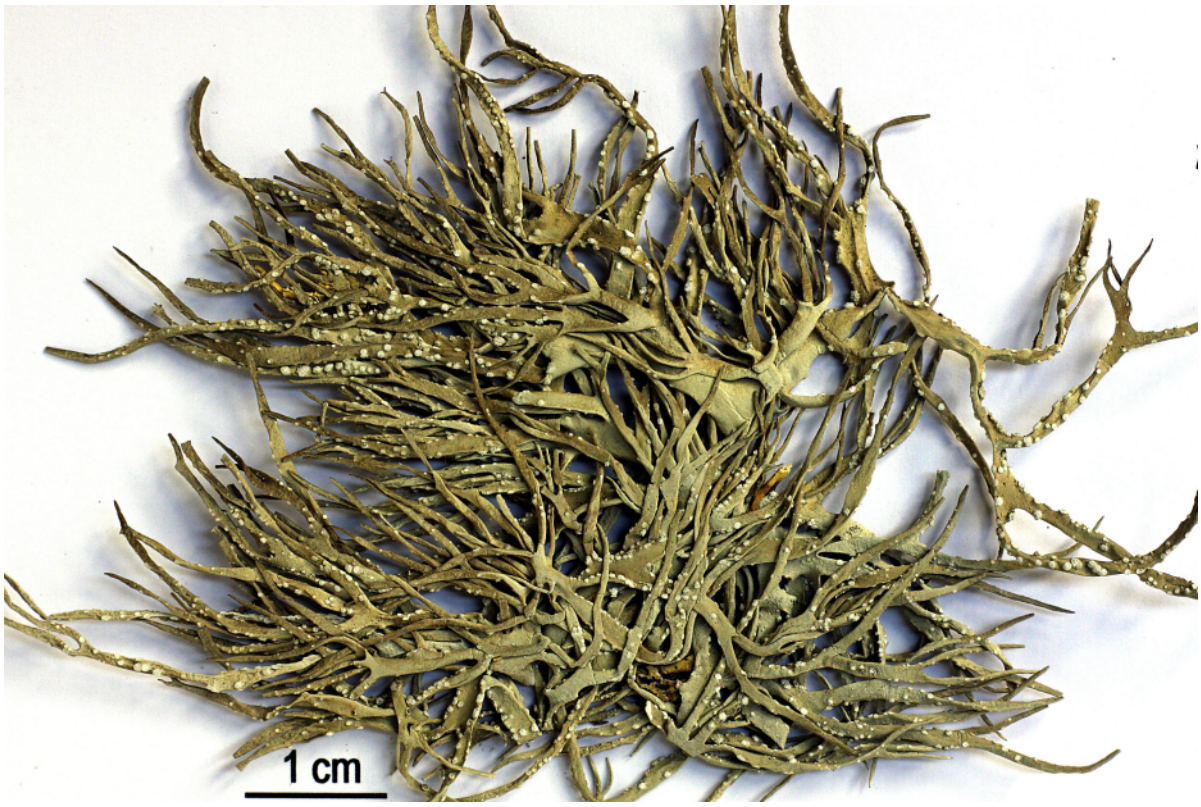
A. Aptroot & F. Schumm

Fruticose Roccellaceae
-
an anatomical-microscopical Atlas and Guide with a worldwide Key and further Notes on some crustose Roccellaceae or similar Lichens



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New species and combinations

Roccella sanctae-helenae Aptroot & Schumm.... 23, 234
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Abstract: The fruticose species of the Roccellaceae are studied morphologically and chemically and a key is presented to the accepted species (and some similar taxa), as well as a comprehensive list of taxa published in *Roccella* with their current disposition. *Roccella sanctae-helenae* Aptroot & Schumm is described new to science and *Roccellina arboricola* (Follmann) Aptroot & Schumm is a new combination.

Introduction

The large fruticose lichen genus *Roccella* was among the first to be described, and the lichen to be of the greatest economic use (see e.g. SáNCHEZ-PINTO 1995). The only taxonomic monograph of the genus (DARBISHIRE 1898) dates from the 19th century and was based almost entirely on herbarium studies as the author saw only the two European species in their natural environment in Britain. All species of the genus are essentially coastal, generally occurring within 10 km of the coast, but on wind-swept islands they occasionally occur a little further inland. They are not universally present on all coasts since they are sensitive to frost and thus restricted to certain tropical, subtropical or oceanic coasts (see below).

The group has received much attention from lichenologists, and many taxa have been described. As the genus is locally abundant or even dominant, species are often collected and identified, often by non-lichenologists. There are a steadily increasing number of taxonomic, and more recently also phylogenetic, publications, each changing the concepts of one or more taxa. Some *Roccella* species have been segregated into separate genera, or combined into existing non-fruticose genera such as *Roccellina*, sometimes being reinstated, and in the case of *Pentagenella fragillima* on two occasions. No doubt most of the changes reflect increased knowledge, but each new publication often raises further questions since only a selection of the names or species relevant to that specific subject are treated, leaving the remainder unresolved. Furthermore, although collectively the papers of TEHLER et al. (2004, 2007, 2009a, 2009b, 2010) treat all taxa, there is no comprehensive key available. The nearest approach to this is the key by FOLLMANN (2001) for South America, but the nomenclature and taxonomy of the species treated have changed considerably in the past decade. Even recent keys by e.g. TEHLER et al. (2004) and SCHUMM (2008, based mainly on PEINE 1995), while ostensibly treating the same set of European/Macaronesian taxa, are somewhat contradictory.

Although specimens of this group have been illustrated since the first monograph, the illustrations are widely scattered, often showing

only a habitus view that lack detail, and some species appear not to have been illustrated at all. The current book aims to fill this gap, without pretending to revise the full taxonomy, in the style of our recent publications (APTROOT & SCHUMM 2007, SCHUMM 2008, SCHUMM & APTROOT 2010). However, it turned out that one of the species collected from St Helena, is new to science and it is therefore formally described below.

Material and methods

It was obvious that a key based only on literature sources would have little value, as some of the relevant characters were never published and other characters, such as cortex structure, are inconsistently interpreted. Therefore, considerable *Roccella* herbarium material was studied (mainly in ABL and Schumm), as well as in the field (marked with *), from the following countries: USA*, Mexico*, Galapagos*, mainland Ecuador*, Peru, Chile, Dutch Antilles (Aruba, Curacao, Bonaire), Azores*, Madeira incl. Port Santo*, Selvagem Isles, Canary Isles*, Cape Verde Islands, Ascension Island*, St. Helena*, Great Britain*, France*, Portugal, Spain* incl. Baleares*, Italy* incl. Sardinia*, Greece*, Algeria, Tunisia*, Togo, Namibia*, South Africa, Madagascar*, Seychelles, Aldabra, Somalia, Oman, Yemen incl. Socotra, India, Sri Lanka, Taiwan*, China* and Papua New Guinea*, supplemented with a selection of other fruticose Roccellaceae and some morphologically similar taxa, viz. *Coronoplectrum* and *Santessonia* (WIRTH 2010) from the same sources.

Most specimens represent certain morphotypes recognizable in the field. All specimens were studied morphologically and chemically with spot reactions (always C, often also Pd, KOH and IKI) and/or tlc (TDA). The different taxa that could be distinguished were named with the available literature; no extensive type studies were undertaken for this publication. Illustrated specimens are mostly from ABL [ABLxxx] or Herb. Schumm [xxx]. The latter spcimens will eventually be preserved in B.

The mikroscopical section were made with a Krysostat HM560 Microm, and observed initially with a PZO Biolar (DIK), later with an Olympus BX51 (DIK) with a Canon EOS40D camera. The pictures were mostly with Blende 5,6 manipulated and from 5-15 pictures combined with the Combine-Z programme. Sections were mounted in water, KOH or pretreated with acetone during several hours. In most cases, part of the section were coloured with Lactophenol-Cotton-Blue, or Gentianaviolett (after Gram with iodine, SCHUMM 1965). Fragile

specimens were put in NEG 50 (Richard-Allan-Scientific) and coloured with either anilin blue, astra blue, malachite green, safranin green or ETZOLDs and mounted with methylglycol in Euparal (SCHUMM 1990).

Names in *Roccella*

There are over 200 publications featuring *Roccella* species, including 135 validly and legitimately described taxa (see Table 1), not counting nominal varieties etc. It should be noted that *Index Fungorum* (in 2008) lists only 91 of these, excluding obligatory nominal varieties, and attributes several taxa to wrong authors, wrong dates etc., and omits two (15%) of the currently accepted Macaronesian species; furthermore, it only refers two species to another genus, while 26 of the taxa initially described in *Roccella* are now known to belong outside the genus; 46 taxa appear to be invalid and are also cited in full (Table 1), as this is the first comprehensive list of *Roccella* names in more than a century. At the species, only the most important synonyms are generally, given, but all synonyms of a given species in the genus *Roccella*.

Taxonomy and nomenclature

The taxonomy and nomenclature of *Roccella* species is rather confusing, as exemplified by the species reported from the Galapagos: DARBISHIRE (1935) reports three species, none of which are restricted to the Galapagos, while FOLLMANN & WERNER (2000), FOLLMANN (2001) and WERNER (2000), publish together 19 endemic taxa and accept one further species from the archipelago. Subsequently, these are reduced to only four (three of which are endemic) by TEHLER et al. (2009), who describes in addition one further endemic species. There are several reasons why this confusion could have arisen:

1. Species pairs. DARBISHIRE (1898) accepted some species to comprise both sorediate and non-sorediate, fertile specimens, since when these taxa have been segregated; however, more recently, some species have been accepted in a wider sense, comprising both sorediate and non-sorediate, fertile specimens again by TEHLER (2004).
2. Typification. Older species were often based on heterogenous material; for instance, the name *R. montagnei* has been used, even recently, by different authors for a sorediate species, a non-sorediate species or for a collective species, and several widely used names, such as *R. arnoldii*, cannot be applied, as their original description includes a previously described species. The commonest European species has alternately been named *R. fucoides* and *R.*

phycopsis, based on various interpretations of nomenclatural details. It was *R. phycopsis* during the 19th century (DARBISHIRE 1898) and the first half of the 20th century. In the influential and much-used key in POELT (1969), it became *R. fucoides*, to change back to *R. phycopsis* for the rest of the century (e.g. FOLLMANN 1993, PEINE 1995), changing back to *R. fucoides* soon after (TEHLER 2002), only to be changed back one year later (TEHLER 2003) to *R. phycopsis*, the name accepted here, without any confidence that it will stay that way.

3. Species concepts. *Roccella* species are extremely plastic in certain aspects of their morphology, especially their gross growth form, and advanced techniques for the detection of secondary metabolites has also unveiled chemical variation. Whether or not some correlation was detected between these aspects, many new species or varieties were described by some, while others accepted more variation within one species.
4. Incorrect reports. Until recently, as many as nine *Roccella* species were thought to occur in North America north of Mexico, while actually only two are known (TEHLER et al. 2009b). Most of the remainder are incorrect identifications, where old world names have been applied to New World taxa.
5. Mislabelled material. Some typication problems result from mislabelled specimens; for instance, TEHLER (2006) did not accept the often-used name *R. babingtonii* because the type specimen belongs to a taxon only known from the paleotropics, while the label indicates a collecting locality in the neotropics, but did correct this later (TEHLER et al. 2010). Another example is *R. caribaea*, the type of which is a specimen which does not occur in the neotropics.

As a consequence of these reasons, a commonly used name like *R. tinctoria* is used in one publication for a sorediate species, in another for a non-sorediate, fertile species, and in yet another for the collective species; it is also reported as restricted to Macaronesia or occurring in e.g. S. Africa or N. America. The commonest N. American species can be found under five different names in post-2000 publications: *R. babingtonii, R. gracilis, R. montagnei* var. *peruensis, R. peruensis* and *R. humboldtiana.* Few people can follow the reasons for such changes and obsolete names are still widely used, especially when these names are still present in the most recent keys available.

It is tempting to address part of the confusion to fashions in taxonomy. Increasingly sensitive chemical tests led initially to a splitting of taxa, and more recently molecular work has elucidated mono-

phyletic groups. It has taken time to evaluate the results in full, and first led to an inconsistent species concept; for instance, TEHLER (2004) accepted species pairs partly as separate taxa and partly as collective species, but the classfication was not yet fully consistent with the molecular evidence, e.g. in the *R. canariensis-tinctoria* species pair, which he retained as separate species. This has since been remedied, but one should bear in mind that a monophyletic group is not necessarily a species, but could represent a grouping hierarchically well below or above it. An example is that of *R. montagnei*, where the current circumscription encompasses various groups which are very different in habitus, distribution, substratum and evolutionary history, and in which several morphologically and genetically well distinguised species can be recognized which locally can co-occur and than even show a different habitat preference (see below).

Generic delimitation

Fortunately, the concept of the genus *Roccella* has not changed greatly over the centuries, until very recently (TEHLER & IRESTEDT 2007). The genus is the only large fruticose representative in the family Roccellaceae (and indeed in the order Arthoniales as a whole). Several small, more or less fruticose, genera are, or have been, recognized in the family, and some of the species therein were initially described in *Roccella*: namely *Combea, Darbishirella, Dendrographa, Dolichocarpus, Gorgadesia, Hubbsia, Ingaderia, Pentagenella, Protoroccella, Reinkella, Roccellaria, Roccellographa, Schizopelte,* and *Simonyella.* In addition, several previously named *Roccella* species are now referred to the similar looking genus *Santessonia*, which is thought to belong in the non-related Physciaceae within the Lecanorales; in Namibia it grows together with the morphologically similar *Coronoplectrum*, thought to belong in the Lecanoraceae s.l. These genera are keyed out below where applicable, and selected species are illustrated.

Recently, several species that have been classified in *Roccella* for up to a century (*R. cumingiana, R. hypomecha* and *R. portentosa*) have been transferred to the traditionally crustose genus *Roccellina,* and the only accepted species of *Roccellaria, R. mollis* is transferred to *Roccellina* (TEHLER & IRESTEDT 2007). No characters uniting these species or differentiating them from the remainder of the genus *Roccella* were reported by these authors, but with a little experience the special cortical structure (branched type) in section can be discerned. Molecular studies suggest that they are more closely related to the studied *Roccellina* species than to the remainder of the studied *Roccella* spe-

cies. The discovery that crustose and fruticose species are interrelated is interesting, although not unsuspected, given the several unrelated fruticose forms already recognized in the Roccellaceae. Apparently, fruticose forms evolved several times within the Roccellaceae. Most fruticose *Roccellina* species occur in the southern Hemisphere, while most *Roccella* species occur in the northern Hemisphere. It is speculative to suggest that they originated in the Hemisphere in which most of their close relatives occur.

Phylogeny and classification of the family

The the family Roccellaceae as until recently circumscribed has been divided over three families by ERTZ & TEHLER (2010), on the basis of a phylogenetic analysis. This families are weakly, if at all, characterized by morphological characters. The Roccellaceae s.str. (with the exception of the basal taxa like *Enterographa*) are mostly characterized by lecanorine, round apothecia with symmetrically 3-septate fusiform ascospores. The other families, the Opegraphaceae and the Roccellographaceae, are mainly characterized by lecideine, generally elongate or branched apothecia with asymmetrically 3- to multiseptate, generally clavate and/or filiform ascospores. Many genera of the Arthoniales, including some which are treated here, are not yet assigned to any of the newly circumscribed families.

Characters

Most species are recognizable in the field mainly by the following characters: main branch in section (round, angular or flattened), presence/absence of soralia, general thallus colour (grey or brown), stipe internally yellow or not, and the surface structure of the thallus with lines, pitted, foveolate. Spot reactions of the cortex, subcortex, medulla and soralia with C, lobe tips cortex with K and medulla with IKI are sometimes necessary to distinguish related species. The softness of the thallus is an additional character, but is rather difficult to quantify (see also the defintions under the chapter “Explanations of the plates”).

Cortex structures in fruticose Roccellaceae

The anatomy of the cortex has for many years been recognized as a valuable species and, in part, genus character in the Roccellaceae, but this character is not easily observed. It is best seen in microtome sections, but thin hand sections can often be helpful. A complicating factor is the presence and often abundance of crystals (generally lecanoric acid). Squeezing the section to get a clear view will destroy the arrangement of the hyphae. It is better to mount it either in KOH or to pretreat the thallus piece with acetone during several hours. The sections must be coloured. It is also important to make longitudinal (not transverse) sections to observe periclinal plectenchyma more clearly.

Cortex structures have been illustrated, sometimes for the first time, for all species treated here. At least four types of cortex structures can be distinguished, as follows:

Palisade plectenchyma. Figs 1-4. Cortex hyphae anticlinal, parallel arranged perpendicular to the axis, nearly equal in length, equal in width and not diminishing to the end, tips rounded – characteristic of e.g. the *Roccella montagnei*-group. Formerly called the *tinctoria*-type, an unfortunate name since the species now known as *R. tinctoria* has another type of cortex (see below).

Intermediate type. Figs 7-8. Cortex hyphae mostly anticlinal, but quite irregular, tips diminishing to the end, sometimes acute – characteristic of e.g. *Roccellina hypomecha* and some other fruticose *Roccellina* species.

Branched type. Figs 5-6. Cortex hyphae branched in all directions (not clearly parallel arranged). – characteristic of e.g. the *Roccella tinctoria*-group. Formerly called the *canariensis*-type, a less fortunate name since this species is now known as *R. tinctoria*, which has given its name to another type of cortex (see above).

Periclinal plectenchyma. Figs 9-10. Cortex hyphae periclinal, arranged parallel to axis – characteristic of e.g. *Pentagenella gracillima* and the *Roccellina mollis*-group.

Palisade plectenchyma

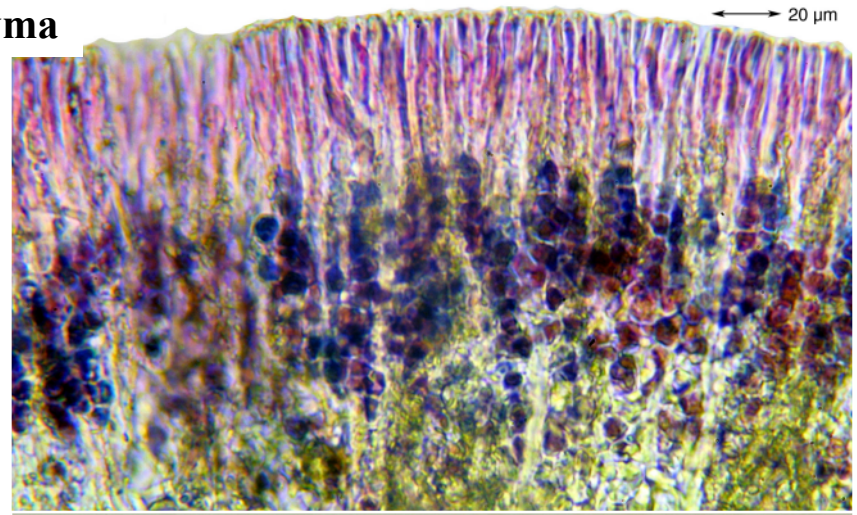


Fig 1: ***Roccella africana***

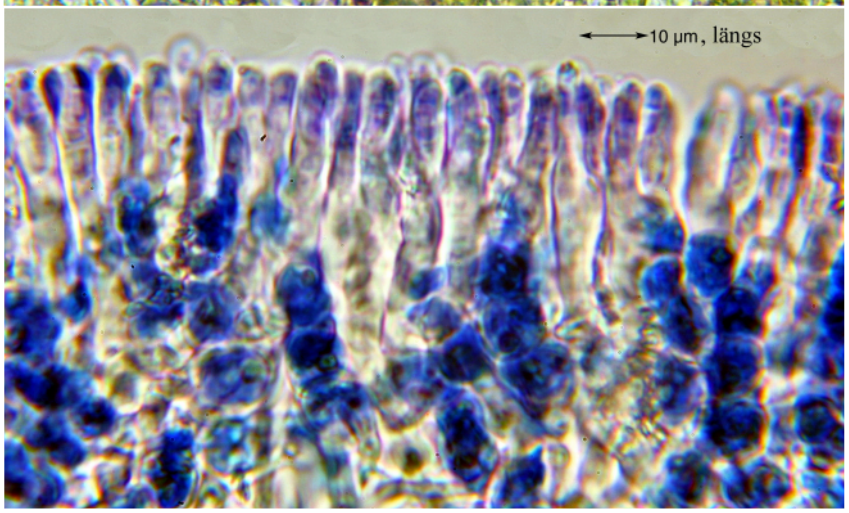


Fig 2: ***Roccella phycopsis***

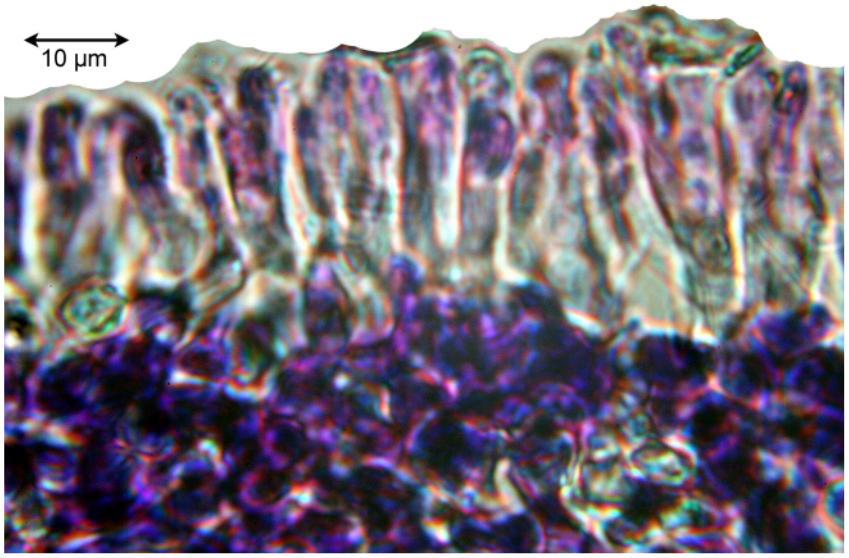


Fig 3: ***Roccella montagnei***

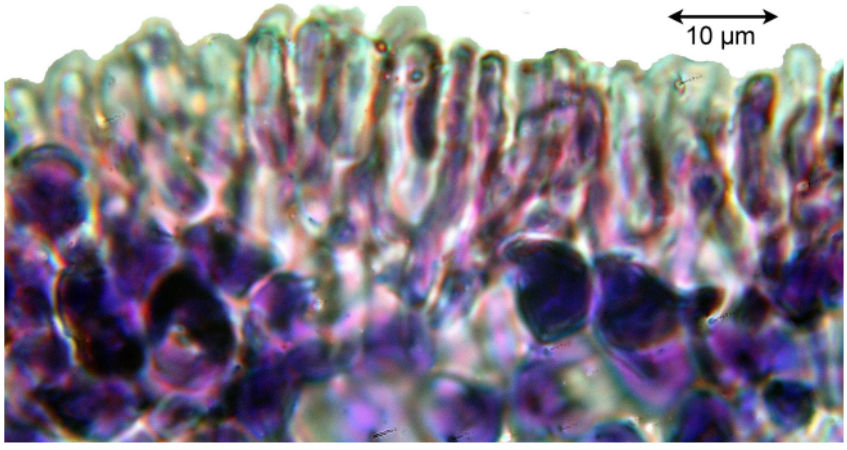


Fig 4: ***Roccella gracilis***

Branched type

Fig 5: ***Roccella tinctoria***

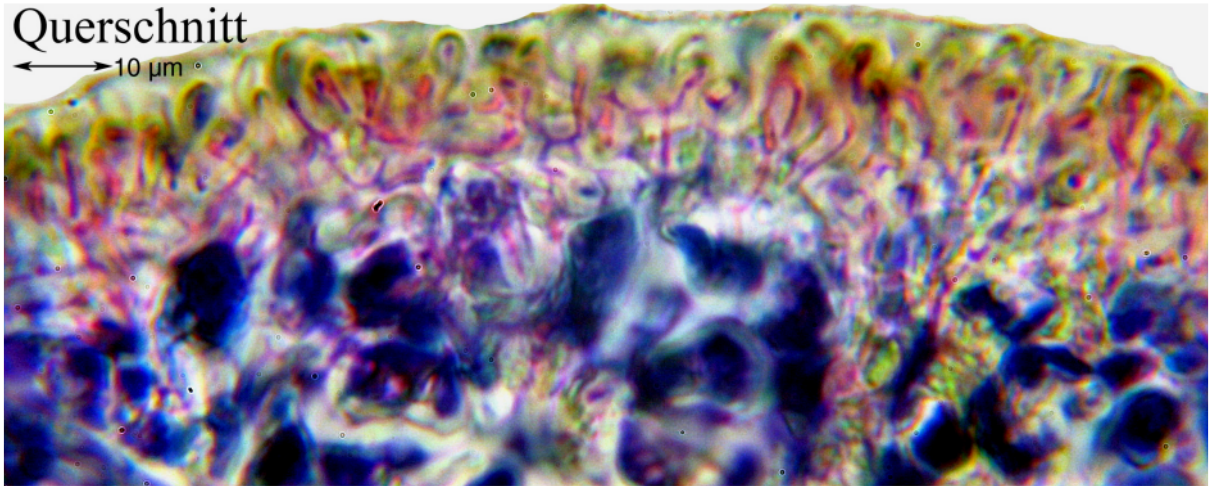
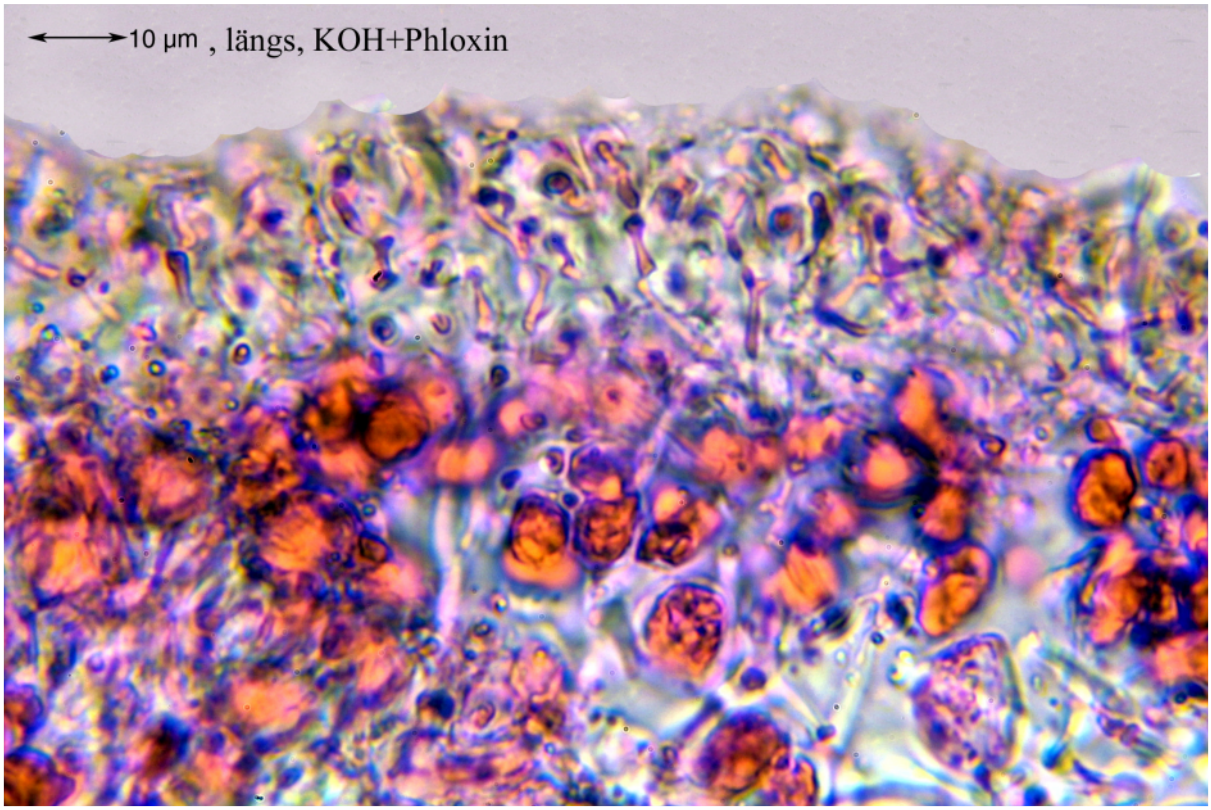


Fig 6: ***Roccella tinctoria***



Intermediate type

Fig 7: ***Roccellina hypomecha***

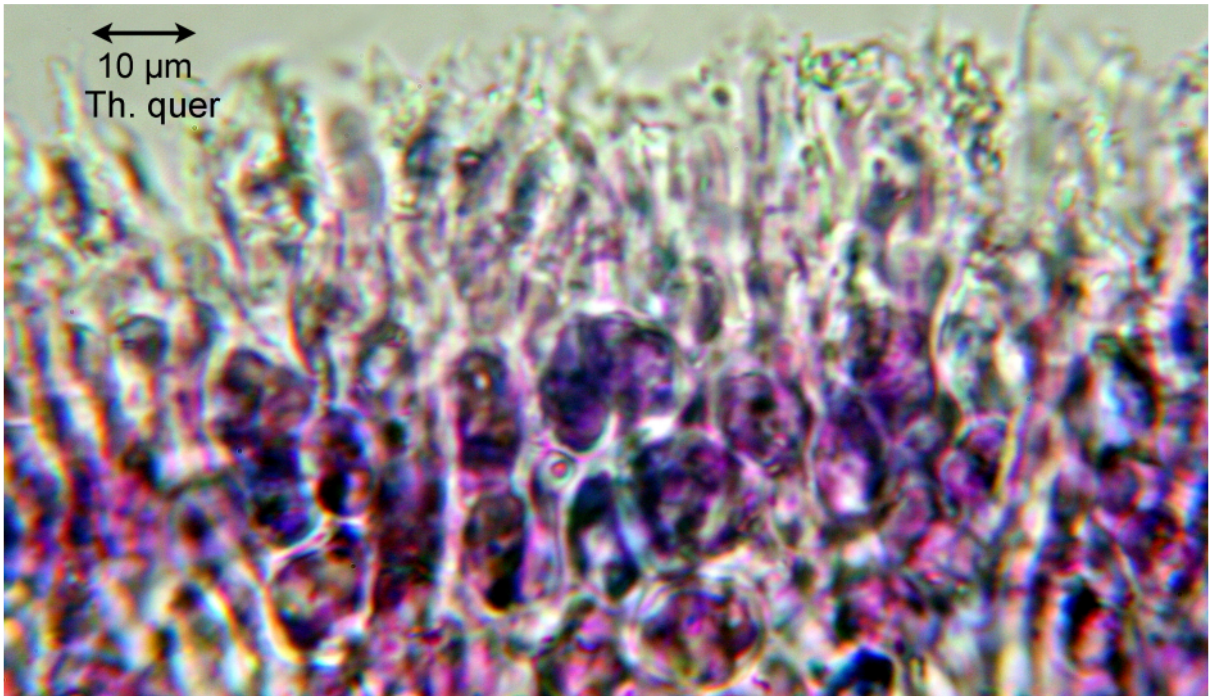
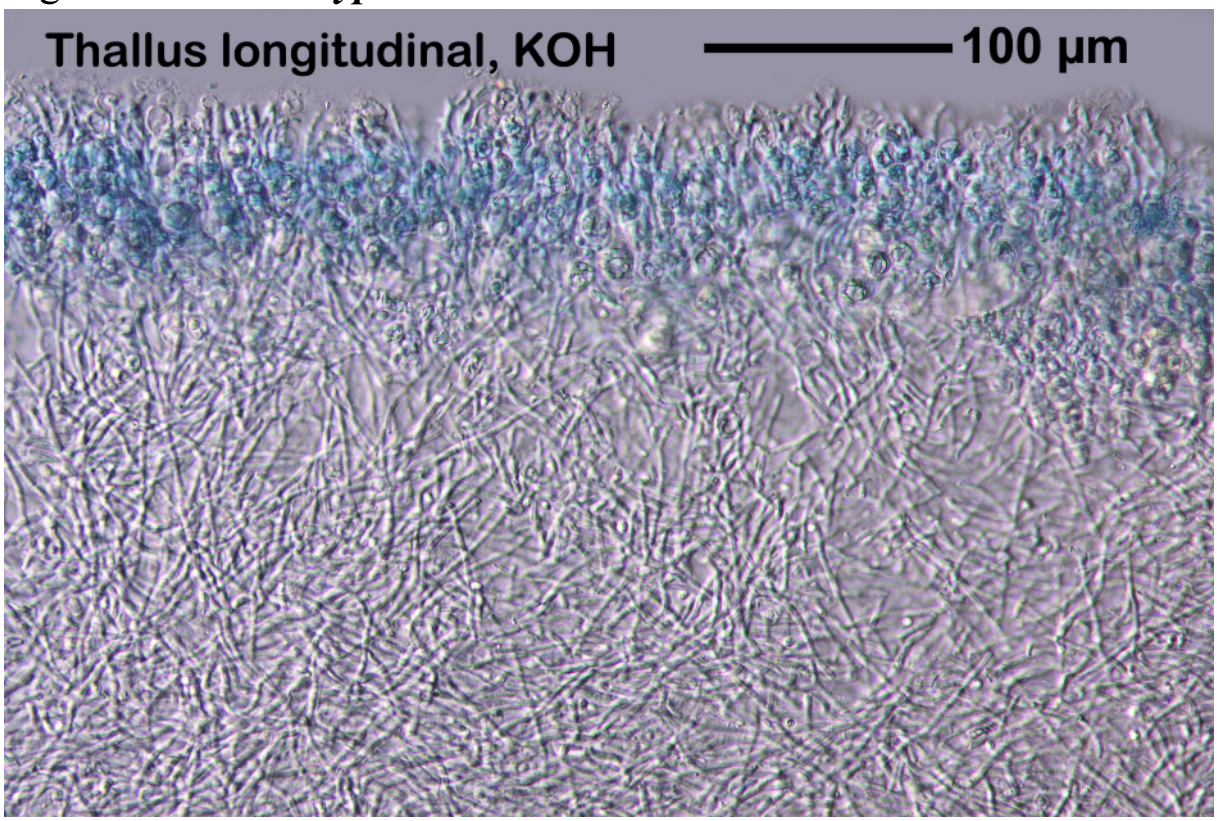


Fig 8: ***Roccellina hypomecha***



Periclinal plectenchyma

Fig 9: ***Pentagenella gracillima***

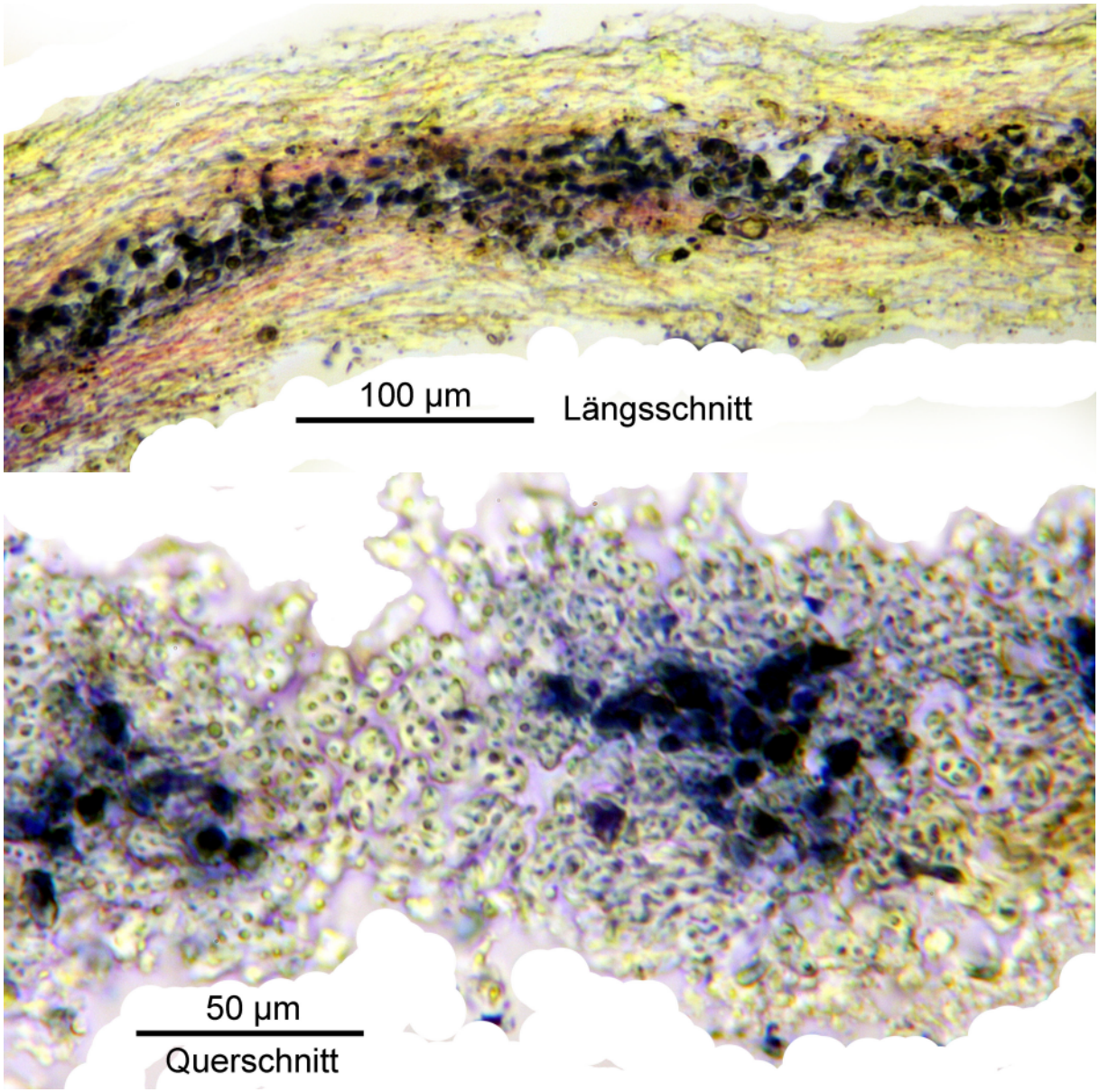
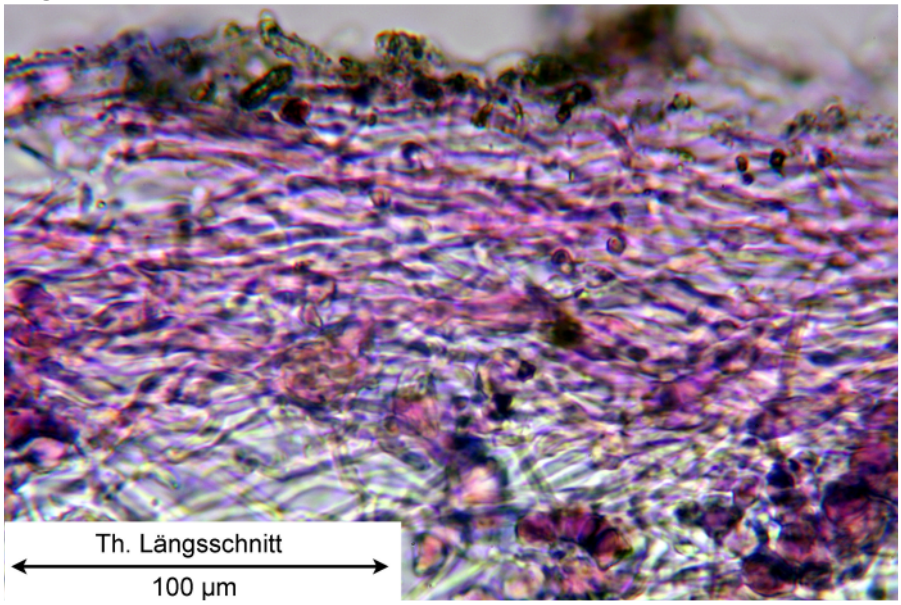


Fig 10: ***Roccellina mollis***



Distribution

The genus *Roccella* is restricted to tropical, subtropical or oceanic coasts. Within these areas, they can occur over wide stretches of coast, but are generally restricted to areas with fluctuating humidity, especially places with frequent fog. Species occur in the following regions: W coast of N. America including Guadeloupe Island to Mexico, Galapagos, Ecuador, Peru, Chile, some Caribbean islands, Caribbean coast of Colombia, Venezuela including the Dutch Antilles, all Atlantic Isles from the Azores to St. Helena, W. coast of Europe from Ireland southwards, Mediterranean coast of Europe east to Turkey, N., W., S. and E. coast of Africa including Madagascar, Mauritius; mainland Yemen and Socotra, Oman, India, Sri Lanka, Thailand, Vietnam, Taiwan, China, Indonesia (Java), S. coast of Papua New Guinea, N. coast of Australia and New Caledonia. There appear to be no reliable reports from Brazil, the East coast of North and South America (even though a species was originally described from Newfoundland!), New Zealand or Hawaii. The apparent absence of the genus throughout most of the Pacific is striking. Its distribution is markedly different from the maps published in DARBISHIRE (1928), not only because of major changes in taxonomy, but also because his maps suggest a much wider distribution, including all of Australasia, all of the Pacific and the interiors of the continents Africa and S. America. The distribution maps presented by FOLLMANN (1993) are largely unchanged, although much of the taxonomy is different, and occurrences on the South Atlantic Isles (Ascension, St Helena) were missing.

The known distribution of all fruticose Roccellaceae species is given in Table 3, and all countries are listed for species with a restricted distribution. The centre of diversity for *Roccella* is without doubt Macaronesia, while the centre of diversity for the remaining fruticose Roccellaceae is the Pacific coast of N. America.

Ecology

The most striking aspect of the ecology of *Roccella* remains its strict adherence to the coast, where one or more ecological factors are a prerequisite. This is not simply explained by the presence of fog; most likely *Roccella* needs salt spray, or at least a constituent element of it. Its distribution is not unique among lichens, since several other groups, most of which are closely related Roccellaceae, show similar trends.

In areas where Roccellaceae are the dominant lichens, they grow equally well on rock and bark, most frequently on overhangs of the former and on branches of the latter. *Roccella* species tend to be

restricted or at least specialized on either rock or bark, with relatively little overlap, which is less than in e.g. *Ramalina* species growing in the same places (APTROOT & SCHUMM 2007). Therefore, the substratum is mentioned for all species treated.

Extinction

There are several reports on the decline in *Roccella* populations, both recent and historical. The larger species have especially suffered much from the industrial collecting (100s of tons a year) in the beginning of the 20th century (SÁNCHEZ-PINTO 1995). This started in Europe but soon spread over all of Macaronesia, and after these populations became depleted, shiploads of *Roccella* were gathered from places like Sri Lanka. Individual *Roccella* thalli can become very old, no doubt more than a century. Long, and thus old, thalli are now only found in places where there has been no commercial collecting, such as St. Helena and some remote areas in Chile.

Major declines have been attributed to other causes, such as climatic conditions arising from El Nino (FOLLMANN 1995). Declines and extinctions of local populations in Chile, the Galapagos and Macaronesia have been noted (FOLLMANN 1993), and the possibility of global extinction of certain *Roccella* species cannot be ignored. Apart from climate change, surviving populations may well be harmed through over-collection by lichenologists, and one is well advised to ensure that the longest and oldest specimens remain *in situ*.

Some special cases

On the basis of personal observations, some deviations from the most recent classification, or indeed from any published classification, seem unavoidable as elaborated upon herewith:

Roccella glebaria is accepted here as one of five endemic *Roccella* species on the Galapagos, although not accepted in the most recent papers on the Galapagos *Roccella* (TEHLER 2007, TEHLER et al. 2009). It is well characterized by the olive colour and inflated branches. A recent collection from (probably, see below) the type location is illustrated below and found to be morphologically distinct and in agreement with the description of this species, if not with its arrangement in published keys, as it is essentially cylindrical rather than angular, albeit with a pitted surface structure on older parts. The chemistry of the new specimen deviates slightly from the three previously found chemistries: galapagin and protocetraric acid. The species occurs only on a very small islet, viz. Gardner near Española. It is remarkable that this

population is so local, yet chemically diverse. Note that the type and other known specimens of the species are reported from a different island, also called Gardner, but near Santa María. Future studies will need to clearly differentiate between these two islands. The classification of the remaining Galapagos taxa (TEHLER 2007, TEHLER et al. 2009) is followed here, after having seen the species *in situ* on many islands.

Roccellina arboricola was described as a new species in the genus *Roccella* by Follmann in 1968 who later (FOLLMANN 2001) synonymized it with *R. portentosa*. However, TEHLER & IRESTEDT (2007) synonymized it with *Roccellina mollis,* which had thus far been generally treated as the only accepted species of *Roccellaria* (FOLLMANN 2001). It is indeed related to the latter species, but there is no evidence that the sorediate saxicolous taxon belongs to the same species as the non-sorediate corticolous one. Thus, the new combination *Roccellina arboricola* (Follmann) Aptroot & Schumm is made below to provide a name for the non-sorediate counterpart, which is not recognized by TEHLER & IRESTEDT (2007).

Roccella immutata and *R. teneriffensis* are accepted at specific rank. Whether or not they present monophyletic groups has not yet been investigated. No specimens have so far been sequenced of these rare taxa, and their phylogenetic position is unknown. Acceptance of them at species level is thus not contradictory to the published phylogenic work.

The *Roccella* species occurring on the remote island of St Helena are also a special case. Although this island was visited by numerous major expeditions to Asia, Africa, Australia or S. America in the 19th century, no *Roccella* species were ever described, and hardly any collected, despite the fact that they are abundant in many localities. Probably botanists on these travels had visited several of the more northern Atlantic islands before finally arriving at St Helena and were convinced that *Roccella* was widely distributed on these islands. There are at least three morphologically distinct species on St Helena: a flat soft sorediate species that is corticolous; a cylindical stiff sorediate saxicolous species which is by far the commonest and never becomes really large (all specimens seem rather young, and they also cover recent buildings), and finally a cylindical stiff fertile saxicolous species that is quite rare and mostly represented by old, large and quite gnarled individuals. Specimens of all taxa were collected by the first author and made available for Tehler's studies. Surprisingly, TEHLER et al. (2010) classified all investigated specimens from St Helena as one species, viz.

R. montagnei, while admitting that they represent different clades with partly significant jackknife values. It is clear from our studies that the taxa differ more from each other than, for example, the two common European species which have been separated for many years. Moreover, they each behave like different species: one is corticolous, one is saxicolous and slow-growing and hardly spreading (K-strategist), and one is saxicolous and growing on all available substrata (r-strategist). The corticolous species conforms to *R. montagnei* s.s., a species known from much of the palaeotropic coasts. The saxicolous sorediate taxon can be distinguised as *R. linearis*. The fertile saxicoulous counterparts are *R. sanctae-helenae*, described below as new to science, and the related *R. africana* (called *R. tinctoria* by most authors from Danbishire to Poelt and Follmann). The fertile corticolous counterpart of *R. montagnei* s.s., common in e.g. India and Madagascar, is *R. belangeriana.* This is a robust classification which is in full accordance with the phylogeny presented by TEHLER et al. (2010), but recognizing more taxa. It is quite likely that a few more species will eventually be distinguished within the complex.

Endemics

The evolutionary picture that emerges from the phylogeny, in combination with morphology and distribution, is as follows: sorediate and non-sorediate species do evolve from each other, which means that non-sorediate species are not necessarily basal, as previously supposed. When a sorediate species reaches or evolves on a remote island it continues spreading, but when a non-sorediate species evolves on a remote island, it cannot leave it. This is how endemics on remote places originate. They have all the characters of good species and should be recognized as such, even if recognition of those species should make the widespread parental species paraphyletic.

Biogeography of fruticose Roccellaceae including some morphologically similar taxa

Due to rapidly changing taxonomy nomenclature and poor reporting, there is now much confusion over the biogeography of the Roccellaceae. It is hoped that the list below, based on recent literature and material seen by the authors, will provide a more comprehensive analysis of this interesting group.

USA, California: *Dendrographa alectoroides, D. leucophaea, Roccella decipiens, R. gracilis, Schizopelte californica, S.*

lumbricoides (= Hubbsia californica), S. parishii (= Hubbsia p.)

