel W von (2007). Weitere Funde von flechtenbewohnenden Pilzen in Bayern – Beitrag zu einer Checkliste III. *Berichte der Bayerischen Botanischen Gesellschaft* **77**: 5–26.

Brackel W von (2008a). *Phoma ficuzzae* sp. nov. and some other lichenicolous fungi from Sicily, Italy. *Sauteria* **15**: 103–120.

Brackel W von (2008b). *Zwackhiomyces echinulatus* sp. nov. and other lichenicolous fungi from Sicily, Italy. *Herzogia* **21**: 181–198.

Brackel W von (2009). Weitere Funde von flechtenbewohnenden Pilzen in Bayern – Beitrag zu einer Checkliste IV. *Berichte der Bayerischen Botanischen Gesellschaft* **79**: 5–55.

Brackel W von (2010a). Checkliste der Flechtenbewohnenden Pilze Bayerns (einschließlich einiger algenbewohnender Arten). URL: www.ivl-web.de/docs/CL_Lifus_Bayern_2010_07.pdf.

Brackel W von (2010b). Some lichenicolous fungi collected on a pre-excursion to the 22th meeting of the Società Lichenologica Italiana in Brescia. *Notiziario delle Società Lichenologica Italiana* **23**: 57–65.

Brackel W von (2010c). Some lichenicolous fungi and lichens from Iceland, including *Lichenopeltella uncialicola* sp. nov. *Herzogia* **23**(1): 93–109.

Brackel W von (2011). Lichenicolous fungi and lichens from Puglia and Basilicata (southern Italy). *Herzogia* **24**: 65–101.

Brackel W von (2013). Miscellaneous records of lichenicolous fungi from the Italian Alps. *Herzogia* **26**: 141–157.

Brackel W von (2015). Lichenicolous fungi from Central Italy with notes on some remarkable hepaticolous, algicolous and lichenized fungi. *Herzogia* **28**: 212–281.

Brackel W von, Berger F (2010). Gall-inducing species of *Polycoccum* (Ascomycota) on the lichen genus *Placopsis*. *Herzogia* **23**: 195–204.

Brackel W von, Feuerer T (2007). *Inventarisierung von Flechten in Kiefern-Naturwaldreservaten, Bericht 2007*. Unveröff. Gutachten im Auftrag der Bayerischen Landesanstalt für Wald und Forstwirtschaft: 1–29.

Brackel W von, Kocourková J (2006). *Endococcus karlstadtensis* sp. nov. und weitere Funde von flechtenbewohnenden Pilzen in Bayern – Beitrag zu einer Checkliste II. *Berichte der Bayerischen Botanischen Gesellschaft* **76**: 5–32.

Braun U (1995). *A monograph of Cercosporella, Ramularia and allied genera (phytopathogenic hyphomycetes). Vol. 1*. IHW-Verlag, Eching.

Braun U (1998). *A monograph of Cercosporella, Ramularia and allied genera (phytopathogenic hyphomycetes). Vol. 2*. IHW-Verlag, Eching.

Braun U, Heuchert B (2013). (2176) Proposal to conserve the name *Coniothecium betulinum* against *Torula stilbospora* (*Ascomycota*). *Taxon* **62**: 2.

Braun U, Crous PW, Dugan FM, *et al.* (2003). Phylogeny and taxonomy of cladosporium-like hyphomycetes, including *Davidiella* gen. nov., the teleomorph of *Cladosporium s.str. Mycological Progress* **2**: 3–18.

Braun U, Heuchert B, Diederich P (2009). Two new and another interesting lichenicolous hyphomycete. *Herzogia* **22**: 165–171.

Bridson GDR (2004a). *BPH-2: Periodicals with Botanical Content. Vol. 1.* Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh.

Bridson GDR (2004b). *BPH-2: Periodicals with Botanical Content. Vol. 2*. Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh.

Brummitt RK, Powell CE (1992). *Authors of Plant Names*. Royal Botanic Gardens, Kew.

Brunaud MP (1888). Miscellanées Mycologiques. *Actes de la Société Linnéenne de Bordeaux* **42**: 85–104.

Bruyn de U (2001). Zur aktuellen Verbreitung epiphytisch auftretender lichenicoler und nicht lichenisierter flechtenähnlicher Pilze im nördlichen Weser-Ems-Gebiet. *Drosera 2001*: 183–188.

Bruyn de U (2005). Zur Moos- und Flechtenflora des Bentheimer Waldes. *Osnabrücker naturwissenschaftliche Mitteilungen* **30/31**: 67–78.

Bruyn de U, Aptroot A, Homm T, *et al.* (2008). Ergebnisse eines Flechten-Kartierungstreffens im Elbe-Weser-Dreieck (Nordwest-Niedersachsen). *Aktuelle lichenologische Mitteilungen der Bryologisch-lichenologischen Arbeitsgemeinschaft für Mitteleuropa*. *Neue Folge* **15**: 4–13.

Bülbül AS, Selçuk F, Hüseyin E (2011). New records of microfungi from Mt. Strandzha in Turkey (south-eastern Europe). I. *Mycologia Balcanica* **8**: 161–167.

Butkus D, Matelis A, Bataitienė IP (2007). Accumulation of radioisotopes associated with the presence of wood-inhabiting fungi in scots pine (*Pinus sylvestris* L.) wood. *Ekologija* **53**(3): 22–29.

Burgaz AR (2006). Check-list of lichenized and lichenicolous fungi of Madrid Community (Spain). *Flora Mediterranea* **16**: 57–110.

Butin H (1991). Mycologische Untersuchungen an vergrauten Holzoberflächen im Gebirge. *Holz als Roh- und Werkstoff* **49**: 235–238.

Cash EK (1952). *A record of the fungi named by J.B. Ellis., Part I.* Division of Mycology and Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. U.S. Dept. of Agriculture, Beltsville, Md.

Catania M del Valle, Romero AI (2009). Micromicetes asociados con corteza y/o madera de *Podocarpus parlatorei* Pilg. en la Argentina V. Ascomycota anamórficos. *Lilloa* **46**: 43–51.

Carestia A (1987–98). Enumerazione dei funghi della Valsesia. *Malpighia* **11**: 214–325.

Caretta G, Mangiarotti AM, Piontelli E (1992). Keratinophilic fungi isolated from soil of Italian parks in the province of Pavia. *European Journal of Epidemiology* **8**: 330–339.

Carmichael JW, Kendrick WB, Conners IL, *et al.* (1980). *Genera of Hyphomycetes*. University of Alberta Press, Edmonton.

CBS Filamentous Fungi Database [http://www.westerdijkinstitute.nl/Collections/BiolomicsInfo.aspx].

Chavarria A, González MC, Dantán E, *et al.* (2010). Evaluación espacial y temporal de la diversidad de los ascomicetes dulceacuícolas del canal turístico Santa Cruz, Xochimilco, México. *Revista Mexicana de Biodiversidad* **81**: 733–744.

Cheewangkoon R, Groenewald JZ, Hyde KD, *et al.* (2012). Chocolate spot disease of *Eucalyptus*. *Mycological Progress* **11**: 61–69.

Chlebicki A, Chmiel AA (2006). Microfungi of *Carpinus betulus* from Poland I. Annotated list of microfungi. *Acta Mycologica* **41**: 253–278.

Chomnunti P, Schoch CL, Aguirre-Hudson B, *et al.* (2011). *Capnodiaceae*. *Fungal Diversity* **51**: 103–134.

Cezanne R, Eichler M (2004). Neu- und Wiederfunde von Flechten und flechtenbewohnenden Pilzen in Hessen. *Hessische Floristische Briefe* **53**: 43–52.

Cezanne R, Eichler M (2015). Verbreitungsatlas der Flechten von Darmstadt. *Botanik und Naturschutz in Hessen Beiheft* **12**: 1–239.

Cezanne R, Eichler M, Hohmann M-L, *et al.* (2008). Die Flechten des Odenwaldes. *Andrias* **17**: 1–520.

Clark MC (1980). *Fungus Flora of Warwickshire*. British Mycological Society, Birmingham.

Clauzade G, Diederich P, Roux C (1989). Nelikeniĝintaj fungoj likenloĝaj. Ilustrita determinlibro. *Bulletin de la Société Linnéenne de Provence, Num. spéc*. **1**: 1–142.

Cole MS, Hawksworth DL (2001). Lichenicolous fungi, mainly from the USA, including *Patriciomyces* gen. nov. *Mycotaxon* **77**: 305–338.

Conners IL (1967). *An Annotated Index of Plant Diseases in Canada and Fungi Recorded on Plants in Alaska, Canada and Greenland.* Canada Department of Agriculture, Ottawa.

Cooke MC, Harkness HW (1881). Fungi on *Eucalyptus*. *Grevillea* **9**: 127–130.

Coppins BJ (1987). The genus *Vezdaea* in the British Isles. *The Lichenologist* **19**: 167–176.

Corda ACJ (1837). *Icones fungorum hucusque cognitorum. Tomus 1*. CG Calve, Pragae.

Corda ACJ (1839). *Icones fungorum hucusque cognitorum. Tomus 3.* CG Calve, Pragae.

Corda ACJ (1842). *Icones fungorum hucusque cognitorum. Tomus 5*. CG Calve, Pragae.

Corda ACJ (1854). *Icones fungorum hucusque cognitorum. Tomus*. CG Calve, Pragae.

Crane JL, Schoknecht JD (1982). Hyphomycetes from freshwater swamps and hammocks. *Canadian Journal of Botany* **60**: 369–378.

Crane JL, Tazik PP (1992). Catalog of Types of the Illinois Natural History Survey Mycological Collections (ILLS). *Bulletin, Illinois Natural History Survey* **34**: 535–550.

Crous PW, Braun U (2003). *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*. *CBS Biodiversity Series* **1**: 1–571.

Crous PW, Kang JC, Braun U (2001). A phylogenetic redefinition of anamorph genera in *Mycosphaerella* based on ITS rDNA sequences and morphology. *Mycologia* **93**: 1081–1101.

Crous PW, Slippers B, Wingfield MJ, *et al.* (2006). Phylogenetic lineages in the *Botryosphaeriaceae*. *Studies in Mycology* **55**: 235–253.