Mexico, Baja Califonia: *Dendrographa leucophaea, Roccella bajasurensis, R. decipiens, R. gracilis, Schizopelte californica, S. lumbricoides (= Hubbsia californica), S. parishii (= Hubbsia p.)*

Mexico, remainder: *Roccella decipiens, R. gracilis*

Cuba: *Roccella gracilis*

Dominican Republic: *Roccella gracilis*

Guadeloupe: *Roccella gracilis*

Netherlands Antilles (Saba, St Eustatius): *Roccella gracilis*

Netherlands Antilles (Aruba, Bonaire, Curacao): *Roccella gracilis, R. verruculosa*

Venezuela: *Roccella gracilis, R. verruculosa*

Colombia: *Roccella verruculosa*

Ecuador, Galapagos: *Roccella albida, R. galapagoensis, R. glebaria, R. gracilis, R. margaritifera, R. nigerrima*

Ecuador, mainland: *Roccella gracilis*

Peru: *Pentagenella gracillima, Roccella gracilis, R. lirellina, Roccellina portentosa, Santessonia peruviensis*

Chile: *Dolichocarpus chilensis, Ingaderia friabillima, I. pulcherrima, Pentagenella fragillima, P. gracillima, P. langei* (*= Hubbsia langei*)*, Roccellina arboricola, R. cumingiana, R. mollis, R. portentosa, Santessonia cervicornis*

Great Britain: *Roccella fuciformis, R. phycopsis*

France: *Roccella fuciformis, R. phycopsis*

Italy: *Ingaderia troglodytica, Roccella fuciformis, R. phycopsis, R. tinctoria*

Greece: *Roccella phycopsis*

Turkey: *Roccella phycopsis*

Egypt: *Roccella phycopsis*

Tunisia: *Roccella phycopsis*

Algeria: *Roccella phycopsis*

Morocco: *Ingaderia troglodytica, Roccella fuciformis, R. phycopsis*

Spain: *Ingaderia troglodytica, Roccella elisabethae, R. fuciformis, R.maderensis, R. phycopsis, R. tinctoria, R. tuberculata*

Portugal, mainland: *Roccella allorgei, R. elisabethae, R. fuciformis, R. maderensis, R. phycopsis, R. tinctoria, R. tuberculata*

Portugal, Azores: *Roccella allorgei, R. elisabethae, R. fuciformis, R. maderensis, R. phycopsis, R. tinctoria, R. tuberculata*

Portugal, Madeira: *Roccella allorgei, R elisabethae, R. fuciformis, R. immutata, R. maderensis, R. phycopsis, R. tinctoria, R. tuberculata, Roccellina hypomecha*
Selvagem Islands: *Roccella fuciformis, R. tinctoria, R. tuberculata*
Canary Isles: *Roccella elisabethae, R. fuciformis, R. immutata, R. maderensis, R. phycopsis, R. teneriffensis, R. tinctoria, R. tuberculata, Roccellina hypomecha*
Cape Verde Islands: *Gorgadesia mira, Roccella fuciformis, R. linearis, R. phycopsis, R. tinctoria, R. tuberculata*
Senegal: *Roccella tinctoria*
Togo: *Roccella linearis*
Equatorial Guinea, São Thomé: *Roccella linearis*
Congo: *Roccella montagnei*
Zaire: *Roccella montagnei*
Angola: *Roccella africana, R. linearis, R. montagnei*
Ascension: *Roccella linearis, R. montagnei*
St Helena: *Dolichocarpus seawardii, Roccella linearis, R. montagnei, R. sanctae-helenae*
Namibia: *Roccella africana, R. linearis, R. montagnei, Santessonia hereroensis, S. lagunebergii, S. namibensis*
S. Africa: *Combea mollusca, Coronoplectrum namibicum, Roccella africana, R. linearis, R. montagnei*
Tanzania: *Roccella babingtonii, R. linearis, R. montagnei*
Kenya: *Roccella babingtonii, R. linearis, R. montagnei*
Comores: *Roccella babingtonii, R. montagnei*
Seychelles: *Roccella babingtonii, R. montagnei*
Madagascar: *Roccella africana, R. applanata, R. belangeriana, R. boryi, R. linearis, R. montagnei*
Réunion: *Roccella boryi*
Mauritius: *Roccella boryi*
Rodriguez: *Roccella boryi*
Somalia: *Roccella montagnei, R. minuta*
Yemen, mainland: *Roccella montagnei, Simonyella variegata*
Yemen, Socotra: *Roccella balfourii, R. belangeriana, R. montagnei, R. minuta, R. phycopsioides, Roccellographa cretacea, Simonyella variegata*
Oman: *Roccella balfourii, R. montagnei, Roccellographa cretacea, Simonyella variegata*
India: *Roccella belangeriana, R. montagnei*
India: *Roccella belangeriana, R. montagnei*
Vietnam: *Roccella montagnei*

China: *Roccella sinensis*
Philippines: *Roccella montagnei*
Indonesia, Java: *Roccella montagnei*
Indonesia,Sumatra: *Roccella montagnei*
Papua New Guinea: *Roccella linearis, R. montagnei*
Australia: *Roccella montagnei*
New Caledonia: *Roccella montagnei*

Explanation of the key

A key is presented for all accepted taxa of fruticose Roccellaceae (including those not illustrated and/or not studied), as well as some morphologically similar taxa. Previous keys to fruticose Roccellaceae rightfully paid great attention to microscopical characters of the cortical and medullary structure; however, these are sometimes difficult to observe, leading even to contradictory published statements on these structures for particular taxa.

Key to the species of fruticose Roccellaceae and some morphologically similar taxa

This key is concise and meant to be used with the illustrations. The genera *Dirina*, *Roccellinastrum*, *Siphula* as well as crustose species of *Roccellina* are are not considered in this key, although some are treated in the main part for comparison..

1a Thallus with *Trebouxia* algae (green, mostly globose).
- 2a Thallus corallinoid, cortex prosoplectenchymatous, ascospores hyaline, non-septate. S. Africa. *Coronoplectrum namibicum* Brusse (1987).
- 2b Thallus cylindical to flattened, cortex byssoid, ascopsores brown, 1-septate.
  - 3a Thallus with soredia.
    - 4a Thalus cylindrical. Namibia. *Santessonia hereroensis* (Vain.) Follmann (1987).
    - 4b Thallus flattened. Peru. *Santessonia peruviensis* Follmann (2006).
  - 3b Thallus without soralia, usually with apothecia.
    - 5a Thallus flattened.
      - 6a In Namibia. *Santessonia namibensis* Hale & Vobis (1978).
      - 6b In Chile.*Santessonia cervicornis* (Follmann) Follmann (1995).
    - 5b Thallus cylindrical.
      - 7a In Namibia. *Santessonia lagunebergii* Sér. & Wess. (1984).
      - 7b In Peru. *Santessonia roccelloides* Follmann (2006).

1b Thallus with *Trentepohlia* algae (partly elongate, partly orange).
- 8a Thallus not repeatedly branched, composed of cushion-like, often holoow, lobes that become divived.
  - 9a Thallus with soralia. California and Baja California.
    Schizopelte parishii (Hasse) Ertz & Tehler (2011)
    [= *Hubbsia parishii* (Hasse) Follmann (1997)].
  - 9b Thallus without soralia, usually with apothecia.
    - 10a Medulla firm. Socotra & Oman. *Roccellographa cretacea* J. Steiner (1902).
    - 10b Medulla lax.
      - 11a Thallus K- and Pd–. Baja California & Guadeloupe Island. *Schizopelte lumbricoides* (W.A. Weber) Ertz & Tehler (2011) [= *Hubbsia californica* (Räsänen) W.A. Weber (1987)].
      - 11b Thallus K+ and Pd+ yellow, with psoromic acid. Chile. *Pentagenella langei* (Follmann) Ertz & Tehler (2011) [= *Hubbsia langei* Follmann (1997)].
- 8b Thallus repeatedly branched, cylindical to flattened, usually not hollow.
  - 12a Thallus with periclinal cortex.
    - 13a Thallus flattened.
      - 14a Apothecia unknown. Spain, Italy and Morocco. *Ingaderia troglodytica* Feige & Lumbsch (1993).

14b Apothecia often present. Chile and Peru.
Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
[= *Ingaderia gracillima* (Kremp.) Feige & Lumbsch (1993)].

13b Thallus cylindrical.

15a Thallus dense on clear holdfast. Chile. *Ingaderia friabillima* Follmann & M. Schulz (1998).

15b Thallus pendant. Chile. *Ingaderia pulcherrima* Darb. (1897).

12b Thallus cortex byssoid or prosoplectenchym or pallisade parenchym.

16a Thallus densely branched, forming dense cushions, apothecia terminal.

17a Ascospores brown, 5-7-septate, Hypothecium dark-brown. California and Baja California. *Schizopelte californica* Th. Fr. (1875).

17b Ascospores hyaline, 3-septate, Hypthecium hyaline. S. Africa. *Combea mollusca* (Ach.) Nyl. (1860).

16b Thallus branched, sections between branching points longer, cylindrical to flattened, apothecia marginal and/or laminal.

18a Apothecia always present, linear or branched.

19a Exciple black. Roccellaceae with parasitic *Opegrapha*.

19b Exciple pale to brown.

20a Apothecia branched. Cape Verde Islands. *Gorgadesia mira* Tav. (1964).

20b Apothecia linear, at the lower surface.

21a Thallus stout, ascospores 5-8-septate. Chile. *Dolichocarpus chilensis* R. Sant. (1949).

21b Thallus slender, ascospors 3-septate. St. Helena. *Dolichocarpus seawardii* Aptroot (2008).

18b Apothecia, when present, round.

22a Cortex byssoid.

23a Thallus soft, flexible.

24a Thallus without soralia, on rock. Chile. *Roccellina mollis* (Hampe) Tehler (2007).

24b Thallus with soralia, on bark. Chile. *Roccellina arboricola* (Follmann) Aptroot & Schumm (2011).

23b Thallus stiff.

25a Thallus with soralia. Chile. *Roccellina cumingiana* (Gay) Tehler (2007).

25b Thallus without soralia.

26a Cortex C+ red. Chile-Peru. *Roccellina portentosa* (Gay) Tehler (2007).

26b Cortex C–. Madeira, Canary Isles, Cape Verde Islands, W. & S. Africa. *Roccellina hypomecha* (Ach.) Tehler (2007).

22b Cortex prosoplectenchymatous or palisade plectenchyma.

27a Cortex branched prosoplectenchyma, often pruinose or rough.

28a Axis hard, glassy, apothecia always present, ascospores brown. Socotra, Yemen, Oman. *Simonyella variegata* J. Steiner (1902).

28b Axis soft, apothecia, when present, with hyaline ascospores.

29a Cortex rough. Chile. *Pentagenella fragillima* Darb. (1898).

29b Cortex pruinose.

30a Terminal branches flattened. California and Baja California. *Dendrographa leucophaea* (Tuck.) Darb. (1895).

30b Terminal branches cylindrical. California. *Dendrographa alectoroides* Sundin & Tehler (1996).

27b Cortx more or less regular palisade plectenchyma or intermediate type cortex.

31a Thallus with soralia.

32a Thallus distincly flattened or angular.

33a Thallus angular, not really flattened, cortex C+ red.

34a Thallus often foveolate, grey. palaeotropics from Papua New Guinea to W. Africa, Cape Verde Islands, Ascension & St Helena. *Roccella linearis* (Ach.) Vain. (1901).

34b Thallus not foveolate, ofen brown. Madagascar, Reunion, Mauritius, Rodriguez. Sorediate *Roccella boryi* Delise ex Fée (1824).

33b Thallus flattened, cortex C+ red or C–.

35a Cortex C+ red

36a Thallus usually saxicolous, stiff. Portugal, Spain, Azores, Madeira, Canary Isles. Sorediate *Roccella maderensis* (J. Steiner) Follmann (1993).

36b Thallus usually corticolous, soft and flexible.

37a Soredia C+ red. Peru, Ecuador, Galapagos, Venezuela, Caribbean, Mexico, California. *Roccella gracilis* Bory (1828).

37b Soredia C–.

38a Thallus partly over 1 cm wide. Madagascar. *Roccella applanata* M. Choisy (1929).

38b Thallus more slender. Palaeotropics from Australia toW. Africa, also Ascension & St Helena. *Roccella montagnei* Bél. (1834).

35b Cortex C–.

39a Soredia C–. Madeira, Canary Isles. *Roccella immutata* (J. Steiner) Follmann (1993).

39b Soredia C+ red.

40a Medulla IKI+ violet. Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe. *Roccella fuciformis* (L.) DC. (1805).

40b Medulla IKI–. Canary Isles. *Roccella teneriffensis* Vain. (1924).

32b Thallus mostly cylindrical.

50a Cortex C+ red

51a Soredia C+ red.

52a Medulla usually Pd+ orange. Galapagos. Sorediate *Roccella margaritifera* B. Werner & Follmann (1998).

52b Medulla Pd–.

53a Branch tips K+ pink. Azores, Madeira, Portugal. Sorediate *Roccella allorgei* Abbayes (1947).

53b Branch tips K–. Azores, Madeira, Canary Isles, W. Mediterranean Europe. *Roccella elisabethae* Tehler (2004).

51b Soredia C–

54a Holdfast white to brownish inside. Galapagos. Sorediate *Roccella albida* Tehler (2009).

54b Holdfast yellow inside.

55a Branch tips K+ pink. Socotra. *Roccella phycopsioides* Tehler (2010).

55b Branch tips K–. Macaronesia, Mediterranean Europe, Turkey, N. Africa. *Roccella phycopsis* Ach. (1804).

50b Cortex C–.

56a Soredia C+ red. Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe, Senegal, Angola. Sorediate *Roccella tinctoria* DC. (1805).

56b Soredia C–.

57a Medulla and subcortex C–. Galapagos. *Roccella nigerrima* (Darb.) Follmann (1998).

57b Medulla or subcortex a least nerthe tips C+ red.

58a Subcortex only C+ red near the tips. Peru. *Roccella lirellina* (Darb.) Follmann (1997).

58b Subcortex C+ red throughout. Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe. *Roccella tuberculata* Vain.

31b Thallus without soralia, usually with apothecia.

59a Thallus distincly flattened or angular.

60a Thallus angular, not really flattened, cortex C+ red or C–.

61a Cortex C+ red. Colombia, Venezuela, Netherlands Antilles. *Roccella verruculosa* Follmann (1980).

61b Cortex C–, subcortex C+ red.

62a Thallus often pitted, medulla IKI+ violet. China. *Roccella sinensis* Nyl. (1860).

62b Thallus smooth, medulla IKI–. Madagascar, Reunion, Mauritius, Rodriguez. Fertile *Roccella boryi* Delise ex Fée (1824).

60b Thallus flattened, cortex C+ red.

63a Thallus mostly corticolous, soft.

64a Medulla partly yellow (below apothecia). E. Africa, Comores, Seychelles. *Roccella babingtonii* Mont. (1852).

64a Medulla white. India, Socotra, Madagascar. *Roccella belangeriana* D.D. Awasthi (1981).

63b Thallus mostly saxicolous, stiff.

65a Branch tips K+ pink. Spain, Portugal, Azores, Madeira, Canary Isles. Fertile *Roccella maderensis* (J. Steiner) Follmann (1993).

65b Branch tips K–. Mexico, California. *Roccella decipiens* Darb. (1897).

59b Thallus mostly cylindrical.

66a Thallus partly reticulate or pitted, medulla often Pd+ orange and/or K+ yellow, cortex C+ red or C–. Galapagos only.

67a Thallus olive, pitted, swollen. Galapagos. *Roccella glebaria* B. Werner & Follmann (2000).

67b Thallus grey to brownish, partly reticulate, slender. Galapagos. *Roccella galapagoensis* Follmann (1968)

66b Thallus smooth, medulla never K+ yellow.

68a Cortex C–.

69a Subcortex C+ red, holdfast white to brownish inside. Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe, Senegal, Angola. Fertile *Roccella tinctoria* DC. (1805).

69b Subcortex C–, holdfast yellow inside. Baja California. *Roccella bajasurensis* Tehler (2009).

68b Cortex C+ red.

70a Holdfast yellow inside. Socotra, Somalia. *Roccella minuta* Tehler (2010).

70b Holdfast white to brownish inside.

71a Branch tips K+ pink. Azores, Madeira, Portugal. Fertile *Roccella allorgei* Abbayes (1947).

71b Branch tips K–.

72a Medulla often Pd+ orange. Galapagos.

73a Thallus white, slender. Galapagos. Fertile *Roccella albida* Tehler (2009).

73b Thallus at least with grey or brownish hue, often gnarled. Galapagos. Fertile *Roccella margaritifera* B. Werner & Follmann (1998).

72b Medulla Pd–. Africa.

74a Ascospores over 6 µm wide. Socotra & Oman. *Roccella balfourii* Müll. Arg. (1882)

74b Ascospore up to 5 µm wide.

75a Thalli gnarled, irregularly branched. St. Helena. *Roccella sanctae-helenae* Aptroot & Schumm (2011)

75b Thalli more regular branched. Angola, Namibia, S. Africa, Madagascar. *Roccella africana* Vain. (1901).

Table 1. Names in *Roccella* and current classification name

name	validity of publishing	current name
Roccella africana Vain. (1901)	valid	accepted here
Roccella albida Tehler (2009)	valid	accepted here
Roccella allorgei Abbayes (1947)	valid	accepted here
Roccella americana Darb. (1898)	invalid	Roccella gracilis Bory (1828)
Roccella applanata M. Choisy (1929)	valid	accepted here
Roccella arboricola Follmann (1968)	valid	Roccellina arboricola (Follmann) Aptroot & Schumm (2011)
Roccella arnoldii Vain. (1901)	valid	Roccella tinctoria DC. (1805)
Roccella atacamensis Follmann (1993)	valid	Roccellina cumingiana (Gay) Tehler (2007)
Roccella babingtonii Mont. (1852)	valid	accepted here
Roccella babingtonii var. difficilis (Darb.) B. Werner (2000)	valid	Roccella gracilis Bory (1828)
Roccella bajasurensis Tehler (2009)	valid	accepted here
Roccella balfourii Müll. Arg. (1882)	valid	accepted here
Roccella belangeriana D.D. Awasthi (1981)	valid	accepted here
Roccella belangerii Fée ex Darb. (1898)	invalid	Roccella montagnei Bél. (1834)
Roccella bellicosa Darb. (1897)	valid	Roccella verruculosa Follmann (1980)

Roccella boergesenii Vain. (1924)	valid	Roccella tinctoria DC. (1805)
Roccella boryi Delise ex Fée (1824)	valid	accepted here
Roccella botrytis B. Werner (2000)	invalid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella cacticola Darb. (1897)	invalid	Roccella decipiens Darb. (1897)
Roccella canariensis Darb. (1897)	valid	Roccella tinctoria DC. (1805)
Roccella canariensis var. subphycopsis Steiner (1904)	valid	Roccella tuberculata Vain. (1901)
Roccella canariensis var. tuberculata (Vain.) Steiner (1904)	valid	Roccella tuberculata Vain. (1901)
Roccella canariensis var. vincentina (Vain.) Zahlbr. (1906)	valid	Roccella tinctoria DC. (1805)
Roccella capensis Follmann (1994)	valid	Roccellina hypomecha (Ach.) Tehler (2007)
Roccella capitata Werner (2000)	invalid	Roccella galapagoensis Follmann (1968)
Roccella caribaea Darb. (1898)	valid	Roccella tinctoria DC. (1805)
Roccella cervicornis Follmann (1967)	valid	Santessonia cervicornis (Follmann) Follmann (1995)
Roccella colonii Follmann (2001)	valid	Roccella galapagoensis Follmann (1968)
Roccella complanata Bory ex Darb. (1897)	invalid	Roccella tinctoria DC. (1805)
Roccella complanata var. intricata Bory ex Darb. (1897)	invalid	Roccella tinctoria DC. (1805)

Roccella condensata Darb. (1898)	valid	Roccellina cerebriformis (Mont.) Tehler (1983)
Roccella crassa Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella cumingii Mont. ex Darb. (1898)	invalid	Roccellina cumingiana (Gay) Tehler (2007)
Roccella decipiens Darb. (1897)	valid	accepted here
Roccella dichotoma (Pers.) Ach. (1814)	valid	Roccella tinctoria DC. (1805)
Roccella difficilis Darb. (1898)	valid	Roccella gracilis Bory (1828)
Roccella dillenii Bory (1828)	valid	Roccella phycopsis Ach. (1804)
Roccella dissecta Müll. Arg. (1891)	valid	Pantagenella gracillima (Kremp.) Ertz & Tehler (2011)
Roccella dubia Darb. (1898)	valid	Roccella tinctoria DC. (1805)
Roccella elisabethae Tehler (2004)	valid	accepted here
Roccella endocrocea M. Choisy (1929)	valid	Roccella babingtonii Mont. (1852)
Roccella falcata Del. ex Darb. (1898)	invalid	Roccella montagnei Bél. (1834)
Roccella fastigiata Bory (1828)	valid	Roccella tinctoria DC. (1805)
Roccella fauiformis Bory ex Darb. (1898)	invalid	Roccellina portentosa (Gay) Tehler (2007)
Roccella fimbriata Darb. (1935)	valid	Roccella decipiens Darb. (1897)
Roccella flaccida Bory (1828)	valid	Roccella boryi Delise ex Fée (1824)

Roccella floreana B. Werner (2000)	invalid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella floribrassica B. Werner (2000)	invalid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella floteana Follmann (1994)	invalid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella fragillima (Darb.) Follmann (1998)	valid	Pentagenella fragillima Darb. (1897)
Roccella fragillissima Mont. ex Follmann (1998)	invalid	Pentagenella fragillima Darb. (1897)
Roccella fruticosa Leunis & Frank (1886)	valid	Roccella gracilis Bory (1828)
Roccella fuciformis (L.) DC. (1805)	valid	accepted here
Roccella fuciformis f. ensiformis Vain. (1924)	valid	Roccella fuciformis (L.) DC. (1805)
Roccella fuciformis var. arborea DC. (1805)	valid	Roccella fuciformis (L.) DC. (1805)
Roccella fuciformis var. elongata C. Bolle ex Darb. (1898)	invalid	Roccella fuciformis (L.) DC. (1805)
Roccella fuciformis var. gracilenta Vain. ex Darb. (1898)	invalid	Roccella linearis (Ach.) Vain. (1901)
Roccella fuciformis var. immutata Steiner (1904)	valid	Roccella immutata (Steiner) Follmann (1993)
Roccella fuciformis var. linearis Ach. (1810)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella fuciformis var. maderensis Steiner (1904)	valid	Roccella maderensis (Steiner) Follmann (1993)
Roccella fuciformis var. palmetta Darb. (1898)	invalid	Roccella fuciformis (L.) DC. (1805)

Roccella fuciformis var. phycopsis Sol. ex Darb. (1898)	invalid	Roccella phycopsis Ach. (1804)
Roccella fuciformis var. ventricosa Mont. (1857)	valid	Roccella tinctoria DC. (1805)
Roccella fucoidea Ach. ex Darb. (1898)	invalid	Roccella montagnei Bél. (1834)
Roccella fucoides (Neck.) Vain. (1901)	valid	Roccella phycopsis Ach. (1804)
Roccella fucoides f. cecilia-metella (Beltr.) Zahlbr. (1924)	valid	Roccella phycopsis Ach. (1804)
Roccella fucoides f. pygmaea (Durieu & Mont.) Zahlbr. (1924)	valid	Roccella phycopsis Ach. (1804)
Roccella fucoides f. tenuior (Cromb.) Zahlbr. (1924)	valid	Roccella phycopsis Ach. (1804)
Roccella fucoides var. arnoldii (Vain.) Zahlbr. (1914)	valid	Roccella tinctoria DC. (1805)
Roccella fucoides var. corticola Cengia-Sambo (1927)	valid	Roccella phycopsis Ach. (1804)
Roccella fucoides var. farinosa Del. ex Cengia-Sambo (1927)	valid	Roccella phycopsis Ach. (1804)
Roccella fusca Werner (2000)	invalid	Roccella galapagoensis Follmann (1968)
Roccella galapagoensis Follmann (1968)	valid	accepted here
Roccella gayana Mont. (1852)	valid	Roccellina portentosa (Gay) Tehler (2007)
Roccella geniculata Follmann & B. Werner (2000)	valid	Roccella galapagoensis Follmann (1968)
Roccella glebaria B. Werner & Follmann (2000)	valid	accepted here
Roccella gracilis Bory (1828)	valid	accepted here

Roccella gracillima Kremp. (1877)	valid	Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Roccella grayi Stirt. (1883)	valid	Siphula ceratites (Wahlenb.) Fr. (1831)
Roccella guanchica Feige & Viethen (1987)	valid	Roccella tinctoria DC. (1805)
Roccella hereroensis Vain. (1923)	valid	Santessonia hereroensis (Vain.) Follmann (1987)
Roccella hertelii Mies & M. Schultz (2004)	valid	Roccella balfourii Müll. Arg. (1882)
Roccella humboldtiana Follmann (2001)	valid	Roccella gracilis Bory (1828)
Roccella hypomecha (Ach.) Bory (1828)	valid	Roccellina hypomecha (Ach.) Tehler (2007)
Roccella hypomecha var. benguellensis (Welw.) Vain. (1901)	valid	Roccellina hypomecha (Ach.) Tehler (2007)
Roccella hypomecha var. isabellina Vain. (1901)	valid	Roccella tinctoria DC. (1805)
Roccella hypomecha var. soredifera Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella immutata (Steiner) Follmann (1993)	valid	accepted here
Roccella incurvata B. Werner (2000)	invalid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella intermedia M. Choisy (1929)	valid	Roccella babingtonii Mont. (1852)
Roccella intricata Mont. (1849)	valid	Roccellina mollis (Hampe) Tehler (2007)
Roccella intricata f. tenuior Hampe ex Darb. (1898)	invalid	Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)

Roccella intricata var. alectorioides Mont. (1849)	valid	Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Roccella kappeniana Follmann & B. Werner (2000)	valid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella lanata Hampe (1843)	valid	Roccellina mollis (Hampe) Tehler (2007)
Roccella leucophaea Tuck. (1858)	valid	Dendrographa leucophaea (Tuck.) Darb. (1895)
Roccella leucophaea var. minor Tuck. (1858)	valid	Dendrographa leucophaea (Tuck.) Darb. (1895)
Roccella linearis (Ach.) Vain. (1901)	valid	accepted here
Roccella linearis var. guineensis Vain. (1901)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella linearis var. hyperchromatica Vain. (1901)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella linearis var. primaria Vain. (1901)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella lirellina (Darb.) Follmann (1997)	valid	accepted here
Roccella maderensis (Steiner) Follmann (1993)	valid	accepted here
Roccella margaritifera B. Werner & Follmann (1998)	valid	accepted here
Roccella margaritifera f. octopodioides B. Werner (2000)	invalid	Roccella margaritifera B. Werner & Follmann (1998)
Roccella mauritiana Darb. (1898)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella medusina Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)

Roccella medusina var. irregularis Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella medusina var. soredifera Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella mexicana Vain. (1926)	valid	Roccella gracilis Bory (1828)
Roccella minima R. Sant. (1944)	valid	Protoroccella minima (R. Sant.) Follmann (2001)
Roccella minuta Tehler (2010)	valid	accepted here
Roccella mollis Hampe (1843)	valid	Roccellina mollis (Hampe) Tehler (2007)
Roccella mollis f. filescens Hampe ex Darb. (1898)	invalid	Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Roccella mollis var. dufoureiformis Hampe (1843)	valid	Roccellina mollis (Hampe) Tehler (2007)
Roccella mollusca (Ach.) Nyl. (1857)	valid	Combea mollusca (Ach.) Nyl. (1860)
Roccella montagnei Bél. (1834)	valid	accepted here
Roccella montagnei f. angusta Nyl. ex Darb. (1898)	invalid	Roccella montagnei Bél. (1834)
Roccella montagnei f. angustata Nyl. in Müll. Arg. (1879)	invalid	Roccella montagnei Bél. (1834)
Roccella montagnei f. angustior Nyl. (1860)	valid	Roccella montagnei Bél. (1834)
Roccella montagnei f. obtusa Vain. (1901)	valid	Roccella babingtonii Mont. (1852)
Roccella montagnei f. teretior Cromb. (1876)	valid	Roccella boryi Delise ex Fée (1824)
Roccella montagnei var. argentina Kremp. ex Darb. (1898)	invalid	Roccella gracilis Bory (1828)

Roccella montagnei var. peruensis Kremp. (1877)	valid	Roccella gracilis Bory (1828)
Roccella montagnei var. peruviensis Kremp. in Müll. Arg. (1879)	invalid	Roccella gracilis Bory (1828)
Roccella montagnei var. rigidula Müll. Arg. (1879)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella mossamedana Vain. (1901)	valid	Santessonia hereroensis (Vain.) Follmann (1987)
Roccella nigerrima (Darb.) Follmann (1998)	valid	accepted here
Roccella obscurissima Follmann & B. Werner (1998)	valid	Roccella galapagoensis Follmann (1968)
Roccella octopodioides Follmann (1994)	invalid	Roccella margaritifera B. Werner & Follmann (1998)
Roccella patellata Stirt. (1874)	valid	Roccella tinctoria DC. (1805)
Roccella pattensis C.W. Dodge (1964)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella pembensis C.W. Dodge (1964)	valid	Roccella linearis (Ach.) Vain. (1901)
Roccella peruensis (Kremp.) Darb. (1898)	valid	Roccella gracilis Bory (1828)
Roccella phycopsioides Tehler (2010)	valid	accepted here
Roccella phycopsis Ach. (1804)	valid	accepted here
Roccella phycopsis f. pygmaea (Durieu & Mont.) Nyl. (1860	valid	Roccella phycopsis Ach. (1804)
Roccella phycopsis f. tenuior Cromb. (1904)	valid	Roccella phycopsis Ach. (1804)
Roccella phycopsis var. cecilia-metella Beltr. (1879)	valid	Roccella phycopsis Ach. (1804)

Roccella phycopsis var. farinosa DC. ex Darb. (1898)	invalid	Roccella phycopsis Ach. (1804)
Roccella podocarpa Vain. (1901)	valid	Roccella africana Vain. (1901)
Roccella portentosa (Gay) Darb. (1898)	valid	Roccellina portentosa (Gay) Tehler (2007)
Roccella purpura-antiquorum Bory (1828)	valid	Roccella tinctoria DC. (1805)
Roccella pusilla Mont. & Durieu (1846)	valid	Roccella phycopsis Ach. (1804)
Roccella pygmaea Durieu & Mont. (1849)	valid	Roccella phycopsis Ach. (1804)
Roccella ramalinoides Bory (1828)	valid	Roccella gracilis Bory (1828)
Roccella rangiformis Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella sanctae-helenae Aptroot & Schumm (2011)	valid	accepted here
Roccella scoparia Follmann ex Tehler (2007)	invalid	Roccella galapagoensis Follmann (1968)
Roccella simensis Nyl. ex Darb. (1898)	invalid	accepted here
Roccella sinensis Nyl. (1860)	valid	accepted here
Roccella stipitata B. Werner & Follmann (2000)	valid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella subpodicellata (Vain.) Follmann & Huneck (1974)	valid	Roccella africana Vain. (1901)
Roccella subpodicellata f. complanata (Vain.) Follmann & Huneck (1974)	valid	Roccella africana Vain. (1901)
Roccella taeniata Mont. ex Darb. (1898)	invalid	Roccellina portentosa (Gay) Tehler (2007)
Roccella teneriffensis Vain. (1924)	valid	accepted here

Roccella tinctoria DC. (1805)	valid	accepted here
Roccella tinctoria f. complanata Vain. (1901)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria f. filiformis Bab. (1839)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria f. gracilis Czerwiak. (1849)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria f. minor Nyl. (1868)	valid	Roccella montagnei Bél. (1834)
Roccella tinctoria f. valida Hampe (1897)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria var. cornuta Hampe ex Darb. (1898)	invalid	Roccella lirellina (Darb.) Follmann (1997)
Roccella tinctoria var. cumingiana Mont. (1852)	valid	Roccellina cumingiana (Gay) Tehler (2007)
Roccella tinctoria var. deformis Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella tinctoria var. dichotoma (Pers.) Ach. (1814)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria var. dufouriaeformis Hampe ex Darb. (1898)	invalid	Roccella lirellina (Darb.) Follmann (1997)
Roccella tinctoria var. fastigiata (Bory) Delise ex Darb. (1898)	valid	Roccella tinctoria DC. (1805)
Roccella tinctoria var. fuciformis (DC.) Bab. (1839)	valid	Roccella fuciformis (L.) DC. (1805)
Roccella tinctoria var. gracilis van Hall ex Darb. (1898)	invalid	Roccella gracilis Bory (1828)
Roccella tinctoria var. hypomecha (Ach.) Ach. (1814)	valid	Roccellina hypomecha (Ach.) Tehler (2007)
Roccella tinctoria var. phycopsis (Ach.) Mudd (1861)	valid	Roccella phycopsis Ach. (1804)

Roccella tinctoria var. portentosa Mont. (1852)	valid	Roccellina portentosa (Gay) Tehler (2007)
Roccella tinctoria var. soredifera Bory ex Darb. (1898)	invalid	Roccella tinctoria DC. (1805)
Roccella tinctoria var. subpodicellata Vain. (1901)	valid	Roccella africana Vain. (1901)
Roccella tinctoria ssp. alectoroides Nyl. ex Darb. (1898)	invalid	Ingaderia gracillima (Kremp.) Feige & Lumbsch (1993)
Roccella translucida Follmann & B. Werner (2001)	valid	Roccella nigerrima (Darb.) Follmann (1998)
Roccella tuberculata Vain. (1901)	valid	accepted here
Roccella tuberculata var. vincentina Vain. (1901)	valid	Roccella tinctoria DC. (1805)
Roccella verruculosa Follmann (1980)	valid	accepted here
Roccella vincentina (Vain.) Follmann (1987)	valid	Roccella tinctoria DC. (1805)
Roccella vincentina var. boergesenii (Vain.) Follmann (1987)	valid	Roccella tinctoria DC. (1805)

Explanation of the plates

Plates and descriptions are provided for most species of fruticose Roccellaceae and for a few morphologically similar taxa and some crustose Roccellaceae. For all taxa studied, several illustrations are presented including a habitus photograph and pictures of details. All pictures have an exact scale to facilitate measurements and comparison. Often we show thicker and thinner sections, coloured (various methods) or not, with and without lecanoric acid, sometimes also in polarized light in order to demonstrate more complete the locations of lichen acids.

After the short description, in every case the location of the examined material is given in the same way as it is written on the labels. If possible, we used G. Follmann's Lichenes Exsiccati Selecti, which have a wide distribution. In cases where we are convinced that it is of advantage to present more specimens of a species, this description and the synonyms are not repeated. Most specimens are deposited in the herbaria of F. Schumm [xxxx] and A. Aptroot [ABLxxxx] and our herbarium numbers of the illustrated specimens are always mentioned at the end in brackets.

A problem was, how to avoid loosing information while arranging the pictures into combined plates at A5 pages. We preferred not to reduce the sizes too much. The explanatory words on the pictures are partly in German, partly in English, reflecting the long time during the pictures have been prepared. We also present pictures of some *Dirina*, *Roccelinastrum*, *Protoroccella*, and *Siphula* species which are not keyed out, in order to present comparable illustrations.

The descriptions are often very short and are restricted to that, what can not be showed in the pictures. We are convinced that the pictures show in any case more than long describing texts, which would repeat structures in simplifying words. To compress the texts we use the following definitions:

> coralloid: compact, dense cushions, with many dichotomous or irregular ramifications, one after another, the part between the ramifications are rather short. In the upper parts of the cushions there are no clear main branches (isotomous branching).
>
> subcortex: layer underneath the upper cortex (only if a cortex is present). Distinguished because the medullary reactions here are

sometimes different from either the cortex and/or the medulla. Often, but not always, the layer with algae.

texture soft: the thallus branches are not stiff, one can easily bend them and they do not immediately break in parts. The reasons may be various and depend of the plectenchyma of the cortex (periclinal or anticlinal orientated hyphae) and the medulla (hyphae dense or lax, parallel or intricate).

Explanation of abbreviations

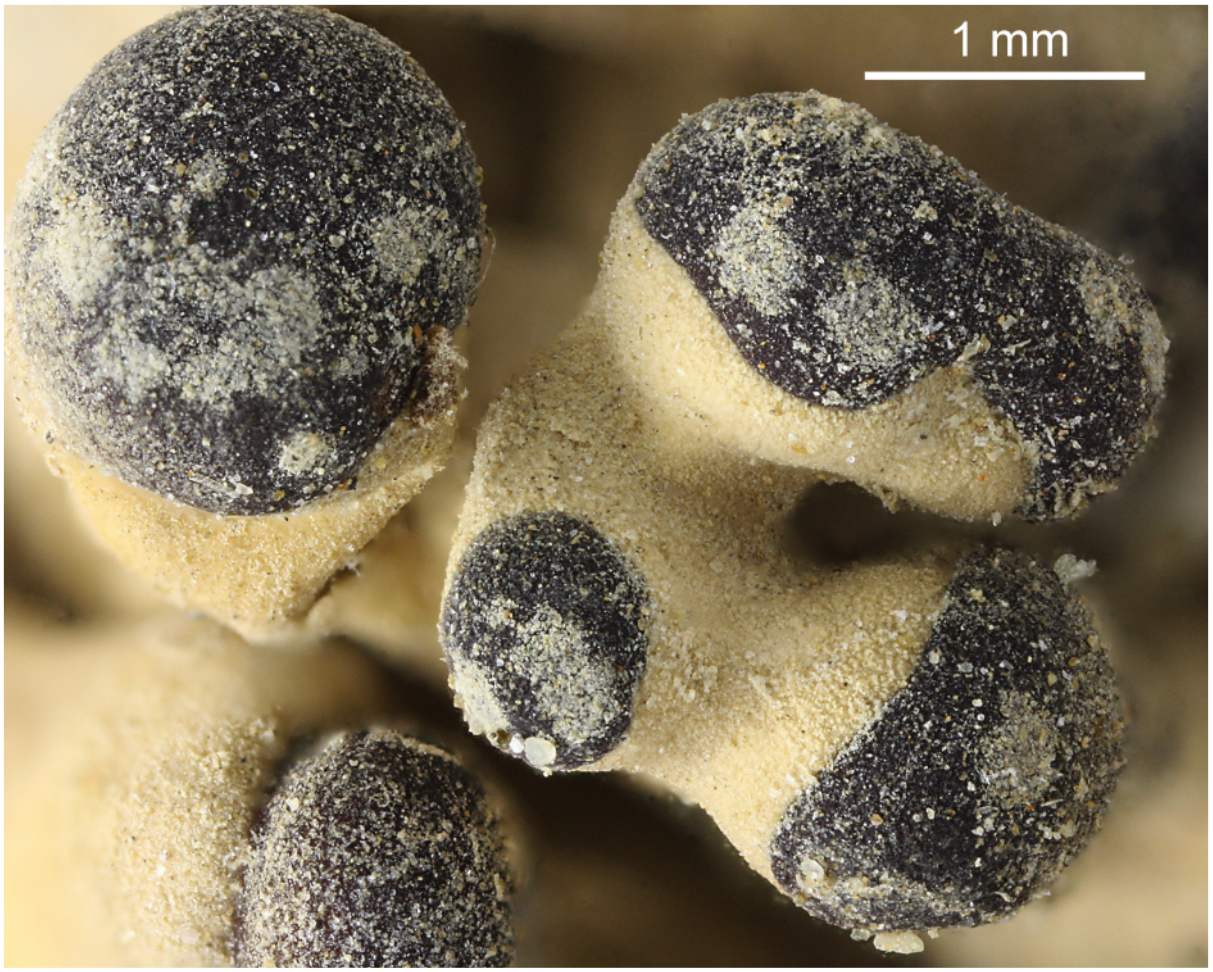
Ap.: Apothecium
Th.: Thallus
±: more or less
C: chlorid of lime in water or undiluted commercial bleach e.g. „Dan Klorix“ (in Germany)
HCl: hydrochloric acid, 20 %
I, IKI, J: Lugol's iodine solution, J for the German Jod
K&J: pretreated with KOH then followed by I
K, KOH: potassium hydroxyde, 10-35 % in water
KC: K followed by C
N: nitric acid 53 %
P, Pd: paraphenylendiamine in alcohol
UV: UVK and also UVL
UVK: ultra-violet light, 254 nm
UVL: ultra-violet light, 366 nm
TLC: thin-layer chromatography
quer = tansversal = section perpendicular to the axis
längs = longitudinal = section parallel to the axis

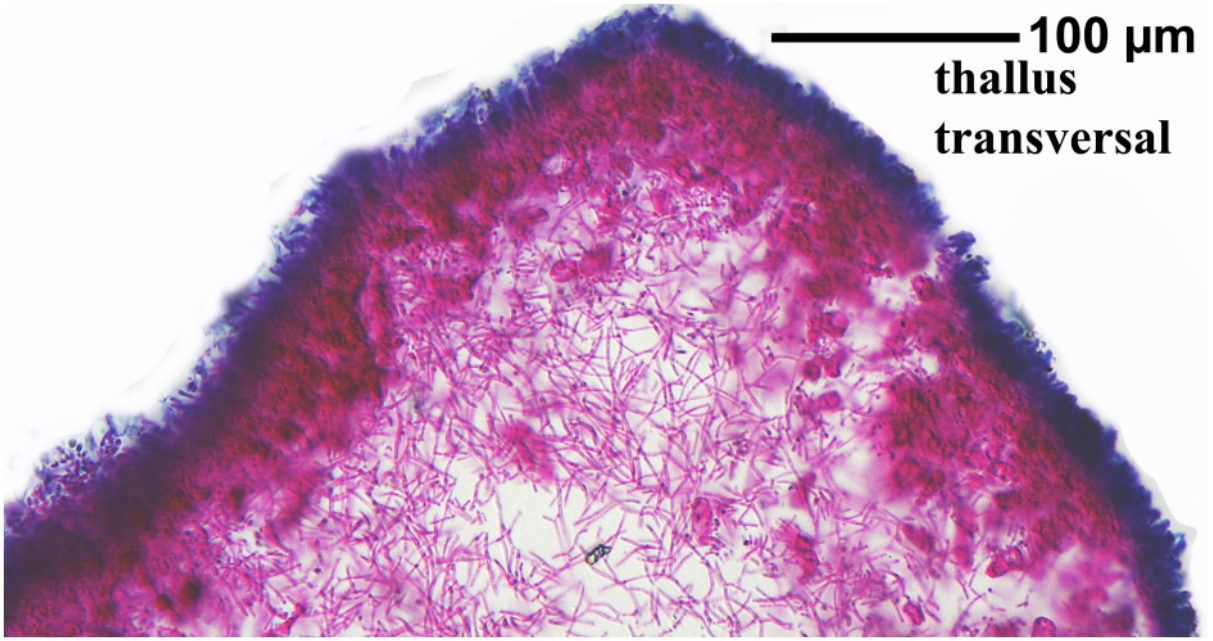
Combea mollusca (Ach.) Nyl. (1860)
Roccella mollusca (Ach.) Nyl. (1857)

Thallus saxicolous or rarely lignicolous, grey, not sorediate, composed of branched, terete lobes, texture rather soft, corallinoid, surface smooth, holdfast internally white to brown. Cortex branched type. Apothecia terminal at expanded tips, round, immersed in the lobe tips, discs dark brown to black, naked or slightly pruinose. Hypothecium hyaline. Ascospores hyaline, 3-septate, 15–18 × 4–5 µm. Cortex C + red, K – , Pd –, medulla C + red, major substances erythrin, schizopeltic, lecanoric. – Namibia.