Crous PW, Braun U, Schubert K, *et al.* (2007a). Delimiting *Cladosporium* from morphologically similar genera. *Studies in Mycology* **58**: 33–56.

Crous PW, Schubert K, Braun U, *et al.* (2007b). Opportunistic, human-pathogenic species in the *Herpotrichiellaceae* are phenotypically similar to saprobic or phytopathogenic species in the *Venturiaceae*. *Studies in Mycology* **58**: 185–217.

Crous PW, Summerell BA, Swart L, *et al.* (2011). Fungal pathogenes of *Proteaceae*. *Persoonia* **27**: 20–45.

Crous PW, Braun U, Hunter GC, *et al.* (2012). Phylogenetic lineages in *Pseudocercospora*. *Studies in Mycology* **75**: 37–114.

Cruz ACR da, Gusmão LFP (2009). Fungos conidiais na Caatinga: espécies lignícolas. *Acta Botânica Brasilica* **23**: 1133–1144.

Curtis MA (1867). *Geological and natural history survey of North Carolina. Part. III. Botany: containing a catalogue of the indigenous and naturalized pants of the state.* Printed at N.C. Institution for the Deaf and Dumb and Blind, Raleight, NC.

Cwalina-Ambroziak B, Bowszys T (2009). Changes in fungal communities in organically fertilized soil. *Plant, Soil and Environment* **55**(1): 25–32.

Czyżewska K (2003a). Distribution of some lichenicolous fungi in Poland. *Acta Mycologica* **38**: 111–122.

Czyżewska K (2003b). Lichens and lichenicolous fungi in the Bolimów Landscape Park. *Monographiae Botanicae* **92**: 233–277.

Czyżewska K, Motiejūaitė J, Cieśliński S (2005). New and noteworthy species of lichens and allied fungi from North-Eastern Poland. *Acta Mycologica* **40**: 277–291.

Czyżewska K, Hachułka M, Łubek A, *et al.* (2008). Distribution of some lichenicolous fungi in Poland. II. *Acta Mycologica* **43**: 193–206.

Dal-Forno M (2009). *Taeniolella Família Graphidaceae (Ascomycota Liquenizados) em Restinga em Pontal do Sul, Pontal do Paraná, Paraná. Dissertação de Mestrado.*Universidade Federal do Paraná, Curitiba.

Damm U, Fourie PH, Crous PW (2007). *Aplosporella prunicola*, a novel species of anamorphic *Botryosphaeriaceae*. *Fungal Diversity* **27**: 35–43.

David JC (1997). A contibution to the systematics of *Cladosporium*. Revision of the fungi previously reffered to *Heterosporium*. *Mycological Papers* **172**: 1–157.

Dearness J (1917). New or noteworthy North American fungi. *Mycologia* **9**: 345–364.

Dearness J (1929). New and noteworthy fungi – VI. *Mycologia* **21**: 326–332.

Delgado G. (2008). South Florida microfungi: a new species of *Stanjehughesia* (hyphomycetes) from *Sabal* palm. *Mycotaxon* **103**: 229–234.

Delgado G, Miller AN (2017). South Florida microfungi: a new species of *Taeniolella* (anamorphic *Sordariomycetes*) isolated from cabbage palm. *Nova Hedwigia* **105**: 1–14.

Descals EC, Sutton BC (1976). *Anavirga dendromorpha* and its *Phialocephala* phialidic state. *Transactions of the British Mycological Society* **67**: 269–274.

Diederich P (1986). Lichenicolous fungi from the Grand Duchy of Luxembourg and surounding areas. *Lejeunia N. S.* **119**: 1–26.

Diederich P (1989). Les lichens épiphytiques et leurs champignons lichénicoles (macrolichens exceptés) du Luxembourg. *Travaux scientifiques du Musée national d'histoire naturelle de Luxembourg* **14**: 1–268.

Diederich P (1990a). Atlas des lichens épiphytiques et de leurs champignons lichénicoles (macrolichens exceptés) du Luxembourg. *Travaux scientifiques du Musée national d'histoire naturelle de Luxembourg* **16**: 1–72.

Diederich P (1990b). New or interesting lichenicolous fungi. 1. Species from Luxembourg. *Mycotaxon* **37**: 297–330.

Diederich P (1992). New or interesting lichenicolous fungi 2. *Taeniolella beschiana* sp. nov. and *Taeniolella serusiauxii* sp. nov. (Hyphomycetes). *Bulletin de la Sociéte des Naturalistes Luxembourgeois* **93**: 155–162.

Diederich P (1996). The lichenicolous heterobasidiomycetes. *Bibliotheca Lichenologica* **61**: 1–198.

Diederich P (2003). New species and new records of American lichenicolous fungi. *Herzogia* **16**: 41–90.

Diederich P (2011). Lichenicolous hyphomycete genera. Pp. 917–920. In: Seifert K, Morgan-Jones G, Gams W, Kendrick B, eds. *The Genera of Hyphomycetes*. [CBS Biodiversity Series no. 9.] CBS, KNAW, Fungal Biodiversity Centre, Utrecht.

Diederich P, Roux C (1991). Champignons lichénicoles non lichénisés récoltés dans la forêt de Fontainebleau et è Staint-Mammès (Seine-et-Marne, France). *Bulletin d´Information de l´Association Française de Lichénologie* **16**: 19–25.

Diederich P, Sérusiaux E (2000). *The lichens and lichenicolous fungi of Belgium and Luxembourg. An Annotated Checklist*. Musée National d'Histoire Naturelle, Luxembourg.

Diederich P, Zhurbenko MP (1997). *Taeniolella rolfii* sp. nov., a new lichenicolous hyphomycete from the Siberian Arctic. *Symbolae Botanicae Upsalienses* **32**: 11–16.

Diederich P, Zhurbenko MP (2001). Nomenclatural notes on *Taeniolella rolfii* (lichenicolous hyphomycetes). *Graphis Scripta* **12**: 37–40.

Diederich P, Sérusiaux E, van den Boom P (1991). Lichens et champignons lichénicoles nouveaux ou intéressants pour la flore de la Belgique et des régions voisines. V. *Lejeunia n. s*. **136**: 1–47.

Diederich P, Braun U, Heuchert B, *et al.* (2010). Four new lichen-associated *Trimmatostroma* species (hyphomycetes). *Bulletin de la Sociéte des Naturalistes Luxembourgeois* **111**: 45–55.

Diederich P, van den Broeck D, Ertz D, *et al.* (2004). Report on two lichenological field meetings in the province of Luxembourg in Belgium. *Bulletin de la Sociéte des Naturalistes Luxembourgeois* **105**: 57–64.

Diederich P, van den Broeck D, Ertz D, *et al.* (2006). Contribution to the knowledge of lichens in northern France. *Bulletin de la Sociéte des Naturalistes Luxembourgeois* **106**: 53–62.

Diederich P, Ertz D, Stapper N, *et al.* (2017a). The lichens and lichenicolous fungi of Belgium, Luxembourg and northern France. URL: http://www.lichenology.info [09.12.2017].

Diederich P, Lücking R, Aptroot A, *et al.* (2017b). New species and new records of lichens and lichenicolous fungi from the Seychelles. *Herzogia* **30**: 182–236.

Dynowska M, Meissner W, Pacyńska J (2013). Mallard duck (*Anas* *platyrhynchos*) as a potential link in the epidemiological chain mycoses originating from water reservoirs. *The Bulletin of the Veterinary Institute in Pulawy* **57**: 323–328.

Earland-Bennett PM, Hitch CJB, Hawksworth DL (2006). New records and new species of lichen and lichenicolous fungi from Mataelpino (Sierra de Guadarrama, Comunidad de Madrid). *Boletín de la Sociedad Micológia de Madrid* **30**: 243–248.

Ehrenberg CG (1818). *Sylvae mycologicae Berolinenses*. Formis Theophili Bruschcke, Berlin.

Eichler M, Cezanne R (2003). Fundmeldungen. *Aktuelle lichenologische Mitteilungen der Bryologisch-lichenologischen Arbeitsgemeinschaft für Mitteleuropa*. *Neue Folge* **10**: 36–37.

Ellis JB, Bartholomew E (1896). New species of Kansas fungi. I. *Erythea* **4**: 79–83.

Ellis JB, Everhart BM (1891). New species of fungi from various localities. *Proceedings of the Academy of Natural Sciences of Philadelphia* **43**: 76–93.

Ellis JB; Everhart BM (1887). New species of fungi from various localities. *The Journal of Mycology* **3**: 127–130.

Ellis MB (1963). Dematiaceous hyphomycetes. IV. *Mycological Papers* **87**: 1–42.

Ellis MB (1971). *Dematiaceous Hyphomycetes*. CMI, Kew.

Ellis MB (1976). *More Dematiaceous Hyphomycetes*. CMI, Kew.

Ellis MB, Ellis JP (1997). *Microfungi on land plants. An identifications handbook. Ed. 2.* The Richmond Publishing Co. Ltd., Burnham.

Ertz D, Bungartz F, Diederich P, *et al.* (2011). Molecular and morphological data place *Blarneya* in *Tylophoron* (*Arthoniaceae*). *Lichenologist* **43**: 345–356.

Ertz D, Diederich P, Lawrey JD, *et al.* (2015). Phylogenetic insights resolve *Dacampiaceae* (*Pleosporales*) as polyphyletic: *Didymocyrtis* (*Pleosporales*, *Phaeosphaeriaceae*) with *Phoma*-like anamorphs resurrected and segregated from *Polycoccum* (*Trypetheliales*, *Polycoccaceae* fam. nov.). *Fungal Diversity* **74**: 53–89.

Ertz D, Heuchert B, Braun U, *et al.* (2016). Contribution to the phylogeny and taxonomy of the genus *Taeniolella*, with a focus on lichenicolous taxa*. Fungal Biology* **120**: 1416–1447.

Esquivel EAR (2009). Notas Micologicas (36): *Taeniolella rudis* (Sacc.) Hughes. Observaciones sobre el Hongo (Hopomiceto; Dematiaceo). Micologia Panamensis, Notas cientificas sobre hongos microscopicos encontrados en Panama. URL: http://micologiapanama.blogspot.de/

Esslinger TL (2016). A Cumulative Checklist for the Lichen-forming, Lichenicolous and Allied Fungi of the continental United States and Canada, Version 21. *Opuscula Philolichenum* **15**: 136–390.