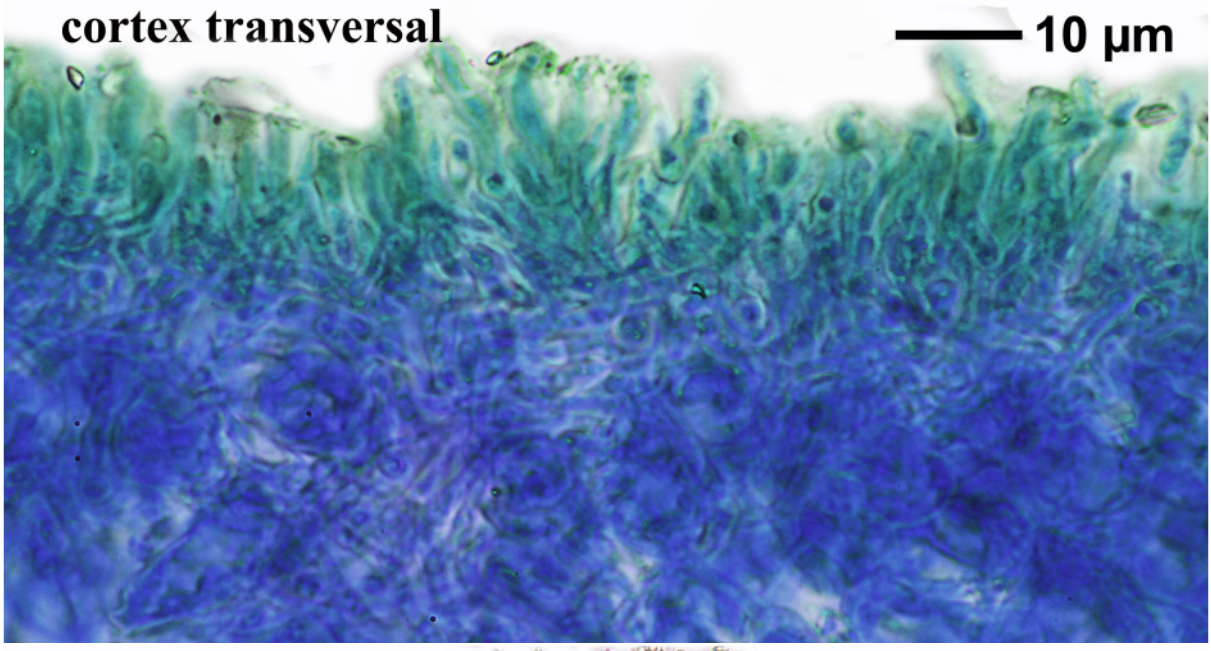
SW Africa, Namibia, Diamon Coast, Lüderitz Peninsula, flat litoral opposite to Halifax Island, on aged wooden posts of a landing-stage, 1-3 m above high-whater level, W-SW exposition, closely packed. Leg. et det. G. Follmann March 1990. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 441. [9989]

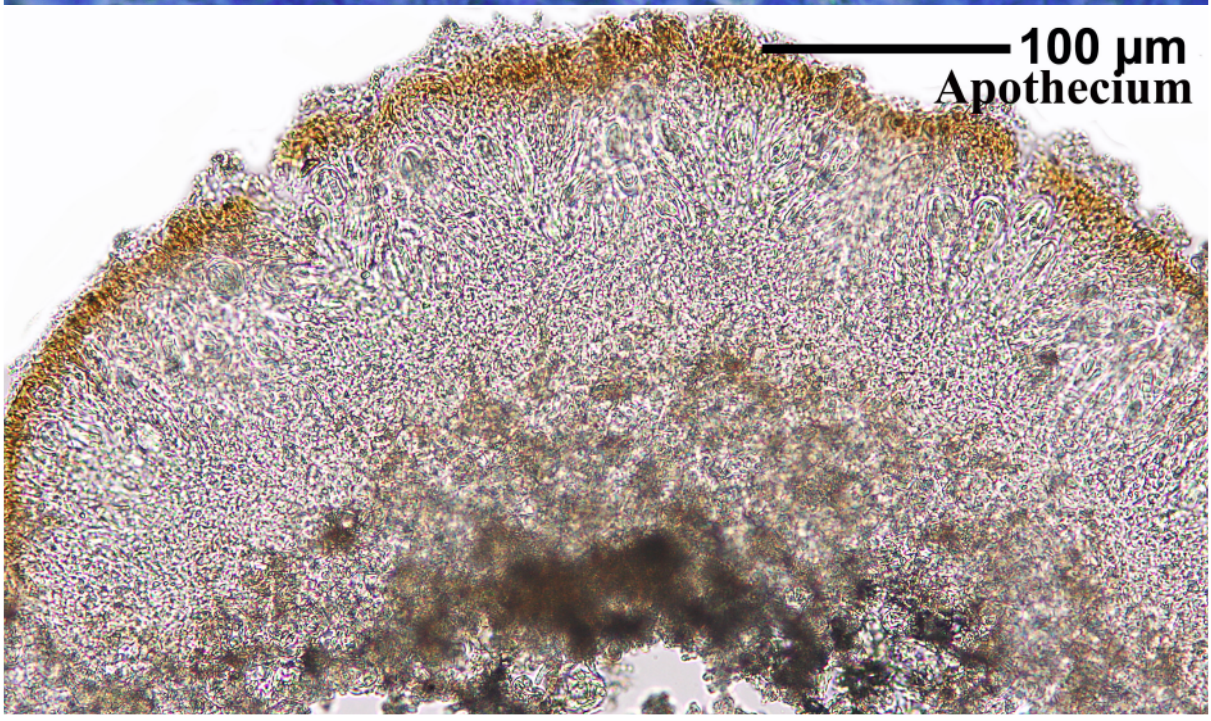


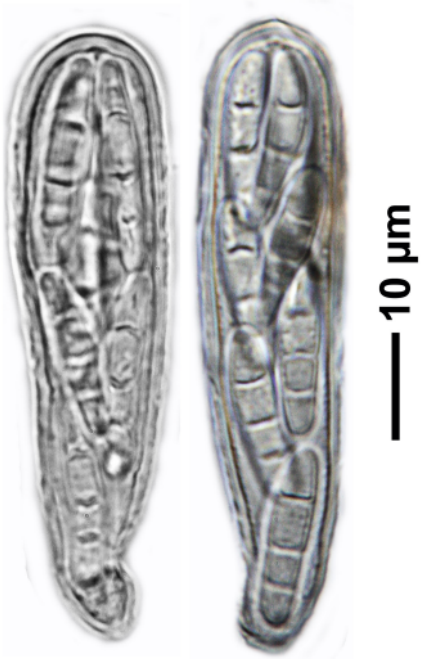




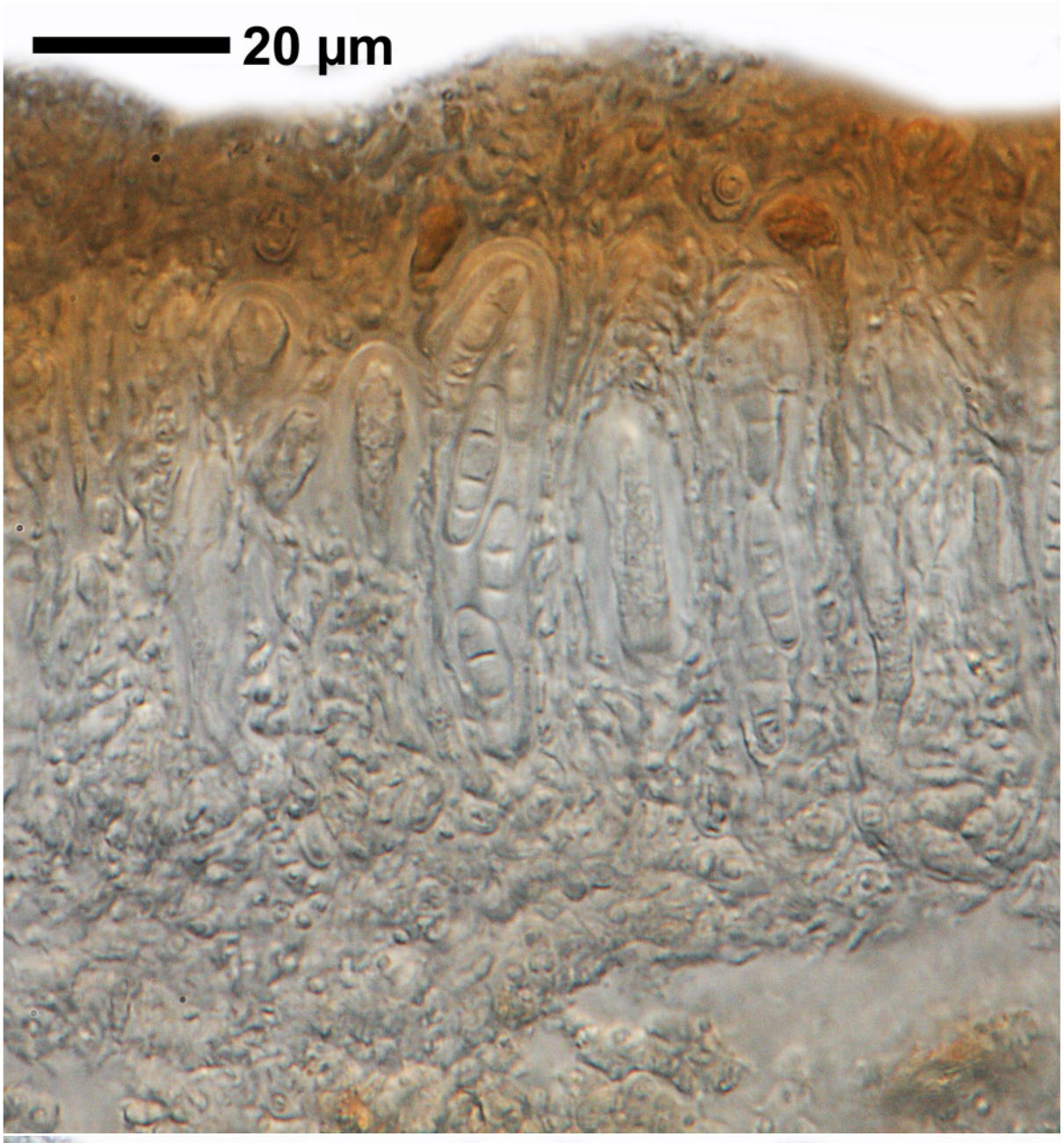
Combea mollusca

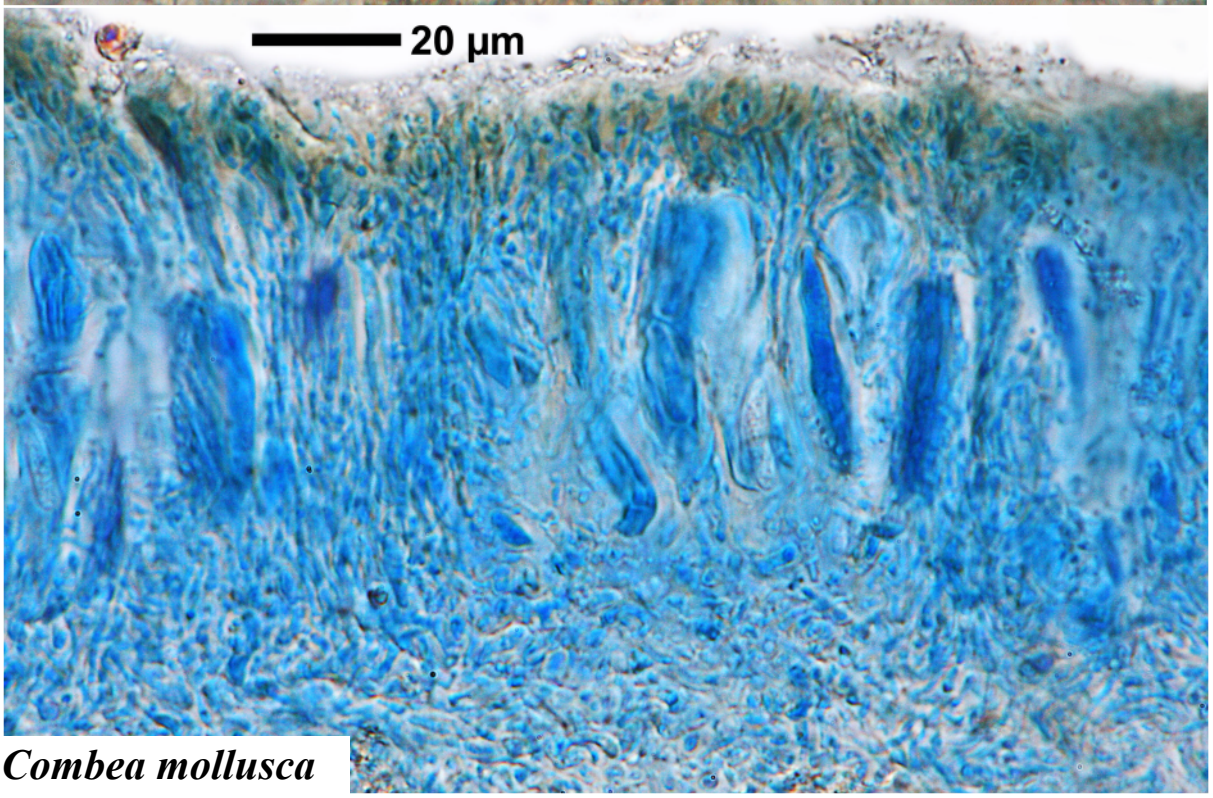




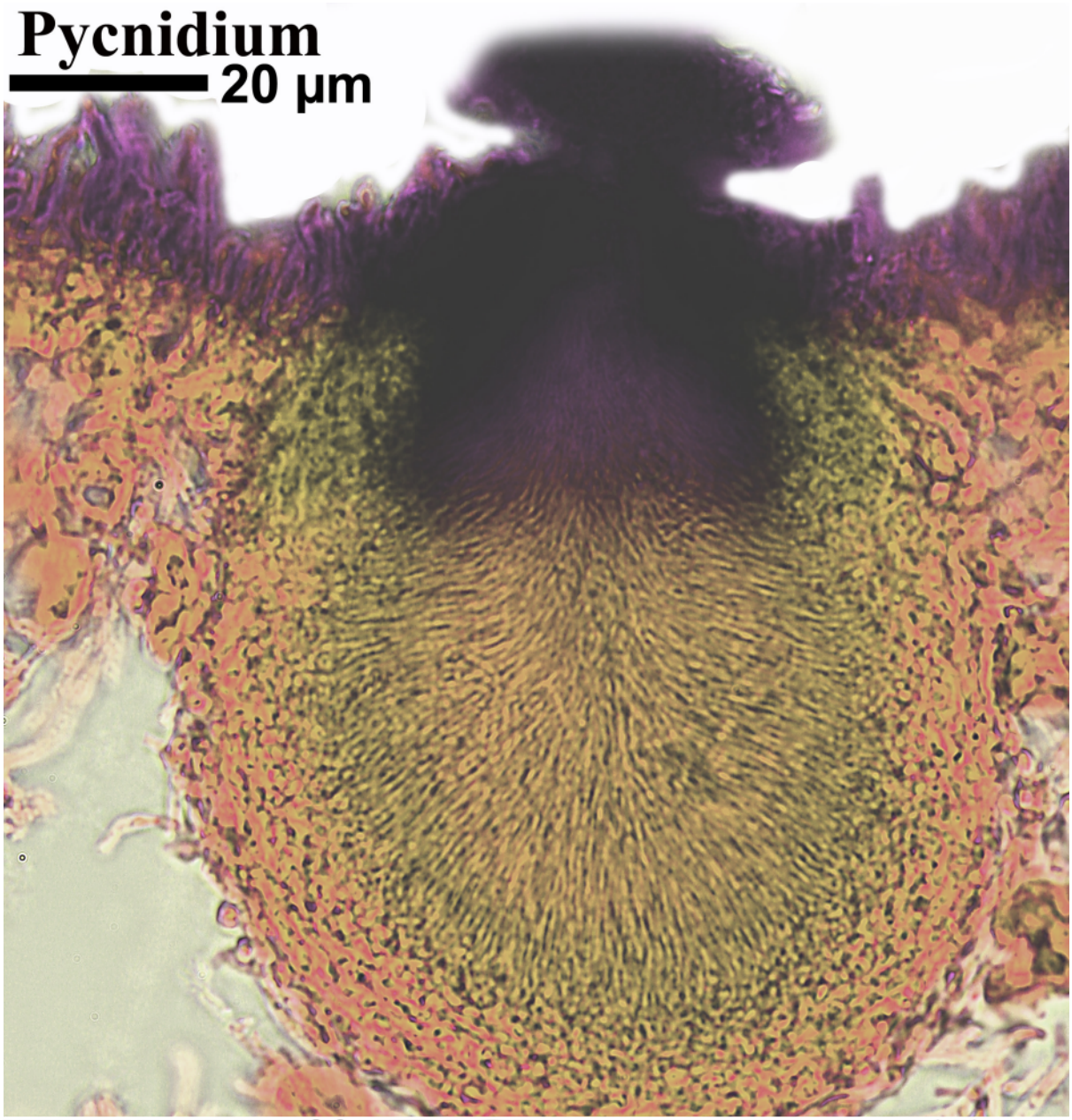


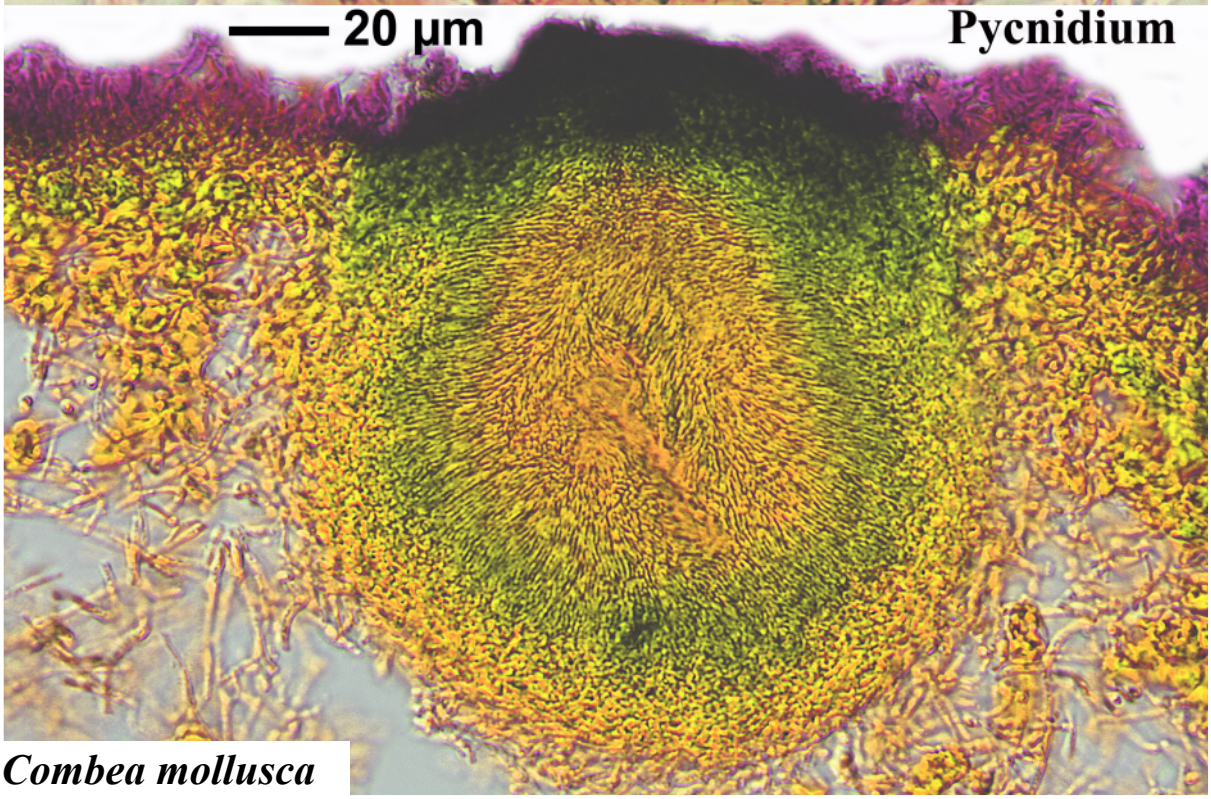
Combea mollusca





Combea mollusca



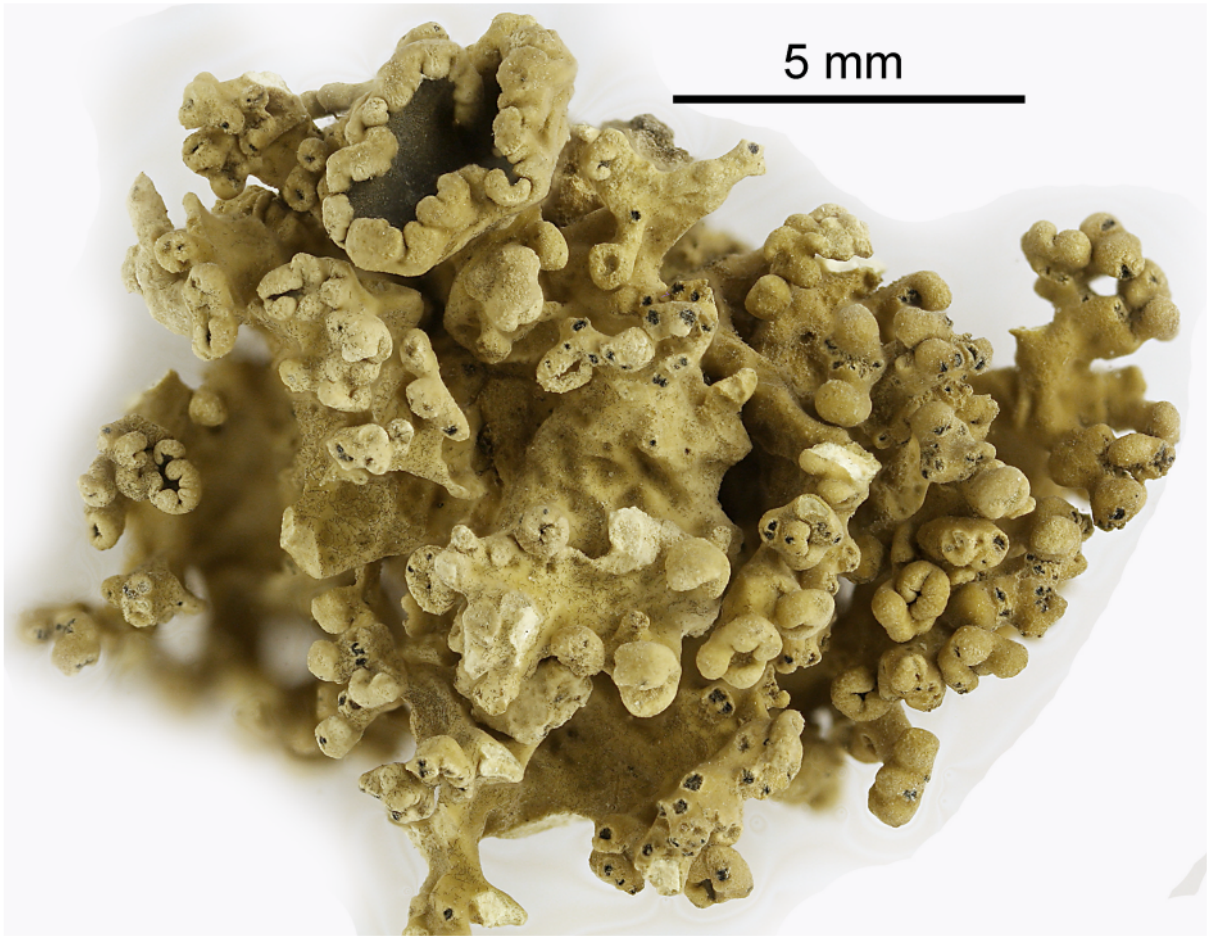


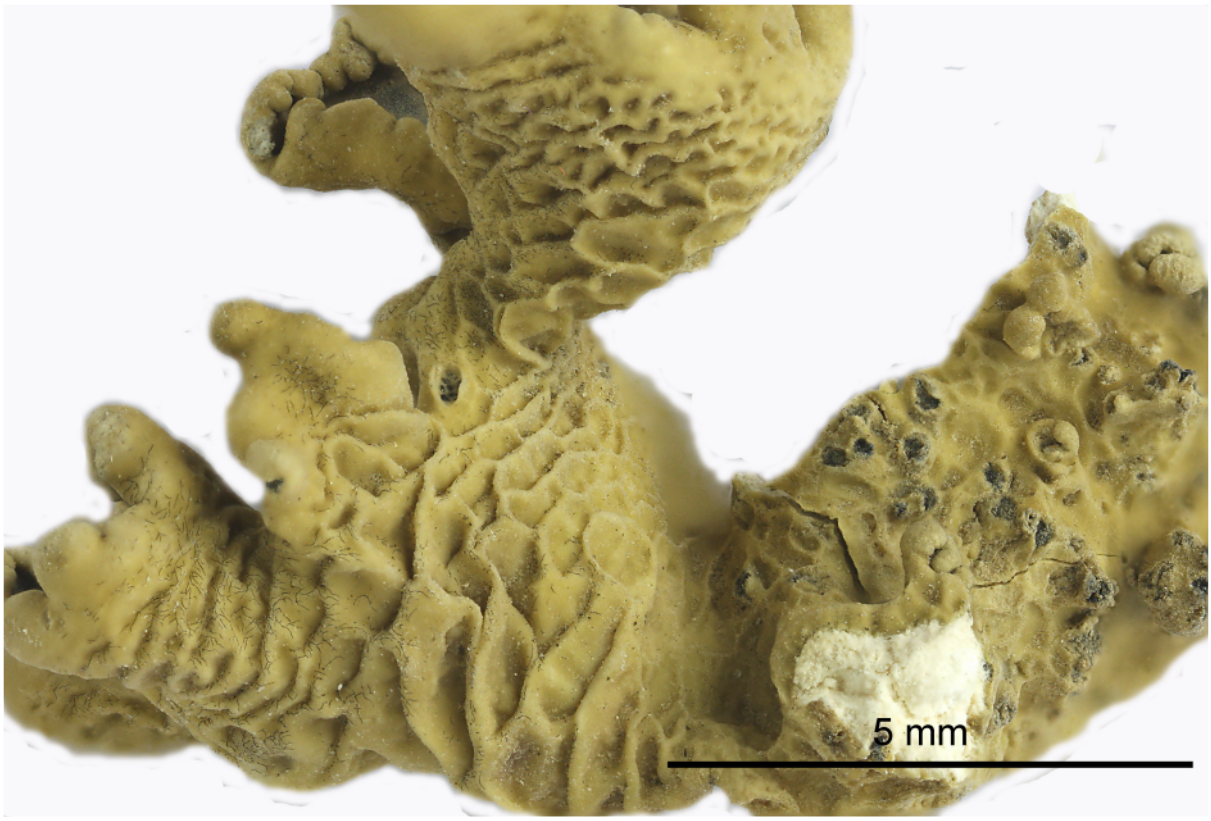
Combea mollusca

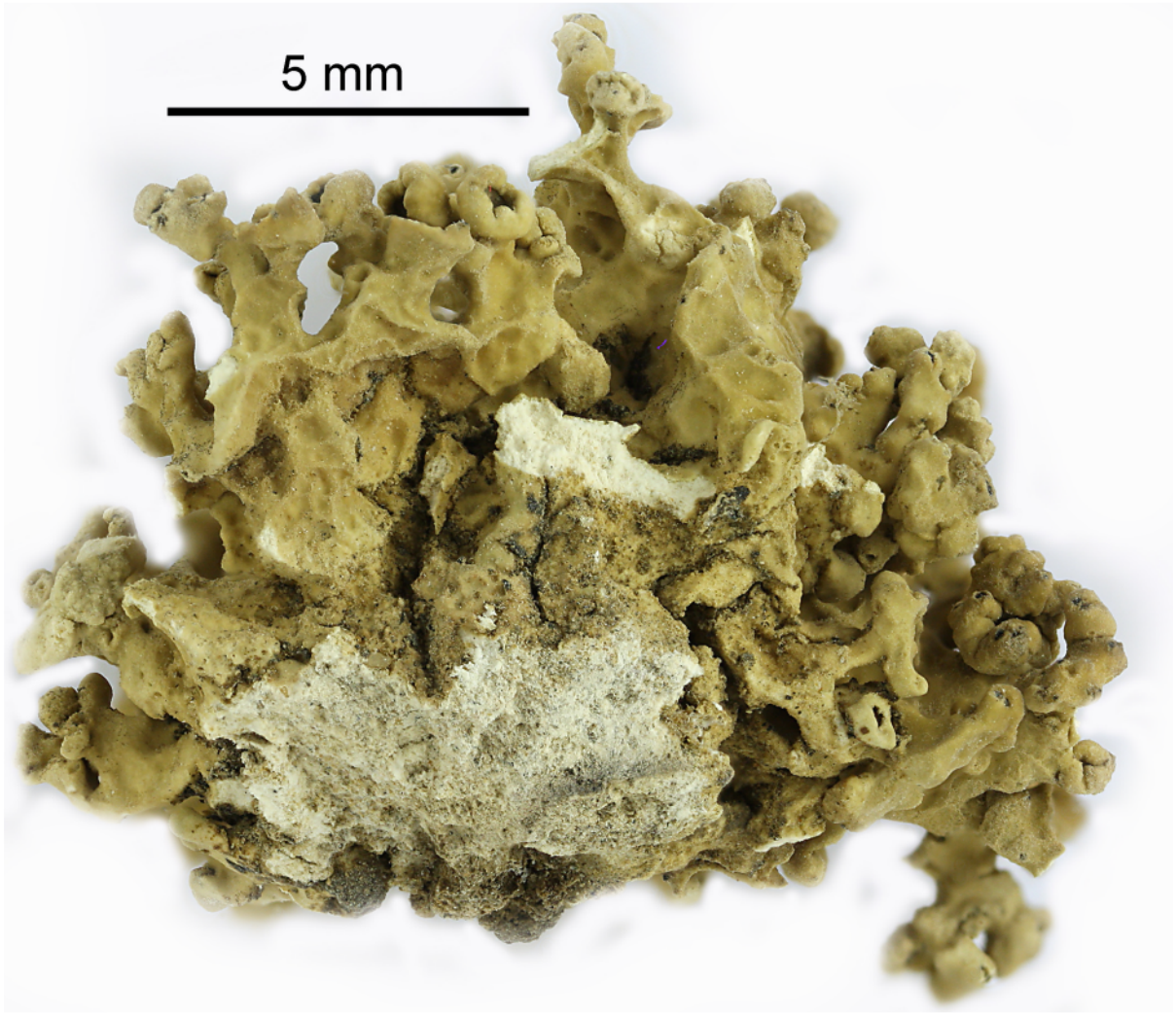
Coronoplectrum namibicum Brusse (1987)

Thallus saxicolous, with *Trebouxia* algae, grey, not sorediate, texture firm, corallinoid, surface smooth, old foveolate or ridged, holdfast internally white to brown. Cortex indistinctly of intermediate type, with thick epinecral layer. Apothecia irregular rounded, with flexuose or inflexed or crenulated thalline margin. Hypothecium hyaline. Ascospores hyaline, not septate, 8–9 × 4 µm. Cortex C –, K –, Pd –, medulla C –, no substances. – Namibia.

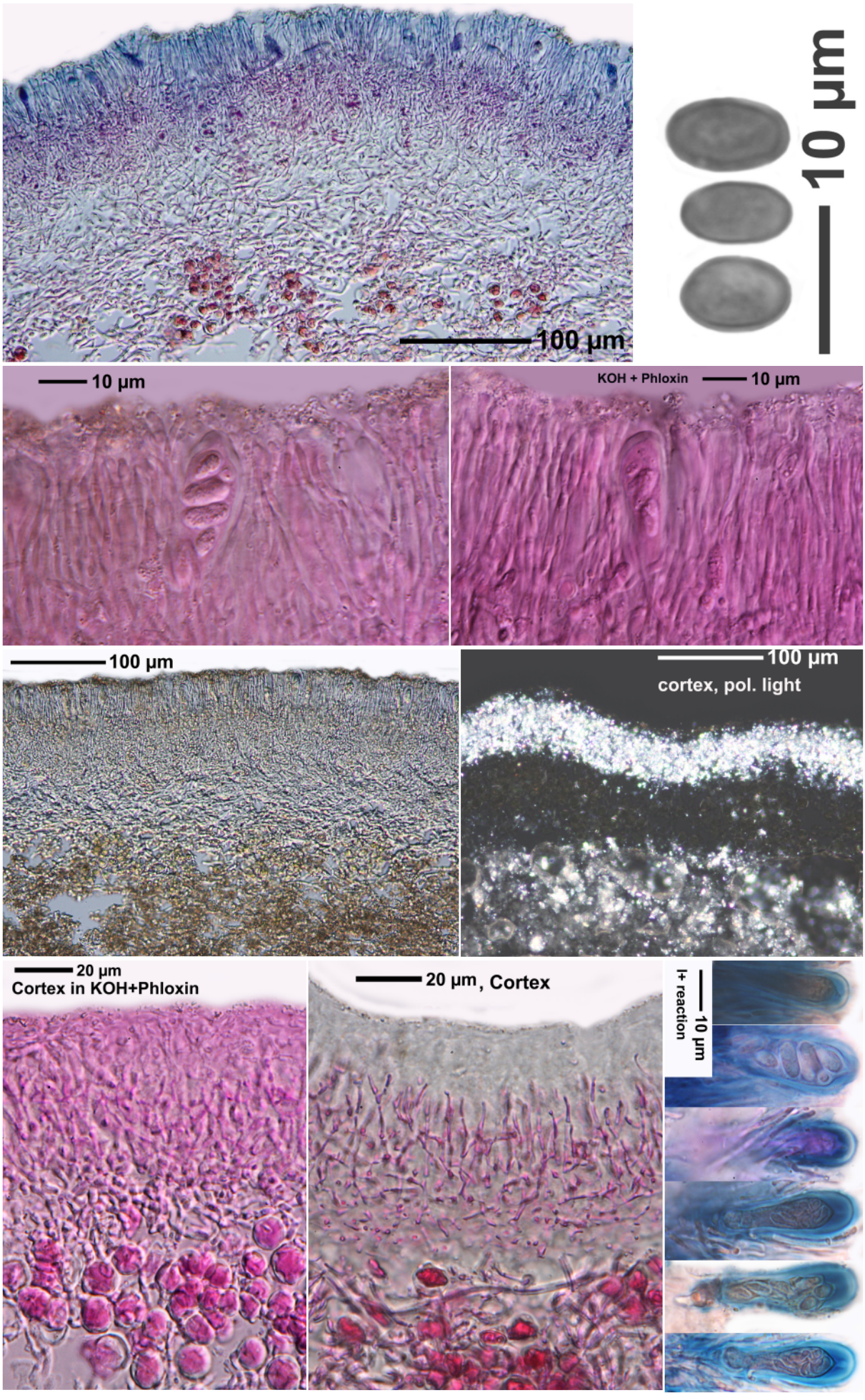
Namibia: Skeleton Coast, Cape Cross, 3 km landeinwärts gelegene Küstenberge südwestlich der Station, licht- und nebeloffene Urgesteinsfelsen, 50 m, W, pH 6,0, gesellig. Leg. G. Follmann (III/1990), det. F.A. Brusse (III/1990). Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 402. Lit. Brusse, F.A.: Mycotaxon 28: 131 (1987). [GF 402]



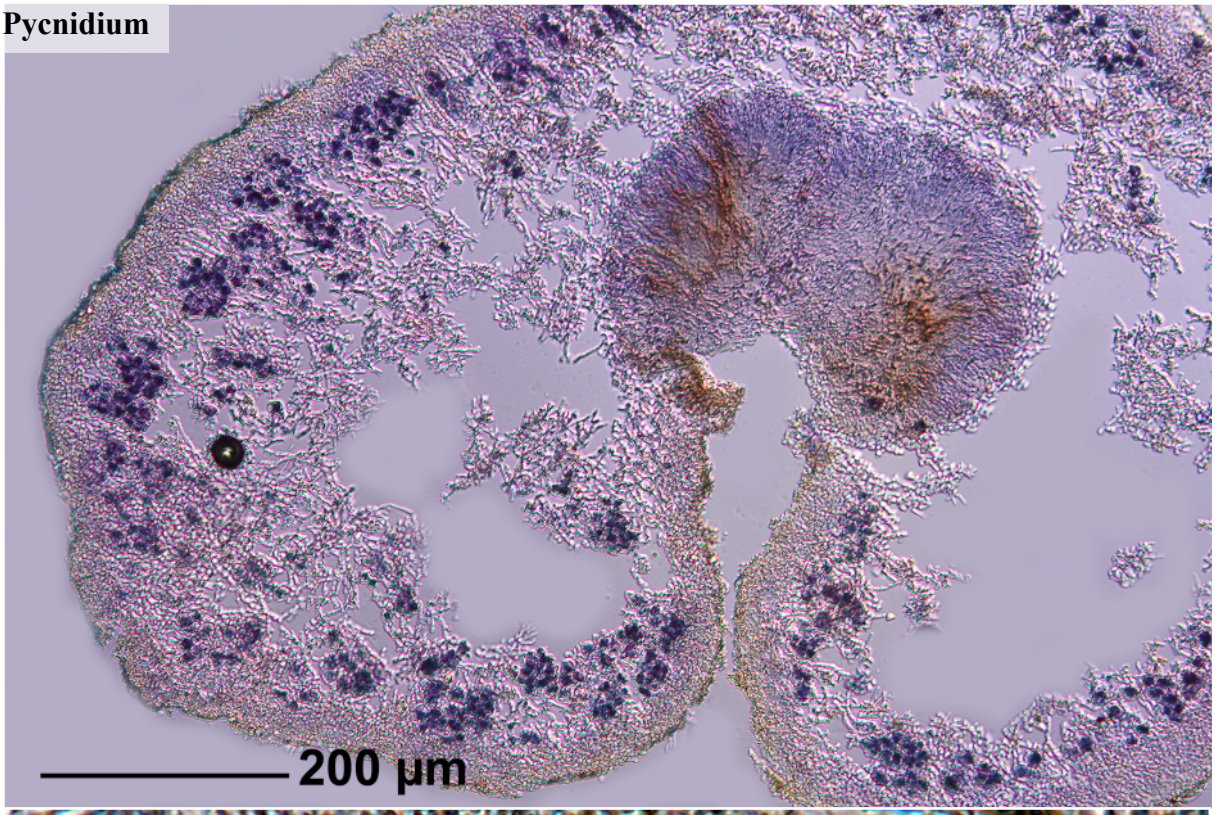


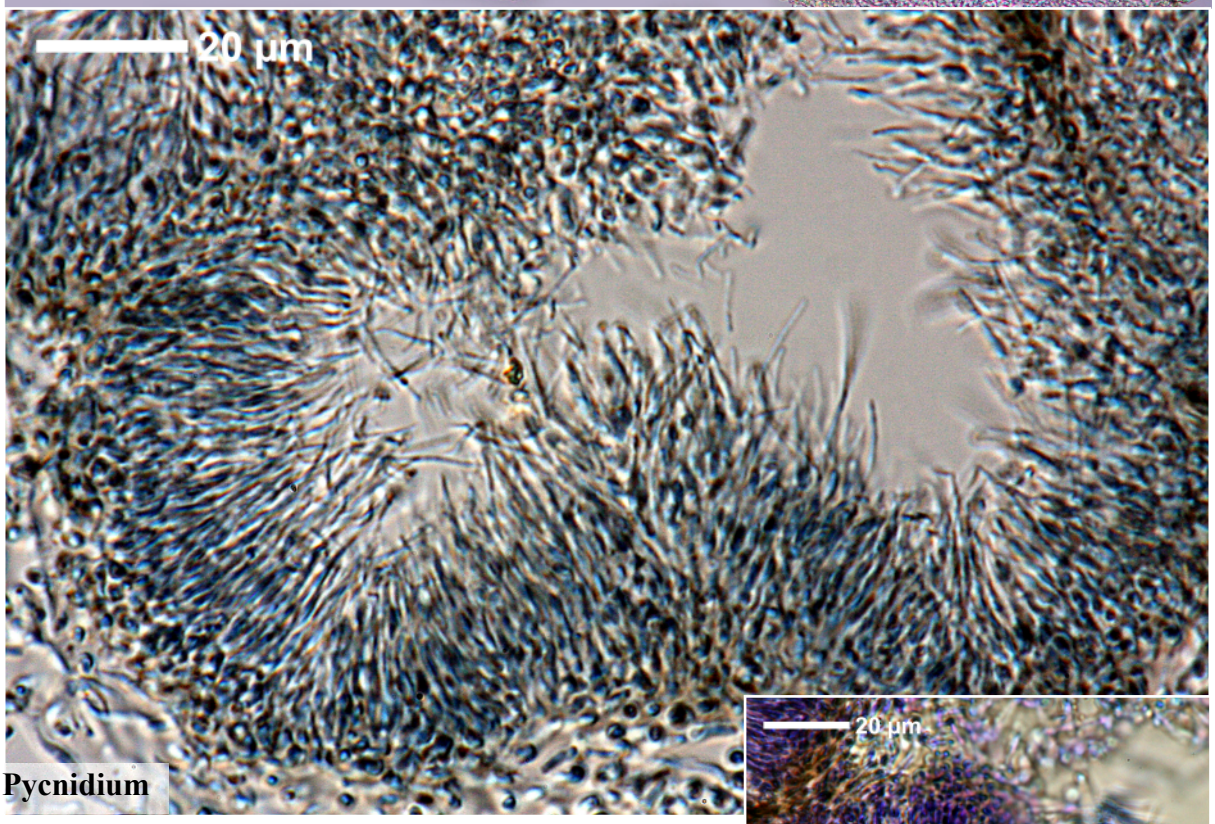


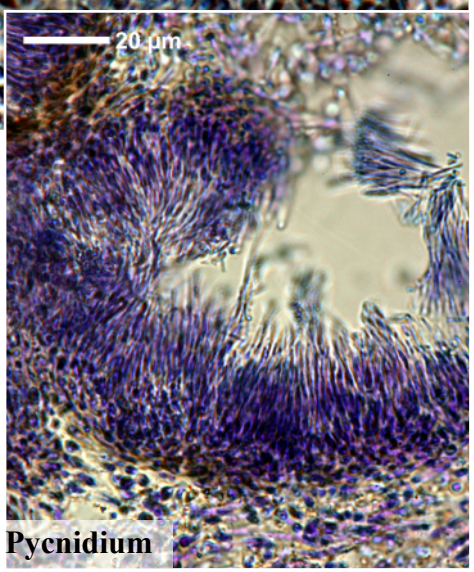
Coronoplectrum namibicum



Coronoplectrum namibicum







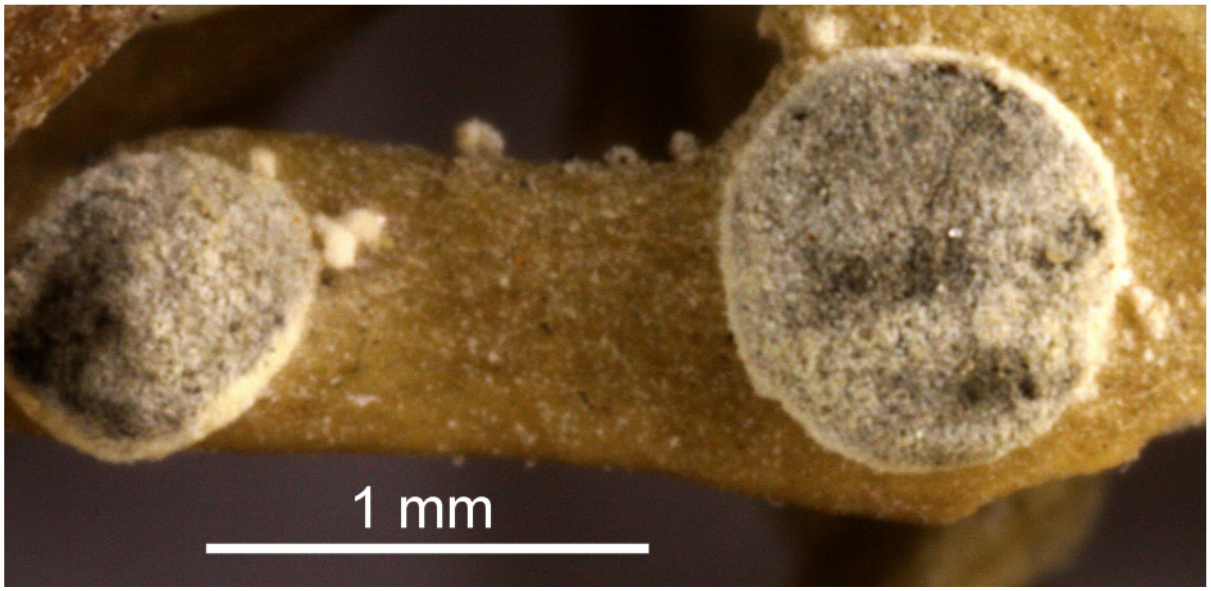
Coronoplectrum namibicum

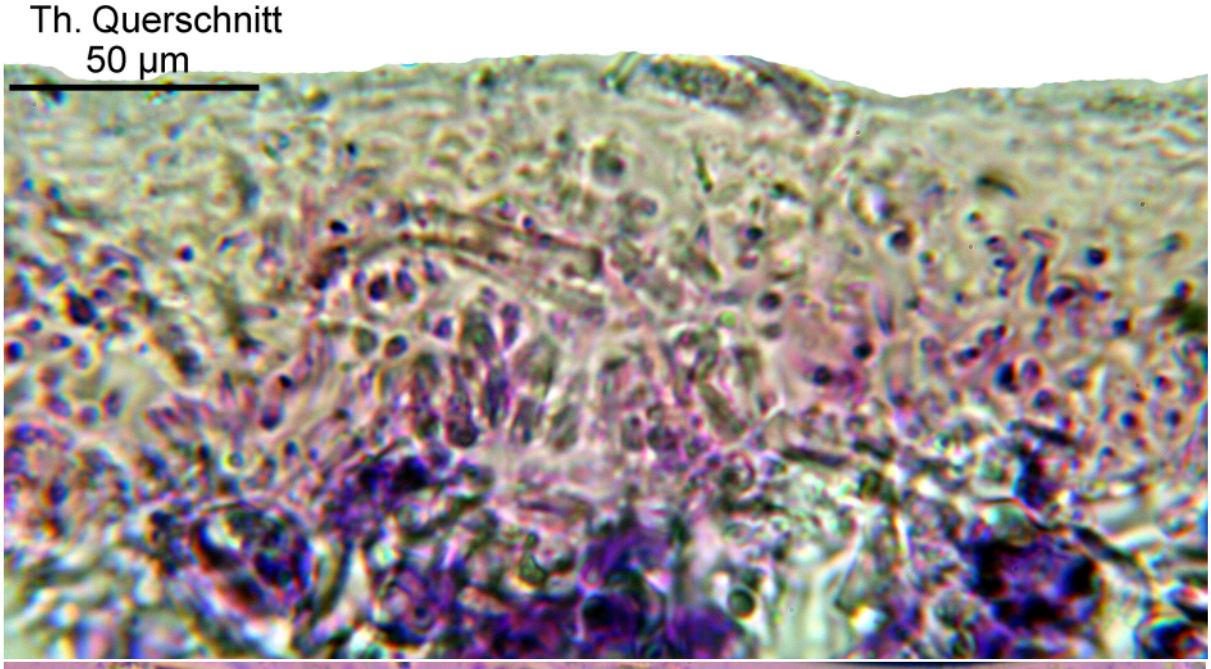
Dendrographa leucophaea (Tuck.) Darb. (1895)
Dendrographa minor (Tuck.) Darb. (1895)
Roccella leucophaea Tuck. (1858)
Roccella leucophaea var. *minor* Tuck. (1858)

Thallus saxicolous, brown, sorediate or not, texture soft, main basis branches flatened, 5(-10) mm wide, often anastomosing, end of branches cylindrical, 1 mm wide, surface rough, holdfast internally white to brown. Cortex with periclinal plectenchyma, not differentiated from the medulla. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–25 × 5–8 µm. Cortex C –, K –, Pd + orange-red, medulla C –, major substance protocetraric and fumarprotocetraric. – California, Baja California.

MEXICO: Baja California: Southern Viscaíno region of Sonoran Desert. Between Laguna Manuela & Punta Domingo. Shrubs. 25 m Sur: 3 km N of San Carlos, sandy, shrub-dominated area behind mangrove area, 24°48'N, 112°06' W, 6 m alt, on Fouquieria. Leg C. Bratt 07.Jan. 1989, det. A. Tehler 1995. Lit. Sundin, R. & Tehler, A. (1996). [9484]