Esslinger TL (2018). A Cumulative Checklist for the Lichen-forming, Lichenicolous and Allied Fungi of the continental United States and Canada, Version 21. *Opuscula Philolichenum* **17**: 6–268.

Etayo J (1989). *Liquenes epifitos del Norte de Navarra*. Tesis Doctoral *ined.*: Univ. de Navarra, Navarra, Spain.

Etayo J (2002). Catálogo de líquenes y hongos liquenícolas del Parque Natural de Bértiz (Navarra, España). *Bulletin de la Société Linnéenne de Provence* **53**: 155–170.

Etayo J (2006). Proyecto de estudio de los líquenes y hongos liquenícolas de Oieleku. URL: http://www.lifeaiakoharria.net/datos/documentos/1.19. Líquenes_Oieleku.pdf

Etayo J (2008). Estudio de los líquenes y hongos liquenícolas de Aiako-Harria. URL: http://www.lifeaiakoharria.net/datos/documentos/Estudio de los líquenes de AH_2008.pdf

Etayo J (2010a). Hongos liquenícolas de Perú. Homenaje a Rolf Santesson. *Bulletin de la Société Linnéenne de Provence* **61**: 1–46.

Etayo J (2010b). Líquenes y hongos liquenícolas de Aragón. *Guineana* **16**: 1–501.

Etayo J, Blasco-Zumeta J (1992). Líquenes epífitos de zonas áridas. El Sabinar de la Retuerta de Pina (Los Monegros, España). *Acta Botanica Malacitana* **17**: 67–78.

Etayo J, Calatayud V (2005). *Taeniolella diederichiana*, a new lichenicolous hyohomycete on *Placopsis*. *The Lichenologist* **37**: 303–305.

Etayo J, Sancho LG (2008). Hongos liquenícolas del Sur de Sudamérica, especialmente de Isla Navarino (Chile). *Bibliotheca Lichenologica* **98**: 247–250.

Fałtynowicz W (1993). A checklist of Polish lichen forming and lichenicolous fungi including parasitic and saprophytic fungi occurring on lichens. *Polish Botanical Studies* **6**: 1–65.

Fałtynowicz W (2003). *The lichens, lichenicolous and allied fungi of Poland: an annotated checklist.* Polish Academy of Sciences, Institute of Botany, Kraków.

Farr DF, Esteban HB, Palm ME (1996). *Fungi on Rhododendron: A World Reference*. Parkway Publisher, Inc. Boone.

Ferraro LI (2004). Morphological diversity in the hyphophores of *Gomphillaceae* (*Ostropales*, lichenized Ascomycetes). *Fungal Diversity* **15**: 151–167.

Fleischhacker A, Grube M, Kopun T, *et al.* (2015). Community Analyses Uncover High Diversity of Lichenicolous Fungi in Alpine Habitats. *Microbial Ecology* **70**: 348–360.

Fox HF (2001). *Census catalogue of the lichenicolous fungi of Ireland*. National Botanic Gardens, Dublin.

Freebury CE (2014). Lichens and lichenicolous fungi of Grasslands National Park (Saskatchewan, Canada). *Opuscula Philolichenum* **13**: 102–121.

Frisch A, Ohmura Y, Ertz D, *et al.* (2015). *Inoderma* and related genera in *Arthoniaceae* with elevated whith pruinose pycnidia or sporodochia. *The Lichenologist* **47**: 233–256.

Fuckel L (1866). Fungi Rhenani exsiccati. Cent. 12–17. *Hedwigia* **5**: 14–30.

Fuckel L (1870). Symbolae mycologicae. Beiträge zur Kenntnis der rheinischen Pilze. *Jahrbücher des Nassauischen Vereins für Naturkunde* **23–24**: 1–459.

Gharizadeh KH, Sheykholeslami A, Kohdaparast SA (2007). A study on the identification of wood inhabiting Hyphomycetes in Chalus vicinity (Iran). *Rostaniha* **8**: 94–109.

Ginns JH (1986). *Compendium of plant disease and decay fungi in Canada 1960–1980*. Research Branch, Agriculture Canada, Ottawa.

Giralt M (1991). *Flora i vegetado liquènica epifítica de la plana i serralades litarais tarragonines. Estimació de la contaminació atmosfèrica a la plana del Camp de Tarragona*. PhD thesis. Universität de Barcelona, Barcelona.

Giralt M (1996). *Líquens epífits i contaminació atmosfèrica a la Plana i les Serralades litorals Tarragonines. Institut d'Estudis Catalans. Arxius de les seccions de Ciències. CXIII*. Secció de Ciències Biològiques, Barcelona.

Giralt M, Gómez-Bolea A (1991). *Líquenes epifítics de Tarragona interessants o nous per a la flora de Gatalunya. II.* Actes del Simposi Internacional de Botànica Pius Font i Quer, 1988, 1 Criptogàmia: 205–212.

Glawe DA (n.d.). *Pacific Northwest Fungi Database*. Department of Plant Pathology, Washington State University, Puyallup, WA. Retrieved January 27, 2014, from http://pnwfungi.wsu.edu/programs/aboutDatabase.asp

Guatimosim E, Firmino AL, Bezerra JL, *et al.* (2015). Towards a phylogenetic reappraisal of *Parmulariaceae* and *Asterinaceae* (*Dothideomycetes*). *Persoonia* **35**: 230–241.

Gulis V (2001). Are there any substrat preferences in aquatic hyphomycetes? *Mycological Research* **105**: 1088–1093.

Gulis V, Marvanová L. (1999). Three new scolecosporous hyphomycetes from waters in Belarus. *Mycotaxon* **72**: 237–250.

Gvritishvili MN, Hayova VP, Kryvomaz, TI, *et al.* (2007). Fungi of Georgia. URL: http://www.cybertruffle.org.uk/gruzfung/eng, website accessed: Nov 2017.

Hafellner J (1996). Beiträge zu einem Prodromus der lichenicolen Pilze Österreichs und angrenzender Gebiete. II. Über einige in der Steiermark erstmals gefundene Arten. *Mitteilungen des Naturwissenschaftlichen Vereins für Steiermark* **125**: 73–88.

Hafellner J (1998). Studien an lichenicolen Pilzen und Flechten IX. Was ist *Abrothallus friesii* Hepp? *Herzogia* **13**: 139–144.

Hafellner J (2003). Ein Beitrag zur Flechtenflora der Fischbacher Alpen (Steiermark). *Fritschiana* **41**: 1–40.

Hafellner J (2005). Addition and corrections to the checklist and bibliography of lichens and lichenicolous fungi of insular Laurimacaronesia. III. *Fritschiana* **50**: 1–13.

Hafellner J (2007). The lichenicolous fungi inhabiting *Tephromela* species. In: Lichenologische Nebenstunden. Contributions to Lichen Taxonomy and Ecology in Honour of Klaus Kalb. (A Frisch, U Lange & B Staiger, eds.) *Bibliotheca Lichenologica* **96**: 103–128.

Hafellner J (2008a). Zur Diversität lichenisierter und lichenicoler Pilze im Gebiet der Koralpe (Österreich: Kärnten und Steiermark, Slowenien). *Mitteilungen des naturwissenschaftlichen Vereins für Steiermark* **138**: 29–112.

Hafellner J (2008b). Additions and Corrections to the Checklist and Bibliographie of Lichens and Lichenicolous Fungi of Insular Laurimacaronesia. IV. *Fritschiana* **64**: 1–28.

Hafellner J (2010). Lichenicolous Biota (Nos 81–100). *Fritschiana* **67**: 11–26.

Hafellner J, Komposch H (2007). Diversität epiphytischer Flechten und lichenicoler Pilze in einem mitteleuropäischen Urwaldrest und einem angrenzenden Forst. *Herzogia* **20**: 87–113.

Hafellner J, Maurer W (1994). Weitere Flechtenfunde im südlichen Burgenland (Österreich). *Mitteilungen des naturwissenschaftlichen Vereins für Steiermark* **124**: 113–134.

Hafellner J, Kocourková J, Obermayer W (2004). Records of lichenicolous fungi from the northern Schladminger Tauern (Eastern Alps, Austria, Styria). *Herzogia* **17**: 59–66.

Halici, MG (2010). *Weddellomyces pertusariicola* (Ascomycota, *Dacampiaceae*), a new species growing on *Pertusaria lactea* in Turkey. *Annales Botanici Fennici* **47**: 148–150.

Hawksworth DL (1979). The lichenicolous Hyphomycetes. *Bulletin of the British Museum (Natural History), Botany* **6**: 183–300.

Hawksworth DL (1982). Secondary fungi in lichen symbioses: parasites, saprophytes and parasymbionts. *Journal of the Hattori Botanical Laboratory* **52**: 357–366.

Hawksworth DL (1983). A key to the lichen-forming, parasitic, parasymbiotic and saprophytic fungi occurring on lichens in the British Isles. *The Lichenologist* **15**: 1–144.

Hawksworth DL (1985). *Kirschsteiniothelia*, a new genus for the *Microthelia incrustans*-group (*Dothideales*). *Botanical Journal of the Linnean Society* **91**: 181–202.

Hawksworth DL (1990). Notes on British lichenicolous Fungi: VI. *Notes from the Royal Botanic Garden, Edinburgh* **46**: 391–403.

Hawksworth DL (2003). The lichenicolous fungi of Great Britain and Ireland: an overview and annotated checklist. *The Lichenologist* **35**: 191–232.

Hawksworth DL, Cole MS (2002). *Intralichen*, a new genus for lichenicolous *'Bispora'* and *'Trimmatostroma'* species. *Fungal Diversity* **11**: 87–97.

Hayova VP (2011). New for Ukraine records of fungi (Ascomycota) from the Gorgany Nature Reserve. *Ukrainian Botanical Journal* **68**: 865–873.

Hepp P (1857). *Abbildungen und Beschreibung der Sporen zum V. VI. VII. und VIII. Band der Flechten Europas*. Heft II. Zürich.