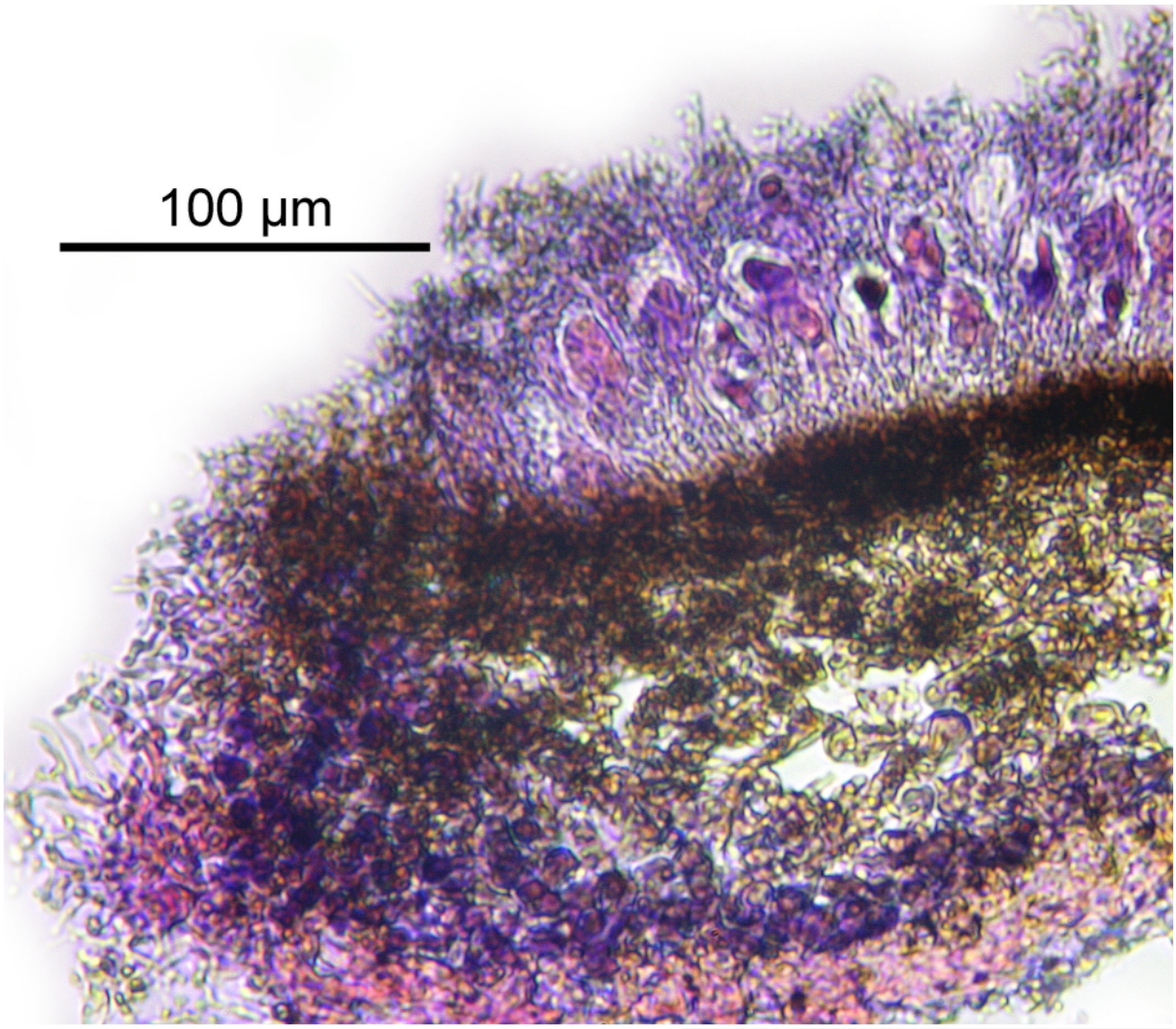


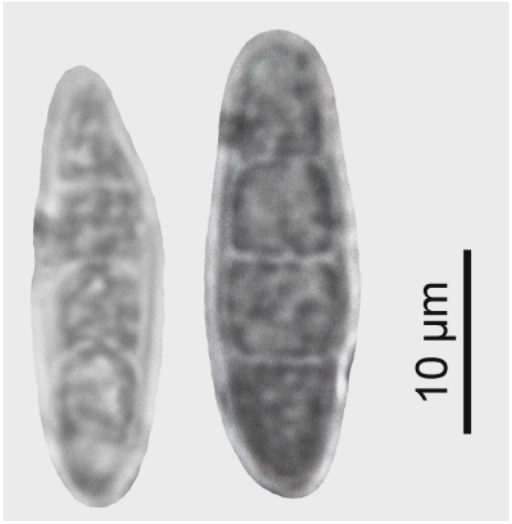




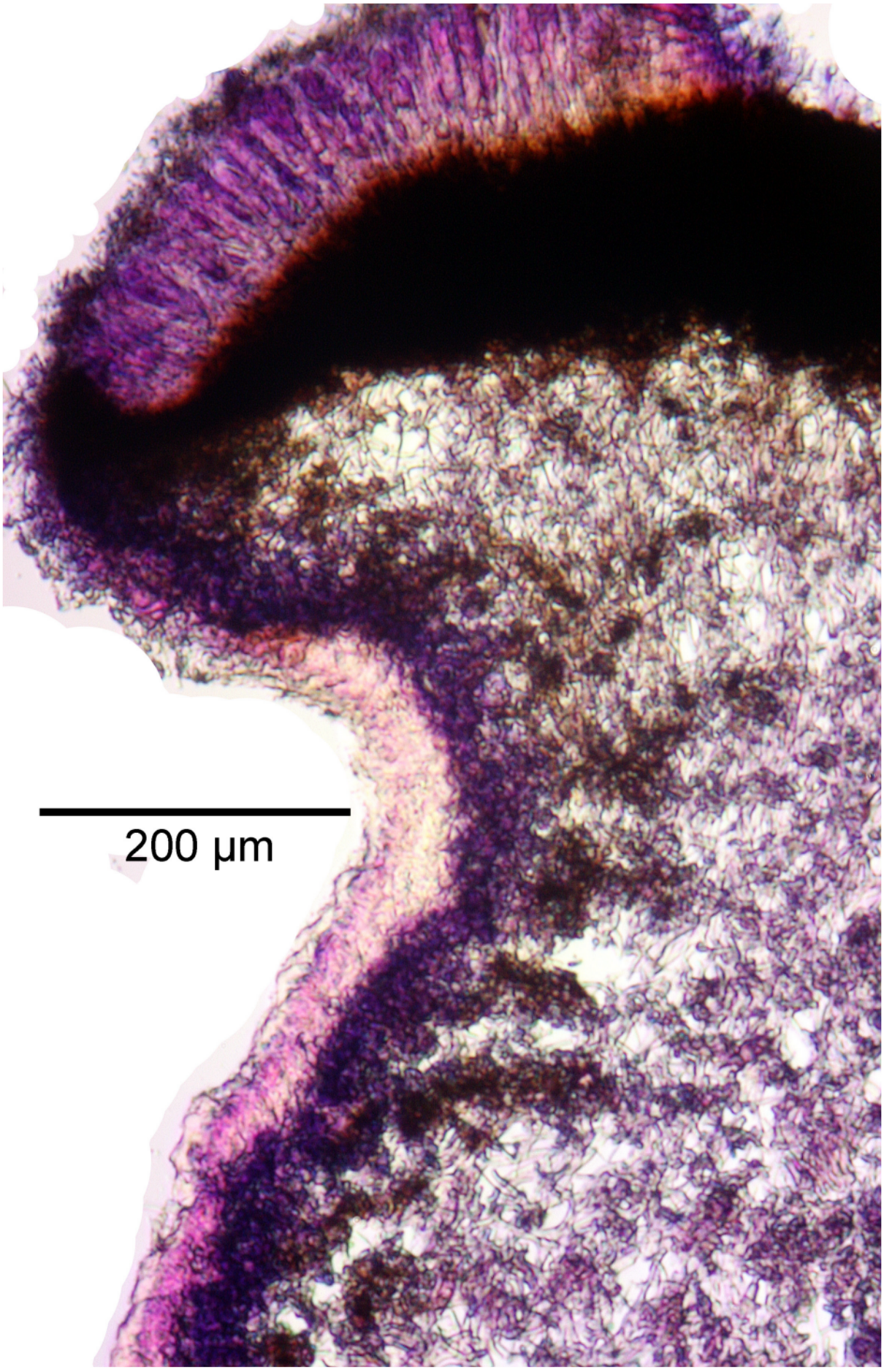


Dendrographa leucophaea





Dendrographa leucophaea

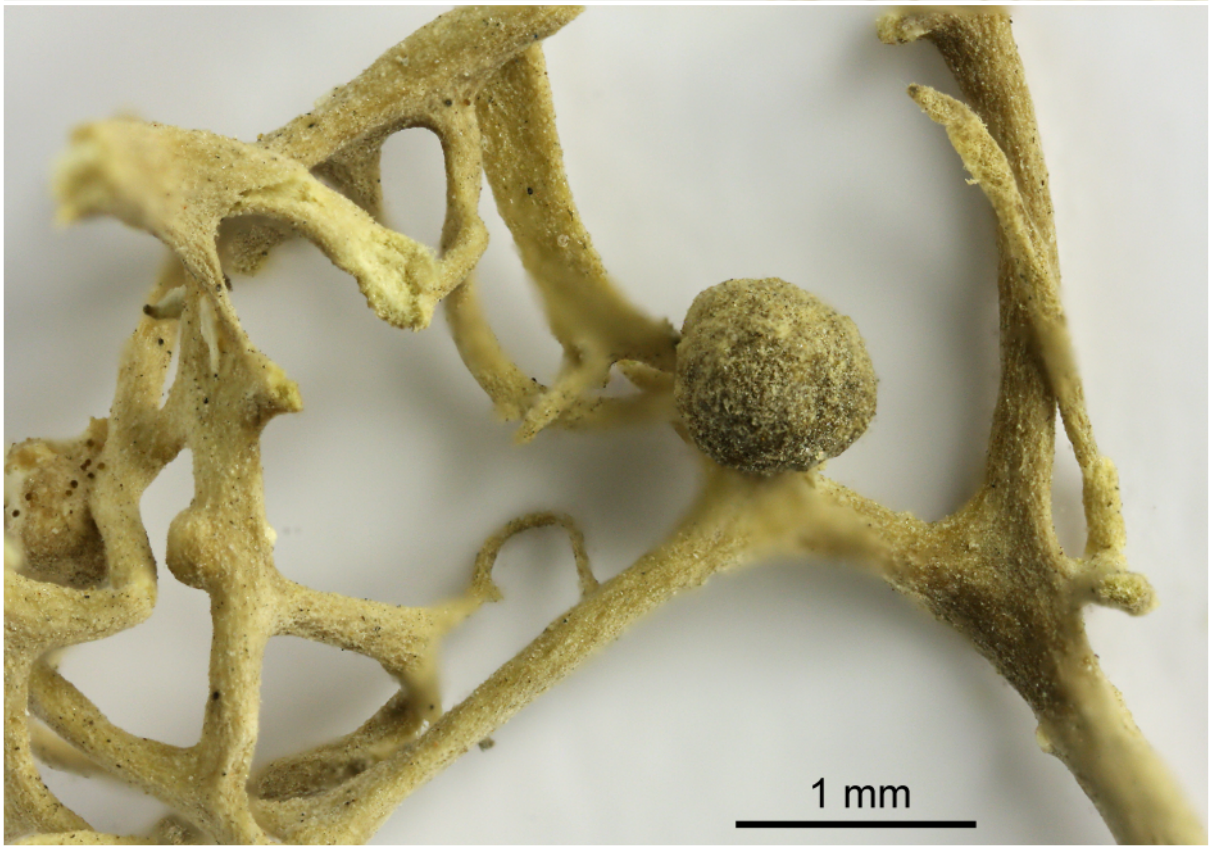


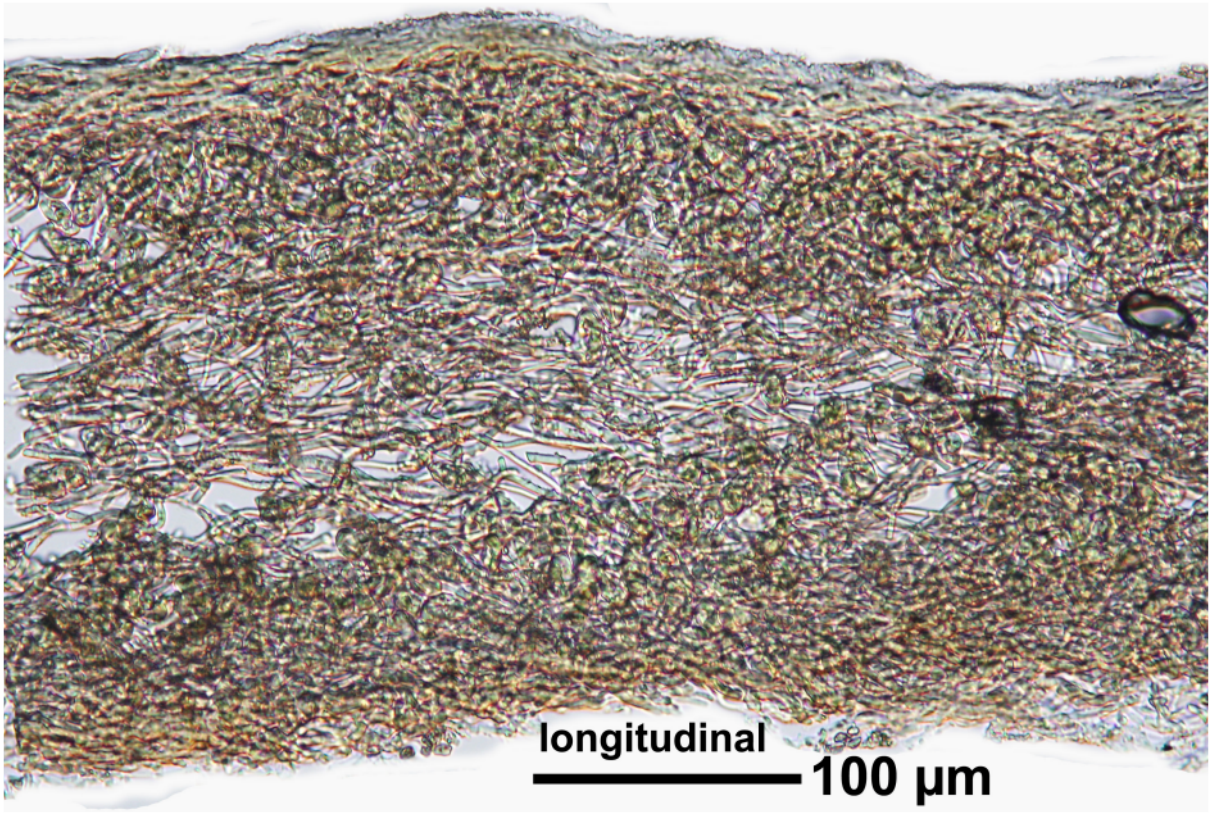
Dendrographa leucophaea

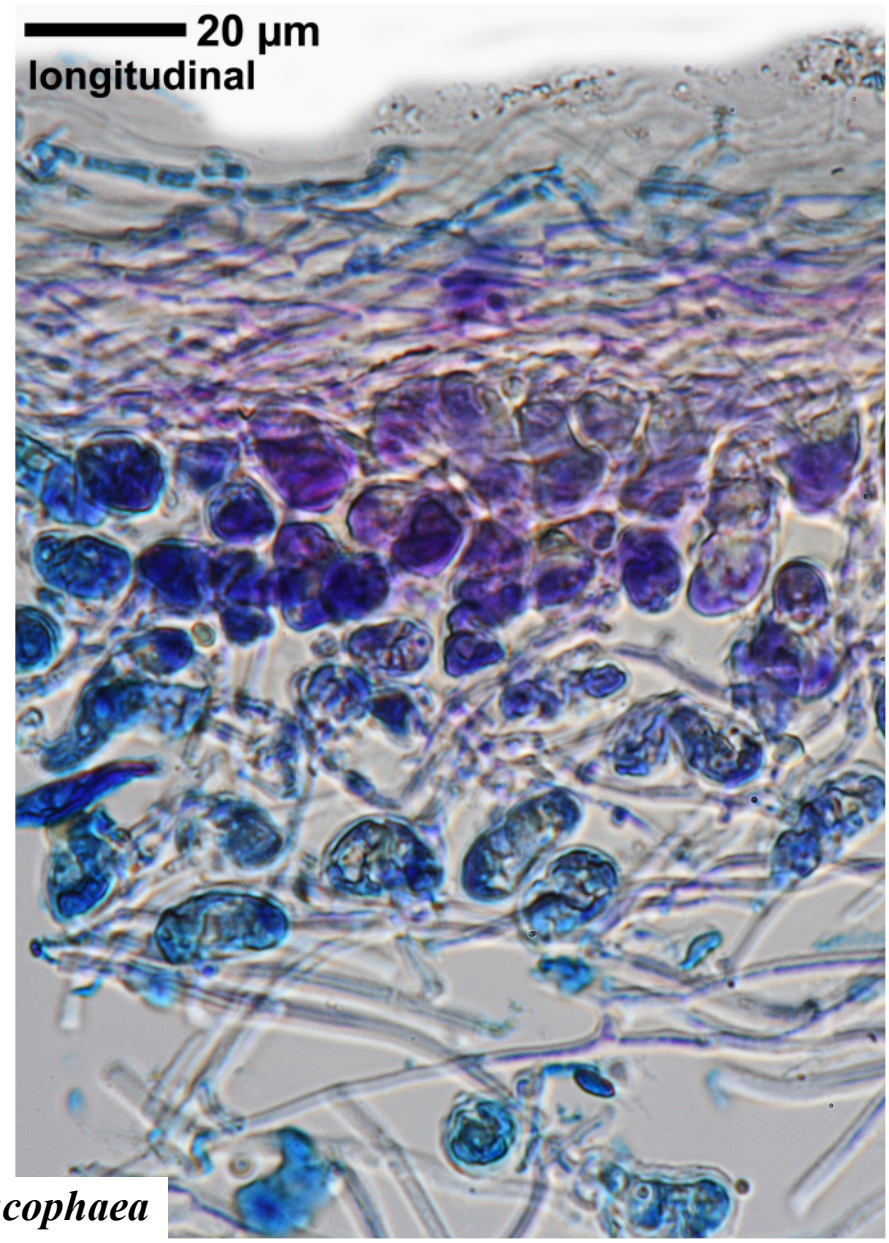
Dendrographa leucophaea (Tuck.) Darb. (1895)

Mexico, Baja California, between Laguna Manuela and Punta Santo Domingo, southern Vizcaino Region of the Sonoran Desert (Fouqueria diguetii, Jatropha, Yucca valida, etc), 0-50 m, post-batholitic basalt and sand, 28°14' N, 114°06' W, on shrub. Leg. A. & M. Aptroot 7.Jan. 1989, det.A. Aptroot 1989. [ABL24641]

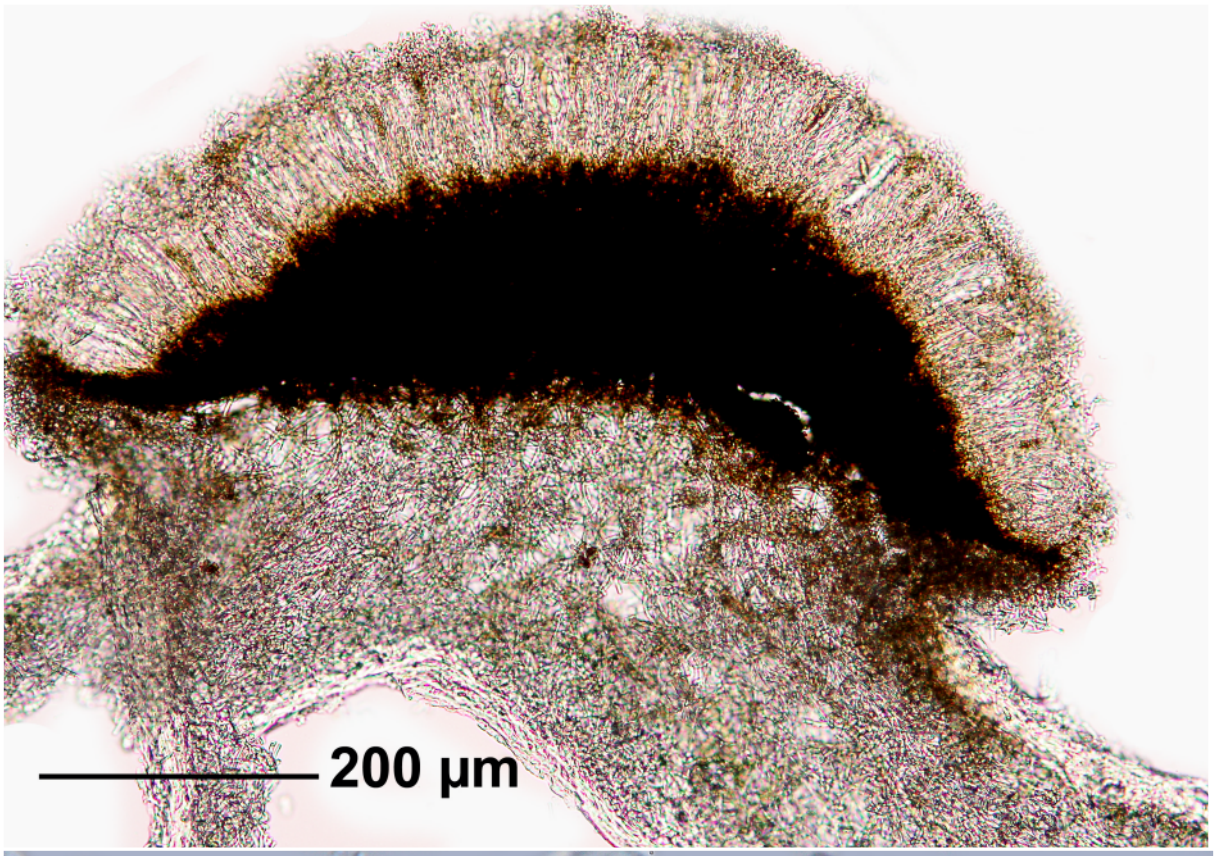


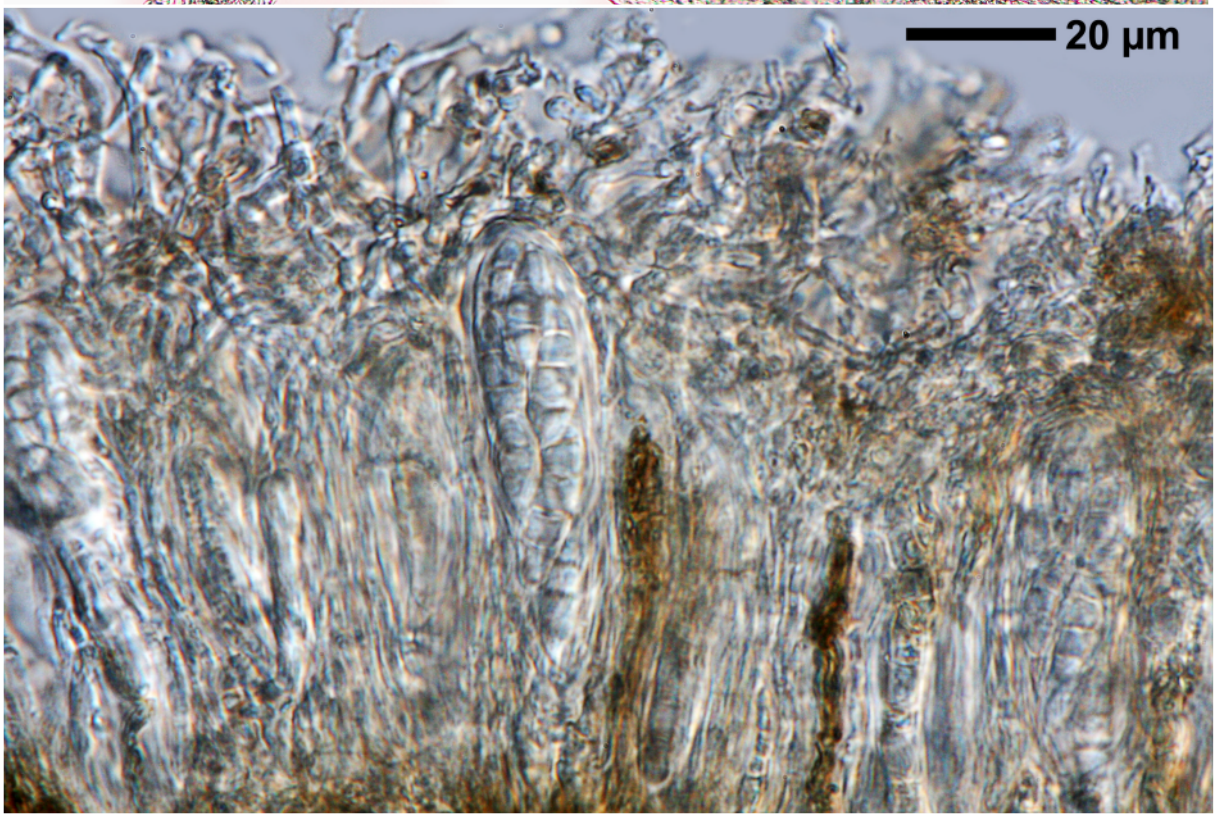






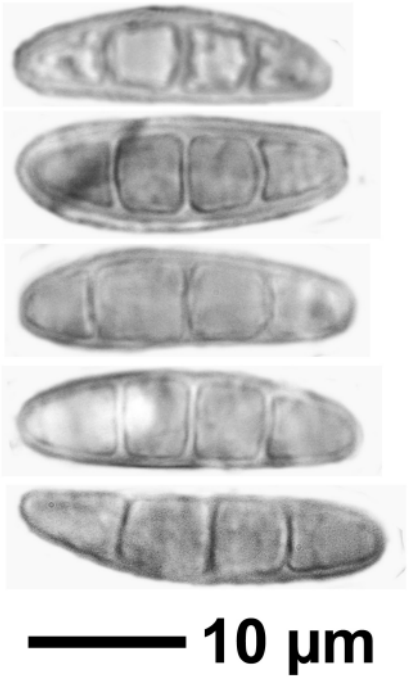
Dendrographa leucophaea

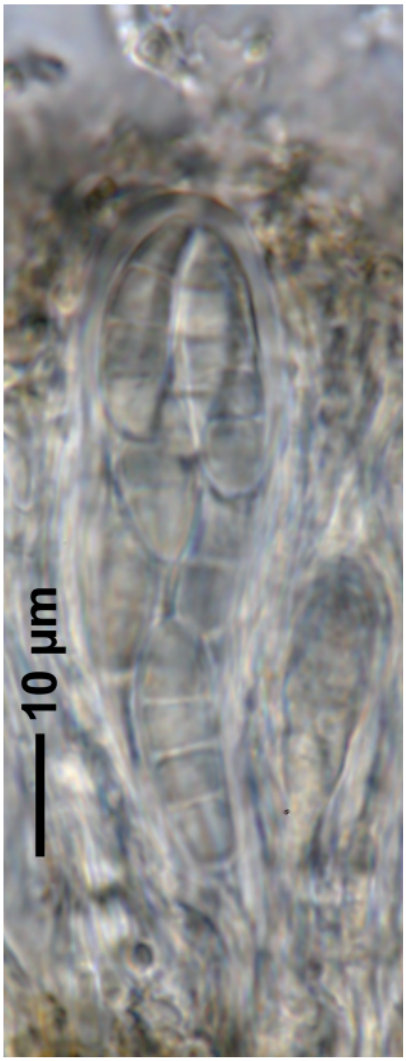


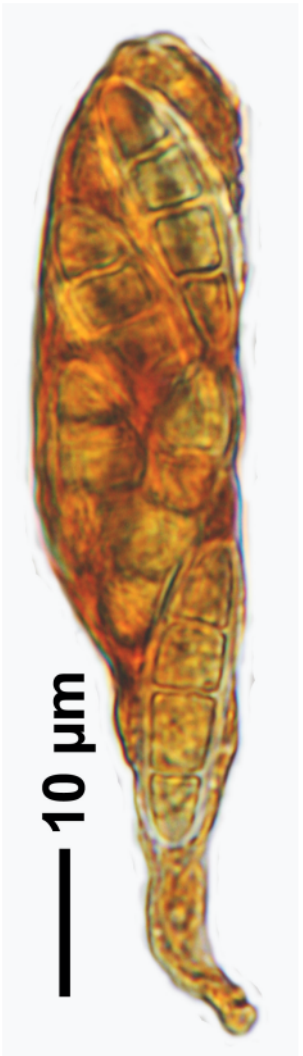


Dendrographa leucophaea







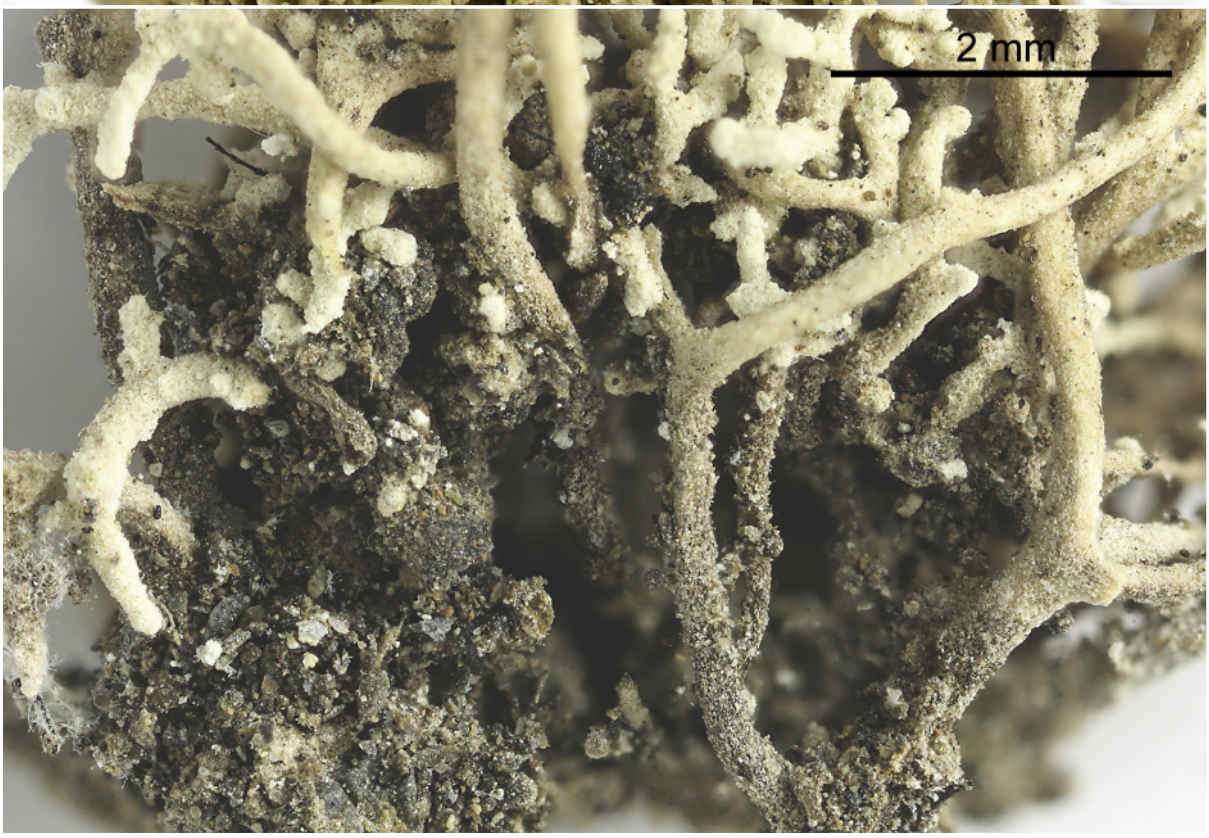


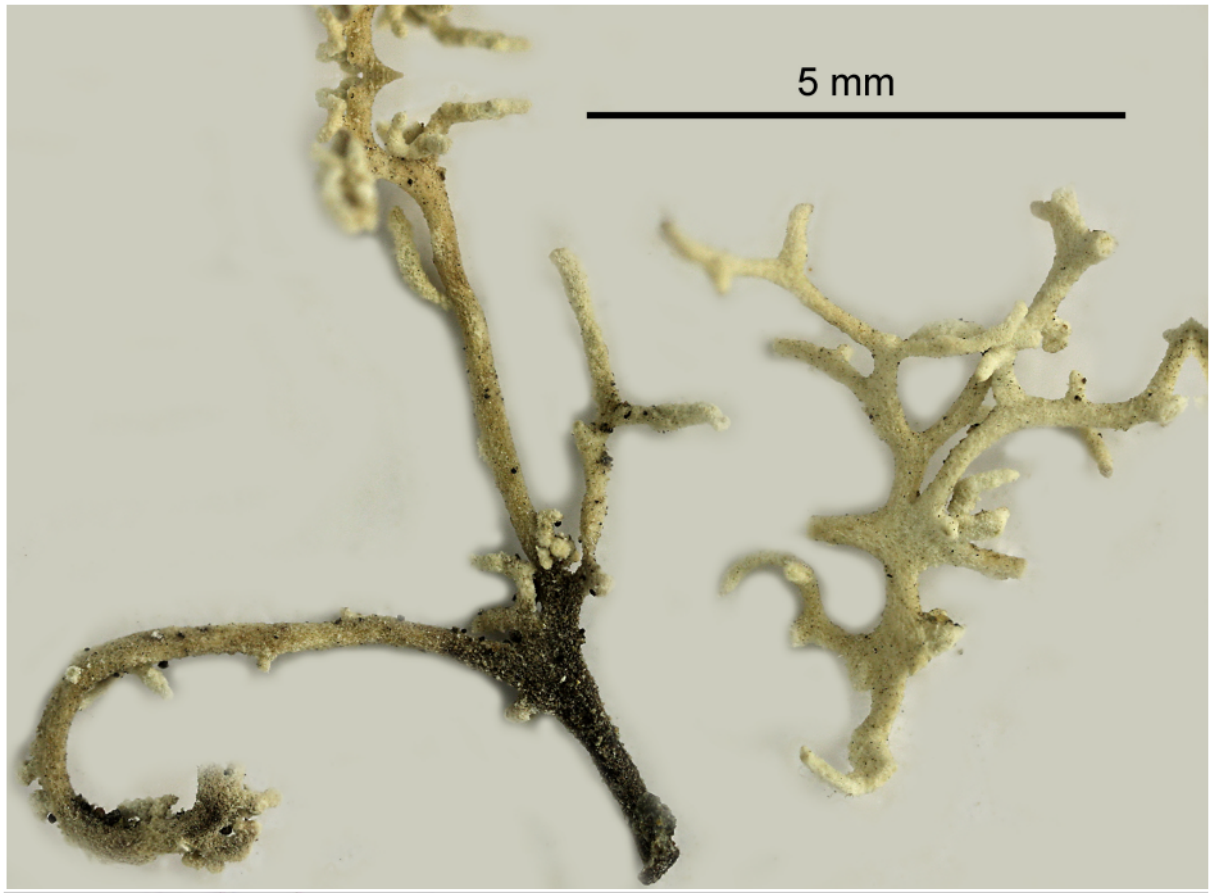
Dendrographa leucophaea

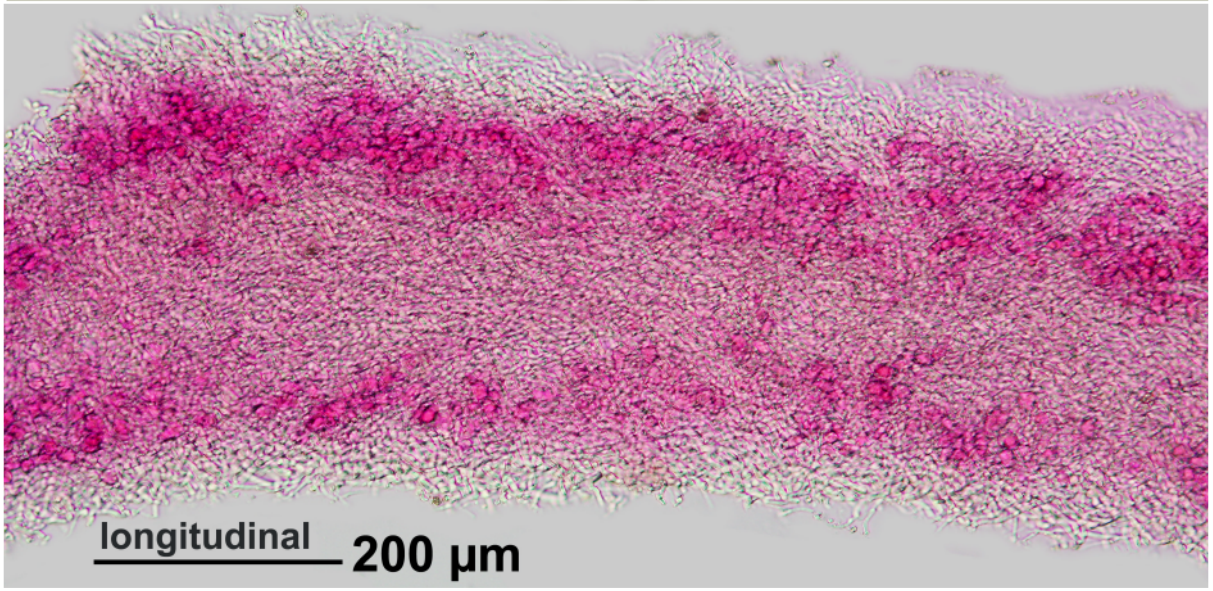
Dendrographa leucophaea (Tuck.) Darb. (1895)

Mexico, Baja California, Punta Santa Tomas, coastal scrub community (Agave shawii, Salvia, Simmondsia, etc.), 0-100 m, pre-batholithic rocks, primalrily volcanic, secondarily sedimantary, 31°33’30” N, 116°42’ W. Leg. A. & M. Aptroot 2. Jan. 1989, det. A. Aptroot. [ABL24231]

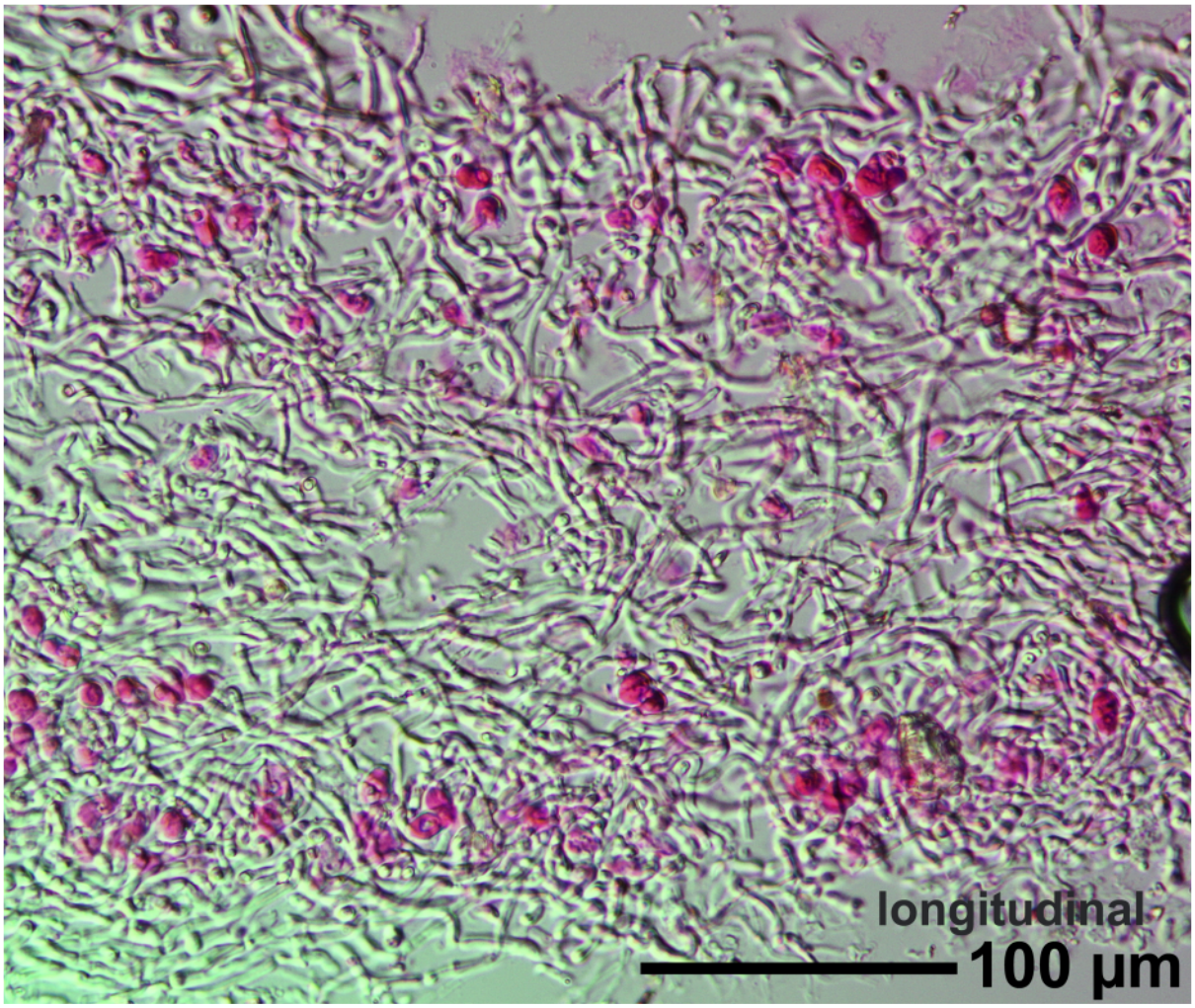




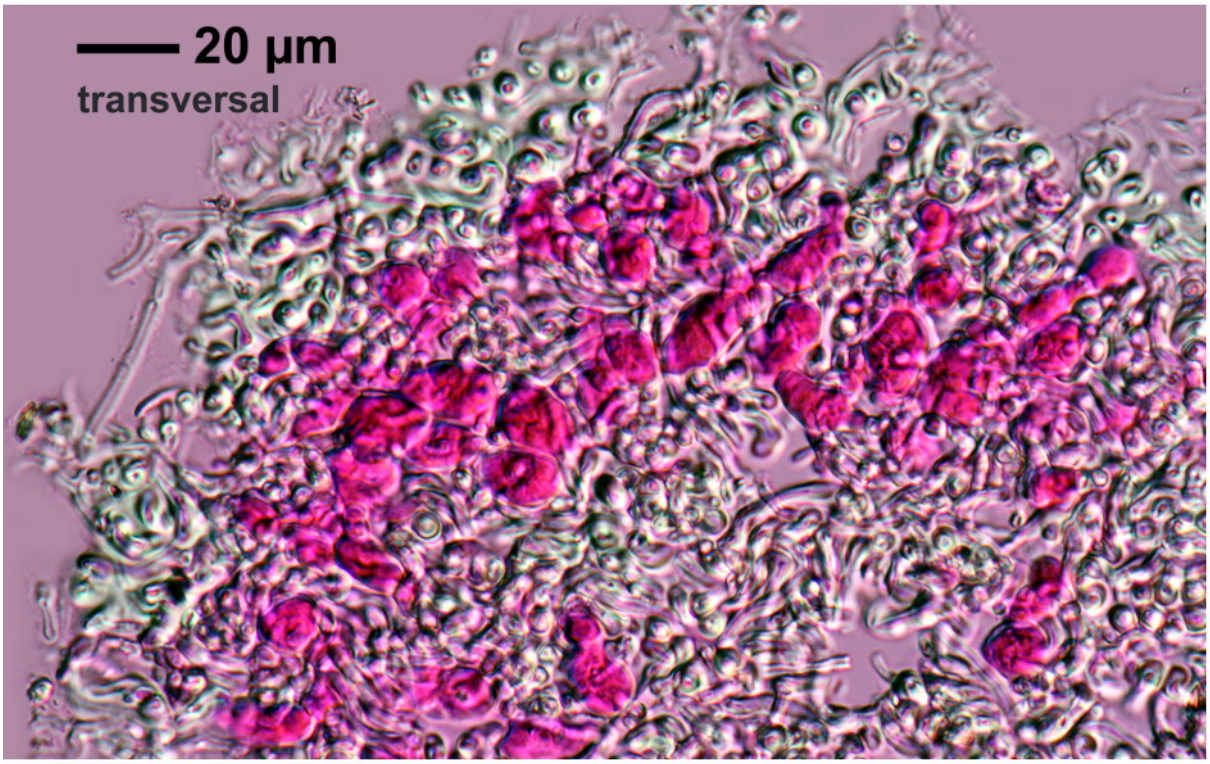


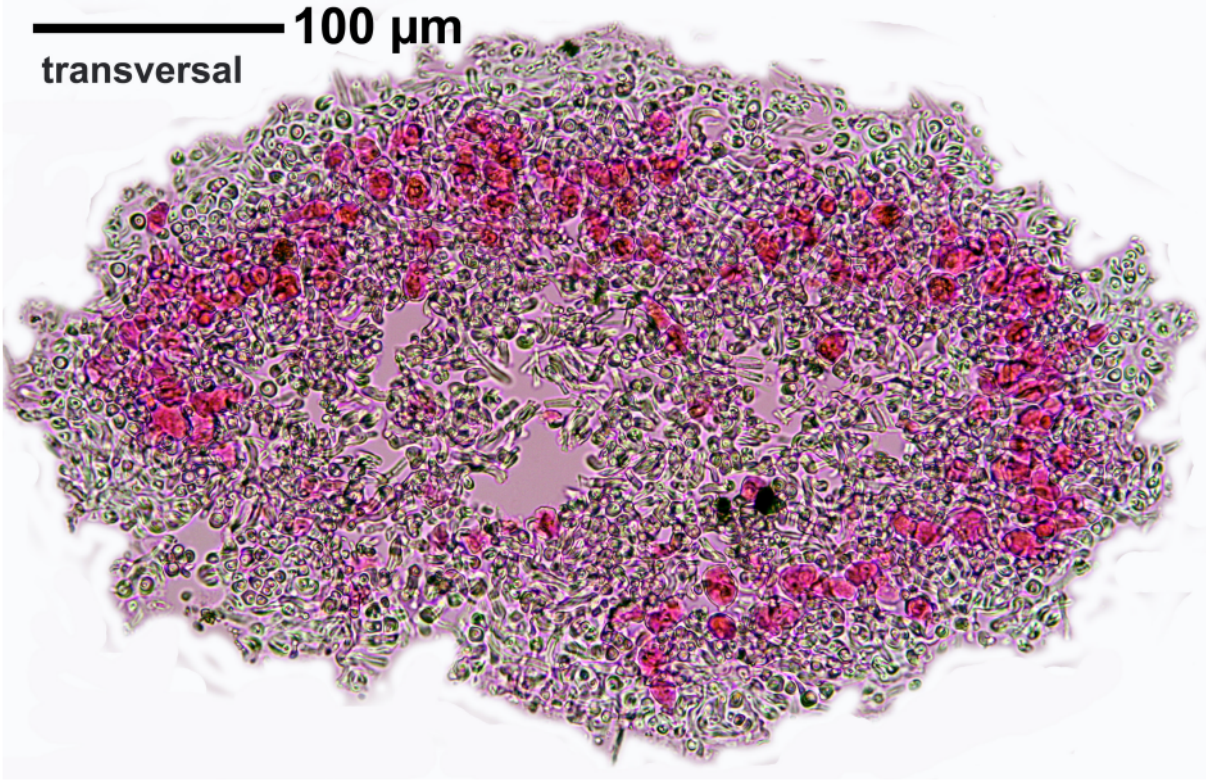


Dendrographa leucophaea



Dendrographa leucophaea





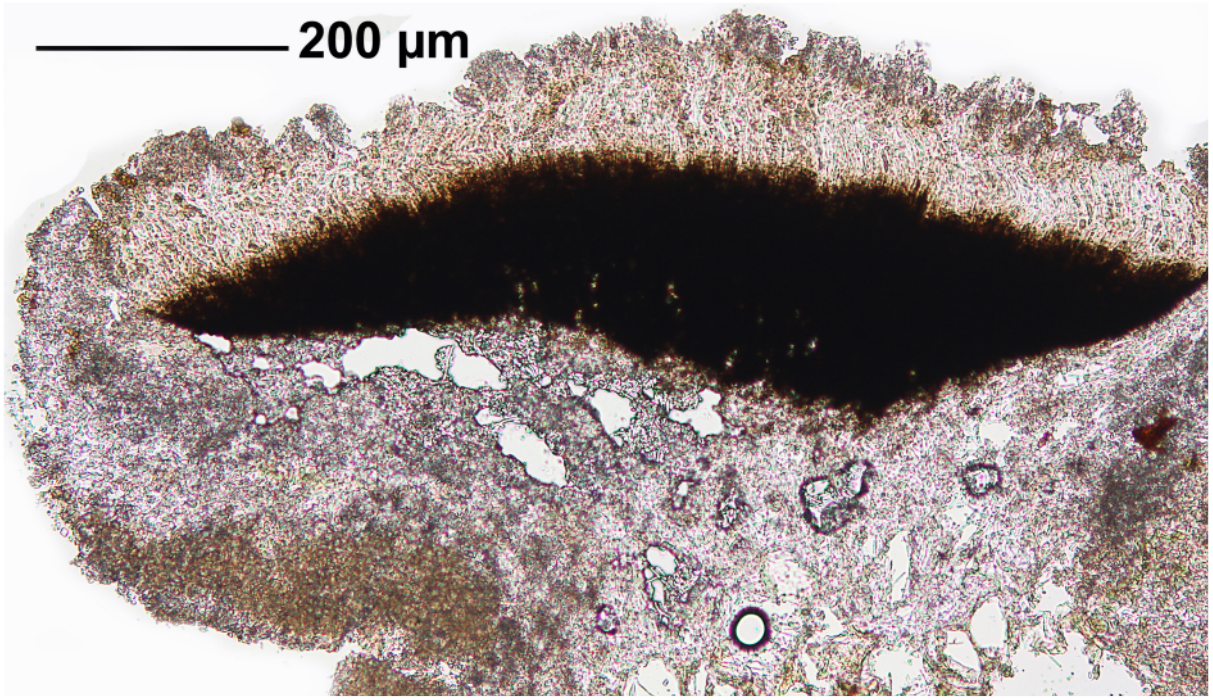
Dendrographa leucophaea

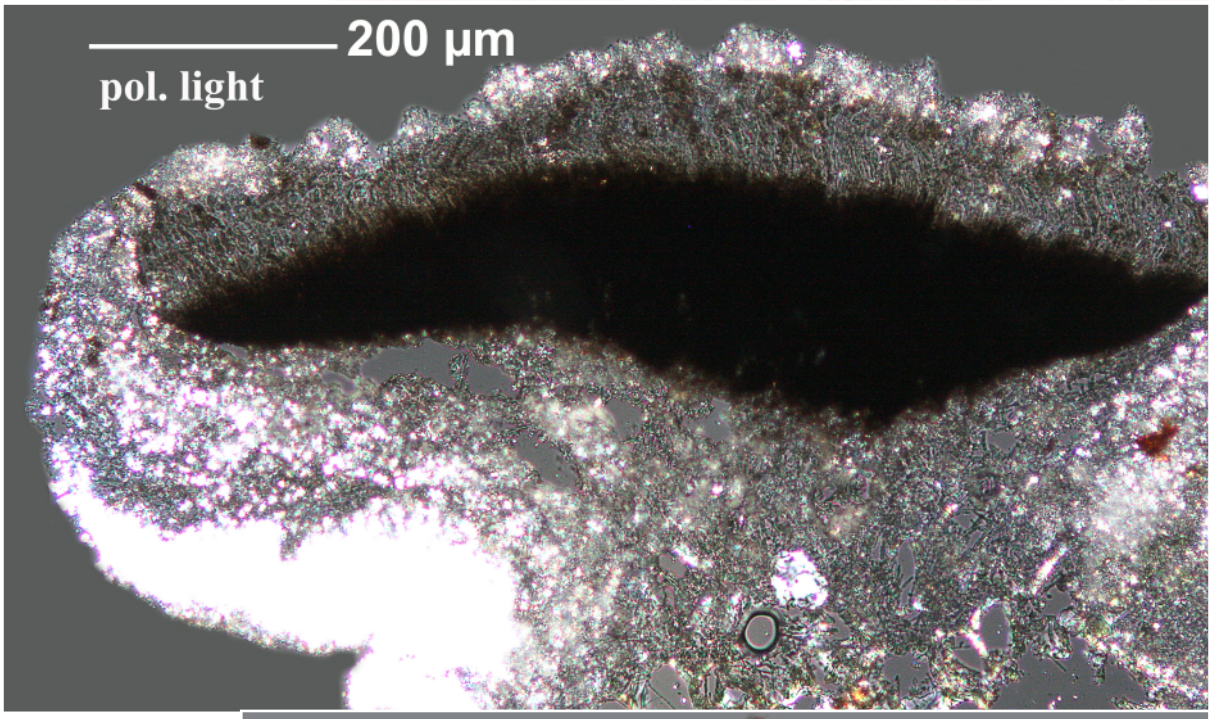
Dirina ceratoniae (Ach.) Fr. (1831)

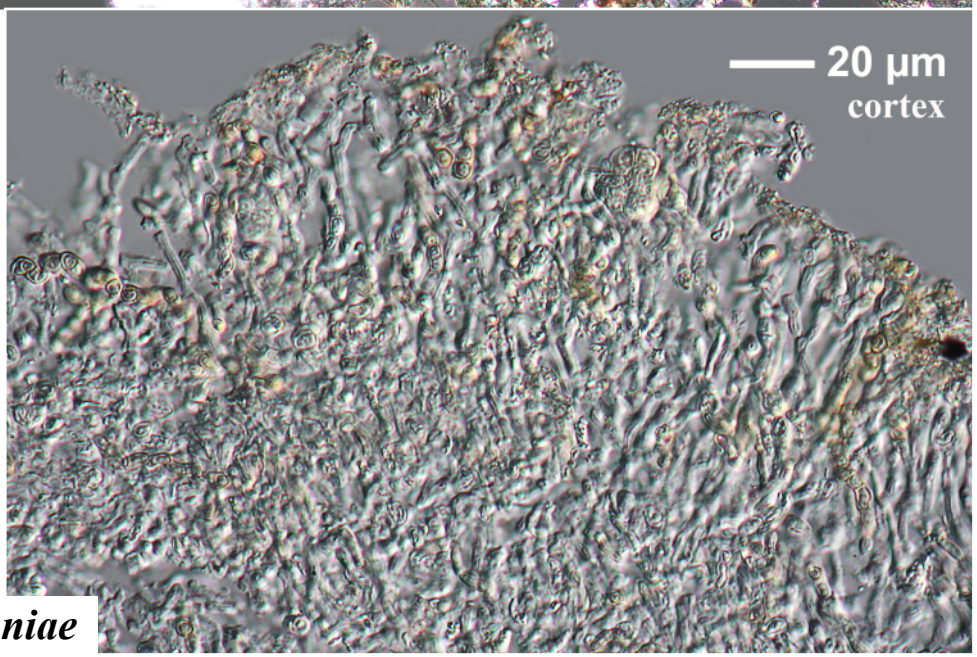
Thallus corticolous, yellowish, not sorediate, texture soft, crustose, surface smooth. Cortex indistinctly, intermediate to intricate branched hyphae, not differentiated from the medulla. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 21–27 × 5–7 µm. Cortex C + red, K –, Pd –, medulla C –, major substances erythrin, lecanoric. – Mediterranean Europe, N Africa.

Südtunesien, Insel Djerba, häufig an Stammbasen von Dattelpalmen an seewindexponierten Standorten im *Dirinetum ceratoniae* Klem., 10 m, N-NO, pH 7.6, Küstenstreifen von Sihidi Mahrez bei Houmt-Souk. Leg. et det. G. Follmann Feb. 1967. Lichenes Exsiccati Selecti Ab Museo Botanico Berolinensi Editi Nr. 4. [2520]

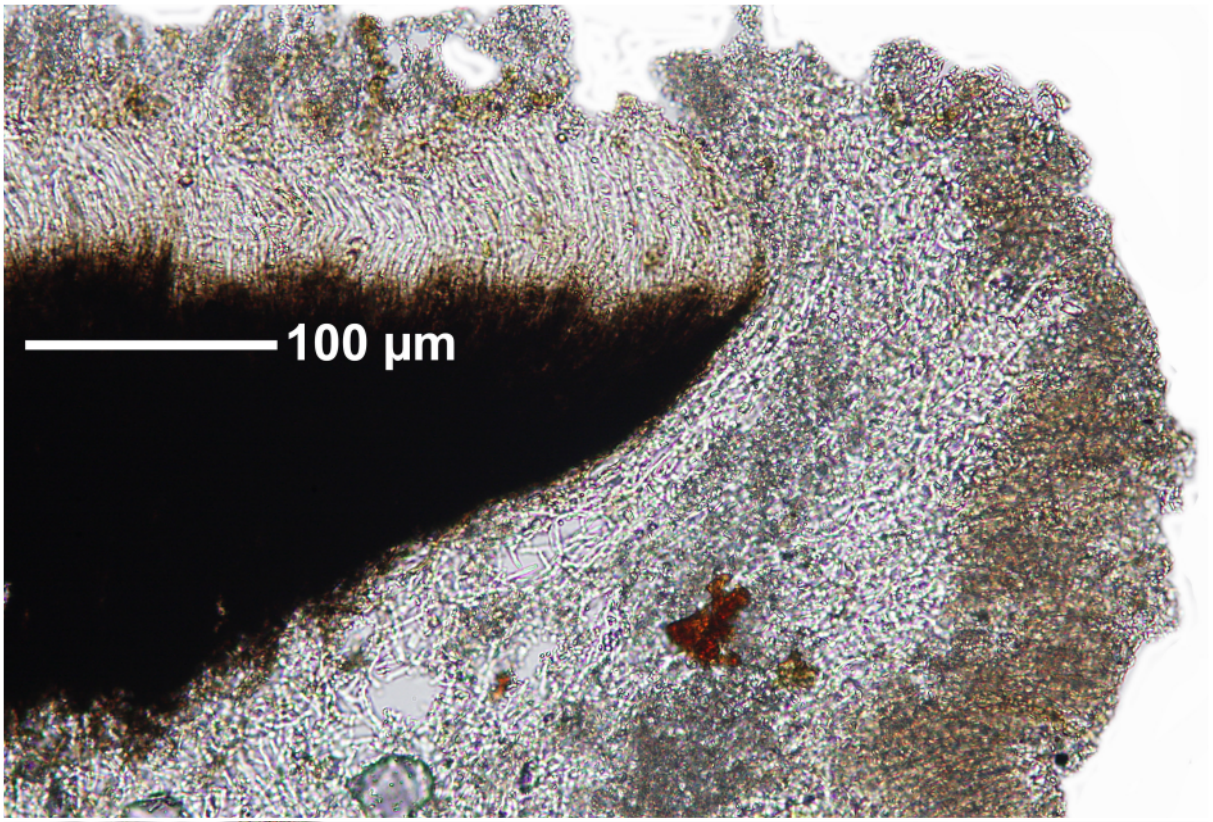


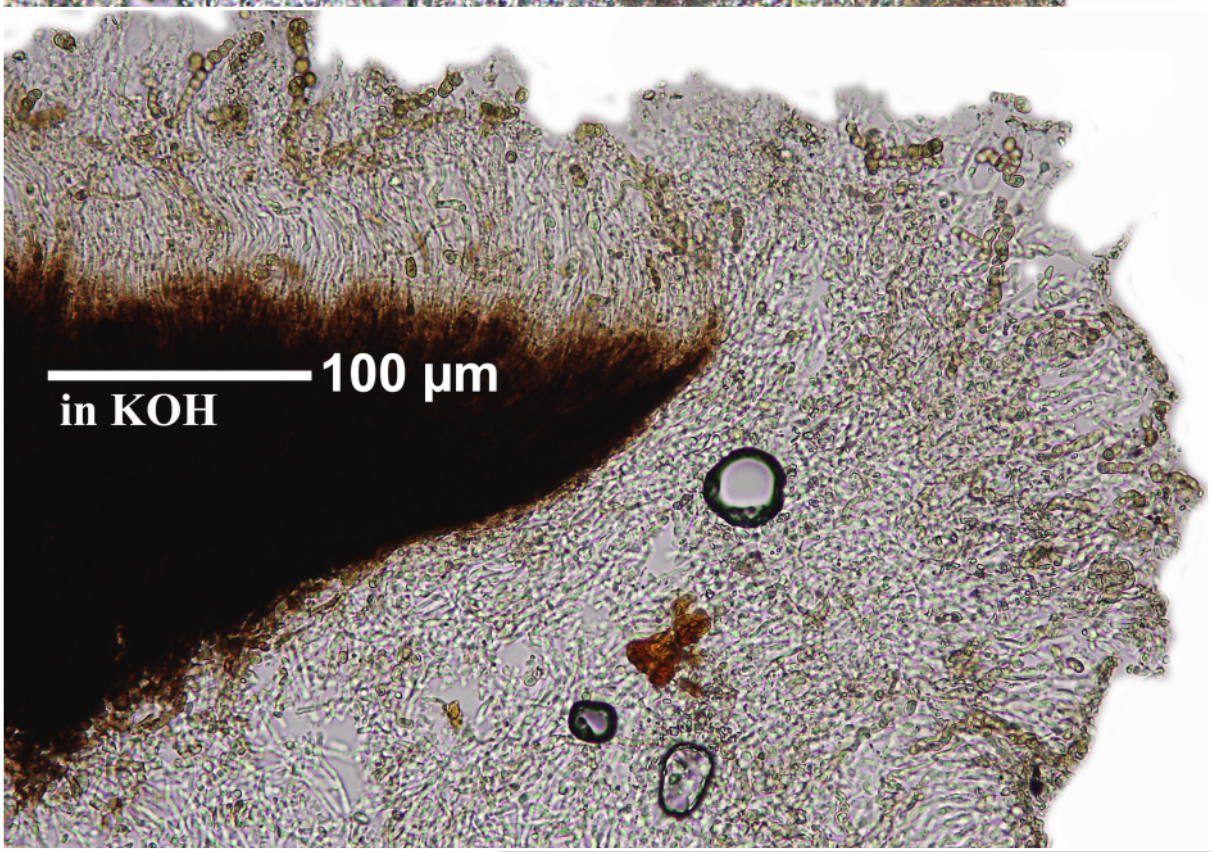


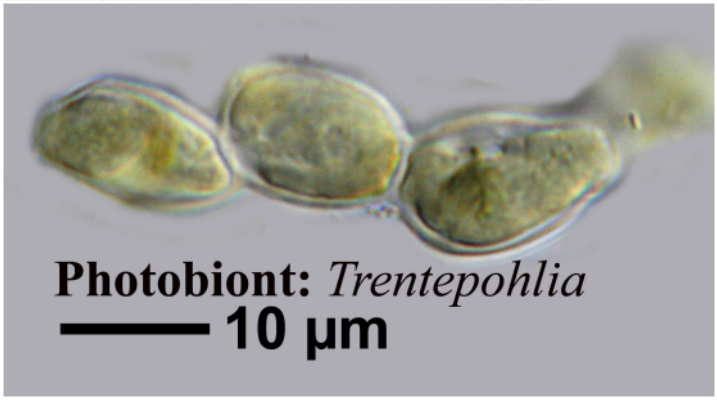




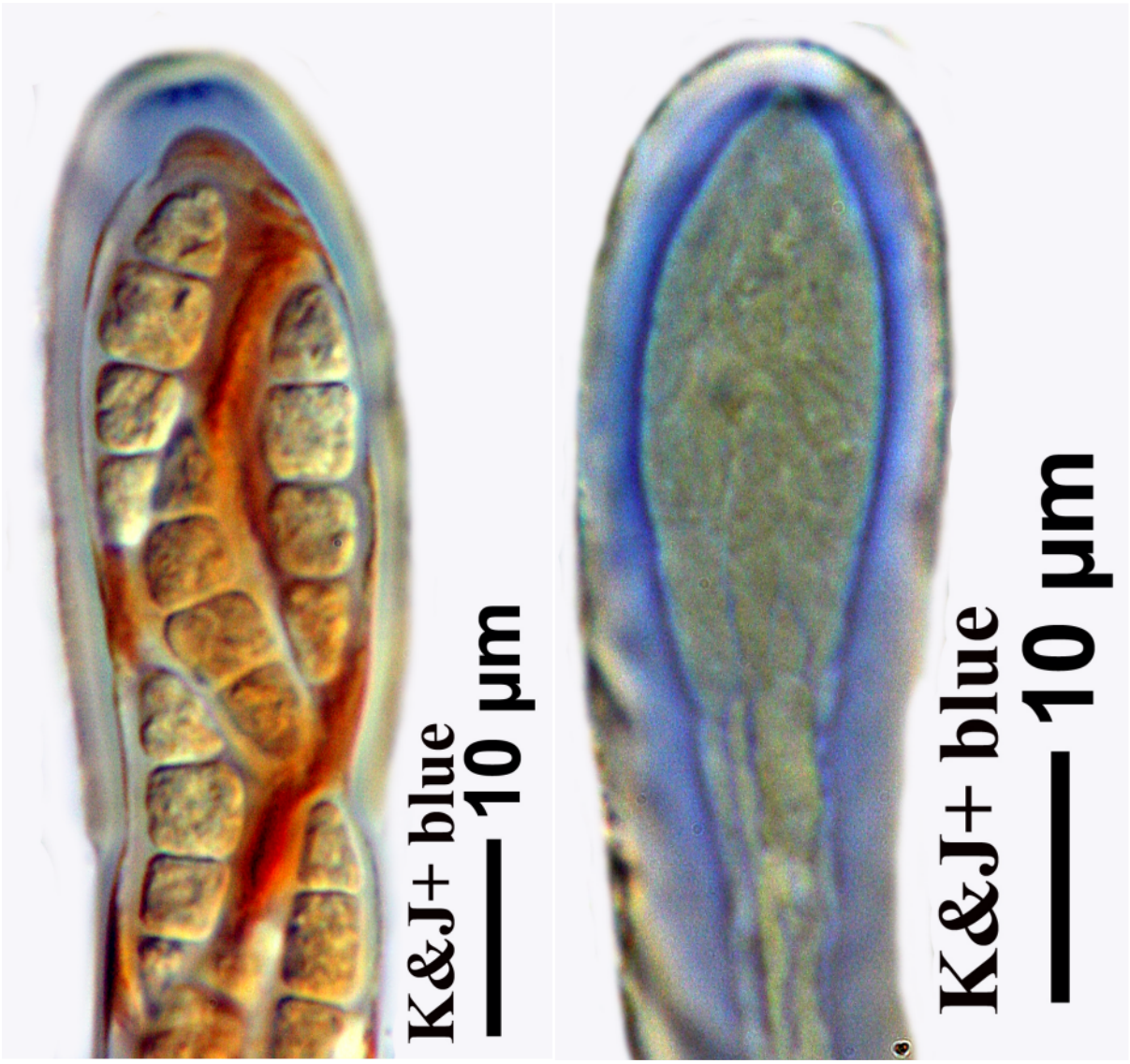
Dirina ceratoniae







Dirina ceratoniae

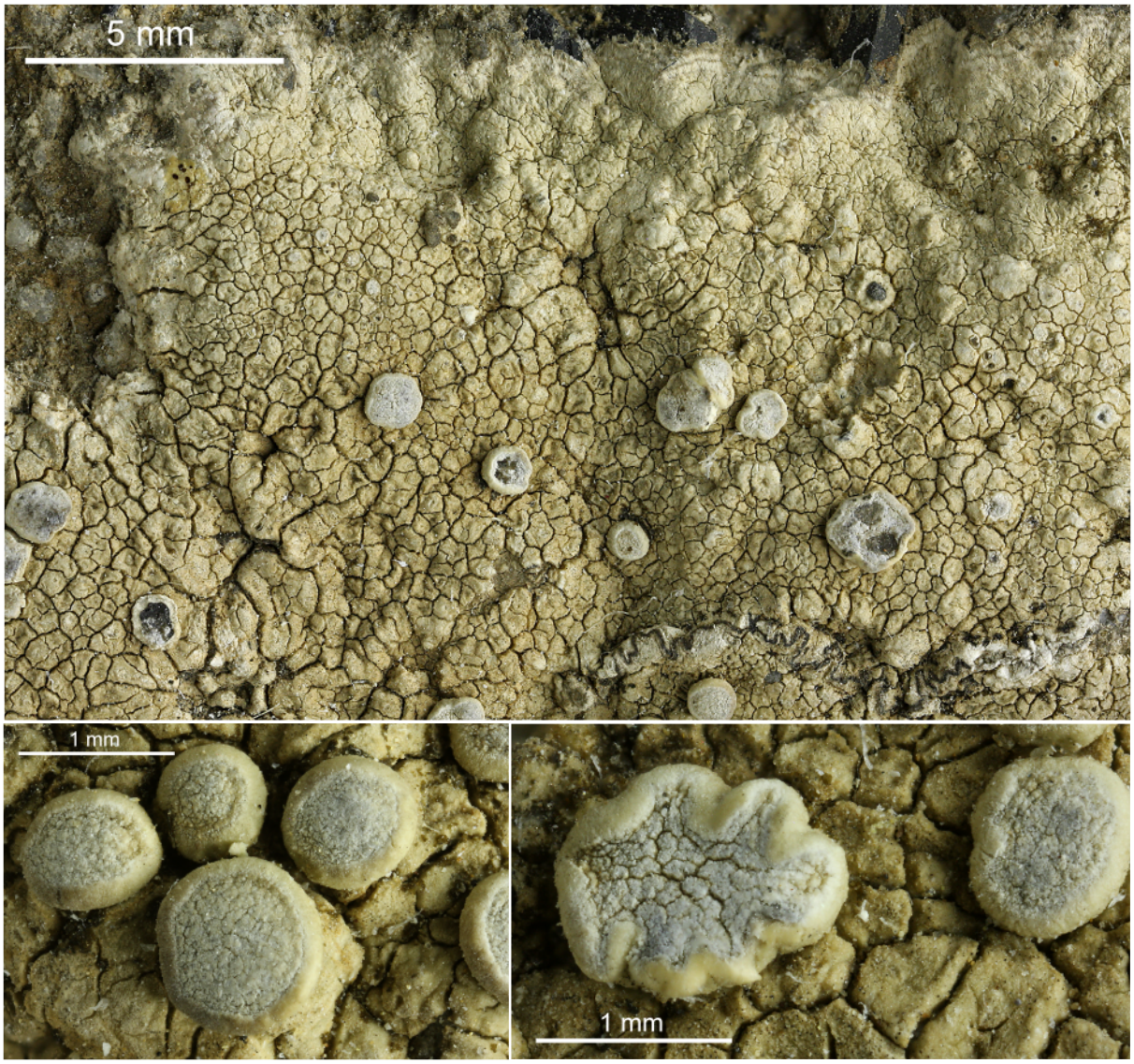


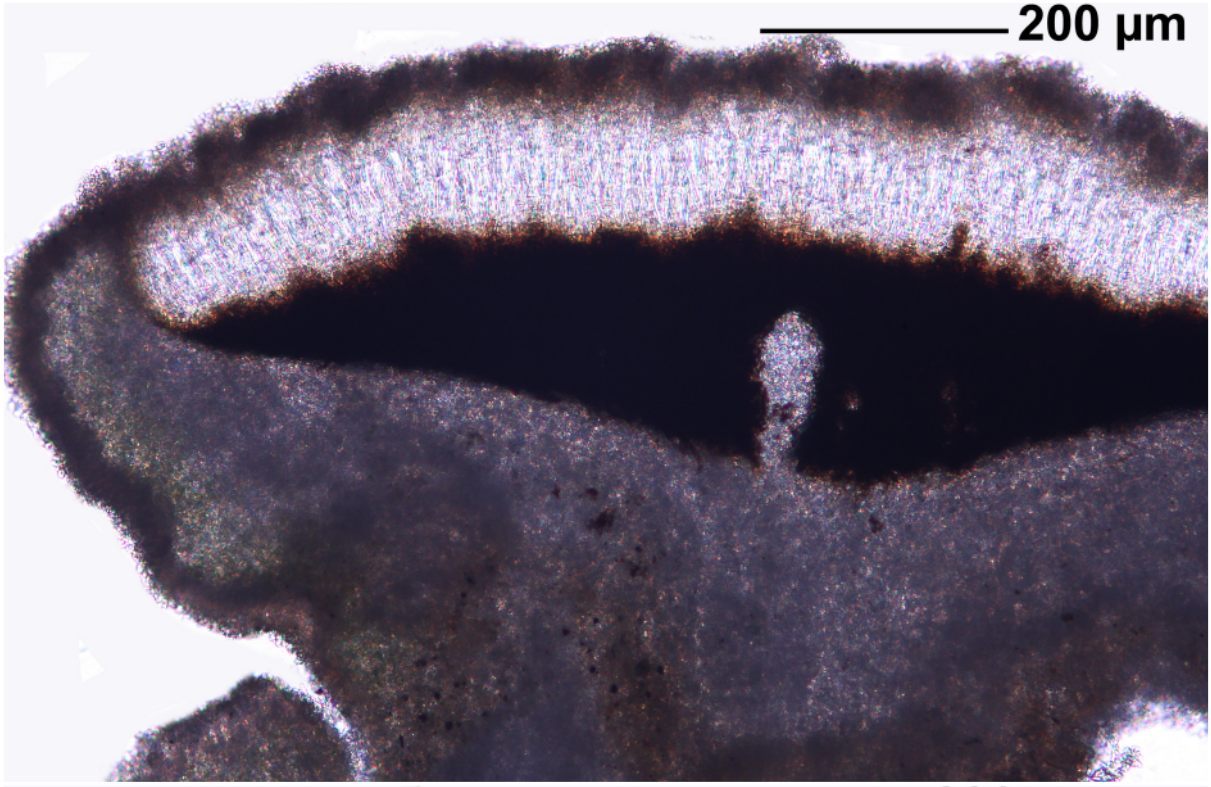
Dirina ceratoniae

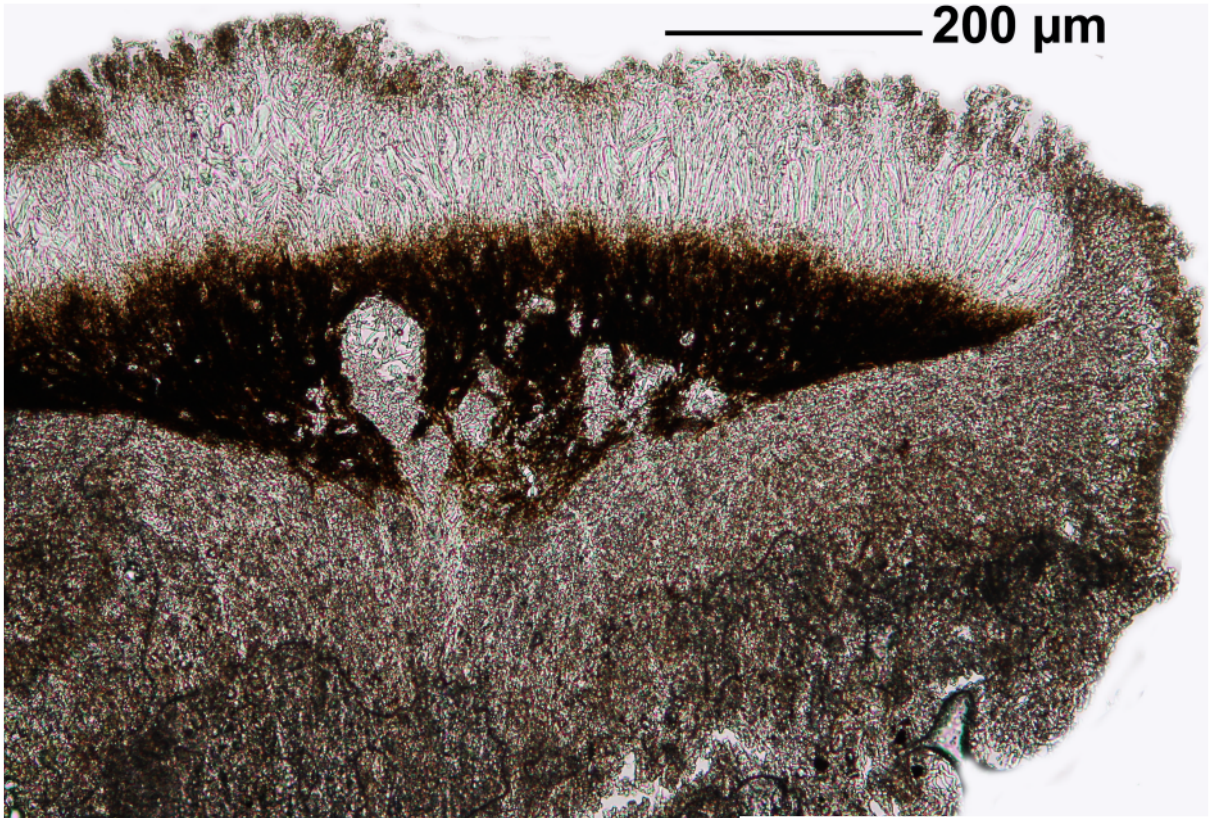
Dirina massiliensis Durieu & Mont. (1847)
Dirina patronii Bagl. (1857)
Dirina stenhammarii Fr. ex Stenhammer (1848)
Dirina repanda Fr. (1825)

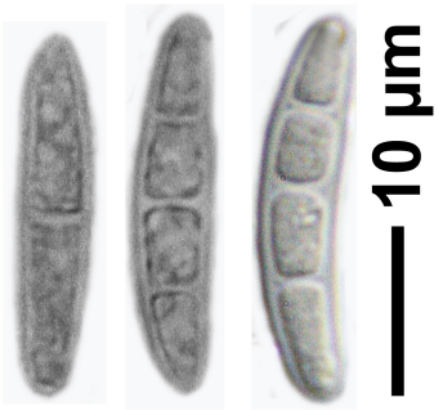
Thallus saxicolous, yellowish, sorediate or not, texture soft, crustose, surface smooth. Cortex indistinctly branchend plectenchyma, not differentiated from the medulla. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–23 × 4–5 µm. Cortex C + red, K –, Pd –, medulla C –, major substances erythrin, lecanoric. – Europe, N Africa.

Südspanien, Prov. Almería, flächendeckend an halbschattigen, windgeschützten Stirn- und Überhangsflächen rauhen Ergußgesteins im *Roccelletum tinctoriae* Klem., 200 m, NW, pH 6.9, Küstenberge westlich Carboneras am Cabo de Gata. Leg. et det. G. Follmann Jan. 1975. Lichenes Exsiccati Selecti A Museo Historiae Naturalis Casselensi Editi Nr. 147 (as *Dirina patronii*). [2480]

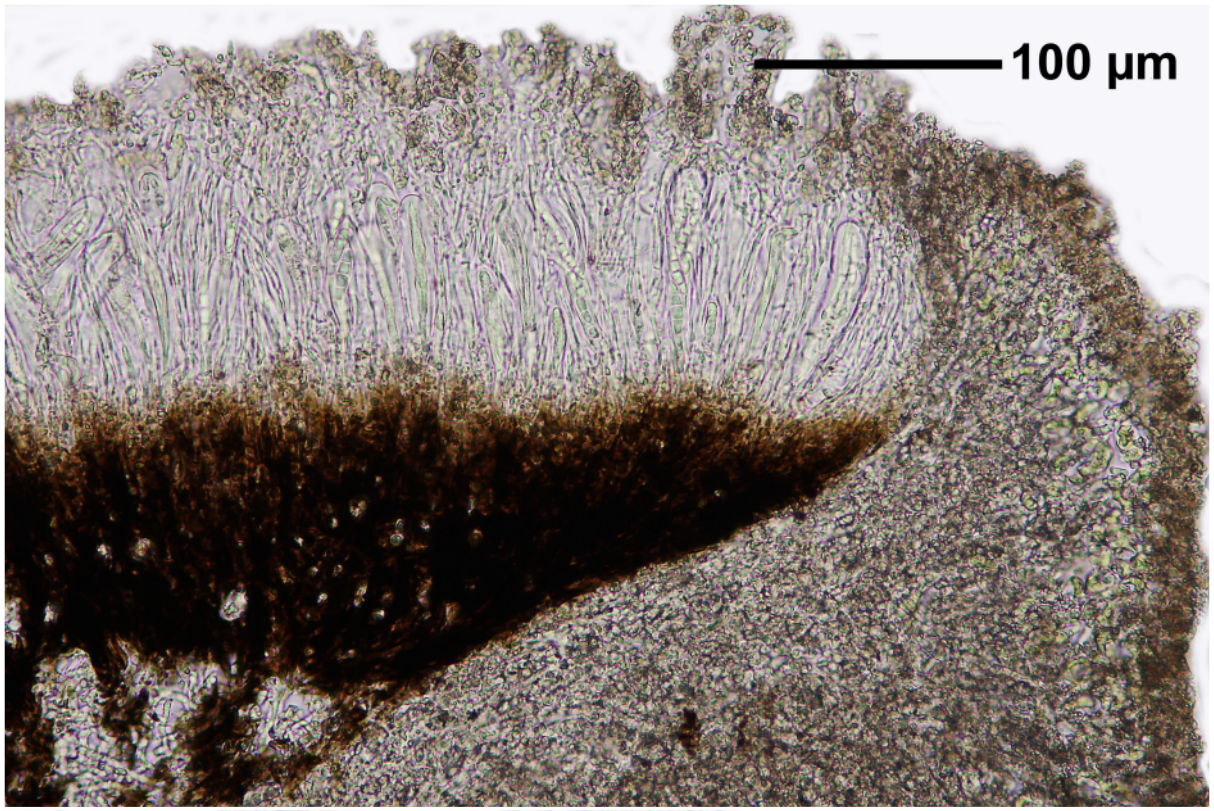


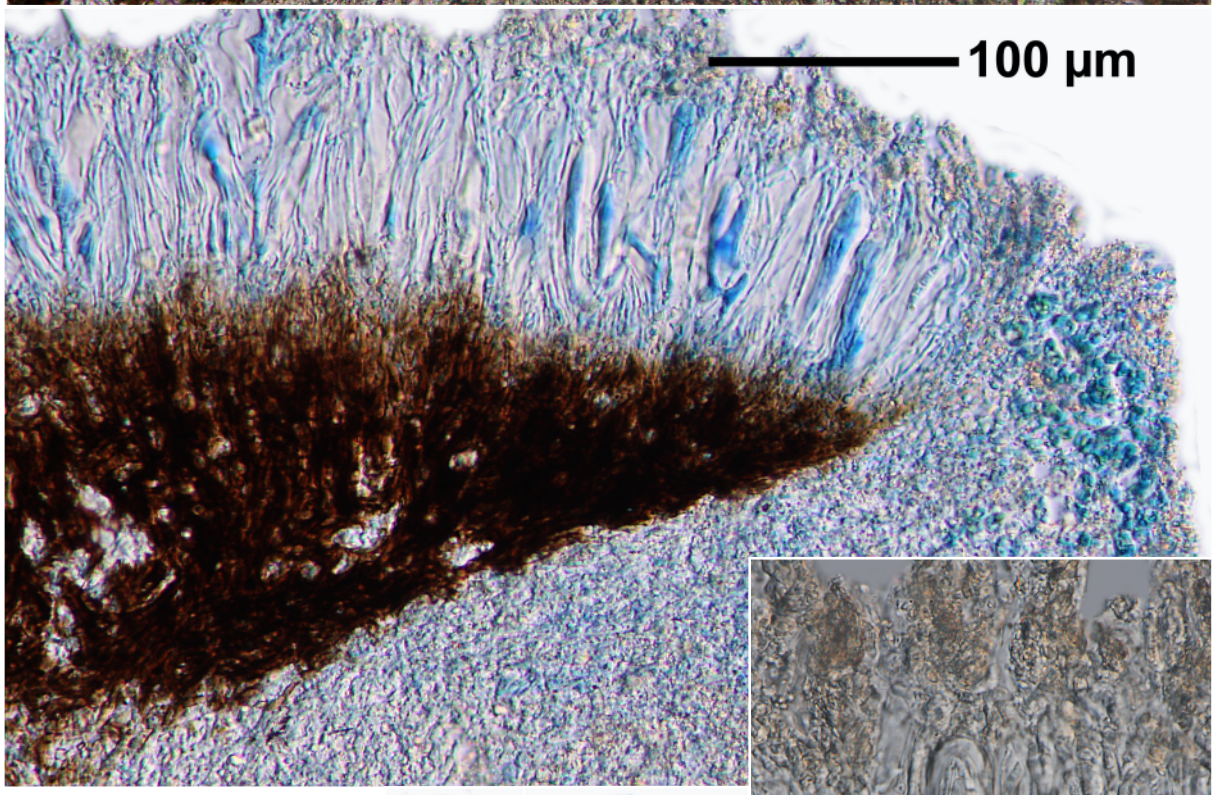


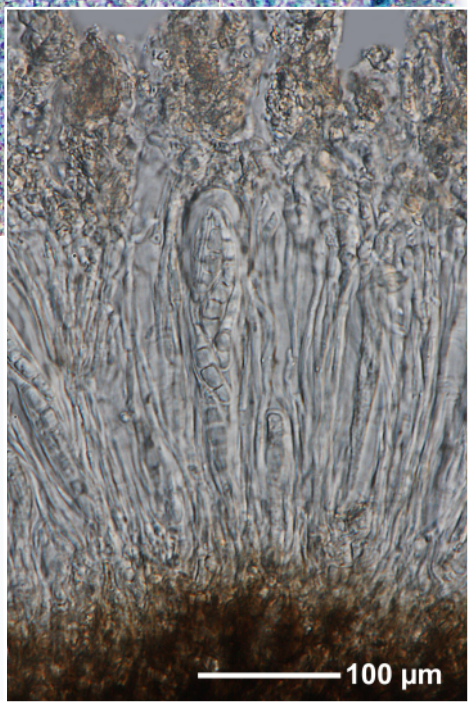




Dirina massiliensis

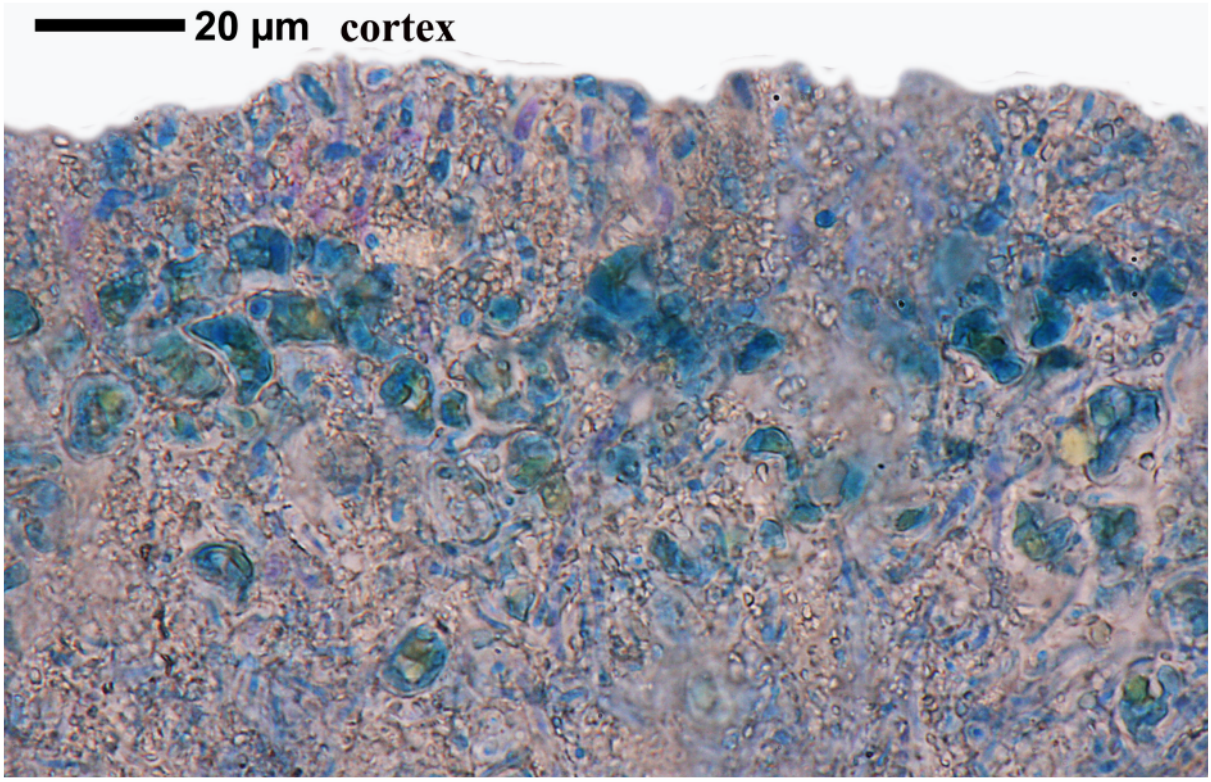


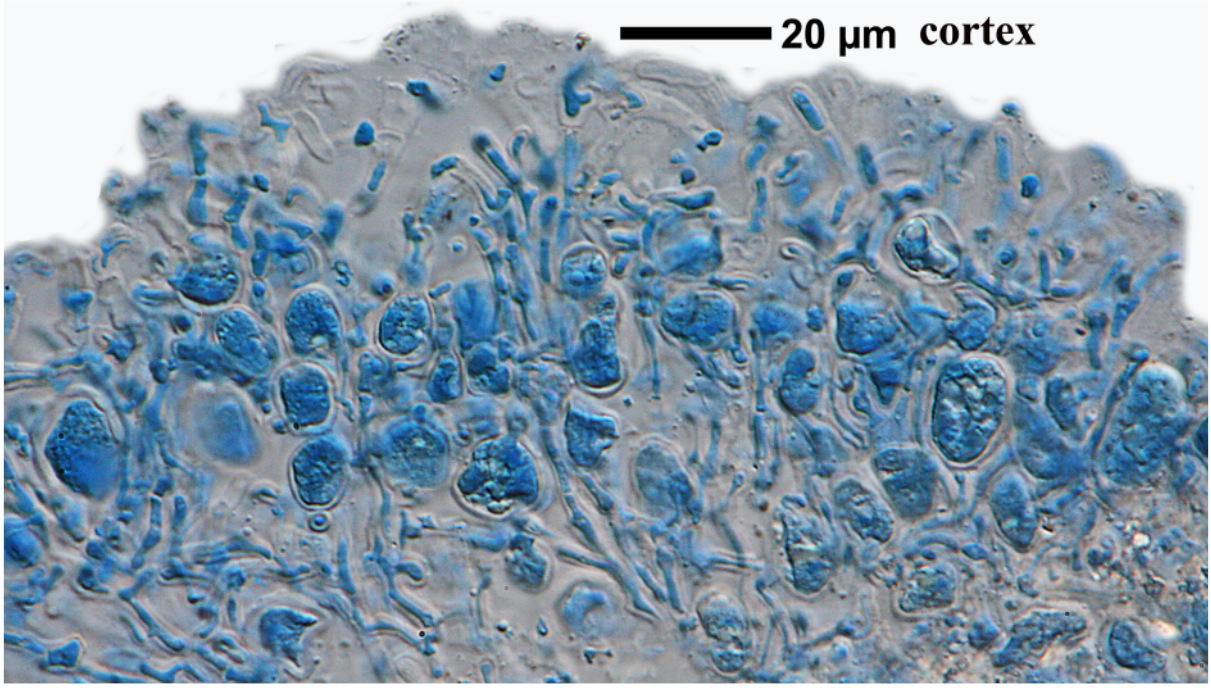






Dirina massiliensis





Dirina massiliensis

Dirina massiliensis Durieu & Mont. (1847)

Westmarokko, Distr. Agadir, gesellig an halbschattigen Stirn- und Überhangsflächen rauher Kalkfelsen im Roccelletum tinctoriae Klem., 40 m, NW-SW, pH 7.8, Steilküste am Cap Rhir unweit Tamri. Leg. et det. G. Follmann Juni 1967. Lichenes Exsiccati Selecti A Museo Historiae Naturalis Casselensi Editi Nr. 87 (as *Dirina repanda*). [2521]

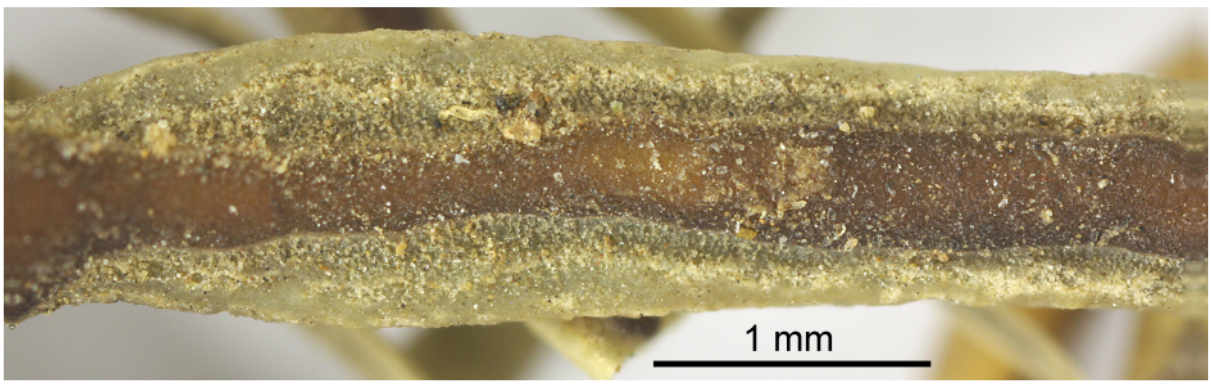


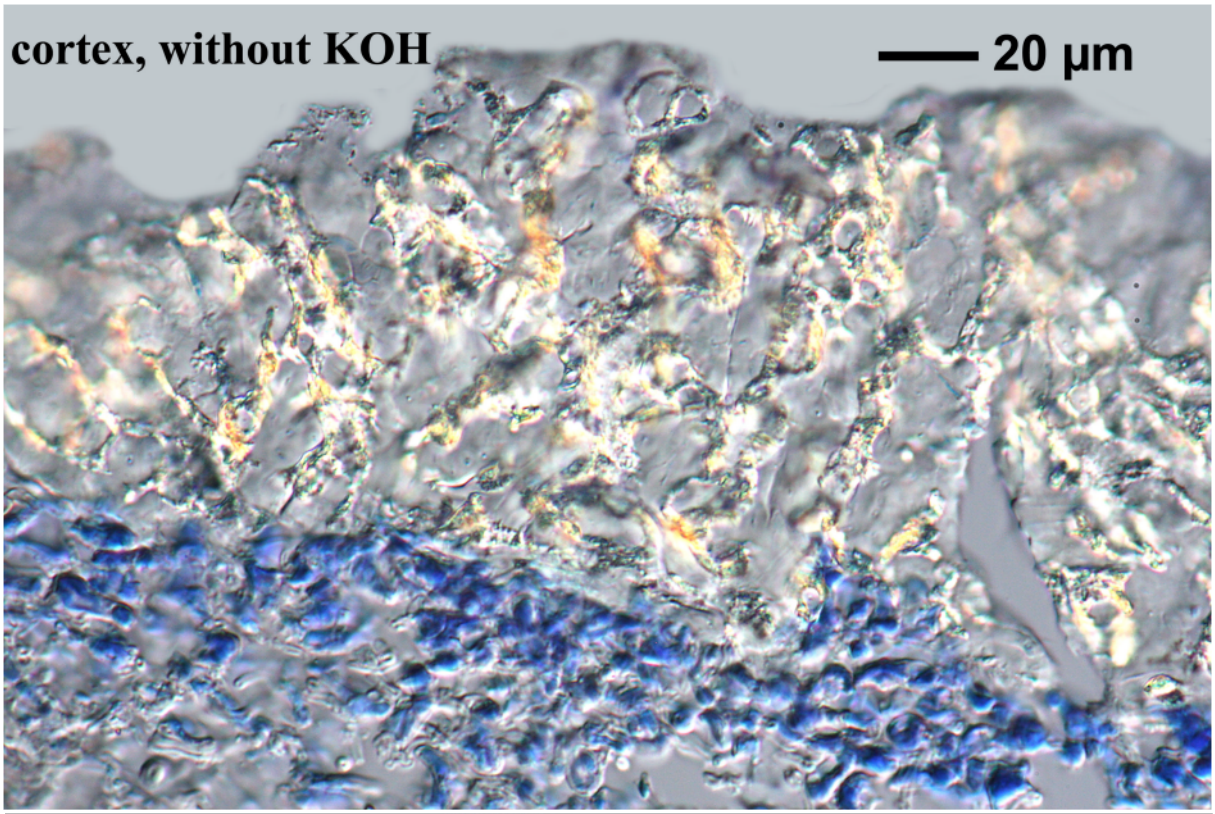
Dolichocarpus chilensis R. Sant. (1949)

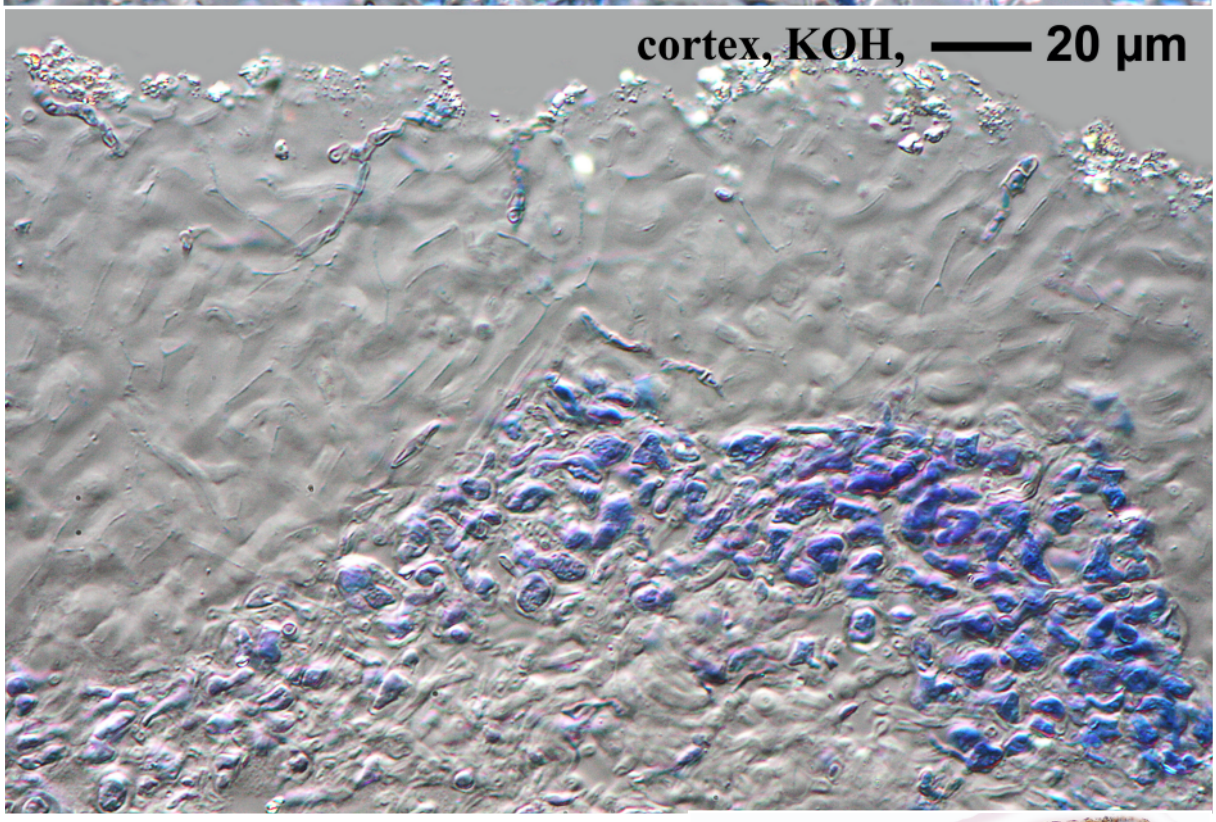
Thallus saxicolous, brown, not sorediate, stiff and easily broken, texture firm, flattened where branched, other parts ± cylindrical, surface rough, holdfast internally white to brown. Cortex indistinctly branched to periclinal plectenchymatous. Apothecia linear, at the upturned ends of the branches at the lower surface, 1-5 x 0.3 mm. Hypothecium hyaline. Ascospores hyaline, 5–8-septate, 20–25 × 3–4 µm. Cortex C + red, K –, Pd –, medulla C + red, major substance gyrophoric. – Chile.