Heredia Abarca G, Mercado Sierra A (1998). Tropical Hyphomycetes of Mexico. III. Some species from the Calakmul Biosphere Reserve, Campeche. *Mycotaxon* **68**: 137–143.

Heredia Abarca G, Mena-Portales J, Mercado Sierra A, *et al.* (2013). Nuevos registros de hongos anamorfos tropicales asociados a restos vegetales para México. *Revista Mexicana de Micologia* **37**: 69–81.

Hernández-Gutiérrez A, Sutton BC (1997). *Imimyces* and *Linkosia*, two new genera segregated from *Sporidesmium* sensu lato, and redescription of *Polydesmus*. *Mycological Research* **101**: 201–209.

Hernández-Restrepo M, Gené J, Castañeda-Ruiz RF, *et al.* (2017). Phylogeny of saprobic microfungi from Southern Europe. *Studies in Mycology* **86**: 53–97.

Hestmark G (1990). Thalloconidia in the genus *Umbilicaria*. *Nordic Journal of Botany* **9**: 547–574.

Heuchert B, Braun U (2006). On some dematiaceous lichenicolous hyphomycetes. *Herzogia* **19**: 11–21.

Heuchert B, Braun U (2014). Two new lichen-associated *Trimmatostroma* species. *Herzogia* **27**: 227–236.

Heuchert B, Braun U, Schubert K (2005). Morphotaxonomic revision of fungicolous *Cladosporium* species (hyphomycetes). *Schlechtendalia* **13**: 1–78.

Heuchert B, Zhurbenko MP, Braun U (2014). Reassessment of the lichenicolous hyphomycete genus *Talpapellis*. *Herzogia* **27**: 83–92.

Hladun N, Llimona X (2002–2007). Checklist of the Lichens and lichenicolous Fungi of the Iberian Peninsula and Balearic Islands. URL: http://botanica.bio.ub.es/checklist/checklist.htm.

Holmgren PK, Holmgren NH, Barnett LC (1990). *Index Herbariorum, Part. 1: The Herbaria of the World. 8th ed*. New York Botanikal Garden, New York.

Holubovà-Jechovà V (1978). Lignicolous Hyphomycetes from Czechoslovakia 5. *Septonema*, *Hormiactella* and *Lylea*. *Folia Geobotanica et Phytotaxonomica* **13**: 421–442.

Holubovà-Jechovà V, Mercado Sierra A (1984). Studies on Hyphomycetes from Cuba II. Hyphomycetes from the Isla de la Juventud. *Česká Mykologie* **38**: 96–120.

Honegger R (1985). The hypomycetous anamorphe of *Coniocybe furfuracea*. *The Lichenologist* **17**: 273–279.

Hoog GS de, Guého E, Masclaux F, *et al.* (1995). Nutritional physiology and taxonomy of human-pathogenic *Cladosporium-Xylohypha* species. *Journal of Medical and Veterinary Mycology* **33**: 339–347.

Hoog GS de, Guarro J, Gené J, *et al.* (2000). *Atlas of clinical fungi, 2nd ed*. CBS, Utrecht and Universitat rovira I virgili, Reus.

Huang F, Zhang CY (2015). Diversity, host- and habitat-preferences on the fungi communities from the roots of *Cymbidium* spp. at two sides of China. *The Journal of Animal & Plant Sciences* **25**: 270–277.

Hughes SJ (1952). Four species of *Septonema*. *The Naturalist* **840**: 7–12.

Hughes SJ (1958). Revisiones hyphomycetum aliquot cum appendice de nominibus rejiciendis. *Canadian Journal of Botany* **36**: 727–836.

Hughes SJ (1974). *Sporidesmium larvatum*. *Fungi Canadensis* **59**: 1–2.

Hughes SJ (1980a). *Taeniolella exilis*. *Fungi Canadensis* **183**: 1–2.

Hughes SJ (1980b). *Taeniolella alta*. *Fungi Canadensis* **184**: 1–2.

Hughes SJ (1980c). *Taeniolella rudis*. *Fungi Canadensis* **185**: 1–2.

Hughes SJ (2007). *Heteroconium* and *Pirozynskiella* n. gen., with comments on conidium transseptation. *Mycologia* **99**: 628–638.

Hyde KD, McKenzy EHC, Ko Ko TW (2011). Towards incorporating anamorphic fungi in a natural classification - checklist and notes for 2010. *Mycosphere* **2**: 1–88.

Hyde KD, Jones EBG, Liu JK, *et al.* (1013). Families of *Dothideomycetes*. *Fungal Diversity* **63**: 1–313.

Ihlen PG, Wedin M (2006). Notes on two lichenicolous fungi on *Cladonia botrytes* in Scandinavia. *Graphis Scripta* **18**: 38–40.

Jando K, Kukwa M (2003). Lichens, lichenicolous and resinicolous fungi of the planned nature reserve “Wisz ce Torfowiska nad jeziorem Jaczno” and the areas adjacent to Lake Jaczno in Suwalski Landscape Park (NE Poland). *Parki Narodowe i Rezerwaty Przyroda* **22**: 3–17.

Jando K, Kowalewska A, Kukwa M (2000). The first record of two lichenicolous fungi, *Lichenoconium pyxidatae* and *Taeniolella beschiana*, in Poland. *Fragmenta Floristica et Geobotanica* **45**: 529–532.

John V (1990). Atlas der Flechten in Rheinland-Pfalz. Vol. 1 (text) & Vol. 2 (maps). *Beiträge zur Landespflege in Rheinland-Pfalz* **13**: 1–276.

John V (1998). Neue Nachweise von Flechten im Saarland. *Delattinia* **24**: 141–148.

John V, Bruyn de U, Dolnik Ch, *et al.* (2011). Flechten und flechtenbewohnende Pilze im Pfälzerwald (BLAM-Exkursion 2010). *Herzogia* **24**: 297–313.

Jones EBG, Eaton RA, Somrithipol S (2002). *Taeniolella rudis* and *Taeniolella longissima* sp. nov. with secondary sympodioconidia from freshwater habitats. *Mycoscience* **43**: 201–206.

Kalgutkar RM (1997). Fossil fungi from the lower Tertiary Iceberg Bay Formation, Eukeka Sound Group, Axel Heiberg Island, Northwest Territories, Canada. *Review of Palaeobotany and Palynology* **97**: 197–226.

Karatygin IV, Nezdoiminogo EL, Novozhilov YK, *et al.* (1999). *Russian Arcti Fungi. Annotated Checklist*. Khimiko-farmatsevticheskaya Akademiya Press, St. Petersburg.

Kärnefelt I (1979). The brown fruticose species of *Certraria*. *Opera Botanica a Societate Botanice Lundensi* **46**: 1–150.

Kärnefelt I (1986). The genera *Bryocaulon*, *Coelocaulon* and *Cornicaulon* and formerly associated taxa. *Opera Botanica a Societate Botanice Lundensi* **86**: 1–90.

Kärnefelt I, Mattsson J-E, Thell A (1993). The lichen genera *Arctocetraria*, *Cetraria* und *Cetrariella* (*Parmeliaceae*) and their presumed evolutionary affinities. *The Bryologist* **96**: 394–404.

Karsten PA (1887). Symbolae ad mycologiam Fennicam. Pars XX. *Meddelanden af Societas pro Fauna et Flora Fennica* **14**: 95–102.

Karsten PA (1888). Symbolae ad mycologiam Fennicam. Pars XXVIII. *Meddelanden af Societas pro Fauna et Flora Fennica* **16**: 37–46.

Karsten PA (1892). Finlands mögelsvampar (Hyphomycetes Fennici). *Bidrag till kännedom of Finlands natur och folk* **51**: 343–534.

Keissler K v (1930). *Die Flechtenparasiten. [Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz*. 2. Aufl., 8.] Verlag von E. Kummer, Leipzig.

Kettunen E, Schmidt AR, Diederich P, *et al.* (2016). Lichen-associated fungi from Paleogene amber. *New Phytologist* **209**: 896–898.

Kettunen E, Schmidt AR, Diederich P, *et al.* (2018). Diversity of lichen-associated filamentous fungi preserved in European Paleogene amber. *Earth and Environmental Science Transactions of the Royal Society of Edinburgh* **108**: 311–320.

Khodosovtsev AYe, Khodosvtseva YuA (2014). Lichens and lichenicolous fungi of the arboretum F.E. Falz-Fein Biosphere Reserve of “Askania-Nova”. *Chornomors’kyi Botanichnyi Zhurnal* **10**: 515–526.

Kirk PM (1981). New or interesting microfungi. I. Dematiaceous hyphomycetes from Devon. *Transactions of the British Mycological Society* **76**: 71–87.

Kirk PM (1982). New or interesting microfungi. IV. Dematiaceous hyphomycetes from Devon. *Transactions of the British Mycological Society* **78**: 55–74.

Kirk PM, Cannon PF, David JC, *et al.* (2001). *Ainsworth & Bisby’s Dictionary of the Fungi, 9th ed*. CABI Publishing, Oxfordshire.

Kirk PM, Cannon PF, Minter DW, *et al.* (2008). *Dictionary of the Fungi. 10th ed*. CABI Publishing, Oxfordshire.

Kocourková J (2000). Lichenicolous fungi of the Czech Republic (The first commented checklist). *Sborník Národního Muzea v Prazě. flada B: Prírodni vědy (Přírodovědný)* **55**: 59–169.

Kocourková J, Brackel W von (2005). Einige für Bayern neue Flechtenbewohnende Pilze – Beitrag zu einer Checkliste I. *Berichte der Bayerischen Botanischen Gesellschaft* **75**: 3–10.

Kocourková J, van den Boom PPG (2005). Lichenicolous fungi from the Czech Republic II. *Arthrorhaphis actoparmeliae* spec. nov. and some new records for the country. *Herzogia* **18**: 23–35.

Kocourková J, Knudsen K, Tucker S (2012). A Checklist of the Lichenicolous Biota of California. *Opuscula Philolichenum* **11**: 64–103.

Kondratyuk SY, Kolomiets IV (1991). Lichens and lichenicolous fungi new for Ukraine from ’Medobory’ reserve. *Ukrainian Botanical Journal* **54**: 42–47.

Kondratyuk SY, Lőkös L, Tschabanenko S, *et al.* (2013). New and noteworthy lichen-forming and lichenicolous fungi. *Acta Botanica Hungarica* **55**: 275–349.

Kristinsson H, Hansen ES, Zhurbenko MP (2006). Panarctic lichen checklist. CAFF–Flora group. URL: http://archive.arcticportal.org/276/01/Panarctic_lichen_checklist.pdf

Kristinsson H, Zhurbenko MP, Hansen ES (2010). *Panarctic checklist of lichens and lichenicolous fungi*. CAFF Technical Report No. 20. CAFF International Secretariat, Akureyri.

Kukwa M (2004). New or interesting records of lichenicolous fungi from Poland II. Species mainly from northern Poland. *Herzogia* **17**: 67–75.

Kukwa M (2005). New or interesting records of lichenicolous fungi from Poland. III. *Herzogia* **18**: 37–46.

Kukwa M, Czarnota P (2006). New or interesting records of lichenicolous fungi from Poland. IV. *Herzogia* **19**: 111–123.

Kukwa M, Flakus A (2009). New or interesting records of lichenicolous fungi from Poland VII. *Herzogia* **22**: 191–211.

Kukwa M, Jabłońska A (2008). New or interesting records of lichenicolous fungi from Poland VI. *Herzogia* **21**: 167–179.

Kukwa M, Kowalewska A (2007). New or interesting records of lichenicolous fungi from Poland V. Species mainly on *Cladonia*. *Herzogia* **20:** 199–207.

Kukwa M, Czarnota P, Perz P (2010). New or interesting records of lichenicolous fungi from Poland. VIII. *Herzogia* **23:** 111–119.

Kukwa M, Montijūnaitė J, Rutkowski P, *et al.* (2002). New or interesting records of lichenicolous fungi from Poland I. *Herzogia* **15**: 129–139.

Kukwa M, Schiefelbein U, Czarnota P, *et al.* (2008). Notes on some noteworthy lichens and allied fungi found in the Białowieża primeval forest in Poland. *Bryonora* **41**: 1–11.

Kukwa M, Szymczyk R, Kowalewska A (2013). New or interesting records of lichenicolous fungi from Poland IX. *Herzogia* **26**: 159–168.

Kumar S, Singh R, Pal VK, *et al.* (2007). Additions to new species of foliicolous hyphomycetes from North-eastern U.P. *Indian Phytopathology* **60**: 350–355.

Kuntze O (1898). *Revisio generum plantarum*, III(3): 1–576. A. Felix [etc.], Leipzig [etc.].

Kuznetsova ES, Motiejūnaitė J, Galanina IA, *et al.* (2013). *Bacidia suffusa* and *Taeniolella punctata* new to the Russian Far East. *Graphis Scripta* **25**: 51–55.

Lal SP, Yadav AS (1964). A preliminary list of microfungi associated with the decaying stems of *Triticum vulgare* and *Andropogon sorghum*. *Indian Phytopathology* **17**: 208–218.

Lal SP, Yadav AS (1966). Addition to Microfungi of Bihar. III. Fungi Imperfecti Associated with the Decaying Graminaceous Stems. *The Journal of the Indian Botanical Society* **44**: 402–406.

Lambley PW (2000). New, rare and interesting British lichen and lichenicolous fungi records. *British Lichen Society Bulletin* **87**: 76–86.

Lawrey JD, Diederich P (2003). New frontiers in bryology and lichenology, lichenicolous fungi: interaction, evolution and biodiversity. *The Bryologist* **106**: 80–120.

Lawrey JD, Diederich P (2017). Lichenicolous fungi. URL: http://www.lichenicolous.net.

Lee S, Mel'nik V, Taylor JE, *et al.* (2004). Diversity of saprobic hyphomycetes on *Proteaceae* and *Restionaceae* from South Africa. *Fungal Diversity* **17**: 91–114.

Liang Y, Wang F, Li AN, *et al.* (2011). Thermotolerant fungi and their phylogenetic analyses based on rDNA-ITS sequences. *Mycosystema* **30**: 542–550.

Lind JVA, Rostrup E (1913). *Danish fungi as represented in the herbarium of E. Rostrup*. Copenhagen.

Linder DH (1931). The genus *Helicoceras*. *Annals of the Missouri Botanical Garden* **18**: 1–8.

Lindau L (1907–1910). *Die Pilze Deutschlands, Oesterreichs und der Schweiz. IX Abteilung. Fungi imperfecti: Hyphomycetes (zweite Hälfte), Dematiaceae (Phaeophragmiae bis Phaeostaurosporae), Stilbaceae, Tuberculariaceae, sowie Nachträge, Nährpflanzenverzeichnis und Register.* [Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz 1(8–9).] Verlag von E. Kummer, Leipzig.

Llimona X, Hladun NL (2001). Checklist of the lichens and lichenicolous fungi of the Iberian Peninsula and Balearic Islands. *Bocconea* **14**: 1–581.

Llimona X, Etayo J, Navarro-Rosinés P (1998). Los líquenes. In: *Ecología de los Monegros. La paciencia como estrategia de supervivencia*. (C Pedrocchi Renault, ed.): 143–154. Instituto de Estudios Altoaragoneses (Diputación de Huesca). y Centro de Desarrollo de Monegros, Huesca.

Llop E, Gómez-Bolea A (2006). Foliicolous lichens and associated lichenicolous fungi in the north-estern Iberian Peninsula: the effect of environmental factors on distribution. *The Lichenologist* **38**: 55–65.

Lohman M (1934). *Lophiosphaera* (*Glonium*) *velata*, with a critical study of its *Septonema multiplex* stage. *The American Journal of Botany* **21**: 314–327.

Lücking R (2009). The taxonomy of the genus *Graphis* sensu Staiger (Ascomycota: Ostropales: *Graphidaceae*). *The Lichenologist* **41**: 319–362.

Lumbsch HT, Huhndorf SM (2009). Outline of Ascomycota – 2009. *Myconet* **14**: 1–247.

Luo J, Yin JF, Cai L, *et al.* (2004). Freshwater fungi in Lake Dianchi, a heavily polluted lake in Yunnan, China. *Fungal Diversity* **16**: 93–112.

Lynge B (1921). Studies on the lichen flora of Norway. *Kunglige Norske Videnskabers Selskab Skrifter* **1921**(15): 1–252.

Ma L-G, Ma J, Zhang Y-D, *et al.* (2012). New species and records of *Heteroconium* (anamorphic fungi) from southern China. *Mycoscience* **53**: 466–470.

Mačkinaitė R (2010). Fungi diversity on wild and cultivated common caraway (*Carum carvi* L.) seeds. *Zemdirbyste-Agriculture* **97**(4): 73–84.

Malíček J, Palice Z (2013). Lichens of the virgin forest reserve Žofínský prales (Czech Republic) and surrounding woodlands. *Herzogia* **26**: 253–292.

Maria GL, Sridhar KR (2003). Diversity of filamentous fungi on woody litter of five mangrove plant species from the southwest coast of India. *Fungal Diversity* **14**: 109–126.

Marincowitz S, Crous PW, Groenewald JZ, *et al.* (2008). *Microfungi occurring on the Proteaceae in the fynbos*. CBS, Utrecht.

Masclaux F, Guého E, Hoog GS de, *et al.* (1995). Phylogenetic relationship of human-pathogenic *Cladosporium* (*Xylohypha*) species inferred from partial LS rRNA sequences. *Journal of Medical and Veterinary Mycology* **33**: 327–338.

Matsushima T (1975). *Icones Microfungorum: a Matsushima lectorum*. Kobe.

Matsushima T (1996). *Matsushima Mycological Memoirs No. 9*. Matsushima Fungus Collection. Kobe.

Matwiejuk A, Bohdan A (2011). New records of *Plectocarpon lichenum* from Białowieża Forest (Poland). *Herzogia* **24**: 381–382.

May TW (2017a). Report of the Nomenclature Committee for Fungi – 20. *IMA Fungus* **8**: 189–203.

May TW (2017b). Report of the Nomenclature Committee for Fungi – 20. *Taxon* **66**: 483–495.

Mel'nik VA (2000). *Opredelitel' Gribov Rossii. Klass Hyphomycetes*. Vyp. 1. Sem. Dematiaceae. Nauka, St. Petersburg.

Mel'nik VA, Popushoi IS (1992). *Nesovershennye Griby na Drevesnykh i Kustarnikovykh Porodakh*. Stiintsa, Kishinev.

Mercado Sierra A (1984a). Nuevas especies de *Deightoniella*, *Phaeoisaria*, *Sporidesmium*, y *Taeniolella* (Hyphomycetes) de Cuba. *Acta Botanica Cubana* **21**: 1–10.

Mercado Sierra A (1984b). *Hifomicetes demaciáceos de Sierra del Rosario, Cuba*. Ed. Academia, La Habana.

Mercado Sierra A, Mena-Portales J (1995). Hifomicetes dematiáceos de tres provincias orientales de Cuba. *Revista Ibérica de Micología* **12**: 101–107.

Migula W (1934). *Kryptogamen-Flora von Deutschland, Deutsch-Österreich und der Schweiz: im Anschluss an Thomé's Flora von Deutschland*. XI, Abt. 2, Band III, Pilze, 4(2). Leipzig.

Milko AA (1985). *Taeniolella aquatilis* (Woronichin) Milko comb. nov. *Novosti Sistematiki Nizshikh Rastenii* **22**: 132–133.

Minter DW, Holubová-Jechová V (1981). New or interesting Hyphomycetes on decaying pine litter from Czechoslovakia. *Folia Geobotanica et Phytotaxonomica* **16**: 195–217.

Montagne JPFC (1845). Cinquième Centurie de plantes cellulaires exotiques nouvelles. Décades VII à X. *Annales des Sciences Naturelles Botanique* **4**: 346–367.

Montijūnaitė J (2009). Lichens and allied fungi of two Regional Parks in Vilnius area (Lithuania). *Acta Mycologica* **44**: 185–199.

Montijūnaitė J (2015). Lichens and allied fungi from the Čepkeliai state nature reserve (Southern Lithuania). *Botanica Lithuania* **21**: 3–12.