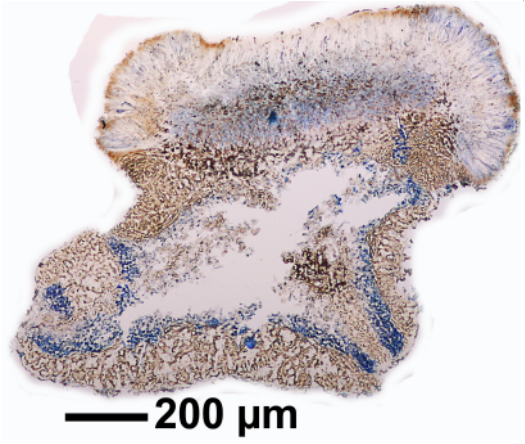
Chile, Province Aconcagua, coastal headlands at Punta Los Molles, 10 m; locally abundant on slightly weathered spines of cacti (Eulychnia); golden-brown and tending to be curled when fresh. Leg. W.A. Weber & Barry Johnston, 13 Nov. 1976. Lichenes Excsiccati, distributed by the University of Colorado Museum, Boulder Nr. 560. [CMB560]



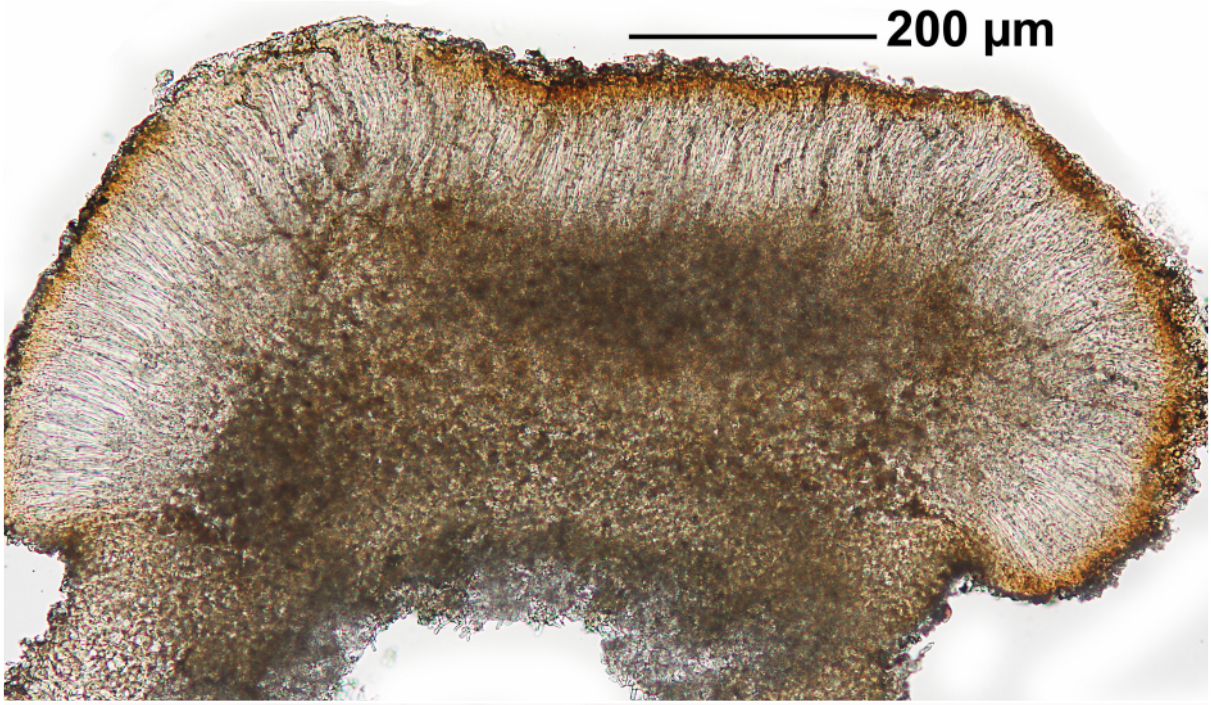


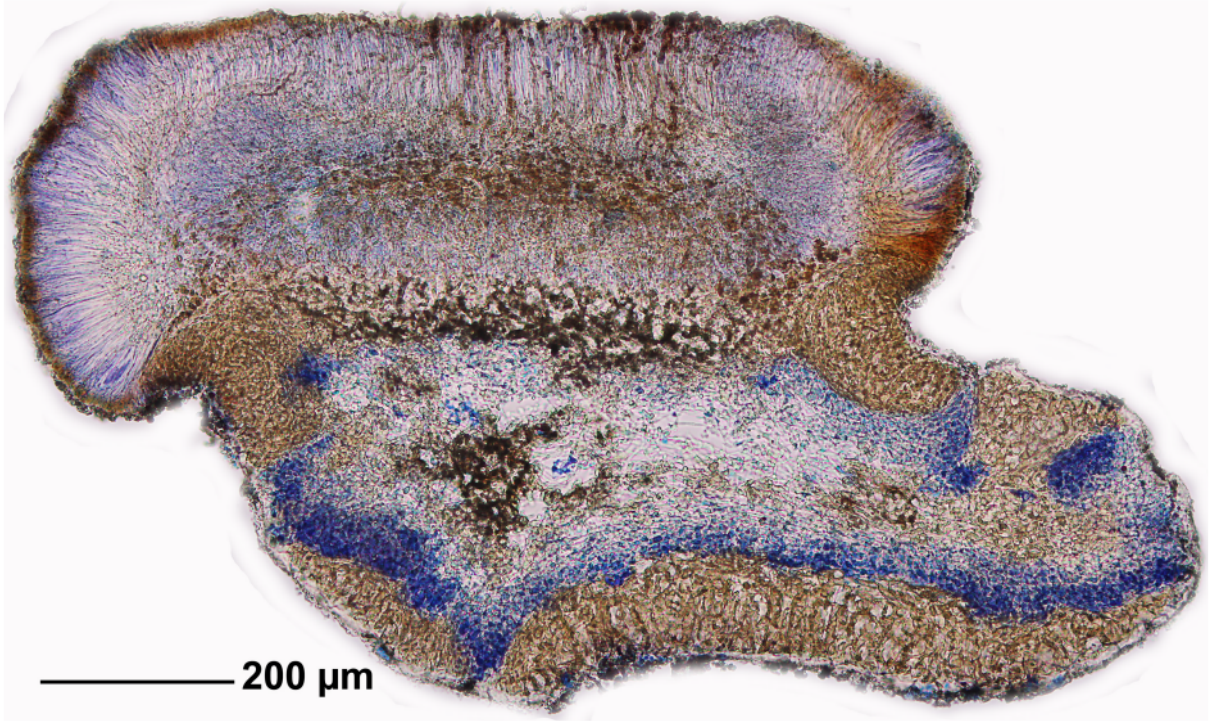






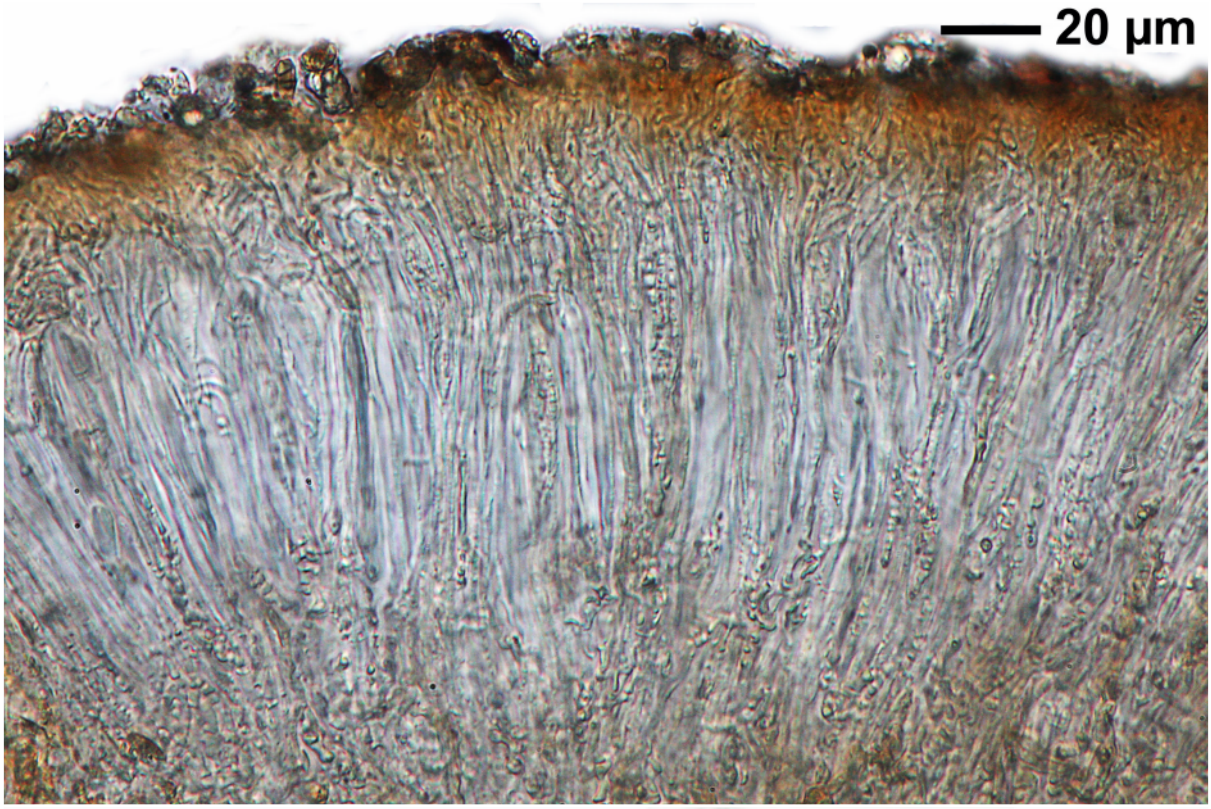
Dolichocarpus chilensis

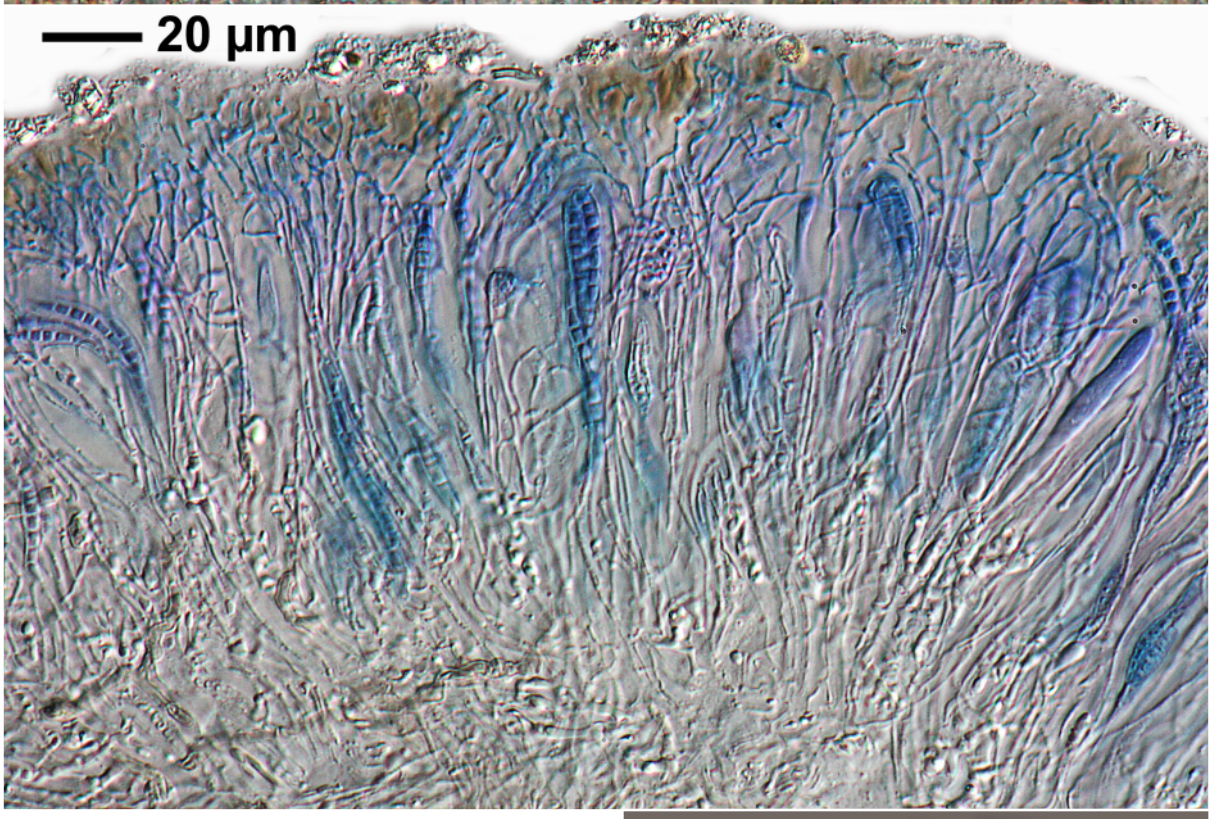


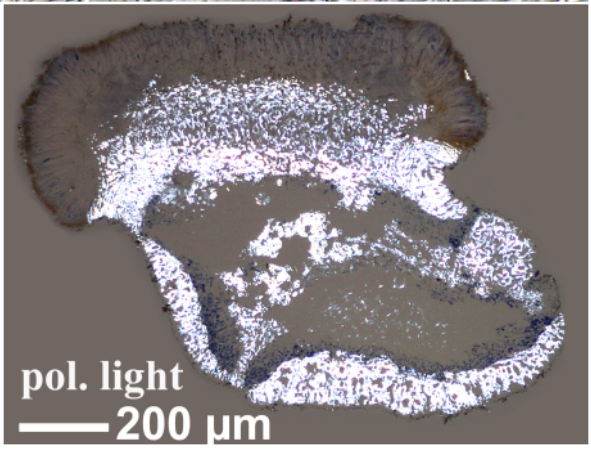




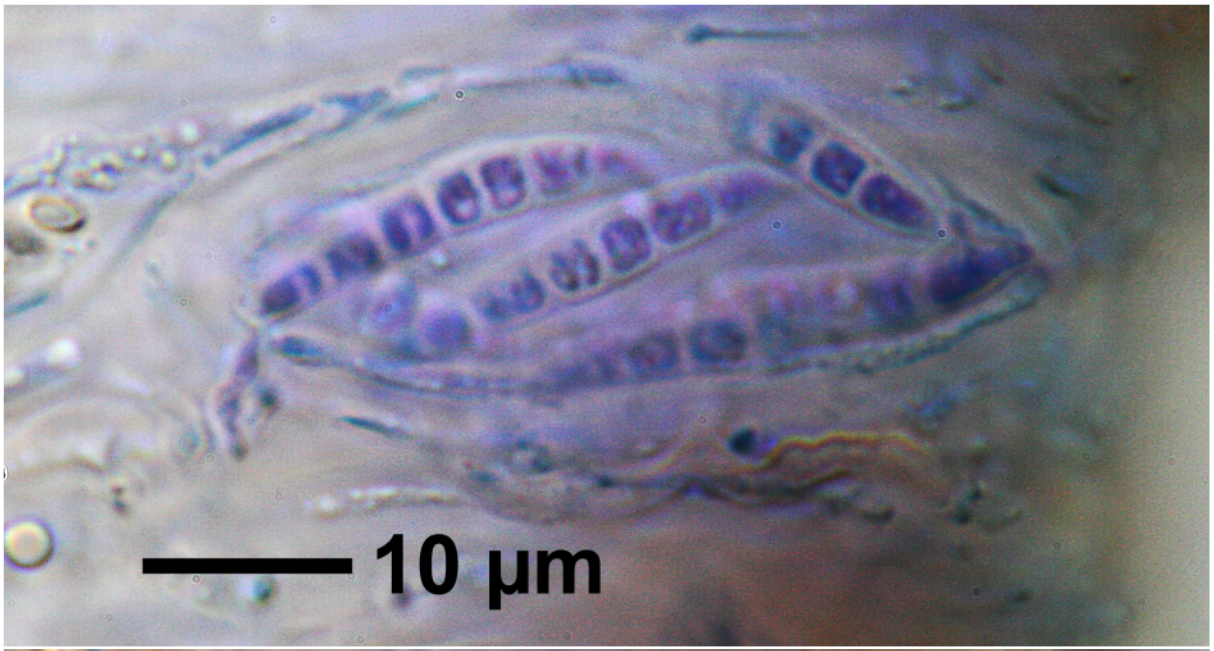
Dolichocarpus chilensis

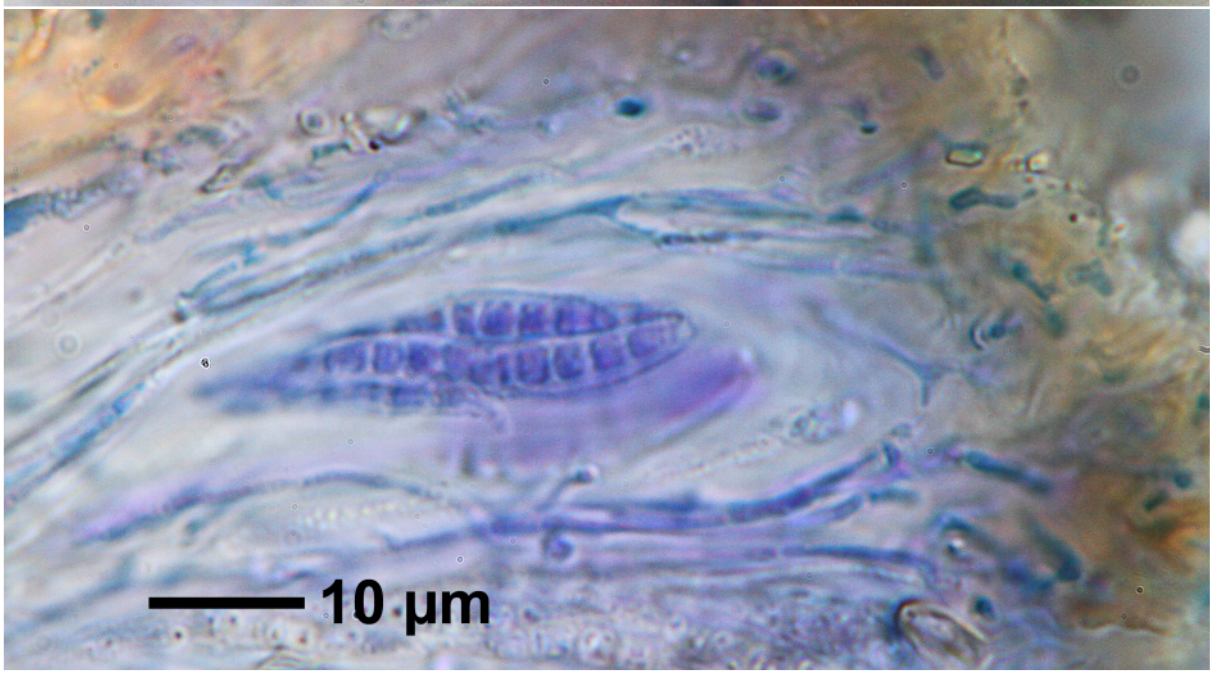


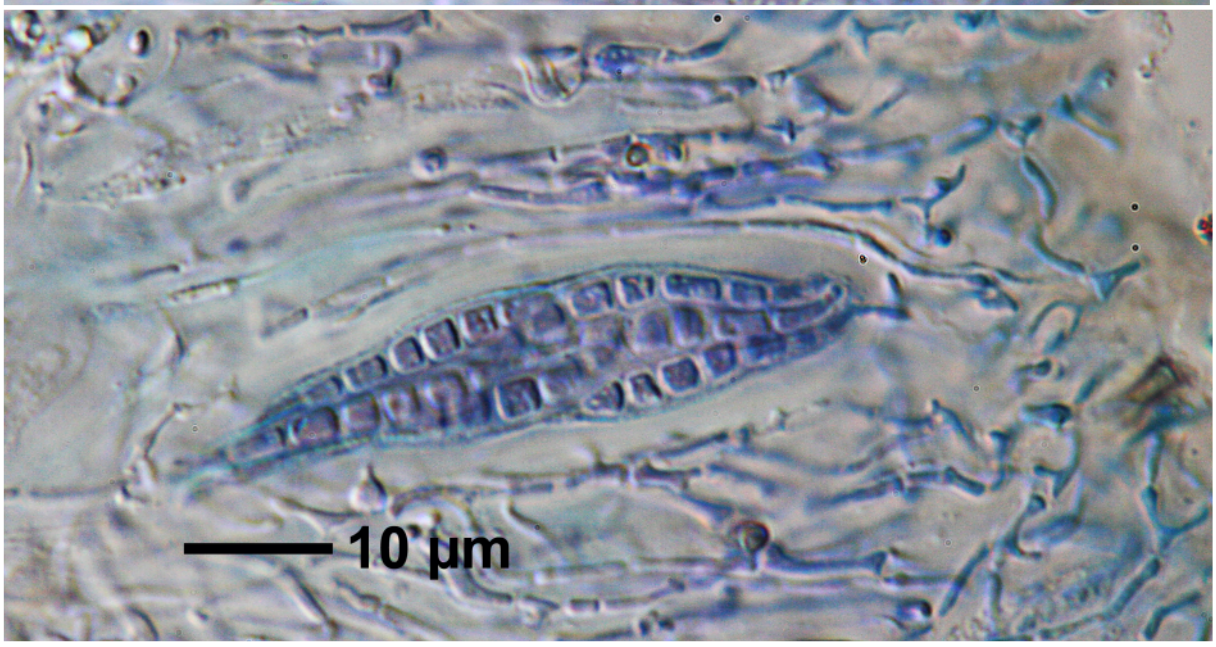




Dolichocarpus chilensis







Dolichocarpus chilensis

Dolichocarpus chilensis R. Sant. (1949)

Chile, Prov. Aconcagua: zerstreut im Dornenwerk von Säulenkakteen im *Anaptychietum intricatae* Follm., 30 m, W, pH 5,9, windoffener Küstenstreifen von Zapallar bei Papudo. Leg. et det. G. Follmann Jan. 1965. Lichenes Exsiccati Selecti A Museo Botanico Berolinensi Editi Nr. 5. [2522]



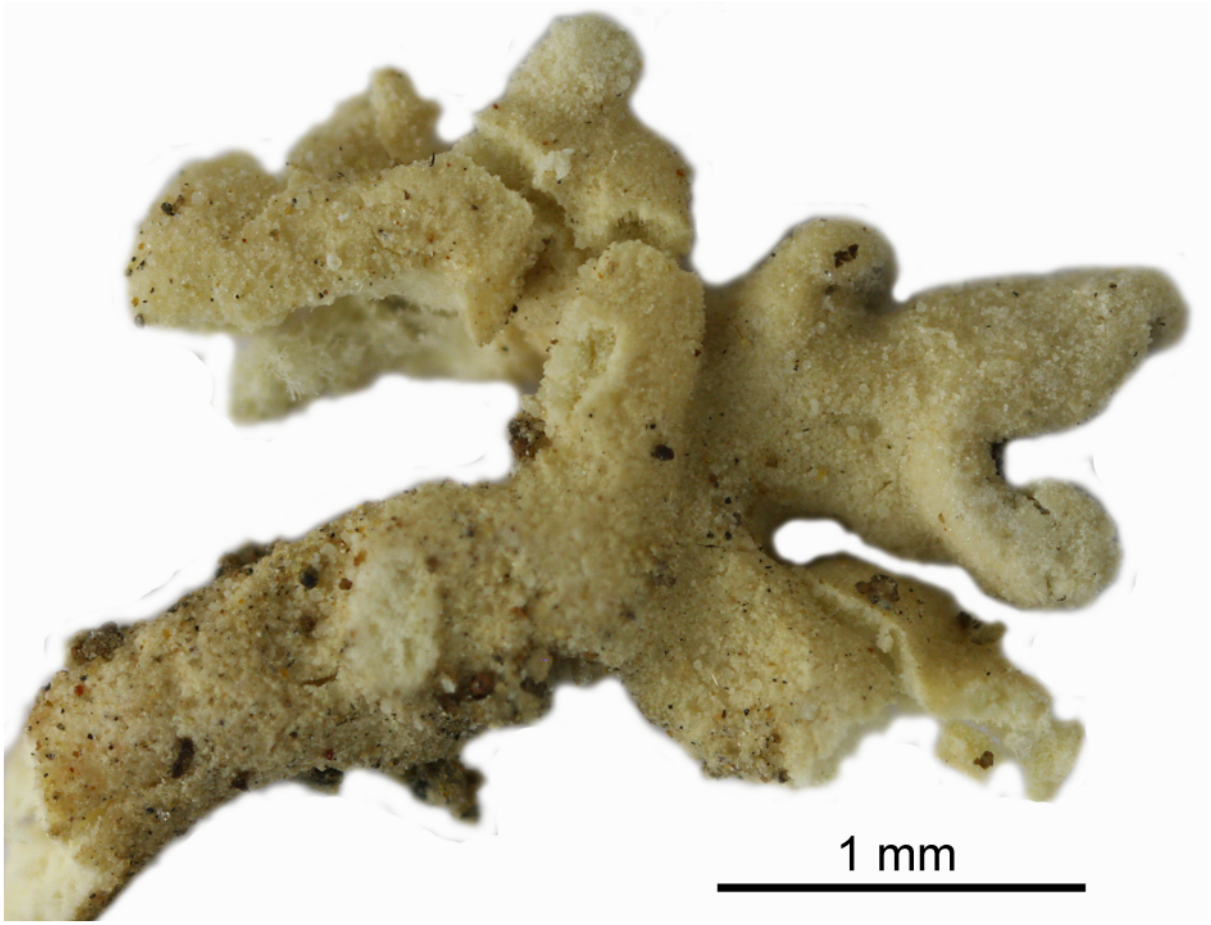
Dolichocarpus seawardii Aptroot (2008)

Thallus saxicolous, ochraceous, not sorediate, texture firm, cylindrical, tips flattened, surface rough, holdfast internally white to brown. Cortex indistinctly, hyphae dense branched, partly prosoplectenchymatous. Apothecia linear, at the upturned ends of the branches at the lower surface. Hypothecium hyaline to pale brown. Ascospores hyaline, 2–4-septate, 16–20 × 3–5 µm. Cortex C + red, K –, Pd –, medulla C + red, major substance erythrin. – St Helena.

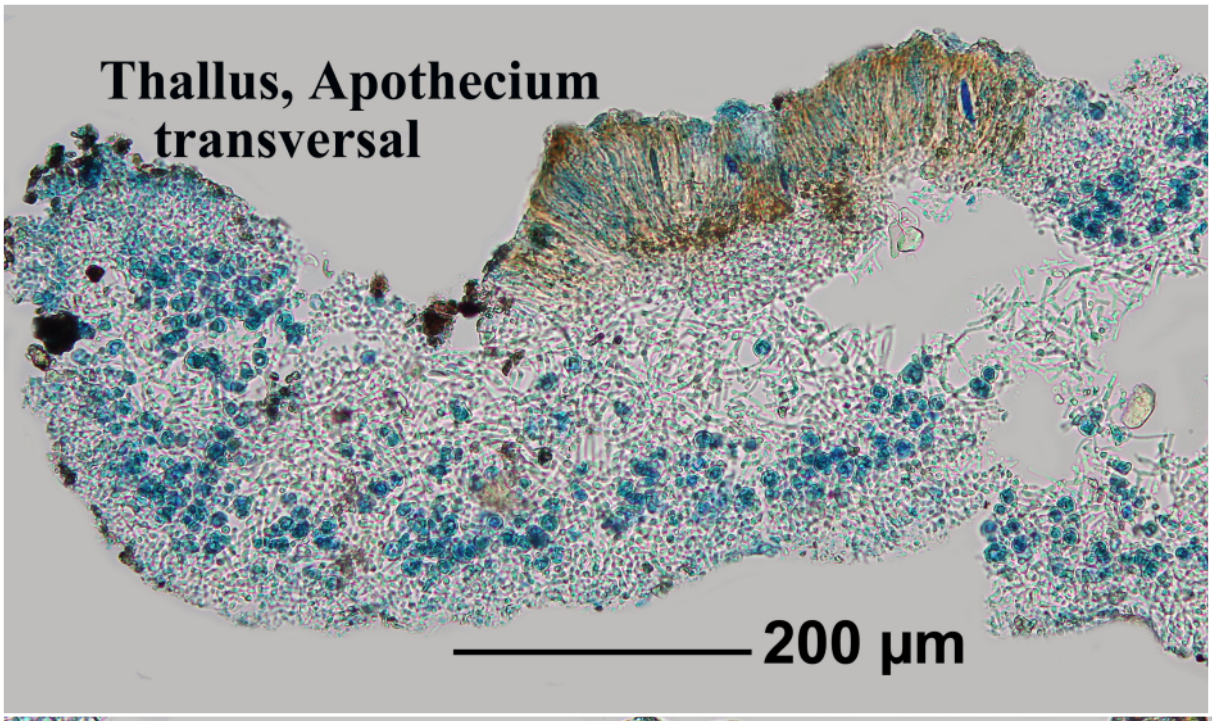
South Atlantic Islands, St. Helena, the Barn, along God's Path. Vertical basalt cliffs and slope with boulders and soil crusts, 15°54.929' S, 5°40.428' W, alt. 475 m, on rock. Leg. et det. A. Aptroot 20. Oct. 2006. (ISOTYPUS). [ABL66460]

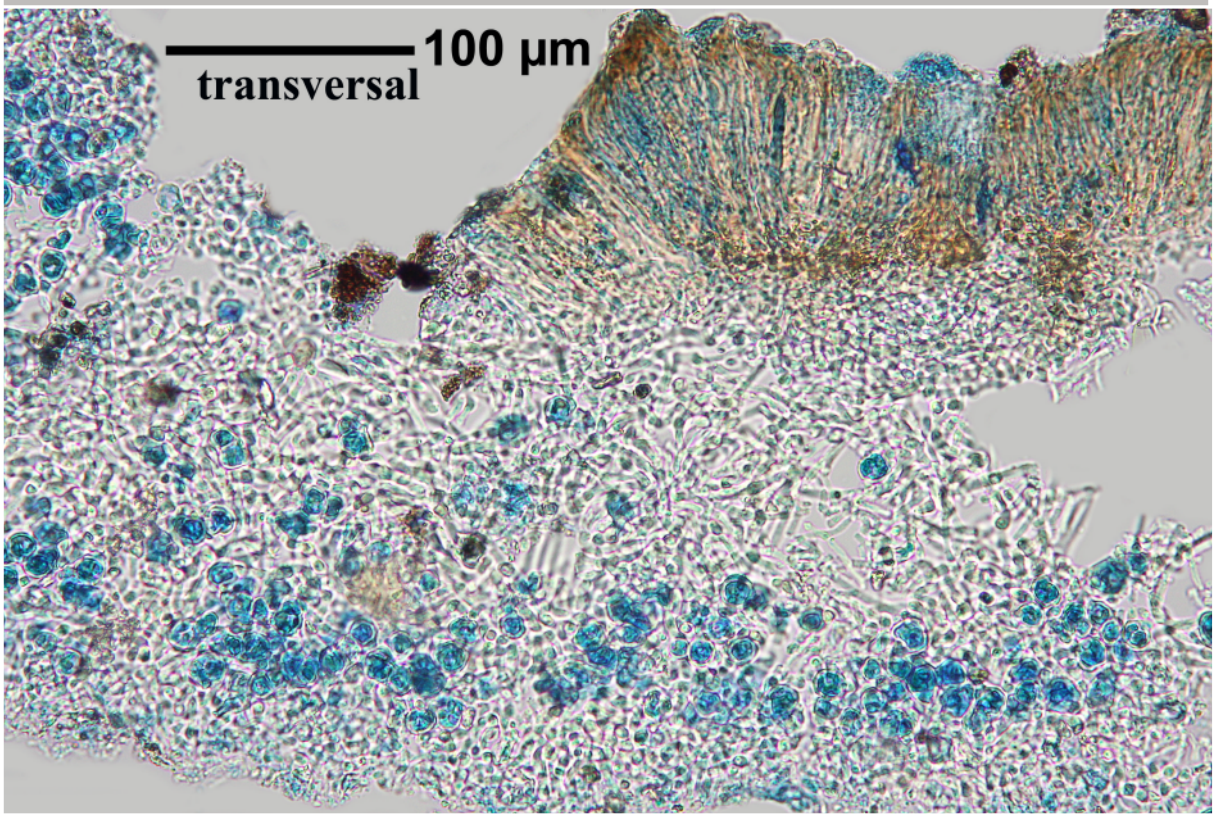


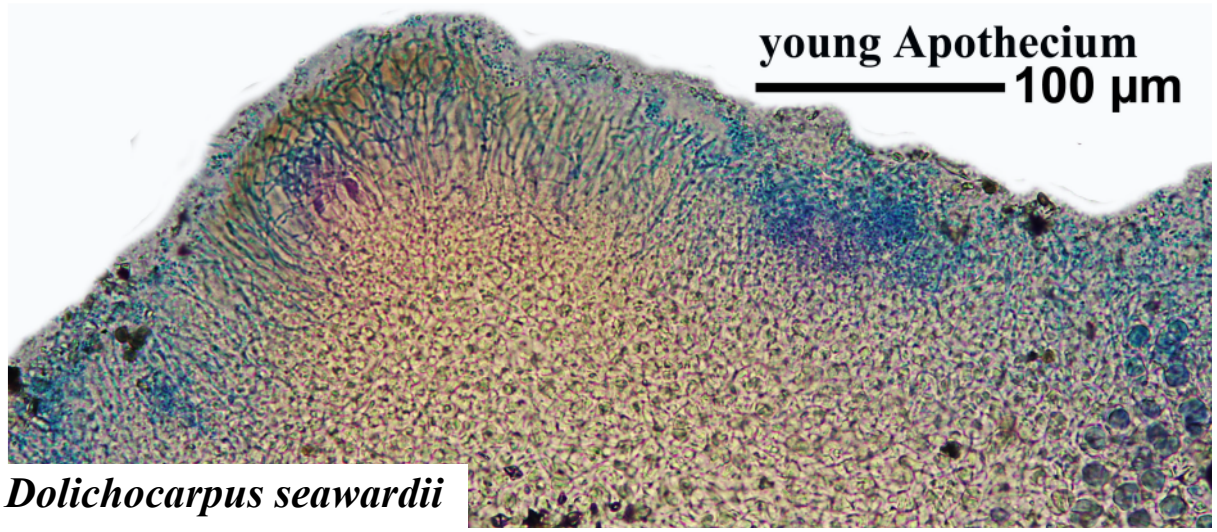




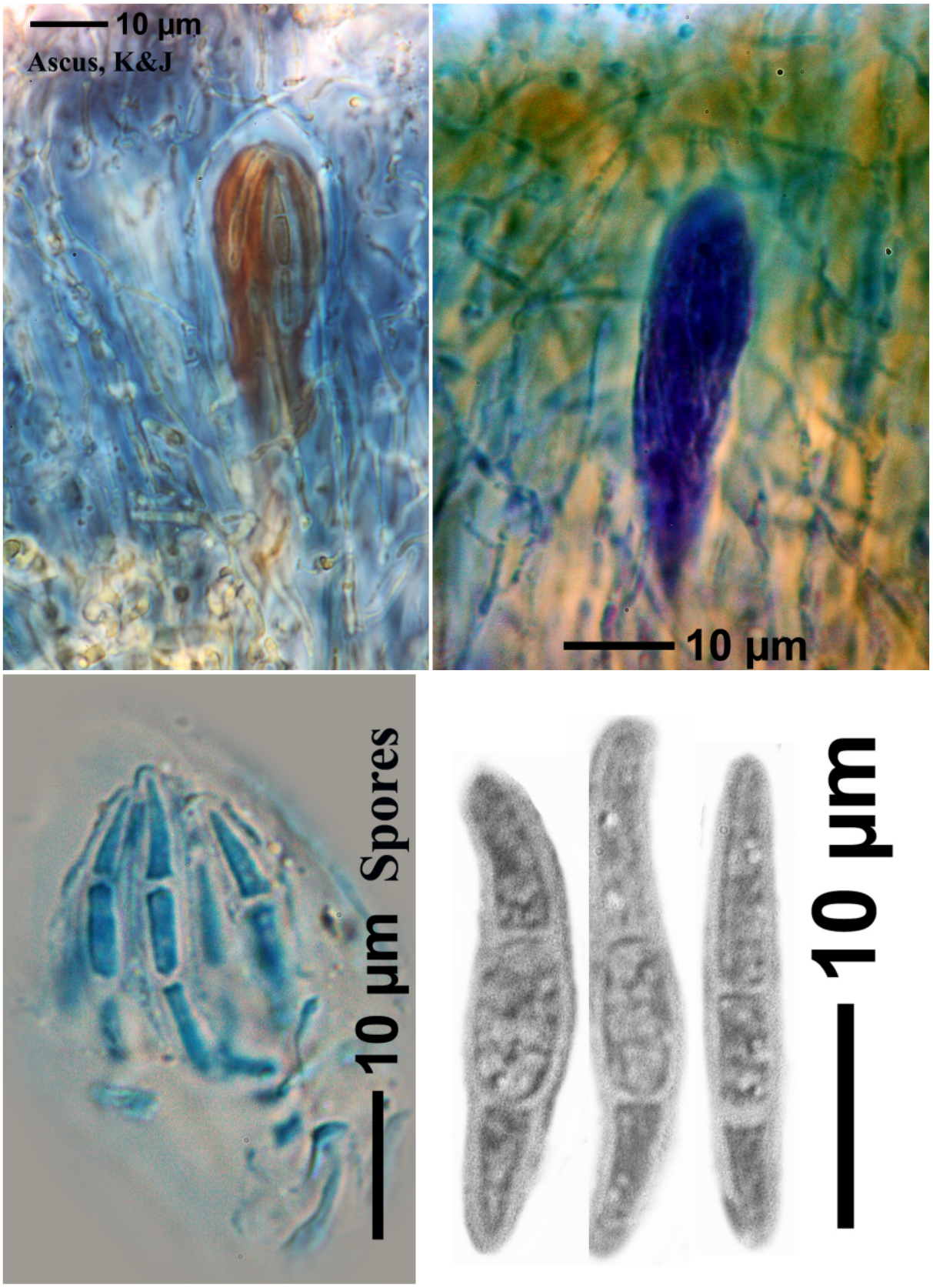
Dolichocarpus seawardii



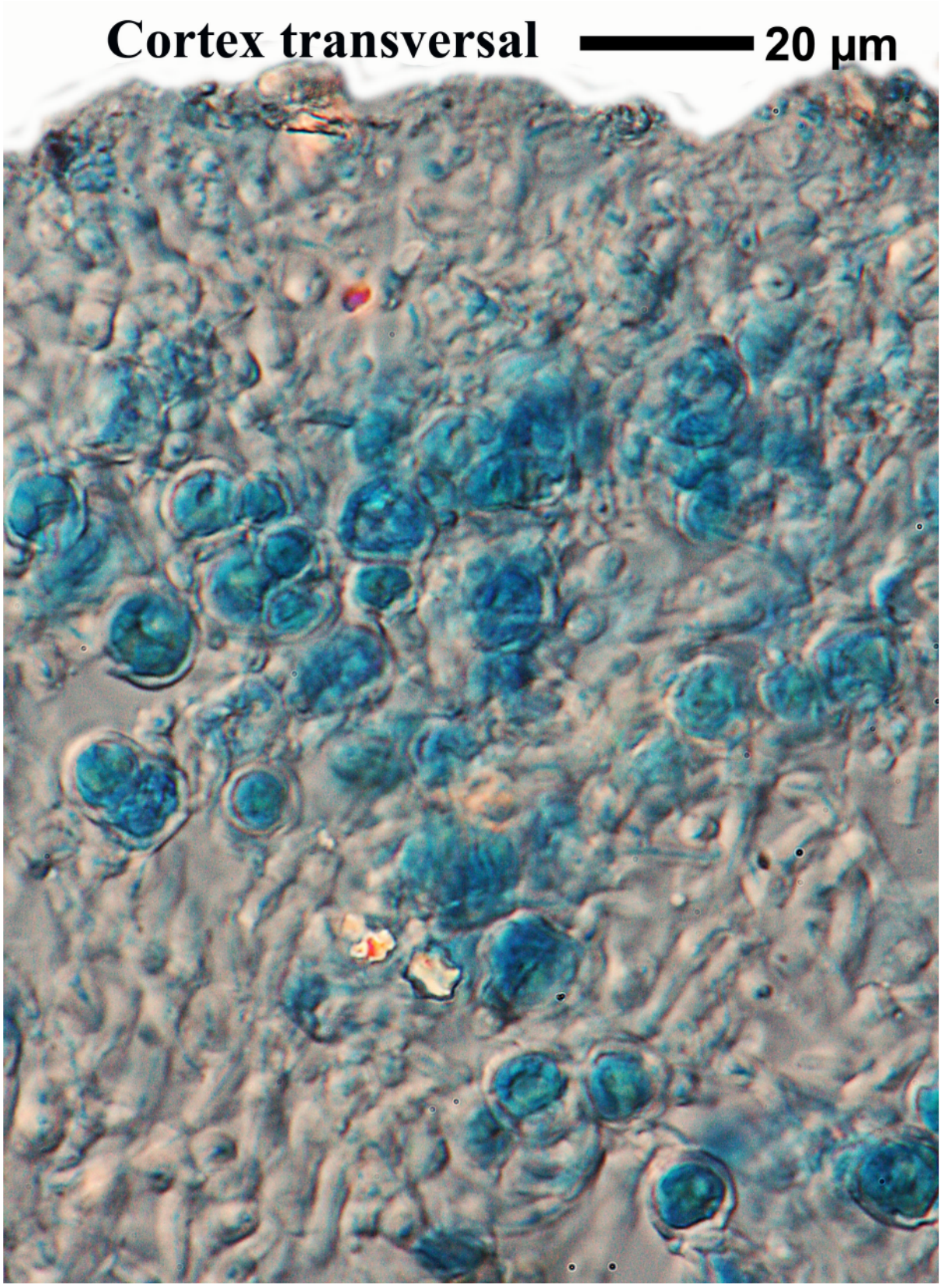




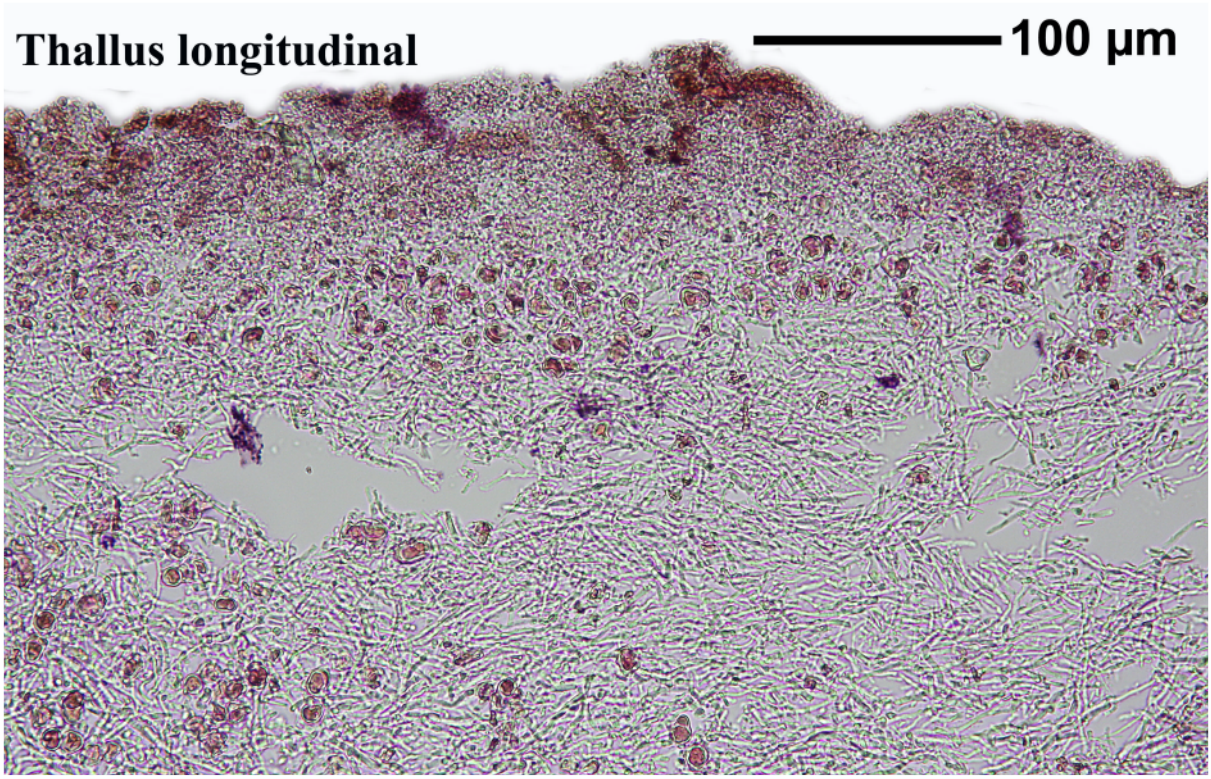
Dolichocarpus seawardii

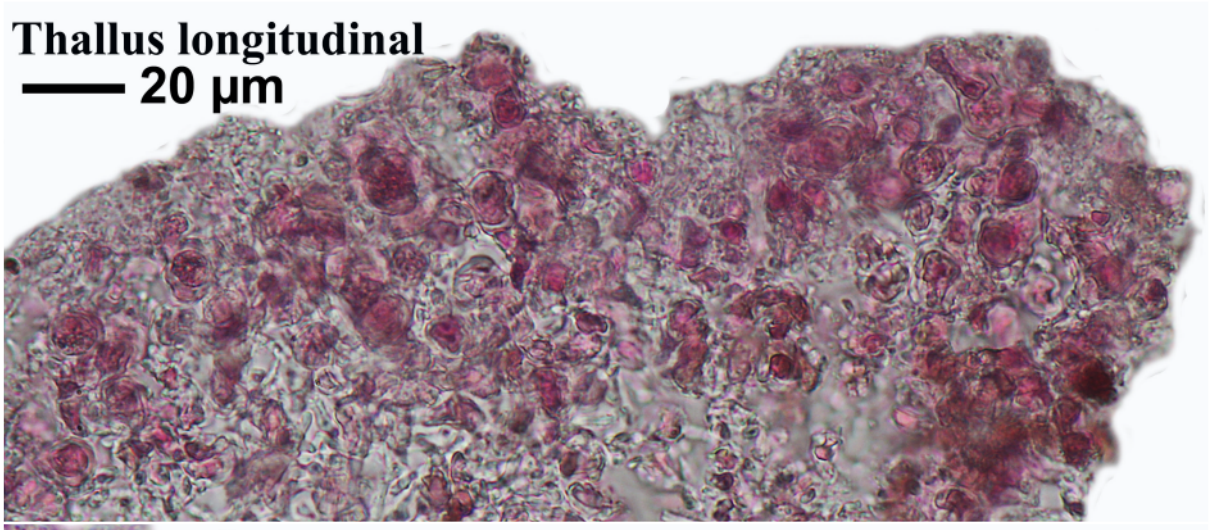


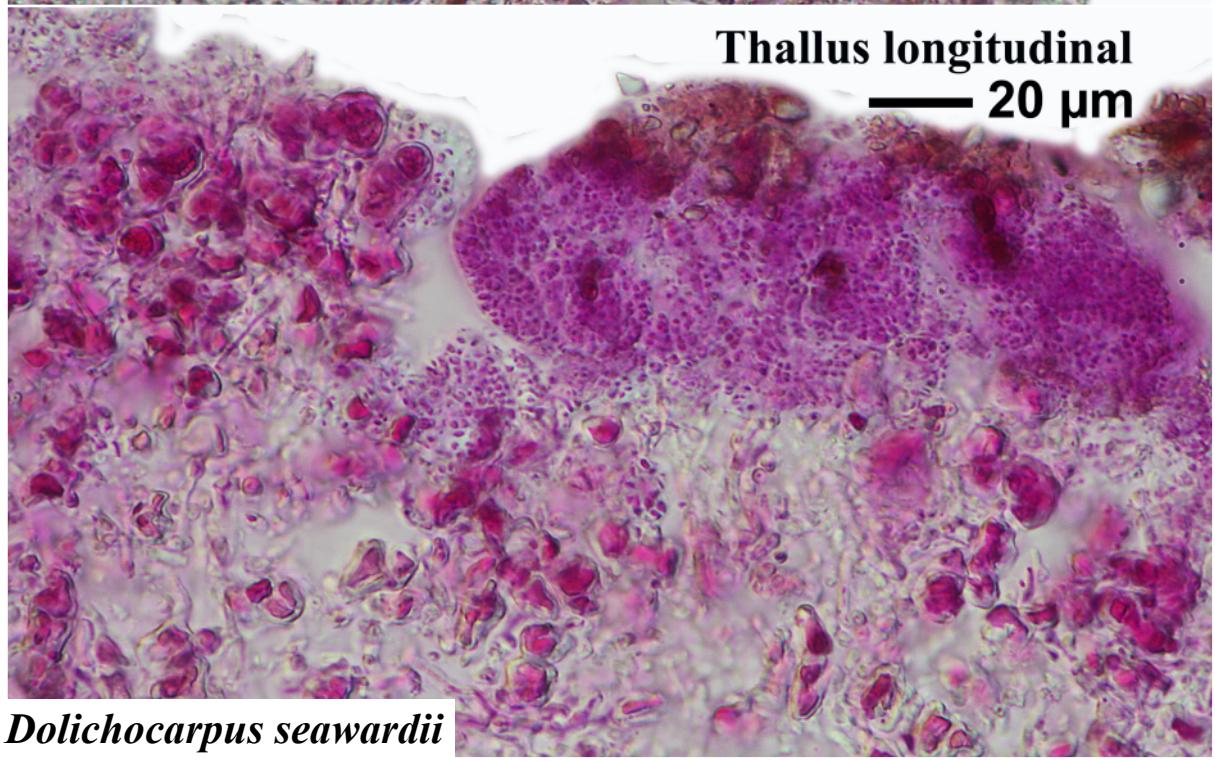
Dolichocarpus seawardii



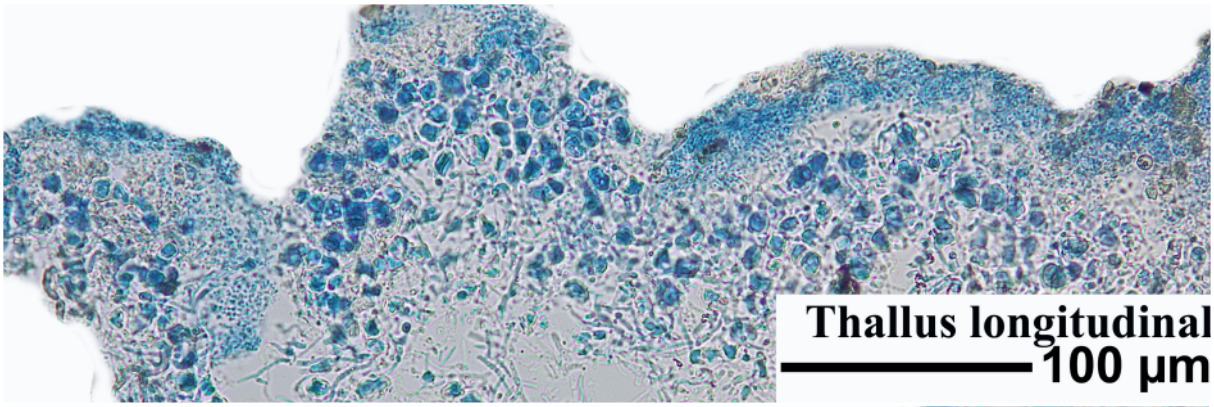
Dolichocarpus seawardii

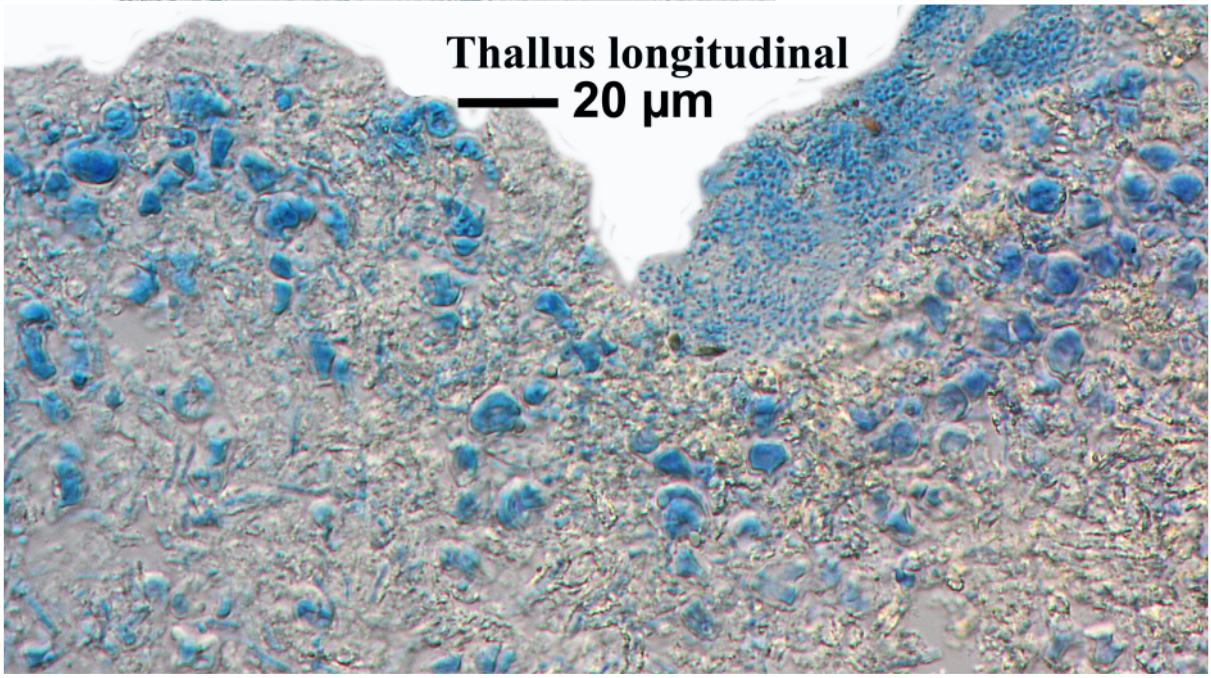


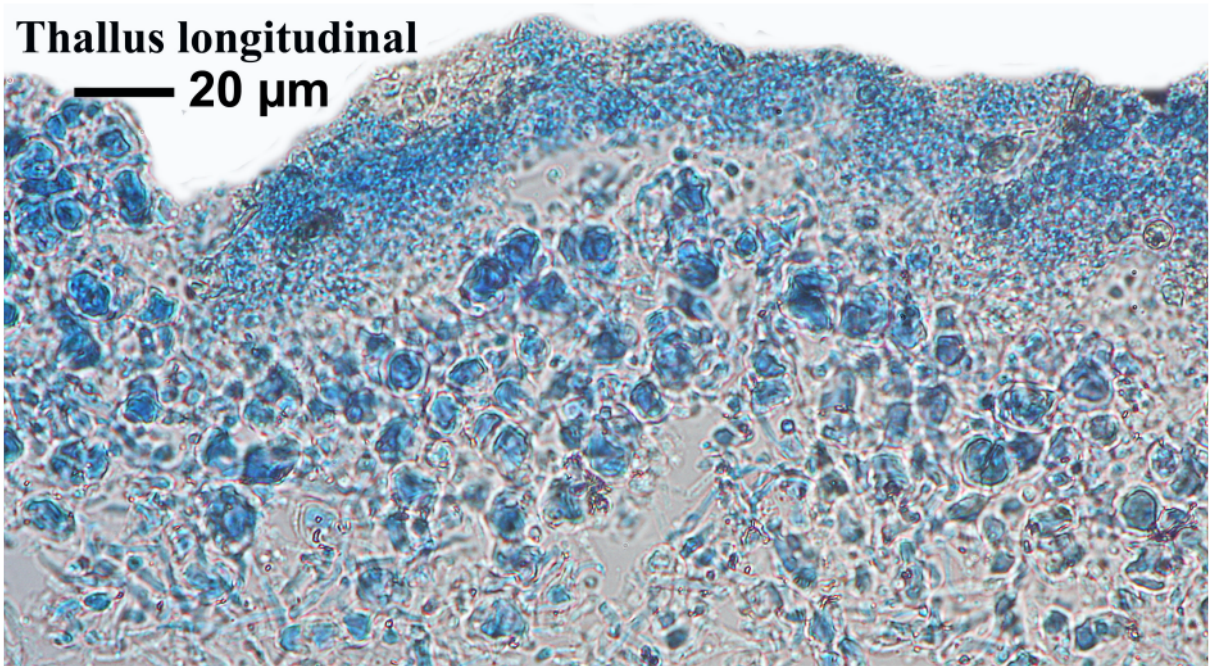




Dolichocarpus seawardii





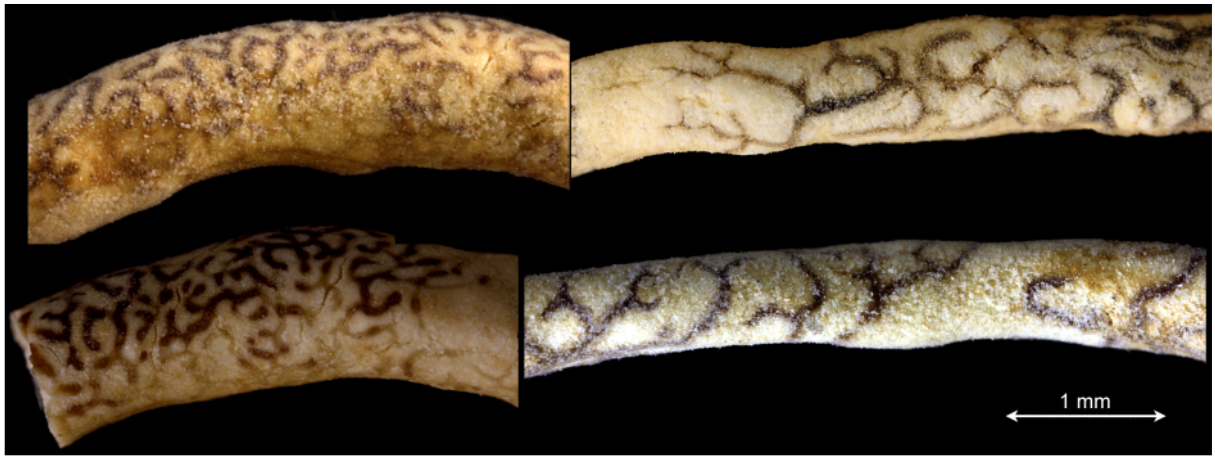


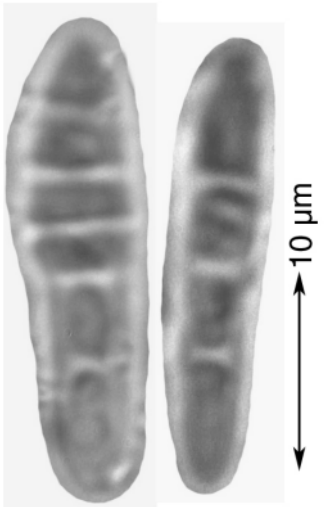
Dolichocarpus seawardii

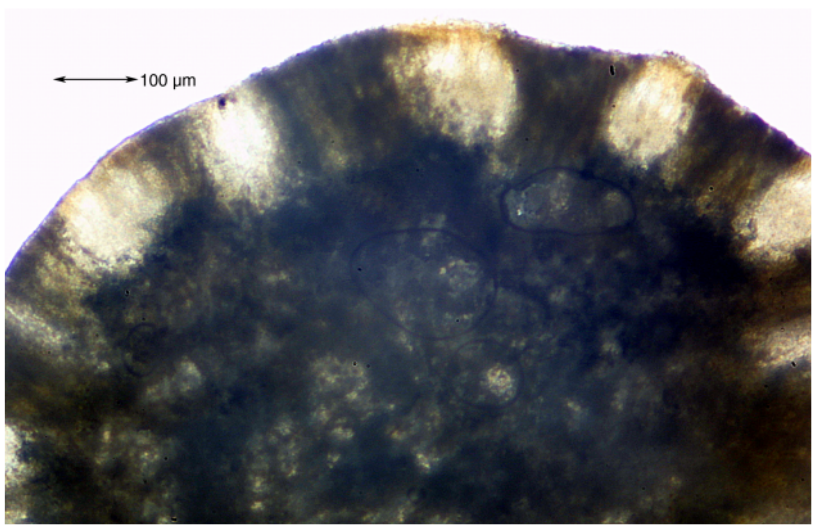
Gorgadesia mira Tav. (1964)