Montijūnaitė J, Andersson L (2003). Contribution to the Lithuanian flora of lichens and allied fungi. *Botanica Lithuania* **9**: 71–88.

Morgan-Jones G, McKemy JM (1990). Studies in the genus *Cladosporium* sensu lato. I. Concerning *Cladosporium uredinicola*, occuring on telial columns of *Cronartium quercuum* and other rusts. *Mycotaxon* **39**: 185–202.

Muggia L, Grube M (2010). Fungal composition of lichen thalli assessed by single strand conformation polymorphism. *The Lichenologist* **42**: 461–473.

Müller E, Petrini O, Fischer PJ, *et al.* (1987). Taxonomy and anamorphs of the *Herpotrichiellaceae* with notes on generic synonymy. *Transactions of the British Mycological Society* **88**: 63–74.

Muntañola-Cvetković M, Hoyo P, Llimona X (1997). Fongos mitospòrics dels estatges montà, subalpí i alpí de Catalunya. *Revista Catalana de Micologia* **20**: 199–212.

Nash TH, Ryan BD, Diederich P, *et al.* (2004). *Lichen Flora of the Greater Sonoran Desert Region. Vol. 2*. Lichens Unlimited, Arizona State Univerity Tempe.

Navarro-Rosinés P, Boqueras M, Llimona X (1994). Primer catàleg dels fongs liquenícoles de Catalunya i zones pròximes (NE de la Península Ibèrica). *Butlletí Societat Catalana de Micologia* **16–17**: 165–204.

NDFF (2015). NDFF Verspreidingsatlas. 20 november 2016, http://verspreidingsatlas.nl. FLORON (2014).

Nordin A, Moberg R, Tønsberg T, *et al.* (2010). *Santesson's Checklist of Fennoscandian Lichen-forming and Lichenicolous Fungi*. Museum of Evolution, Uppsala University, Uppsala.

Otte V (2004). Flechten, Moose und lichenicole Pilze aus dem nordwestlichen Kaukasus – erster Beitrag. *Feddes Repertorium* **115**: 155–163.

Otte V, van den Boom B, Rätzel S (2006). Bemerkenswerte Funde von Flechten und lichenicolen Pilzen aus Brandenburg XI. *Verhandlungen des Botanischen Vereins von Berlin und Brandenburg* **139**: 275–291.

Panwar KS, Chouhan JS (1977). Two new species of Hyphomycetes. *Current Science* **46**: 786–787.

Patil AS, Rao VG (1981). A contribution to the deuteromycetous fungi of Maharashtra. *Biovigyanam* **7**: 21–28.

Peck CH (1873). Plants found growing spontaneously in the state and not before reported. *Report (Annual) of the New York State Museum of Natural History by the Regents of the University of the State of New York* **25**: 89.

Peck CH (1878). Species not before reported. *Report (Annual) of the New York State Museum of Natural History by the Regents of the University of the State of New York* **30**: 53.

Persoon CH (1822). *Mycologia Europaea* 1, i–[ii], 1–356, [iii–iv], plates 1–12. Erlangen.

Petrak F (1949). Neue Hyphomyceten-Gattungen aus Ekuador. *Sydowia* **3**: 259–266.

Petutschnig W (1992). *Gesteinsabhängigkeit von Krustenflechten in Bereich der Kärntner Zentralalpen (Nationalpark Nockberge, Österreich).* Dissertation Naturwissenschaftliche Fakultät Universität Graz, Graz.

Pirogov MB, Khodosovtsev AYe (2013). Novi dlya Ukrainy vidi likhenofilnikh hribiv – *Arthonia phaeophysciae* Grube & Matzer (*Arthoniaceae*) i *Taeniolella phaeophysciae* D.Hawksw. (Anamorphic Ascomycota). *Ukrayins'kyi Botanichnyi Zhurnal* **70**: 535–537.

Popov ES, Kovalenko AE, Gapienko OS *et al*. (2013). *Mikrobiota Belorussko-valdajskogo Poozer'ja*. Moskau, St. Petersburg.

Rambold G, Triebel D (1992). The inter-lecanoralean associations. *Bibliotheca Lichenologica* **48**: 1–201.

Randlane T, Saag A (eds.) (2004). *Estonian Microlichens*. University of Tartu, Tartu. (in Estonian)

Rätzel S, Otte V, Sipman HJM, *et al.* (2003). Bemerkenswerte Flechtenfunde aus Brandenburg VIII (inkl. lichenicoler und lichenoider Pilze). *Verhandlungen des Botanischen Vereins von Berlin und Brandenburg* **136**: 321–340.

Réblová M (1999). Studies in *Chaetospaeria* sensu lato III. *Umbrinosphaeria* gen. nov. and *Miyoshiella* with *Sporidesmium* anamorphs. *Mycotaxon* **71**: 13–43.

Réblová M, Seifert K (2011). Discovery of the teleomorph of the hyphomycete, *Sterigmatobotrys macrocarpa*, and epitypification of the genus to holomorphic status. *Studies in Mycology* **68**: 193–202.

Réblová M, Seifert K, Fournier J, *et al.* (2012). Phylogenetic classification of *Pleurothecium* and *Pleurotheciella* gen. nov. and its dactylaria-like anamorph (Sordariomycetes) based on nuclear ribosomal and protein-coding genes. *Mycologia* **104**: 1299–1314.

Reddy BS, Manoharachary C, Rao VG (1997). Two new hyphomycetous fungal species from India. *Journal of the Indian Botanical Society* **76**: 173–175.

Reddy SS, Reddy SM (1978). A new species of *Taeniolella* Hughes. *Mycotaxon* **6**: 508–510.

Ren S-C, Ma J, Zhang X-G (2012). Two new *Heteroconium* species and two other forest microfungi newly recorded from China. *Mycotaxon* **119**: 361–367.

Révay Á (1985). Dematiaceous Hyphomycetes inhabiting forest debris in Hungary I. *Studia Botanica Hungarica* **18**: 65–71.

Révay Á (1988). Dematiaceous Hyphomycetes inhabiting forest debris in Hungary III. *Studia Botanica Hungarica* **20**: 95–100.

Révay Á (1993). Some new or interesting Hyphomycetes from Hungary. *Nova Hedwigia* **56**: 473–482.

Révay Á (1998). Review of the hyphomycetes of Hungary. *Studia Botanica Hungarica* **27–28**: 5–74.

Rippon JW (1987). Symposium on medical mycology. *Mycopathologia* **99**: 143–146.

Rossman AY, Crous PW, Hyde KD, *et al*. (2015). Recommended names for pleomorphic genera in Dothideomycetes. *IMA Fungus* **6**: 507–523.

Rossman AY, Farr DF, Castlebury LA (2007). A review of the phylogeny and biology of the *Diaporthales*. *Mycoscience* **48**: 135–144.

Rostrup O (1916). Bidrag til Danmarks Svampeflora. *Dansk Botanisk Arkiv* **2**(5): 1–56.

Roux C (2012). Liste des lichens et champignons lichénicoles de France. *Bulletin de la Société Linnéenne de Provence, Numéro Spécial* **16**: 1–220.

Roux C, Bricaud O, Tranchida F (2001). Importance des lichens et champignons lichénicoles dans la richesse spécifique et la gestion de la réserve de Chambord. *Bulletin de la Société Linnéenne de Provence* **52**: 161–183.

Roux C, Coste C, Bricaud O, *et al.* (2006). Catalogue des lichens et des champignons lichénicoles de la région Languedoc–Roussillon (France méridionale). *Bulletin de la Société Linnéenne de Provence* **57**: 85–200.

Roux C, Masson D, Bricaud O, *et al.* (2011). Flore et végétation des lichens et champignons lichénicoles de quatre réserves naturelles des Pyrénées-Orientales (France). *Bulletin de la Société Linnéenne de Provence, Numéro Spécial* **14**: 3–151.

Roux C, Monnat J-Y, Gonnet O, *et al.* (2017). *Catalogue des lichens et champignons lichénicoles de France métropolitaine. 2^e^ édition revue et augementeé. Édit*. Association française de lichénologie (A.F.L.), Fontainbleau.

Saccardo PA (1878). Fungi Veneti novi vel critici vel mycologiae Venetae addendi. Series VIII. *Michelia* **1**(2): 239–275.

Saccardo PA (1881). *Fungi Italici Autographice Delineati Fascs 17–28: tabs 641–1120.* Patavii.

Saccardo PA (1882). Fungi Veneti novi vel critici v. mycologiae Veneti addendi (adjectis nonnullis extra-Venetis). Series XIII. *Michelia* **2**(8): 528–563.

Saccardo PA (1886). *Sylloge Fungorum omnium hucusque cognitum digessit*. Vol. 4. P.A. Saccardo, Padova.

Saccardo PA (1892). *Sylloge Fungorum omnium hucusque cognitum digessit*. Vol. 10. P.A. Saccardo, Padova.

Santesson R (1993). *The lichens and lichenicolous fungi of Sweden and Norway.* SBT-förlaget, Lund.

Santesson R (1994a). Fungi Lichenicoli Exsiccati. Fasc. 7 & 8 (151–200). *Thunbergia* **21**: 1–18.

Santesson R (1994b). Fungi Lichenicoli Exsiccati. Fasc. 9 & 10 (201–250). *Thunbergia* **22**: 1–24.

Santesson R (2001). Fungi Lichenicoli Exsiccati. Fasc. 13 & 14 (301–350). *Thunbergia* **31**: 1–18.

Santesson R (2008). Fungi Lichenicoli Exsiccati. Fasc. 15 & 16 (351–400). *Thunbergia* **36**: 1–36.

Santesson R, Moberg R, Nordin A, Tønsberg T, Vitikainen O (2004). *Lichen-forming and lichenicolous fungi of Fennoscandia.* Museum of Evolution, Uppsala University, Uppsala.

Schiefelbein U (2013). Additions to the lichenized and lichenicolous fungi of Mecklenburg-Western Pomerania (Germany). *Herzogia* **26**: 65–72.

Schiefelbein U, Czarnota P, Thüs H, *et al.* (2012). The lichen biota of the Drawieński National Park (NW Poland, Western Pomerania). *Folia Cryptogamica Estonica* **49**: 59–71.

Schiefelbein U, Brackel W v, Cezanne R, *et al.* (2017). *Trimmatostroma arctoparmeliae* sp. nov. and noteworthy records of lichenized, lichenicolous and allied fungi from the Harz Mountains and surrounding regions. *Herzogia* **30**: 80–102

Scholz P (2000). Katalog der Flechten und flechtenbewohnenden Pilze Deutschlands. *Schriftenreihe für Vegetationskunde* **31**: 1–298.

Schubert K, Ritschel A, Braun U (2003). A monograph of *Fusicladium s.lat.* (Hyphomycetes). *Schlechtendalia* **9**: 1–132.

Schubert K, Groenewald JZ, Braun U, *et al.* (2007). Biodiversity in the *Cladosporium herbarum* complex (*Davidiellaceae*, *Capnodiales*), with standardisation of methods for *Cladosporium* taxonomy and diagnostics. *Studies in Mycology* **58**: 105–156.

Schulzer v. Müggenburg S (1872). Mykologische Beobachtungen. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* **22**: 405–424.

Schulzer v. Müggenburg S, Saccardo PA (1884). Micromycetes Slavonici novi. *Hedwigia* **23**: 125–128.

Seifert K, Morgan-Jones G, Gams W, Kendrick B (2011). *The Genera of Hyphomycetes*. CBS-KNAW Fungal Biodiversity Centre, Utrecht.

Selçuk F, Hüseyin E, Şahin A, *et al.* (2014). Hyphomycetous fungi in several forest ecosystems of Black sea provinces of Turkey. *Mycosphere* **5**: 334–344.

Senthikumar K, Udaiyan K, Manian S (1993). Successional pattern of mycoflora associated with litter degradation in a *Cymbopogon caesius*-dominated tropical grassland. *Tropical Grasslands* **27**: 121–127.

Sérusiaux E (1979). Contribution a l'etude des lichens de Kivu (Zaire), du Rwanda et du Burundi. III. *Vezdaea*, a new genus for Africa. *Mycotaxon* **8**: 135–139.

Sérusiaux E, Lambinon J, Malaise P (1983). Lichens et champignons lichénicoles nouveaux ou intéressants pour la flore de Belgique et des régions voisines I. *Dumortiera* **33**: 25–35.

Sérusiaux E, Diederich P, Ertz D, *et al.* (2003). New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. IX. *Lejeunia n. s.* **173**: 1–48.

Sharma AD, Munjal RL (1979). Some hyphomycetes from Himachal Pradesh. I. *Kavaka* **7**: 73–77.

Shaw CG (1973). Host fungus index for the Pacific Northwest – I. Hosts. *Washington State Bulletin of the Washington State Agricultural Experimentation Station* **765**: 1–121.

Shearer CA, Raja HA, Miller AN, *et al.* (2009). The molecular phylogeny of freshwater *Dothideomycetes*. *Studies in Mycology* **64**: 145–153.

Shenoy BD, Jeewon R, Wu WP, *et al.* (2006). Ribosomal and RPB2 DNA sequence analyses suggest that *Sporidesmium* and morphologically similar genera are polyphyletic. *Mycological Research* **110**: 916–928.

Shoemaker RA, Hambleton S (2001). "*Helminthosporium*" *asterinum*, *Polydesmus elegans*, *Imimyces*, and allies. *Canadian Journal of Botany* **79**: 592–599.

Simón MCS (2011). *Hifomicetes dematiáceos de la península Ibérica*. Universitat Rovira i Virgili, Reus.

Sizonenko TA, Zagirova SV, Khabibullina FM (2009). Microbial Communities in the Litter of Middle Taiga Bilberry–Spruce Forests. *Eurasian Soil Science* **43**: 1132–1139.

Smith AL (1903). New or critical microfungi. *Journal of Botany British and Foreign* **41**: 257–260.

Sridhar KR (2009). *Frontiers in Fungal Ecology, Diversity and Metabolites*. IK International Publishing House Pvt. Ltd. New Delhi.

Søchting U, Alstrup V, Kocourkova J, *et al.* (2007). Additions to the lichen and lichenicolous flora of Denmark VII. *Graphis Scripta* **19**: 40–47.

Šoun J, Halda J, Kocourková J, *et al.* (2006). Lišejníky zaznamenané během 16. bryologicko-lichenologických dnů v Kameničkách (CHKO Žďárské vrchy, 2.–5. 10. 2003). [Lichens recorded during the 16th Bryological and Lichenological Days in Kameničky (PLA Žďárské vrchy, Czech Republic) in 2003]. *Bryonora* **38**: 39–47.

Sparrius LB (2000). *Agonimia gelatinosa* (Ach.) Brand & Diederich en *Taeniolella punctata* M. S. Christ. & D. Hawksw. nieuw voor Nederland. *Buxbaumiella* **51**: 51–52.

Sparrius LB, Diederich P, Signoret J, *et al.* (2002). The lichen flora of the Boulonnais (France, Pas-de-Calais). *Belgian Journal of Botany* **135**: 50–75.

Spribille T, Pérez-Ortega S, Tønsberg T, *et al.* (2010). Lichens and lichenicolous fungi of the Klondike Gold Rush National Historic Park, Alaska, in a global biodiversity context. *The Bryologist* **113**: 439–515.

Straßer P (1916). Achter Nachtrag zur Pilzflora des Sonntagsberges (N.-Ö.). *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* **73**: 223–247.

Sturm J (1829). Deutschlands Flora, Abtheilung III. *Die Pilze Deutschlands* **2**(8): 1–136.

Subhedar AW (1977). PhD thesis. Univ. of Poona. Poona.

Subhedar AW, Rao VG (1975). Some interesting fungi from Western India. *Biovigyanam* **1**: 191–196.

Suija A (2005). Lichenicolous fungi in Estonia II: Basidiomycota and conidial fungi. *Nova Hedwigia* **80**: 349–365.

Suija A, Jüriado I (2002). Lichens and lichenicolous fungi of the Hiiumaa Islets Landscape Reserve (Estonia). *Folia Cryptogamica Estonica* **39**: 37–50.

Suija A, Leppik E, Randlane T, *et al.* (2007a). New Estonian records: Lichens and lichenicolous fungi. *Folia Cryptogamica Estonica* **43**: 73–76.

Suija A, Lõhmus P, Jüriado I (2007b). The lichen biota of the Agusalu and Puhatu reserves (Estonia): the first overview. *Forestry Studies / Metsanduslikud Uurimused* **41**: 99–116.

Suija A, Lõhmus P, Motiejūnaitė J (2008). New Estonian records: Lichens and lichenicolous fungi. *Folia Cryptogamica Estonica* **44**: 156–159.

Suija A, Czarnota P, Himelbrant DE, *et al.* (2010). The lichen boita of tree natural reserves in island Saaremaa, Estonia. *Folia Cryptogamica Estonica* **47**: 85–96.

Sutton BC (1975). Hyphomycetes on cupules of *Castanea sativa*. *Transactions of the British Mycological Society* **64**: 405–426.

Svanidze TV [as Сванидзе ТВ] (1984). *Mycoflora of Rachi (Western Georgia).* PhD Thesis. Tbilisi. (in Ukrainian).

Sydow P (1897). *Sylloge Fungorum omnium hucusque cognitum digesit. Vol. 12*. Index universalis … Borntraeger, Berlin.

Szymczyk R, Zalewska A (2008). Lichen biota of the Grabianka river valley in the Elblag upland (Wysoczyzna Elblaska). *Polish Journal of Natural Sciences* **23**(1): 398–414.

Taran NA (1992). Plant-inhabiting microfungi new for Ukraine. *Ukrainian Botanical Journal* **49**(5): 71–79. (in Ukrainian).

Taran NA (2002). Levels of organization of microbiots of anthropogenically changed landscapes of steppe. *Ecology and Noosperology* **12**(3): 65–71. (in Ukrainian).

Treigien A, Markovskaja S (2007). Microscopic fungi on *Carpinus betulus* in Lithuania. 2. Anamorphic fungi. *Botanica Lithuanica* **13**(1): 45–50.

Triebel D, Scholz P (2001). Lichenicolous fungi from Bavaria as represented in the Botanische Staatssammlung München. *Sendtnera* **7**: 211–231.

Triebel D, Scholz P (2001–2013). „IndExs – Index of Exsiccatae". – Botanische Staatssammlung München. URL: http://indexs.botanischestaatssammlung.de.

Tschermak-Woess E, Poelt J (1976). *Vezdaea*, a peculiar lichen genus, and its phycobiont. In: *Lichenology: Progress and Problems*. (DH Brown, DL Hawksworth & RH Bailey (eds.). Academic Press, New York.

Tsurykau A (2017). New or otherwise interesting records of lichens and lichenicolous fungi from Belarus. III. With an updated checklist of lichenicolous fungi. *Herzogia* **30**: 152–165.

Tsurykau A, Suija A, Khramchankova V (2013). New records of lichenicolous fungi from the Gomel Region of Belarus. *Folia Cryptogamica Estonica* **50**: 67–71.

Tsurykau A, Golubkov V, Kukwa M (2014). New or otherwise interesting records of lichens and lichenicolous fungi from Belarus. *Herzogia* **27**: 111–120.

Tsurykau A, Suija A, Heuchert B, *et al.* (2016). New or otherwise interesting records of lichens and lichenicolous fungi from Belarus. II. *Herzogia* **29**: 164 –175.

Türk R, Berger F (1999). Neue und seltene Flechten sowie lichenicole Pilze aus den Ostalpen III. *Linzer Biologische Beiträge* **31**(2): 929–953.

Türk R, Poelt J (1993). Bibliographie der Flechten und flechtenbewohnenden Pilze in Österreich. *Österreichische Akademie der Wissenschaften Wien, Biosystematics and Ecology Series* **3**: 1–168.

Uecker FA (1988). A world list of *Phomopsis* names with notes on nomenclature, morphology and biology. *Mycological Memoirs* **13**: 1–231.

Van den Boom PPG, Etayo J (2014). New records of lichenicolous fungi and lichenicolous lichens from the Iberian Peninsula, with the description of four new species and one new genus. *Opuscula Philolichenum* **13**: 44–79.