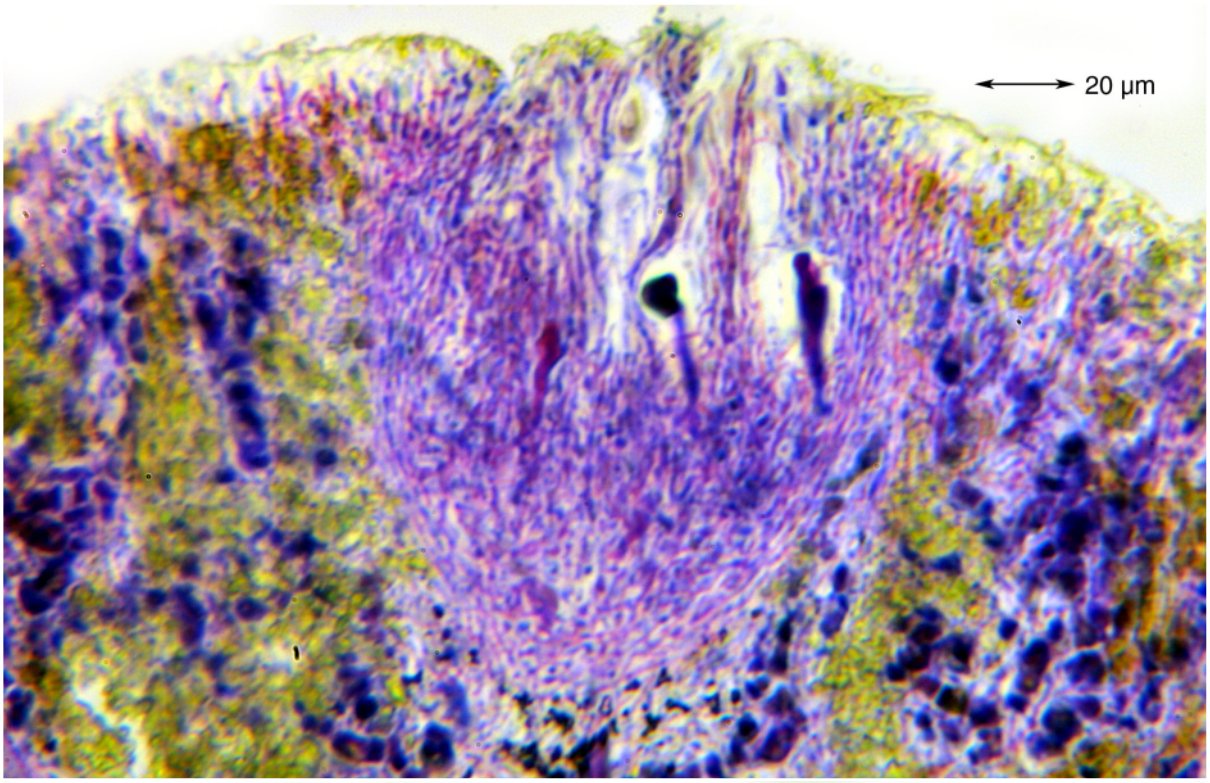
Thallus saxicolous, brown, not sorediate, texture firm, lobes cylindrical, 0.5-1 mm thick, surface smooth, holdfast internally white to brown. Cortex intermediate type, with thick epinecral layer. Apothecia linear, branched. Hypothecium hyaline. Ascospores hyaline, 3–5-septate, 16–29 × 3–5 µm. Cortex K –, C –, KC–, Pd + yellow, medulla C –, major substance psoromic. – Cape Verde Islands.

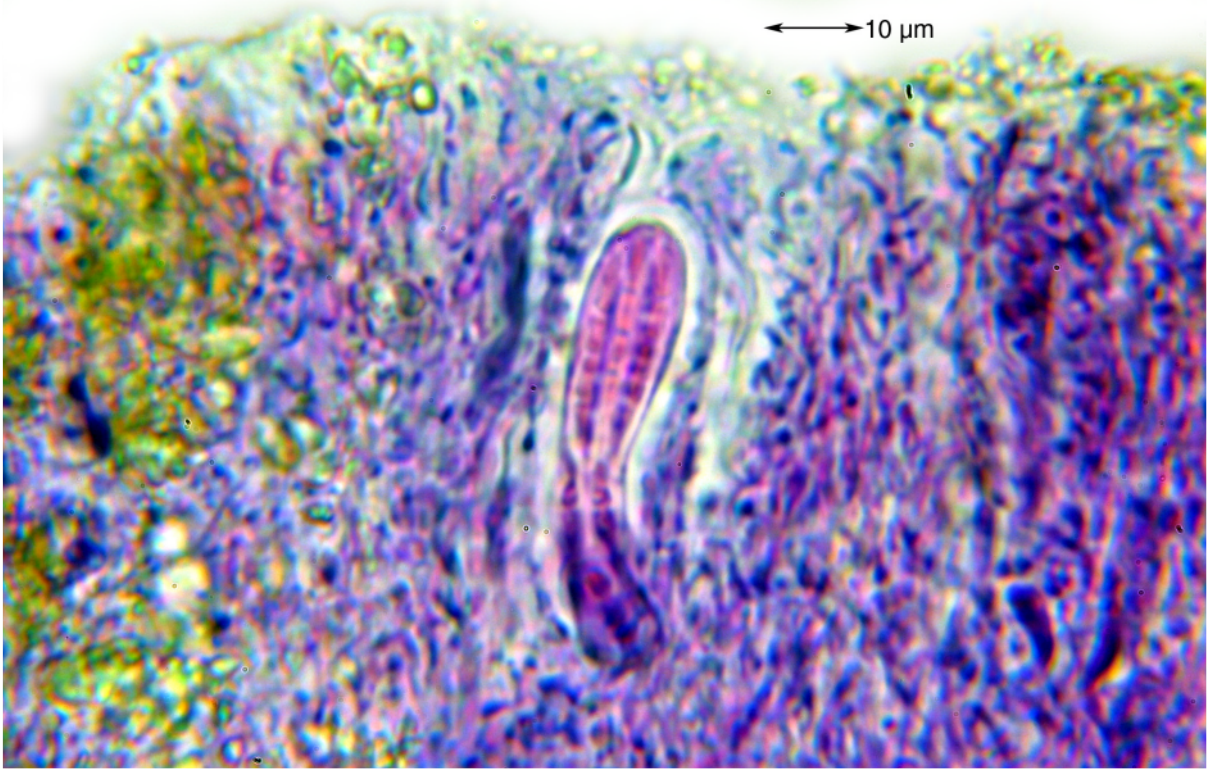
Cape Verde Islands. Sao Nicolau, Punta Espechim, W of Ribeira Funda, N Coast, on base of moist rockwall, exp. N, alt. 280 m. Chemistry by HPLC: Psoromic acid, 2 unknown minor compounds. Leg. Bruno Mies 28.Sept. 1988 (Nr. CV 4293). Ex Almborn: Lichenes africani No. 132. Lit. Tavares (1964). [ALA 132]



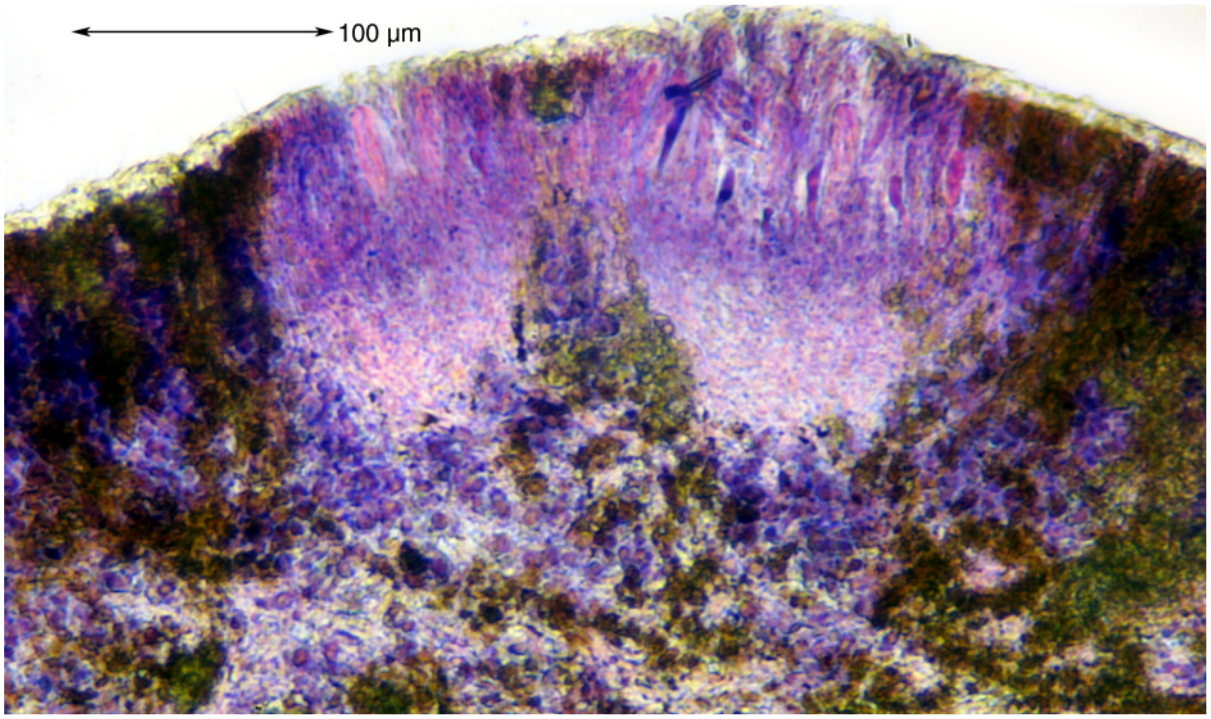


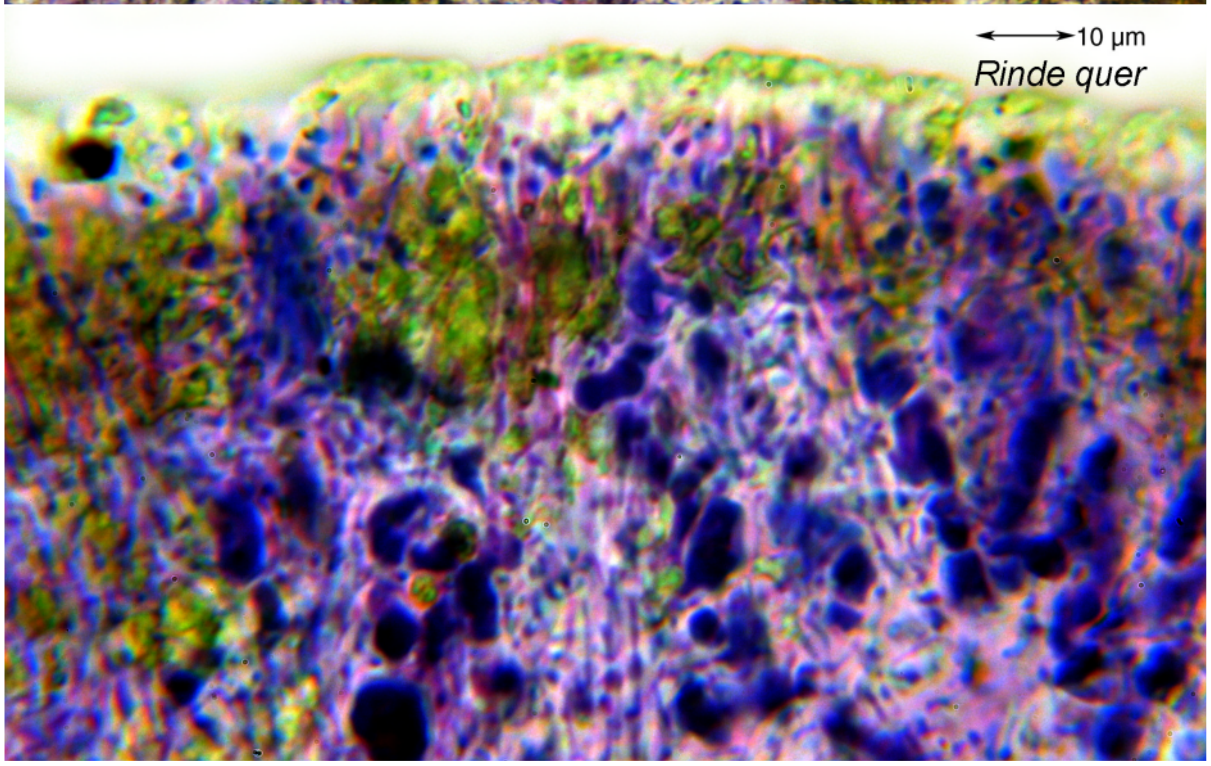


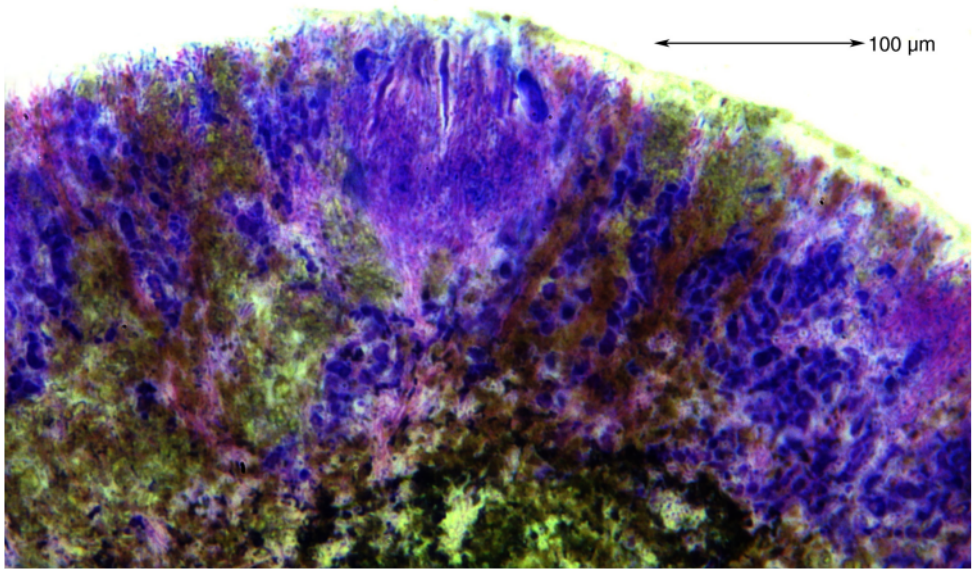




Gorgadesia mira





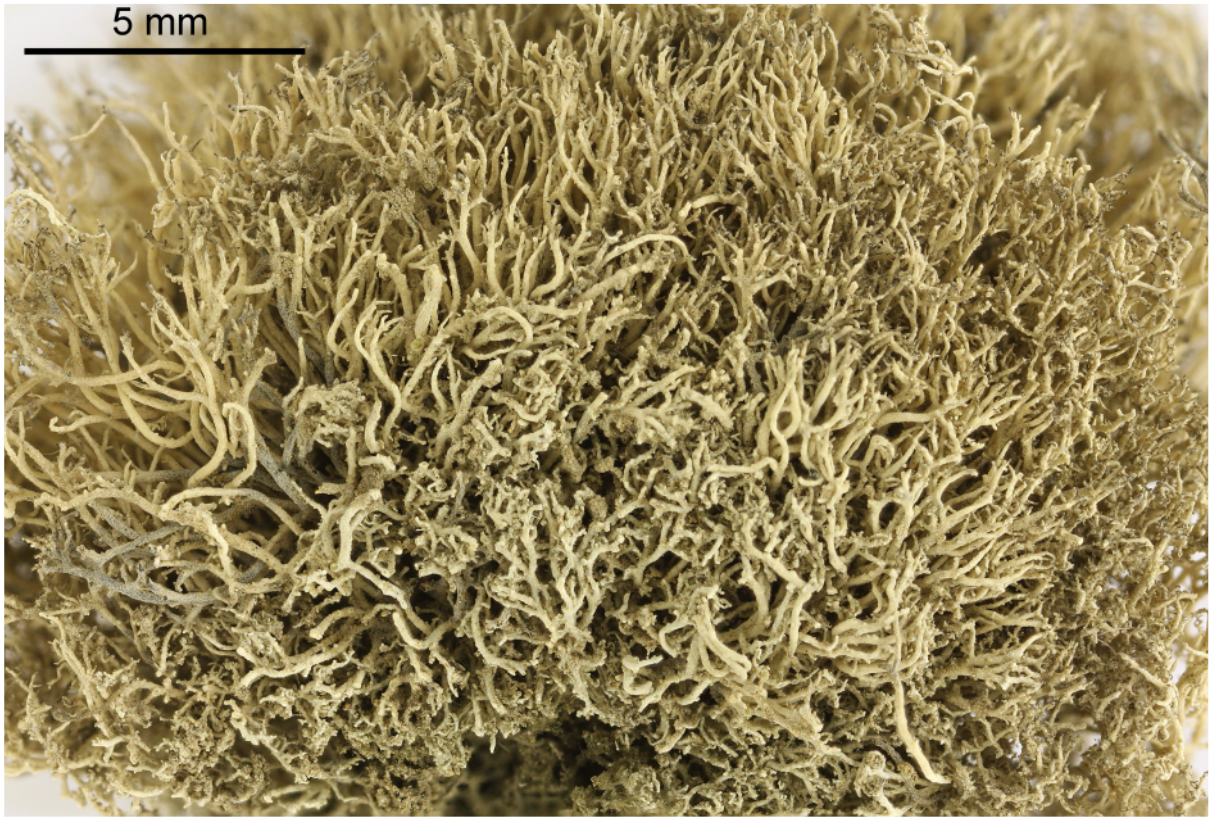


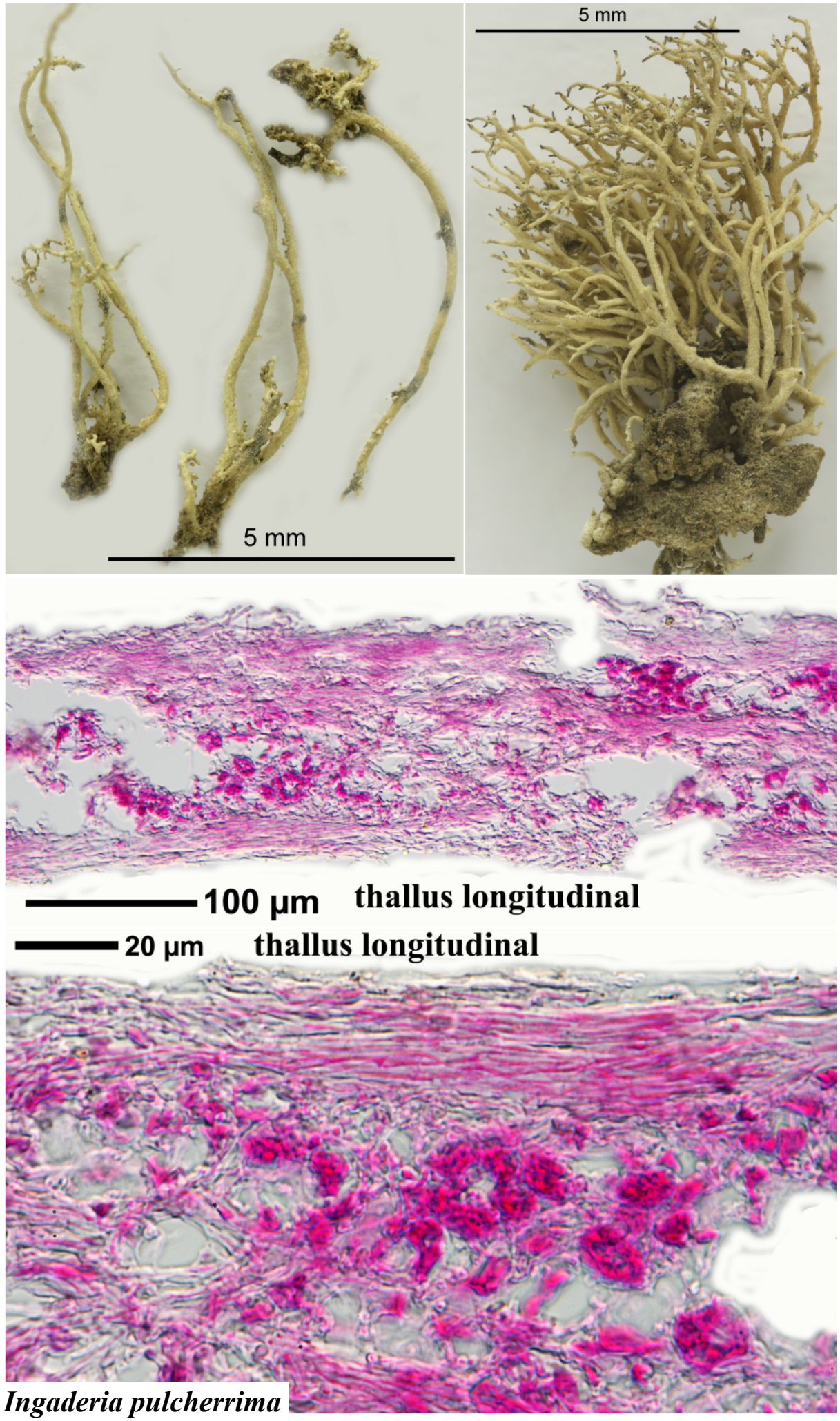
Gorgadesia mira

Ingaderia pulcherrima Darb. (1897)

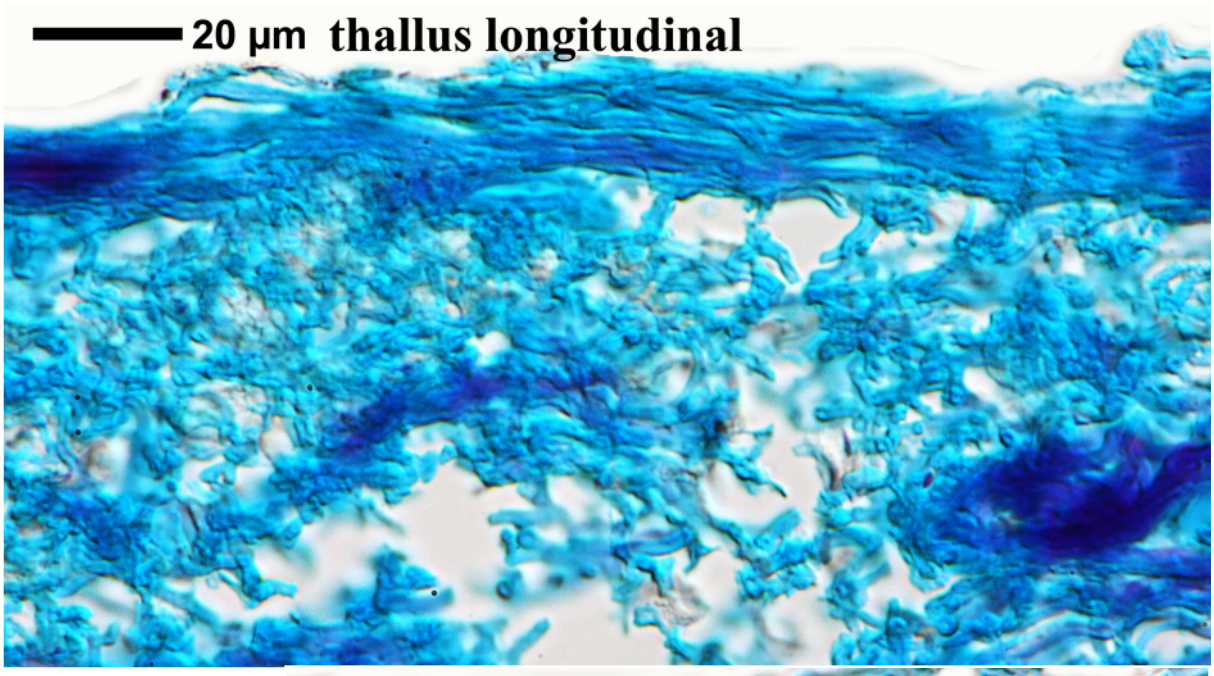
Thallus saxicolous, brown, not sorediate, thallus soft but nevertheless very fragile, cylindrical, often anastomosing, tips not flattened, surface rough, holdfast internally white to brown. Cortex distinctly periclinal plectenchmateous, not strongly differentiated from the medulla. Apothecia rare, round. Cortex C + red, K –, Pd–, medulla C + red, major substances erythrin, lecanoric. – Chile.

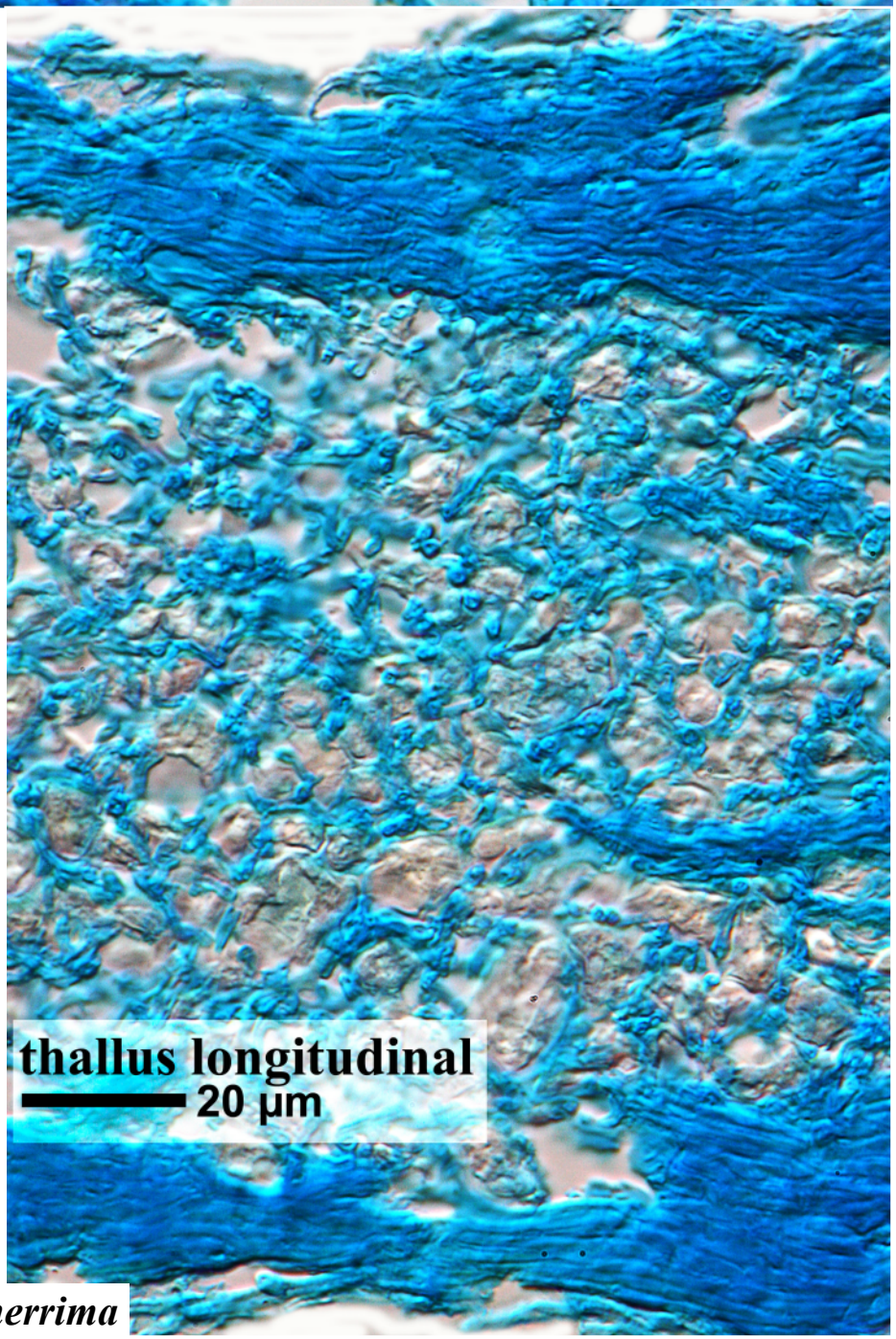
Chile, Antofagasta, Quebrada de la Chimba, im mittleren Stammbereich von *Eulychnia iquiquensis* (Schum.) Britt et Rose, in südwestlicher nebeloffener Hanglagre, 450 m, NW-SW, pH 5.5, gesellig. Leg. et det. G. Follmann Aug. 1991. Lichenes Exsiccatia Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 403. [9450]





Ingaderia pulcherrima



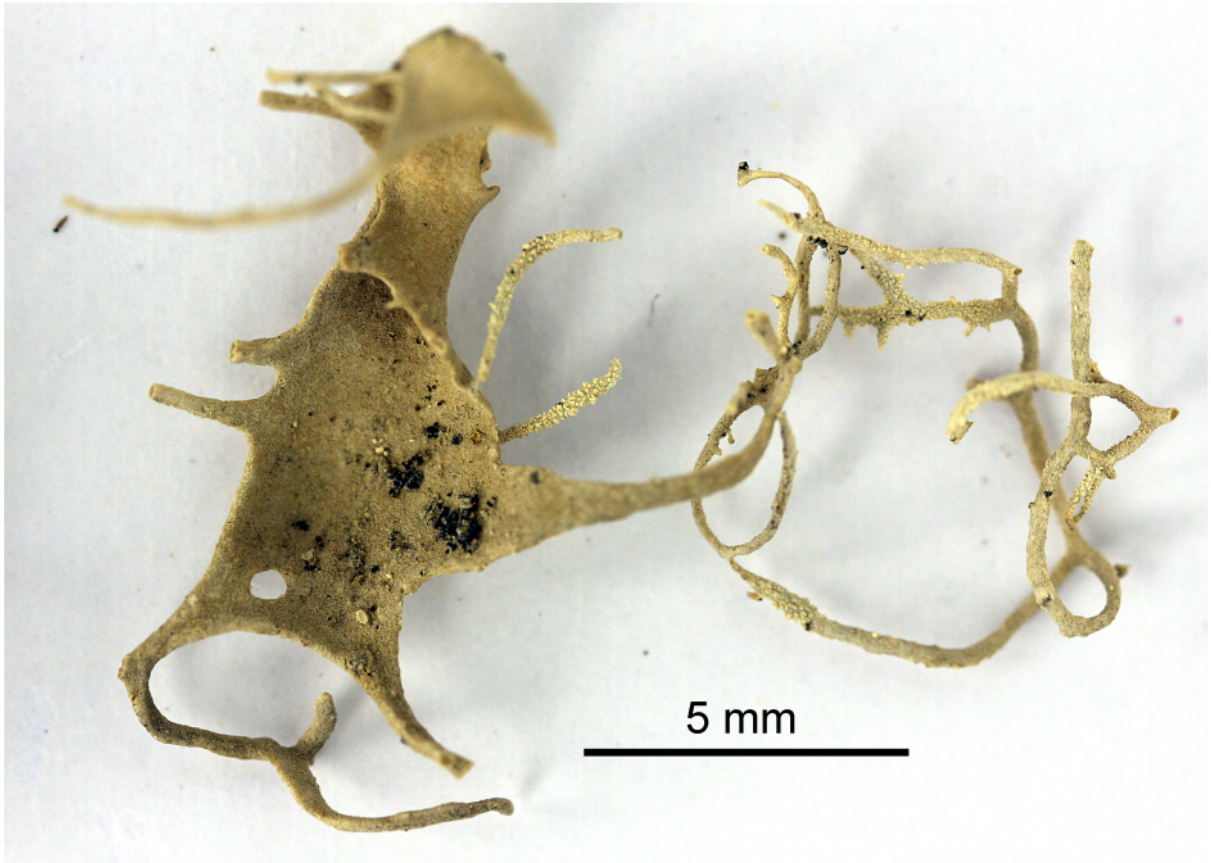


Ingaderia pulcherrima

Pentagenella fragillima Darb. (1898)
Roccella fragillima (Darb.) Follmann (1998)
Roccella fragillissima Mont. ex Follmann (1998)

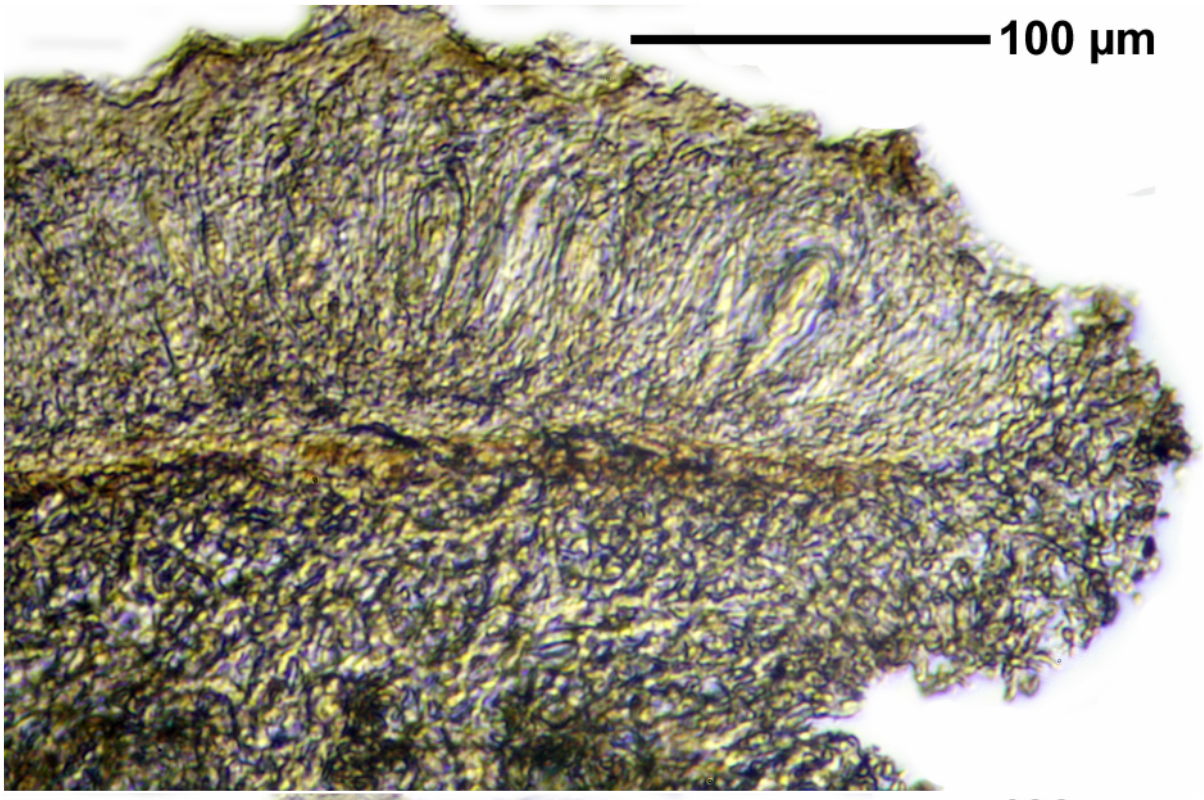
Thallus saxicolous, grey to brown, not sorediate, texture soft but very fragile, main branches at the base flat, tips cylindrical, sometimes anastomosing, surface rough, holdfast internally white to brown. Cortex indistinctly intricate to periclinal plectenchymatous, not differentiated from the medulla. Apothecia round. Hypothecium hyaline. Ascospores hyaline, 3-septate, 19–21 × 7–8 µm. Cortex C + red, K –, Pd + yellow to red, medulla C–, major substances erythrin, protocetraric. – Chile.

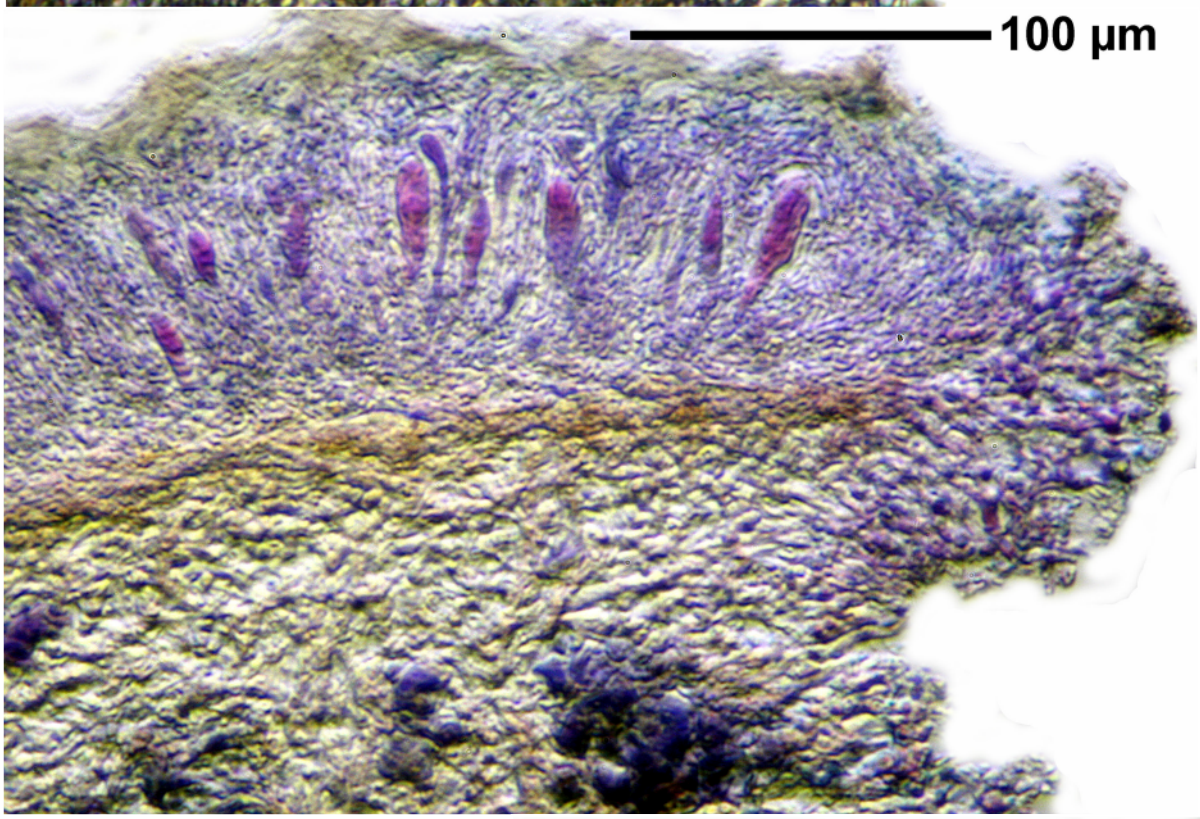
Chile. Antofagasta, Cerro Moreno, mittlerer Westhang, Felswand, 600 m, SW. Leg G. Follmann 09.1991- Herbarium Follmann Nr. 34336 (in Berlin). [GF34336]

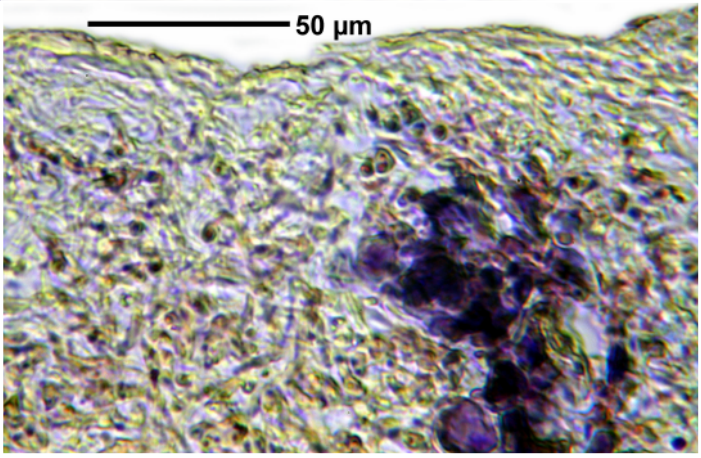




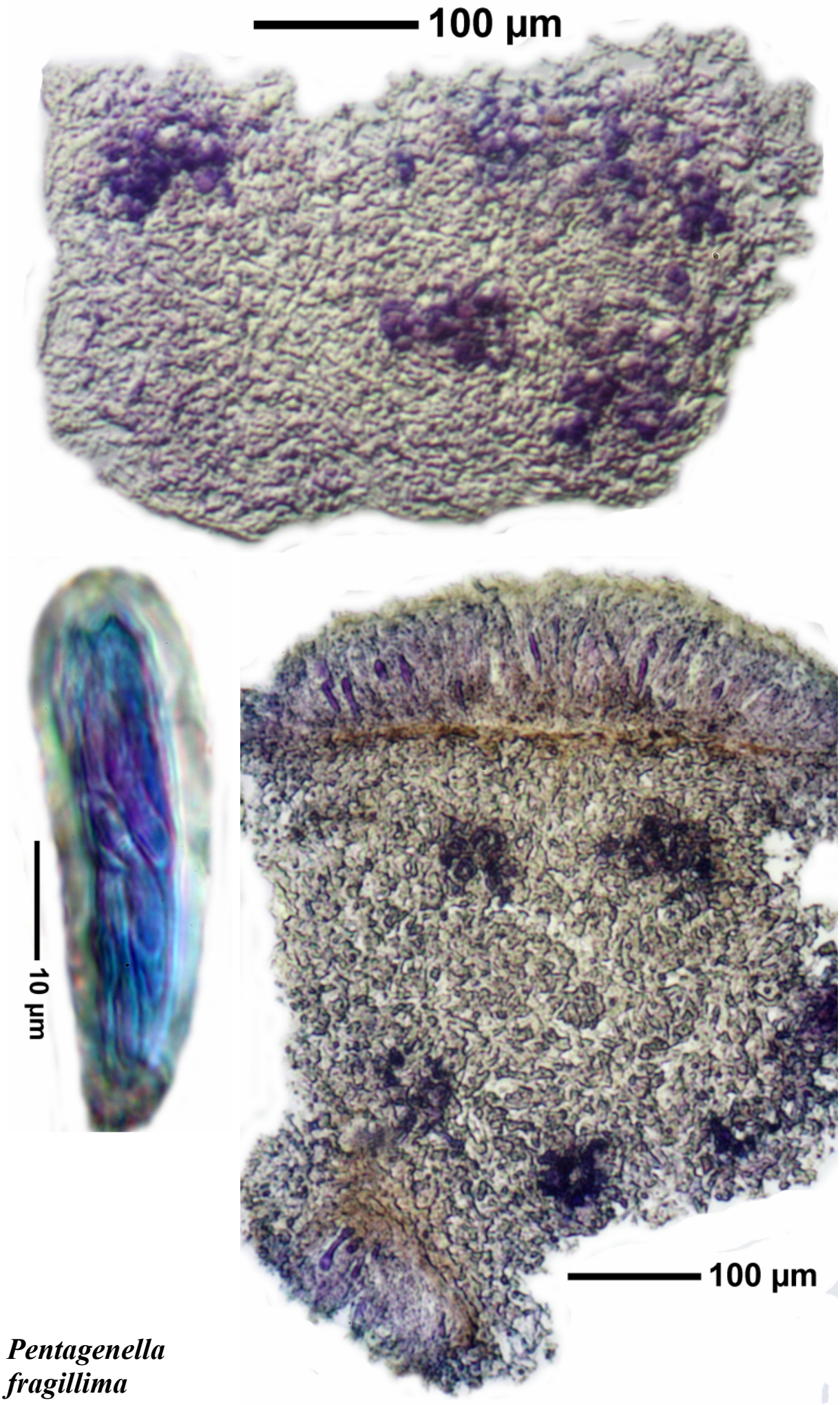
Pentagenella fragillima







Pentagenella fragillima



Pentagenella fragillima

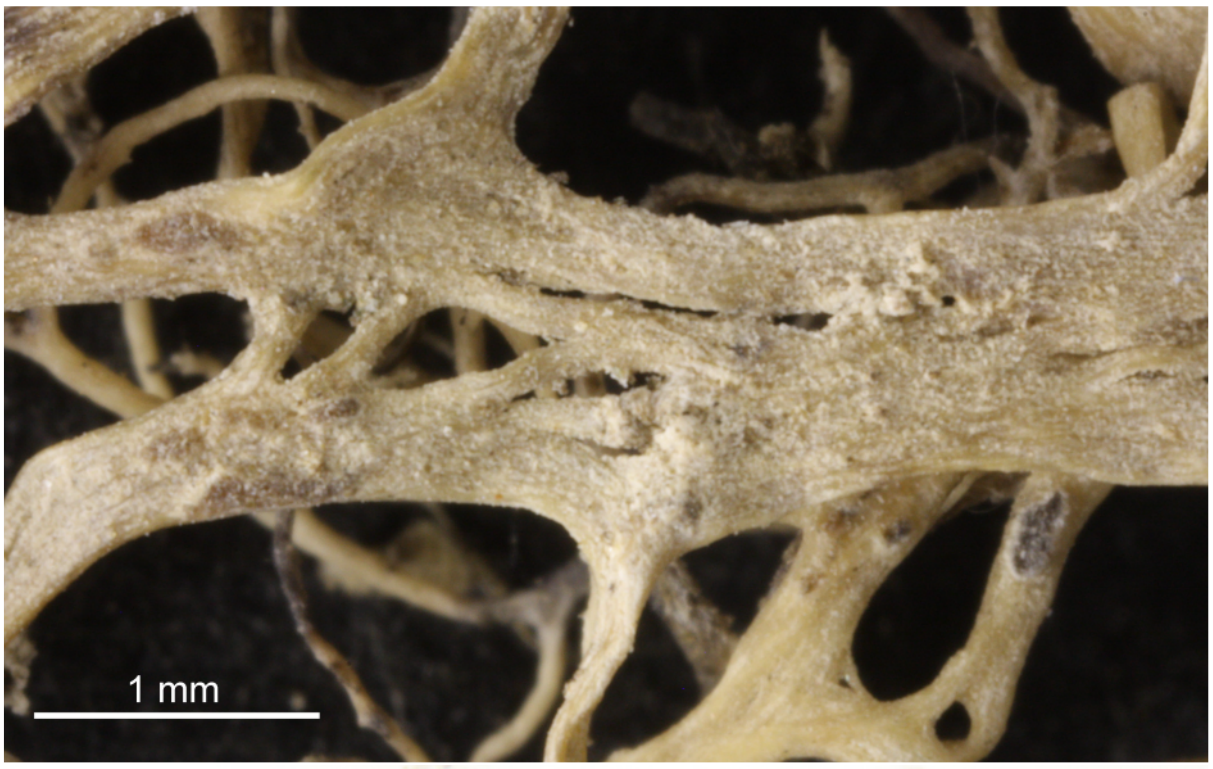
Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Ingaderia gracillima (Kremp.) Feige & Lumbsch (1993)
Darbishirella gracillima (Kremp.) Zahlbr. (1898)
Roccella dissecta Müll. Arg. (1891)
Roccella gracillima Kremp. (1877)
Roccella intricata f. *tenuior* Hampe ex Darb. (1898)
Roccella intricata var. *alectorioides* Mont. (1849)
Roccella mollis f. *filescens* Hampe ex Darb. (1898)
Roccella tinctoria ssp. *alectoroides* Nyl. ex Darb. (1898)

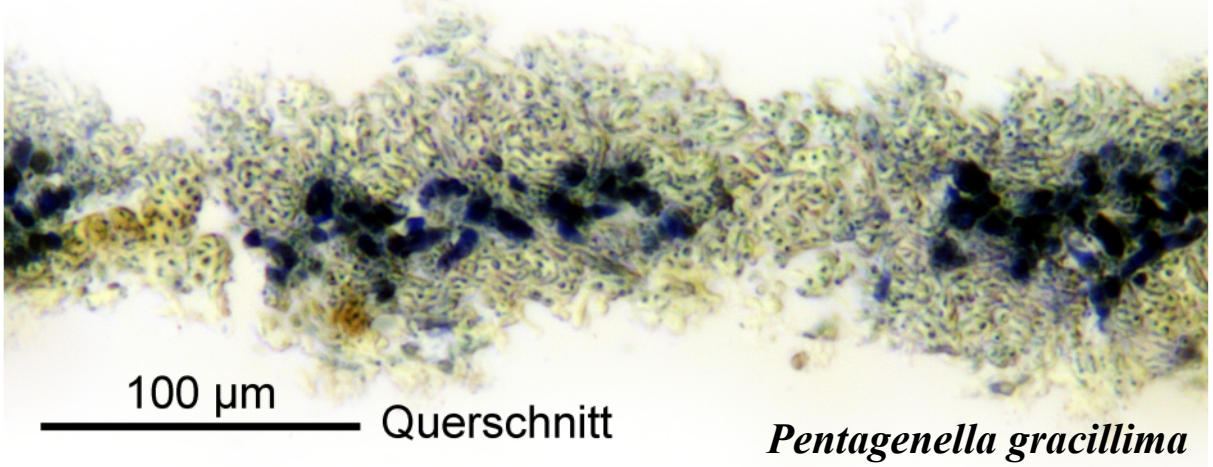
Thallus saxicolous or corticolous, grey to brown, not sorediate, texture soft, flattened, often anastomosing, tips rounded, surface rough, holdfast internally white to brown. Cortex distinctly periclinal plectenchymatous, not strongly differentiated from the medulla. Apothecia round or somewhat elongated Hypothecium hyaline to browenish. Ascospores brown, 3-septate, 16–20 × 7–8 µm. Cortex C –, K –, Pd + yellow, medulla C –, major substance psoromic. – Chile, Peru.