Van den Boom PPG, van den Boom B (2006). An inventory of lichens and lichenicolous fungi in nothern Belgium (area of Stramprooierbroek). *Bulletin de la Société des Naturalistes Luxembourgeois* **106**: 39–52.

Van den Boom PPG, Breuss O, Sier L, *et al.* (1996). Beitrag zur Flechtenflora Kärntens. Ergebnisse der Feldbergtagung der Bryologischen und Lichenologischen Arbeitsgruppe der KNNV in Weissbriach 1994. *Linzer Biologische Beiträge* **28**: 619–654.

Van den Boom PPG, Serusiaux E, Diederich P, *et al.* (1998). A lichenological excursion in May 1997 near Han-sur-Lesse and Saint-Hubert, with notes on rare and critical taxa of the flora of Belgium and Luxembourg. *Lejeunia n. s.* **158**: 1–58.

Varghese KIM, Rao VG (“1979/80” 1980). Forest Mico-Fungi IV. Some new taxa of dematiaceous hyphomycetes. *Journal of the University of Bombay* **48–49**: 47–55.

Vězda A (1986). *Lichenes Selecti Exsiccati Fasc*. **85**: 7. Instituto botanico academiae scientiarum Čechoslovacae, Praha.

Vězda A (1973). Foliicole Flechten aus der Republik Guinea (W-Afrika). I. *Časopis Slezskeho Muzea* [Acta Musei Silesiae], *Ser. A. (Opava)* **22**: 67–90.

Vitikainen O, Ahti T, Kuusinen M, *et al.* (1997). Checklist of lichens and allied fungi of Finland. *Norrlinia* **6**: 1–123.

Vobis G, Hawksworth DL (1981). Conidial lichen-forming fungi. In: *Biology of conidial fungi*, vol 1. (GT Cole & B Kendrick, eds): 245–273. Academic Press, New York.

Vondrák J, Etayo J (2007). A contribution to the diversity of lichen-forming and lichenicolous fungi in the Spanish Pyrenees. *Herzogia* **20**: 189–198.

Voronin L (1992). Fungal complexes on dead macrophytes in Estonian lakes. Proceedings of the Estonian Academy of Sciences. *Biology* **41**: 77–85. (in Russian).

Vouaux L (1913). Synopsis des champignons parasites de lichens. *Bulletin trimestriel de la Société Mycologique de France* **29**: 447–494.

Wang CJK (2010). *Wood-Inhabiting Microfungi (Molds) of New York*. Final Report NYHER 070401 to The New York State Biodiversity Research Institute. Department of Environmental and Forest Biology State University of New York, New York.

Watanabe T (1989). Soil fungal flora in Hachijo-jima island. *Transactions of the Mycological Society of Japan* [Nihon Kingakkai kaiho] **30**: 427–435.

Watanabe T (1992). *Taeniolella phialosperma* sp. nov. from Japan. *Mycologia* **84**(3): 478–483.

Watanabe T (1997). Taxonomy and Identification, and Biology of Fungi Associated with Soilborne Plant Diseases. *Annals of the Phytopathological Society of Japan* [Nippon shokubutsu byori-gakkai ho] **63**: 136–138.

Watanabe T (2002*). Pictorial atlas of soil and seed fungi: morphologies of cultured fungi and key to species*. 2nd ed. CRC Press, Boca Raton.

Watanabe T (2010). *Pictorial atlas of soil and seed fungi: morphologies of cultured fungi and key to species*. 3rd ed. CRC Press, Boca Raton.

Werth S, Millanes AM, Wedin M, *et al.* (2013). Lichenicolous fungi show polulation subdevisions by host species but do not share population history with their hosts. *Fungal Biology* **117**: 71–84.

Willdenow CL (1824). *Species plantarum*, Ed. 4, 6(1), Berlin.

Wirth V, Hauck M, Brackel W von, *et al.* (2010). Checklist of lichens and lichenicolous fungi in Germany. URL: http://wwwuser.gwdg.de/~mhauck/01Lichenicolous fungi.pdf

Wittmann H, Türk R (1990). Die Flechten im Nationalpark Nockberge (Kärnten, Österreich). *Kärntner Nationalpark-Schriften* **4**: 1–112.

Woronichin NN (1925). Zur Erforschung des Periphytons der Wolga. *Trudy Saratovskago Obshchestva Estestvoispytatelei i Lyubitelei Estestvozaniya* **10**: 55–64.

Woudenberg JHC, Groenewald JZ, Binder M, *et al.* (2013). *Alternaria* redefined. *Studies in Mycology* **75**(1): 171–212.

Wu W-P, Zhuang W-Y (2005). *Sporidesmium*, *Endophragmiella* and related genera from China. *Fungal Diversity Research Series* **15**: 1–531.

Xia J-W, Ren S-C, Ma L-G, *et al.* (2012). *Heteroconium bannaense* sp. nov. and a new record of the genus from China. *Mycotaxon* **121**: 413–417.

Yang HL, Sun GY, Batzer JC, *et al.* (2010). Novel fungal genera and species associated with the sooty blotch and flyspeck complex on apple in China and the USA. *Persoonia* **24**: 29–37.

Yurchenko EO (2001). On some wood-inhabiting dematiaceous Hyphomycetes with remarkable conidia in Belarus. *Mycena* **1**: 32–54.

Zalewska A, Faltynowicz W (eds.) (2004). Lichens of the protected areas in the Euroregion Niemen*.* Suwałki.

Zamora JC, Pérez-Ortega S, Rico VJ (2014). *Heteroacanthella ellipsospora* sp. nov., the first lichenicolous basidiomycete with acanthoid basidia. *The Lichenologist* **46**: 17–23.

Zelski SE, Raja HA, Miller AN, *et al.* (2011). *Chaetorostrum quincemilensis*, gen. et sp. nov., a new freshwater ascomycete and its *Taeniolella*-like anamorph from Peru. *Mycosphere* **2**: 593–600.

Zhang YL, Zhang TY (2007). Notes on soil dematiaceous hyphomycetes from Zhangjiajie National Silvan Park, Hunan Province. *Mycosystema* **26**: 190–195.

Zhdanova NN, Vasilevskaya AI, Artyshkova LV, *et al.* (1990). Microfungi contaminated with soil radionuclides. *Mikologiya i Fitopatologiya* **24**: 298–308. (in Russian).

Zhurbenko MP (1998). Lichens and lichenicolous fungi from the north of Pyrasino lake, Taimyr peninsula, Siberia. *Folia Cryptogamica Estonica* **32**: 153–159.

Zhurbenko MP (2001). Lichenicolous fungi from Murmansk region of Russia. *Mikologiya i Fitopatologiya* (St.-Petersburg) **35**(1): 34–40.

Zhurbenko MP (2007). The lichenicolous fungi of Russia: geographical overview and a first checklist. *Mycologia Balcanica* **4**: 105–124.

Zhurbenko MP (2008). Lichenicolous fungi from Russia, mainly from its Arctic. II*. *Mycologia Balcanica* **5**: 13–22.

Zhurbenko MP (2009). Lichenicolous fungi and some lichens from the Holarctic. *Opuscula Philolichenum* **6**: 87–120.

Zhurbenko MP (2010). Lichenicolous fungi and lichens growing on *Stereocaulon* from the Holarctic, with a key to the known species. *Opuscula Philolichenum* **8**: 9–39.

Zhurbenko MP (2012). Lichenicolous fungi growing on *Thamnolia*, mainly from the Holarctic, with a worldwide key to the known species. *The Lichenologist* **44**: 147–177.

Zhurbenko MP (2013). Lichenicolous fungi and some allied lichens from the Canadian Arctic. *Opuscula Philolichenum* **12**: 180–197.

Zhurbenko MP, Alstrup V (2004). Lichenicolous fungi on *Cladonia* mainly from the Arctic. *Symbolae Botanicae Upsalienses* **34**: 477–499.

Zhurbenko MP, Brackel W. von (2013). Checklist of lichenicolous fungi and lichenicolous lichens of Svalbard, including new species, new records and revisions. *Herzogia* **26**: 323–359.

Zhurbenko MP, Braun U (2013). *Ameroconium cladoniae* gen. et sp. nov. and *Phoma psoromatis* sp. nov., new anamorphic lichenicolous fungi from the Holarctic. *The Lichenologist* **45**: 583–591.

Zhurbenko MP, Daniëls FJA (2003). New and rarely reported lichenicolous fungi and lichens from the Canadian Arctic. *Mycotaxon* **88**: 97–106.

Zhurbenko MP, Davydov EA (2000). Lichenicolous fungi and some lichens from the Russian Altai, southern Siberia. *Folia Cryptogamica Estonica* **37**: 109–117.

Zhurbenko MP, Himelbrant DE (2002). Lichenicolous fungi from the Kandalaksha Gulf, Karelia Keretina, Russia. *Folia Cryptogamica Estonica* **39**: 51–59.

Zhurbenko MP, Kobzeva, AA (2014). Lichenicolous fungi from Northwest Caucasus, Russia. *Herzogia* **27**: 377–396.

Zhurbenko MP, Otnyukova TN (2001). Lichenicolous fungi from the Sayan-Tuva Mountains, Southern Siberia, Russia. *Folia Cryptogamica Estonica* **38**: 79–84.

Zhurbenko MP, Santesson, R (1996). Lichenicolous fungi from the Russian Arctic. *Herzogia* **12**: 147–161.

Zhurbenko MP, Raynolds MK, Walker DA, *et al.* (2005). Lichens and lichenicolous fungi from the Kolyma delta region, Russian Arctic. *Graphis Scripta* **17**: 27–31.

Zhurbenko M, Hermansson J, Pystina TN (2012a). Lichenicolous fungi from the Komi Republic of Russia. II. Folia *Cryptogamica Estonica* **49**: 89–91.

Zhurbenko MP, Himelbrant DE, Kuznetsova E, *et al.* (2012b). Lichenicolous fungi from the Kamchatka Peninsula, Russia. *The Bryologist* **115**: 295–312.

Zhurbenko MP, Braun U, Heuchert B, *et al.* (2015). New lichenicolous hyphomycetes from Eurasia. *Herzogia* **28**: 584–598.