Mittelchile, Prov. Aconcagua: häufig an stark geneigten Küstenfelsen (Porphyrittuff) im Roccelletum portentosae, 10 m, SW, pH 6,3, Los Molles bei Los Vilos; Follmann 09.1964. Leg. et det. G. Follmann 1964. Lichenes Exsiccati Selecti A Museo Botanico Berolinensi Editi No. 3. [2513]

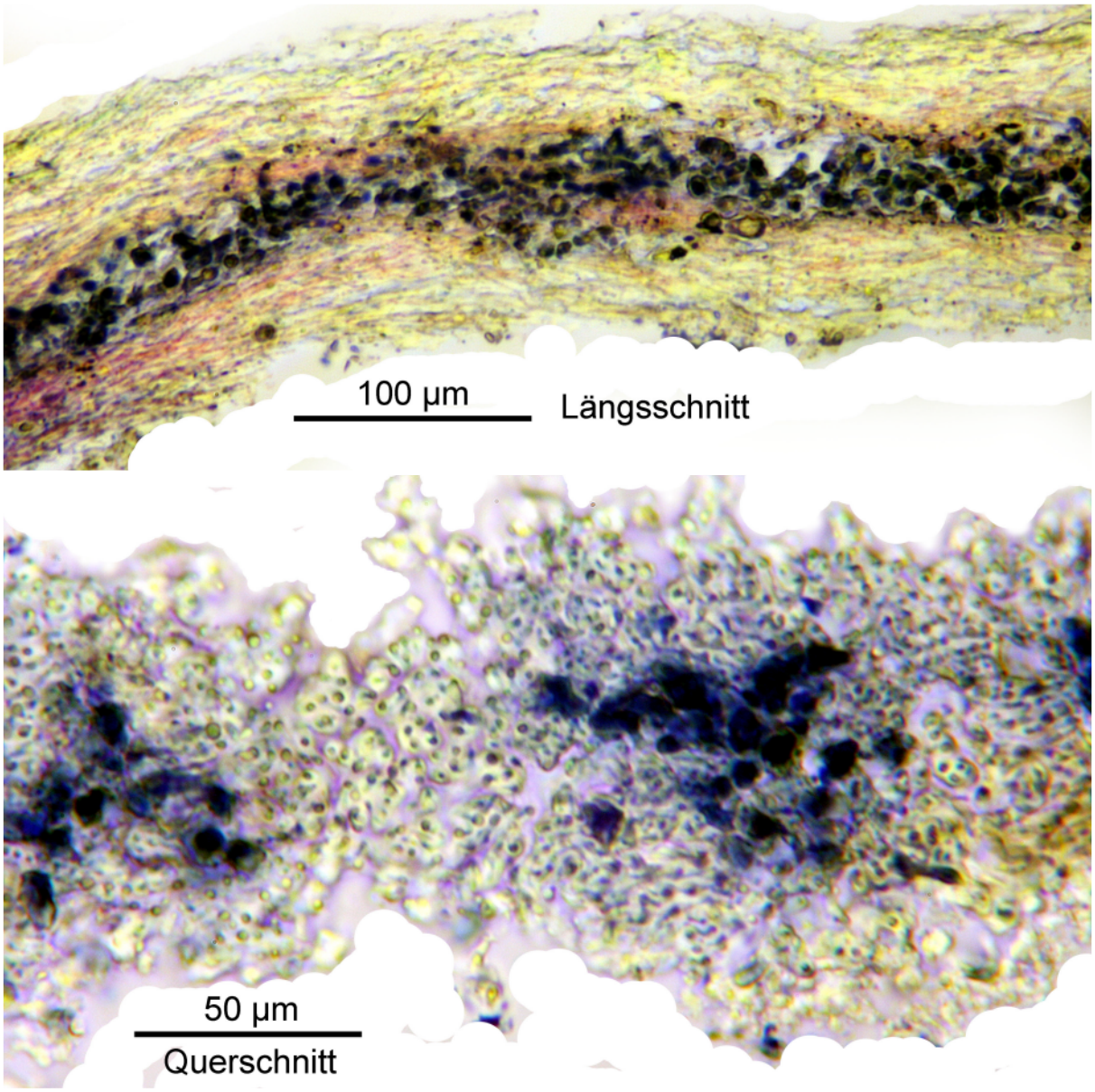




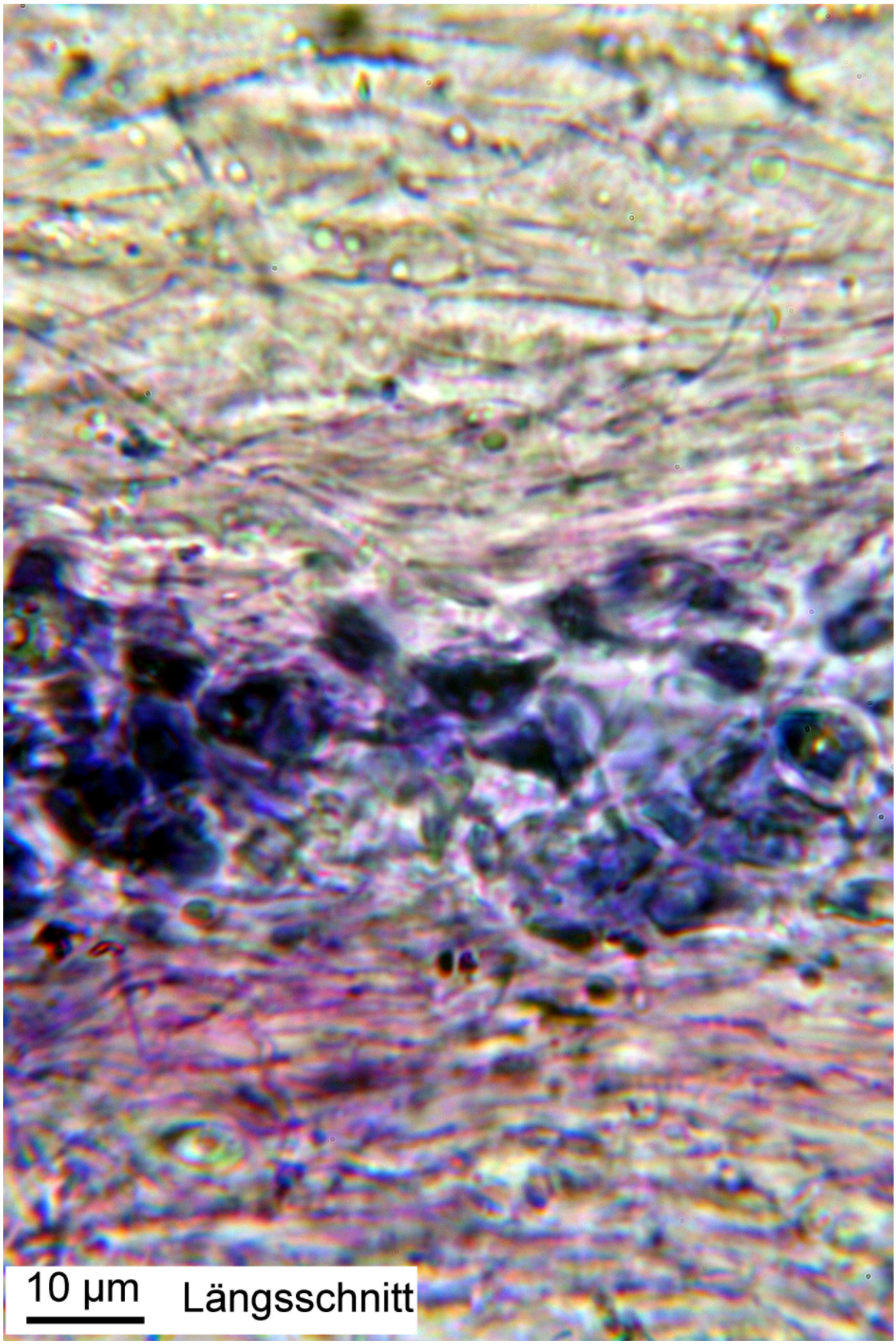




Pentagenella gracillima



Pentagenella gracillima



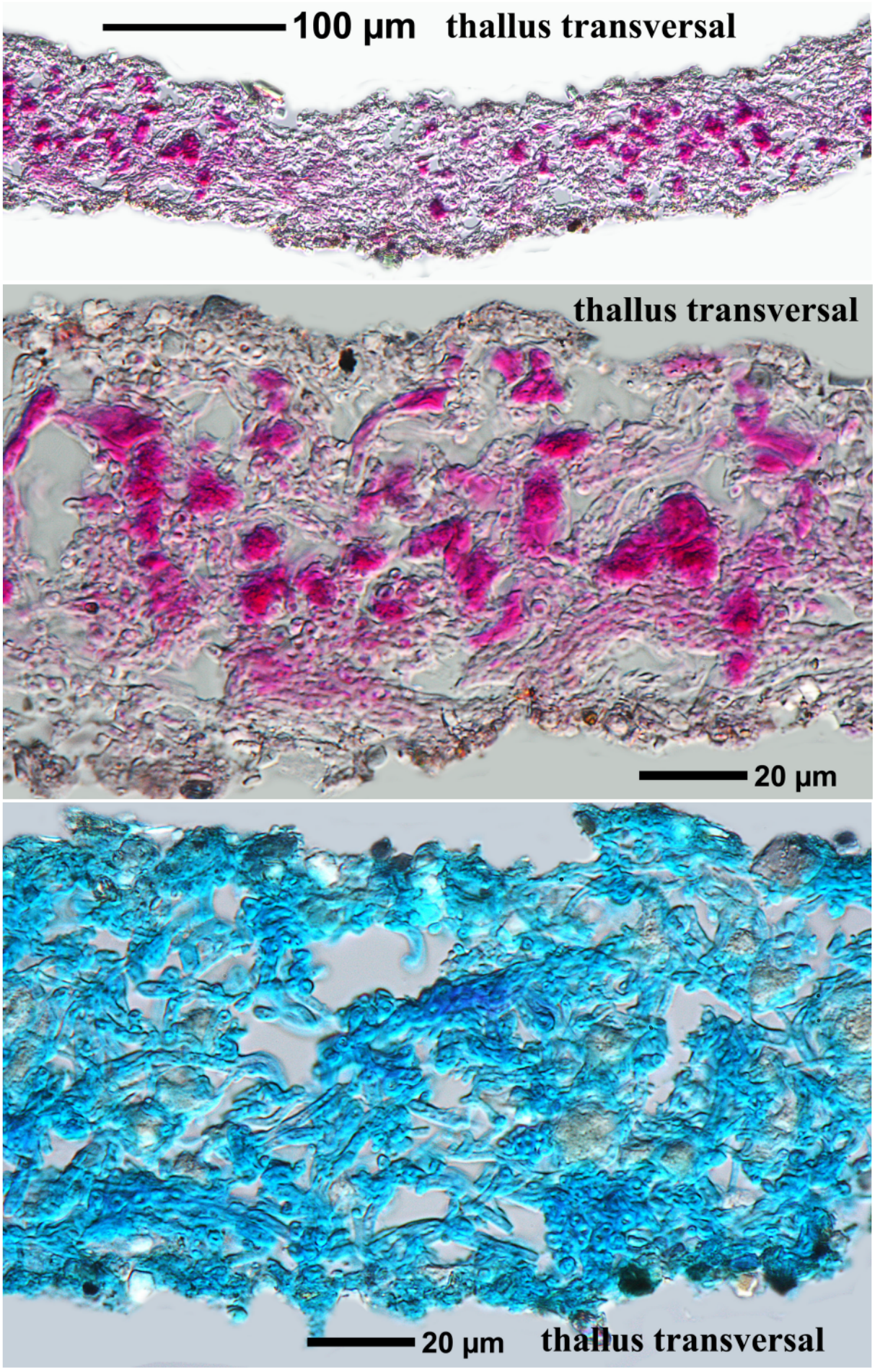
Pentagenella gracillima

Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Ingaderia gracillima (Kremp.) Feige & Lumbsch (1993)

Chile, Antofagasta, Paposo north of Taltal, lower fog-belt, curtainlike on the weather-sides of larger columnar cacti, especially *Eulychnia iquiquensis* (Schum.) Britt et Rose, 300-400 m, W-SW exposition, gregarious. Leg. et det. G. Follmann. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitats Coloniensis Editi Nr. 426. [9449]







Pentagenella gracillima

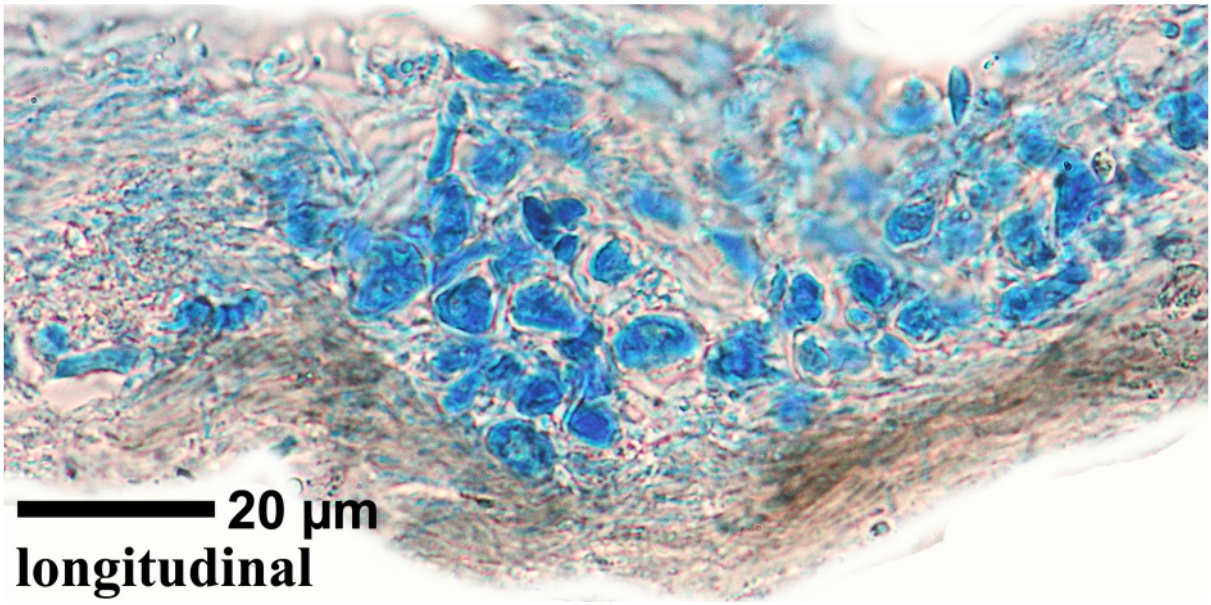
Pentagenella gracillima (Kremp.) Ertz & Tehler (2011)
Ingaderia gracillima (Kremp.) Feige & Lumbsch (1993)

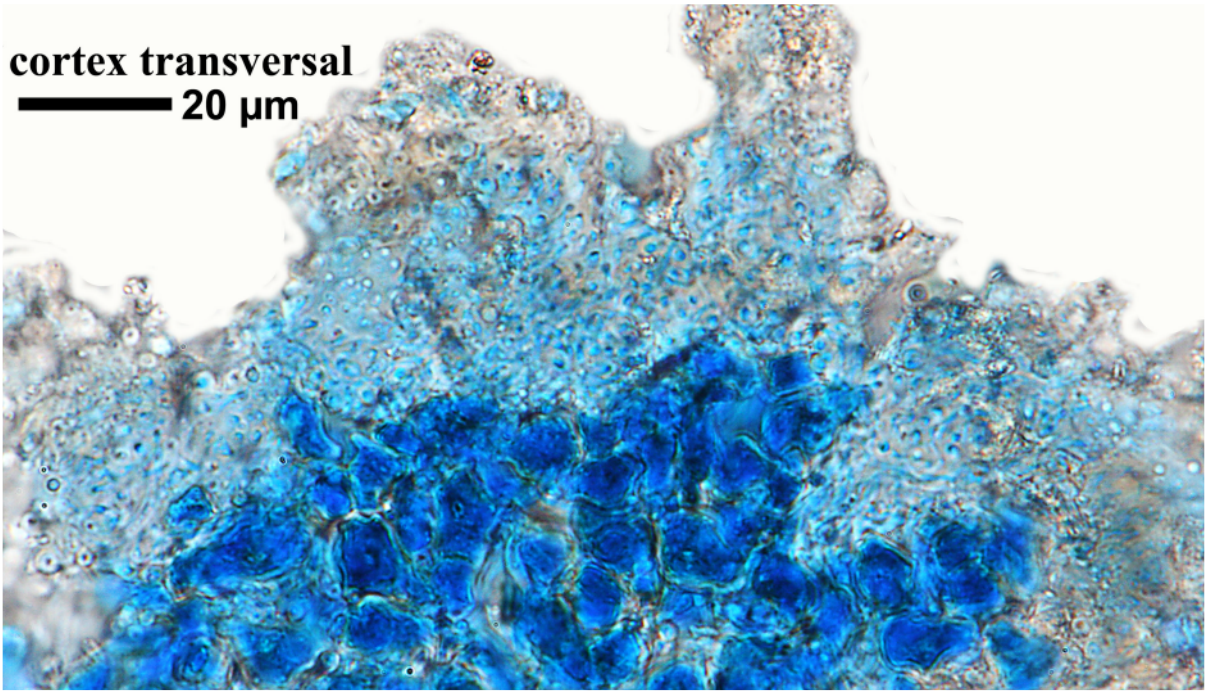
Chile. Prov. Aconcagua. Coastal headlands at Punto Los Molles, 10 msm; locally abundant on the bases of cactus truncs exposed to the fog and sea winds. W.A. Weber & Barry Johnston, 13. November 1976. Lichenes Exsiccati Distributed by the University of Colorado Museum, Boulder, Nr. 554. [CMB554]



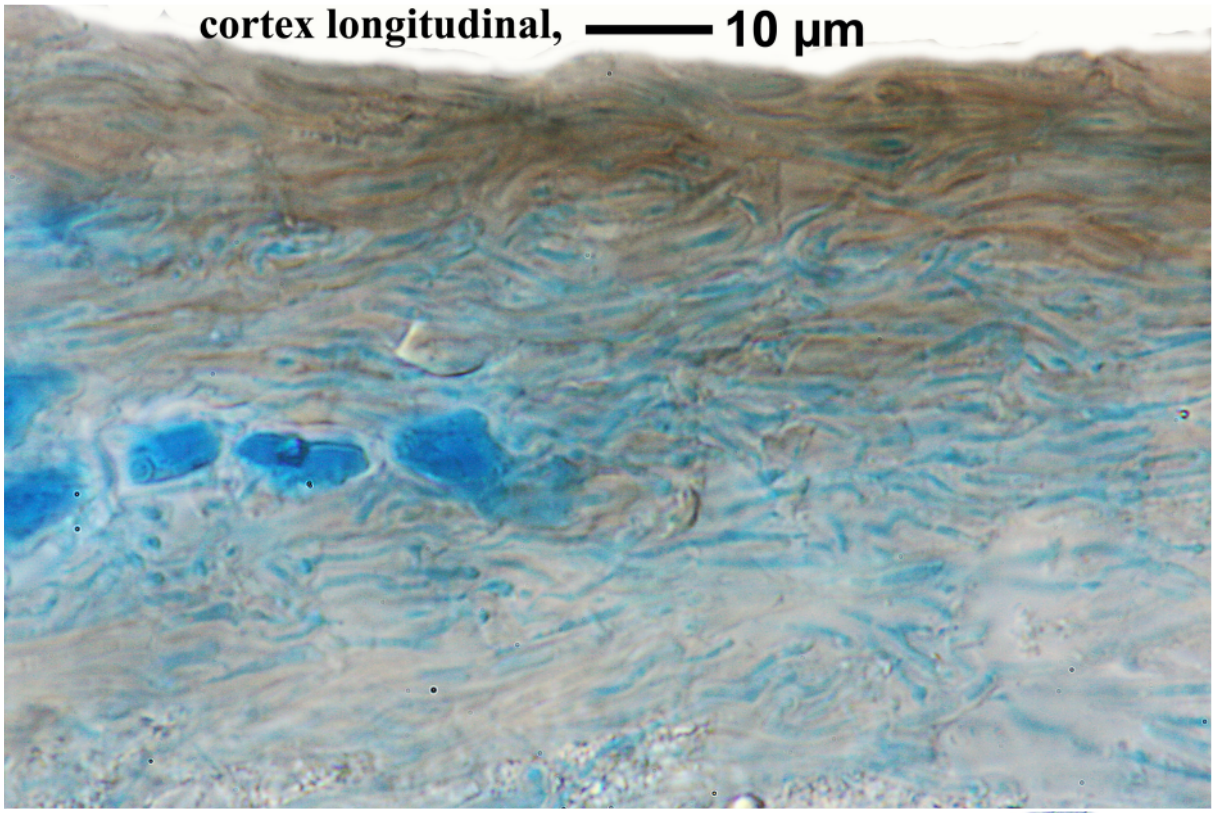


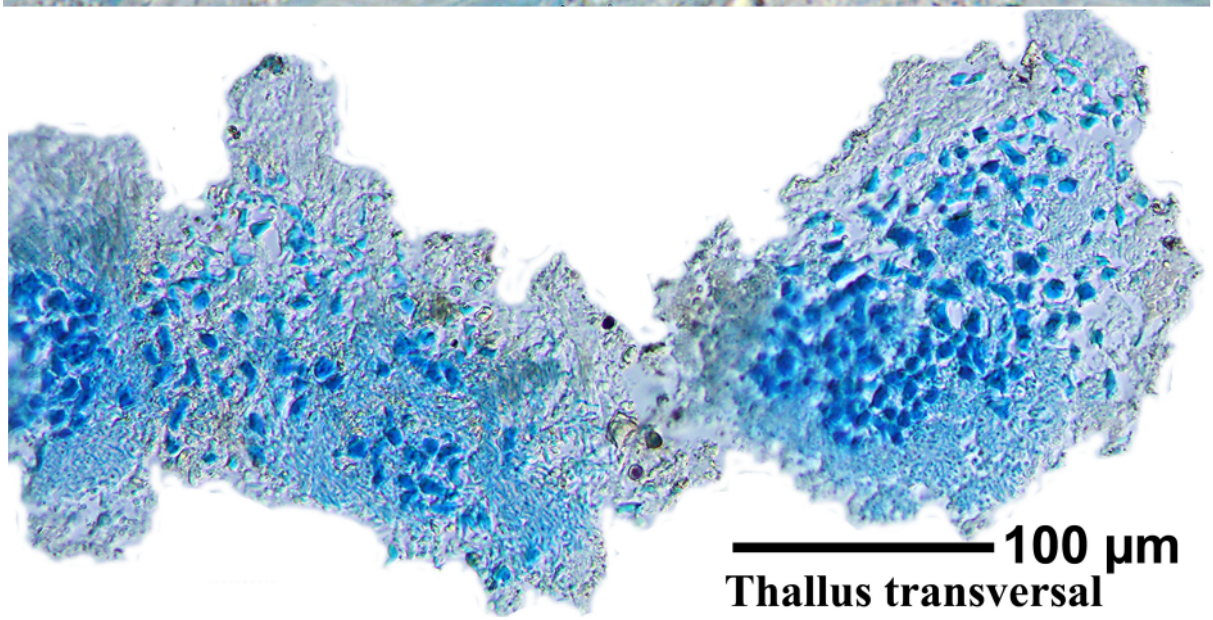


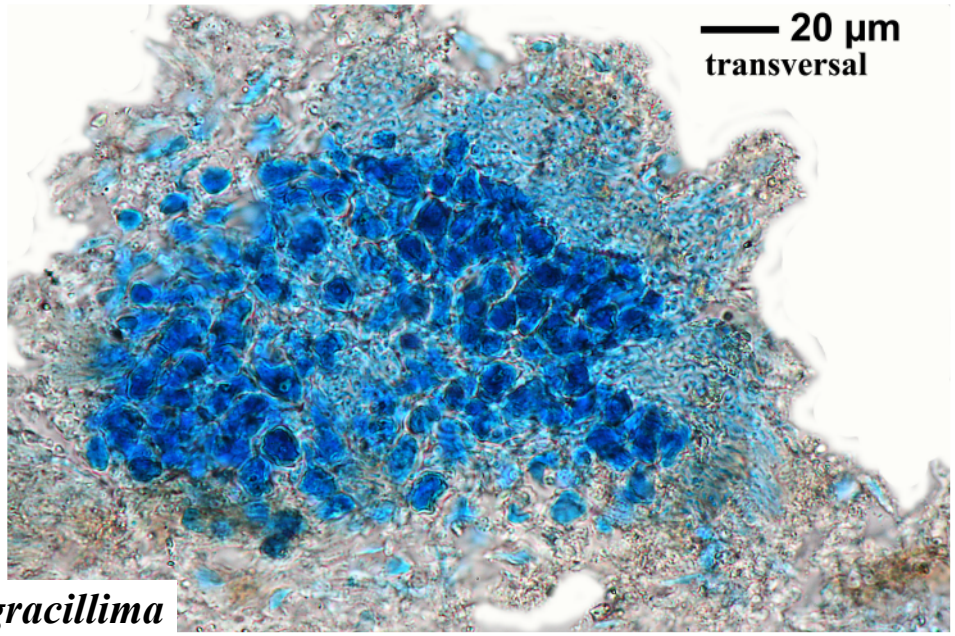




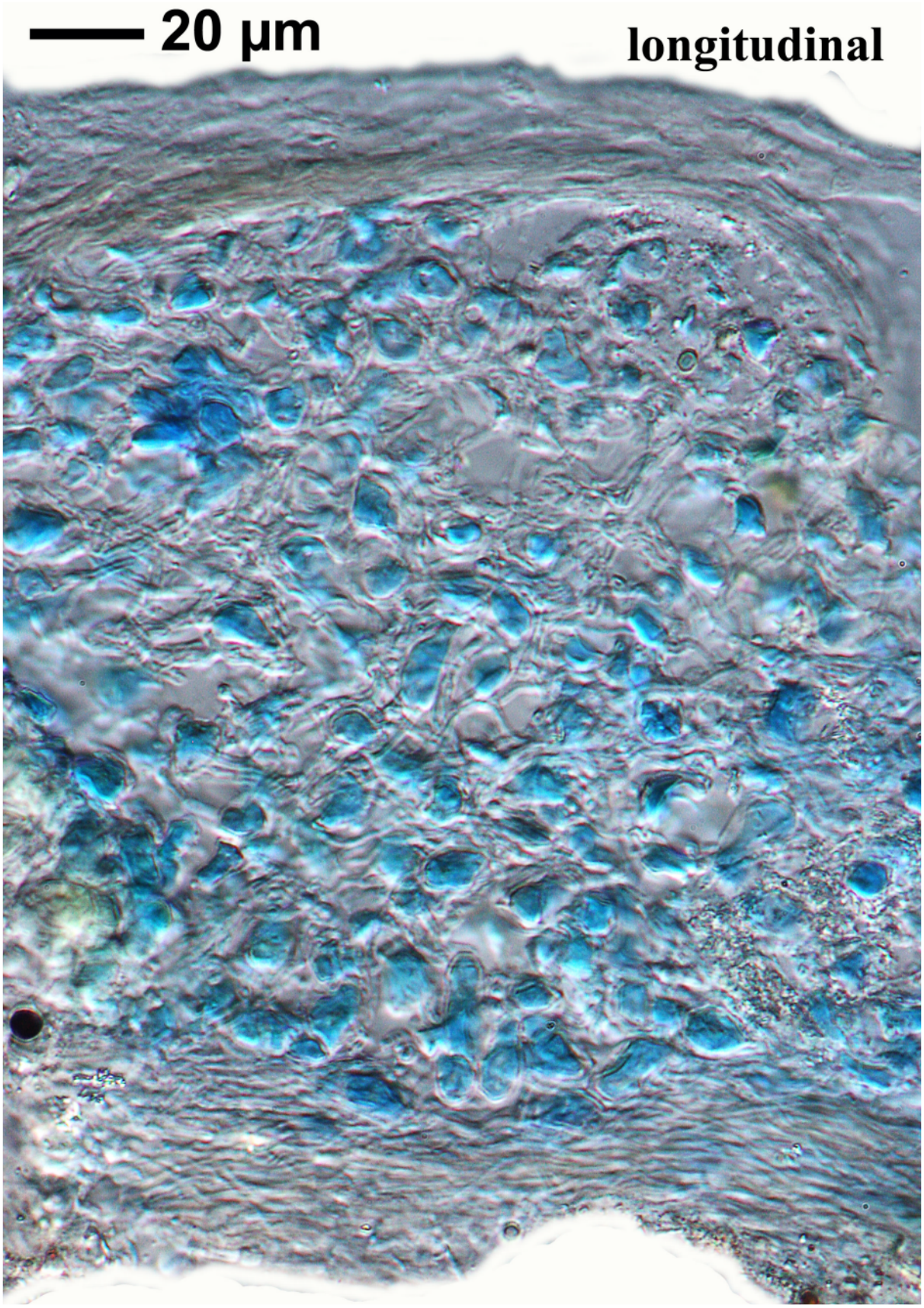
Pentagenella gracillima



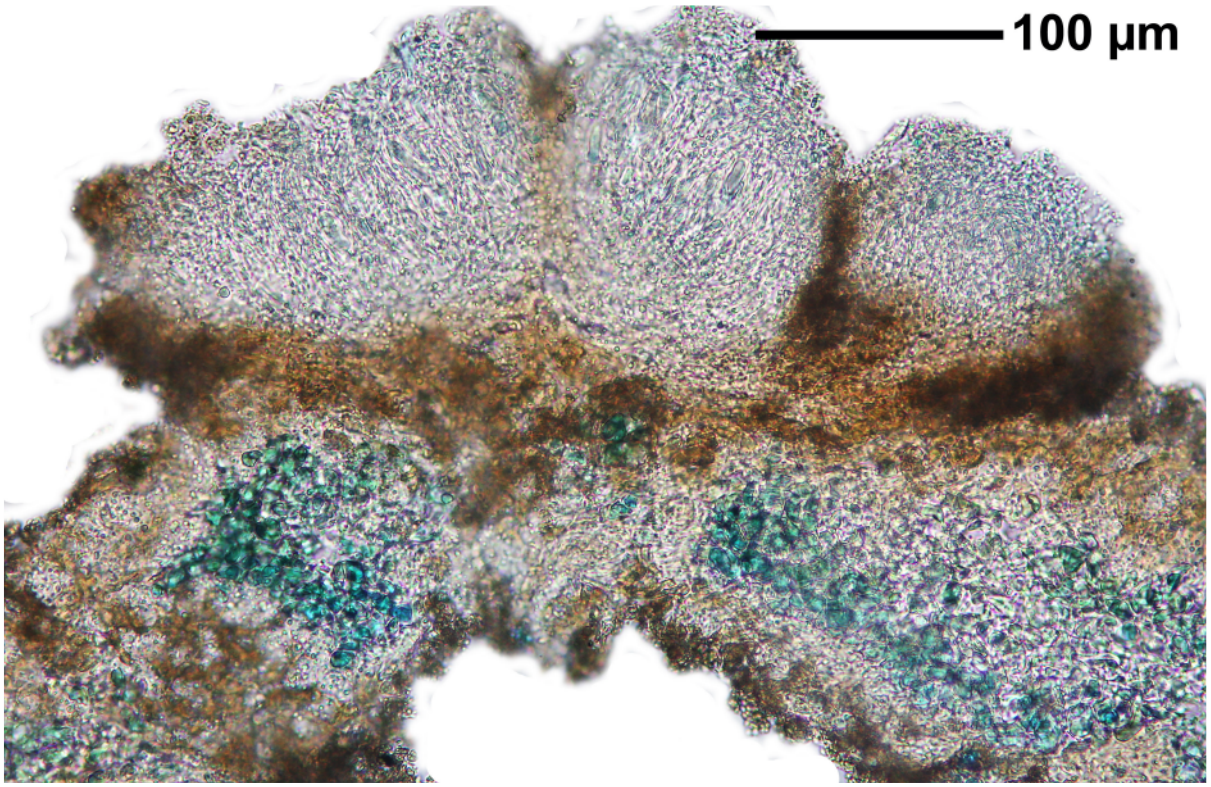


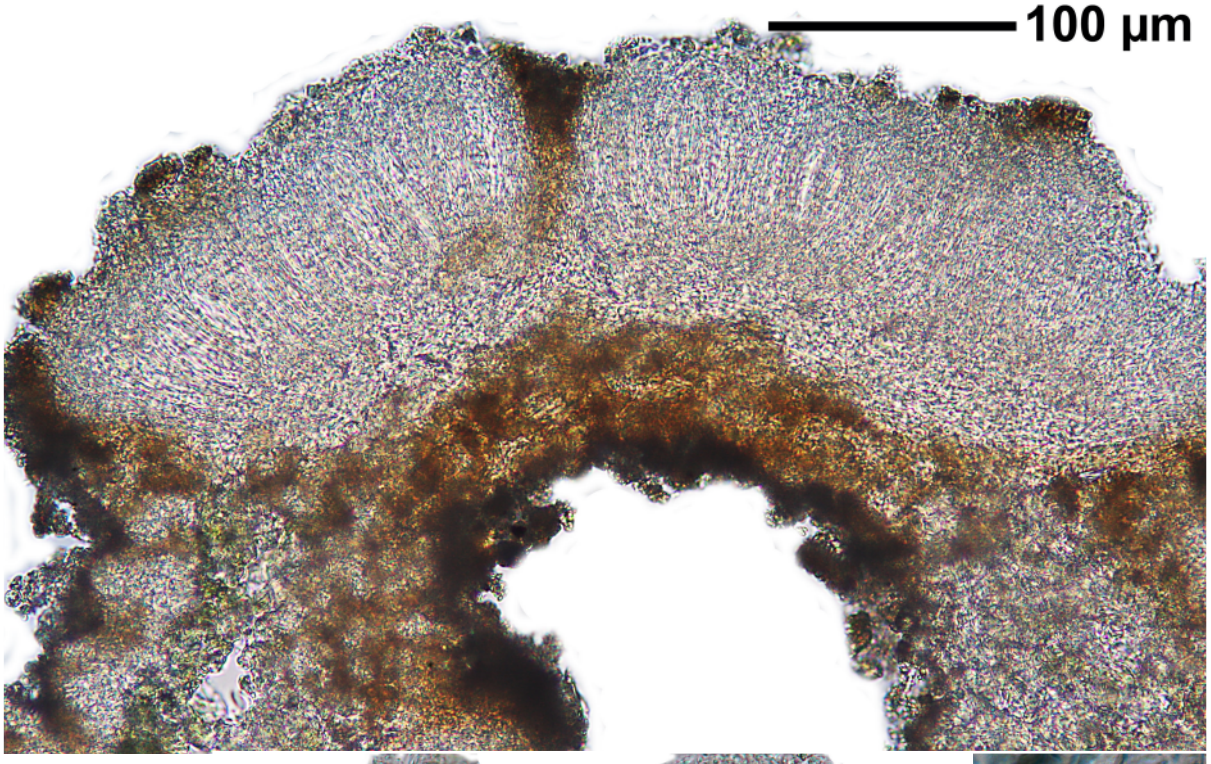


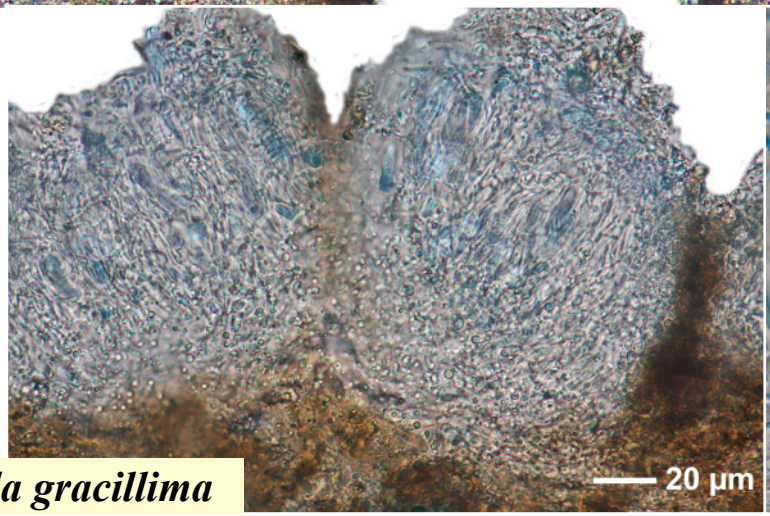
Pentagenella gracillima

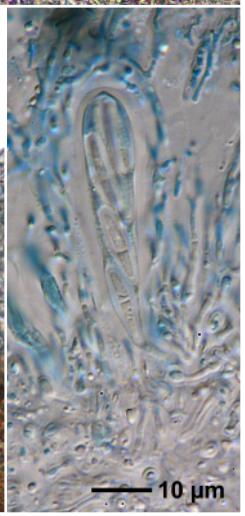


Pentagenella gracillima

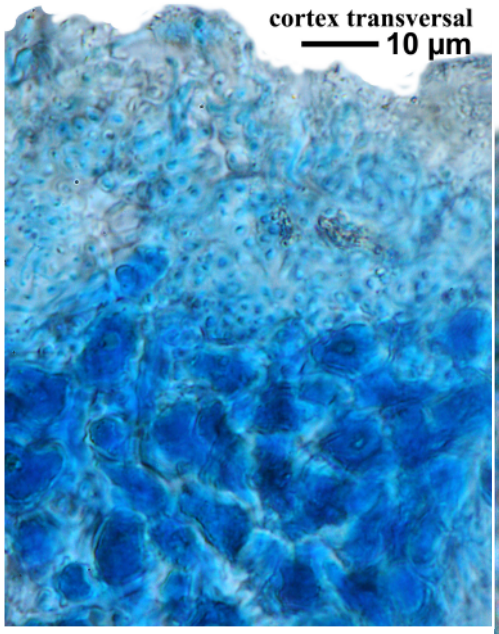


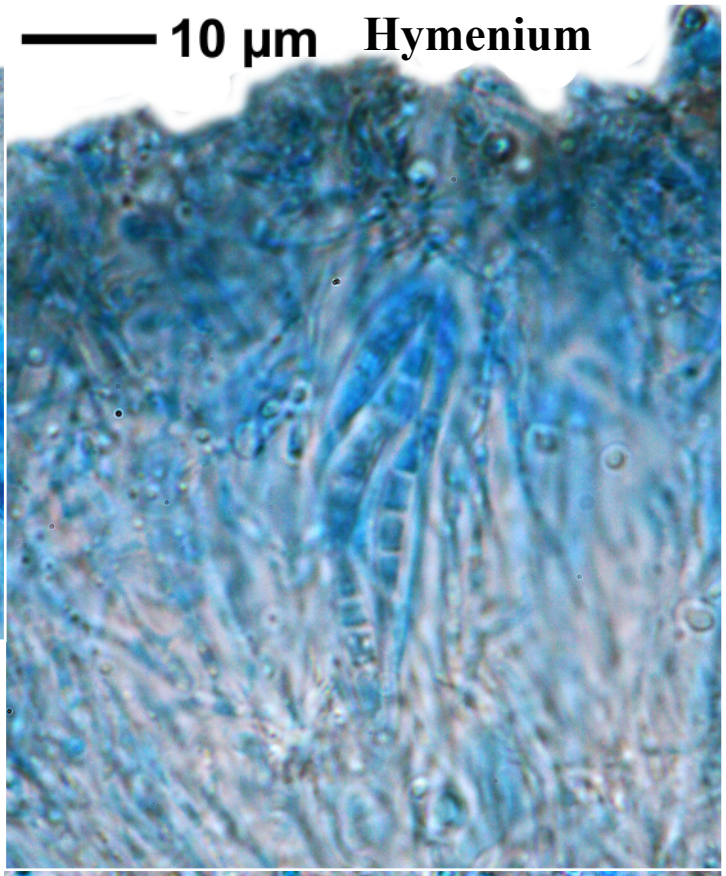






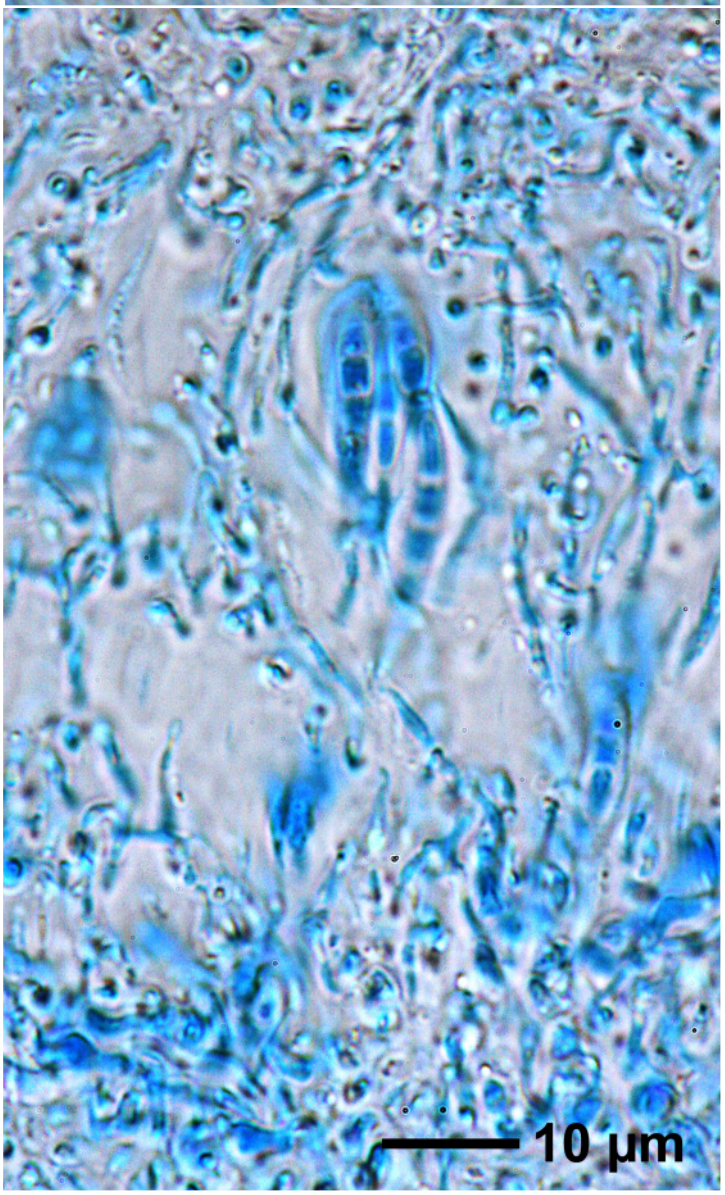
Pentagenella gracillima







10 µm

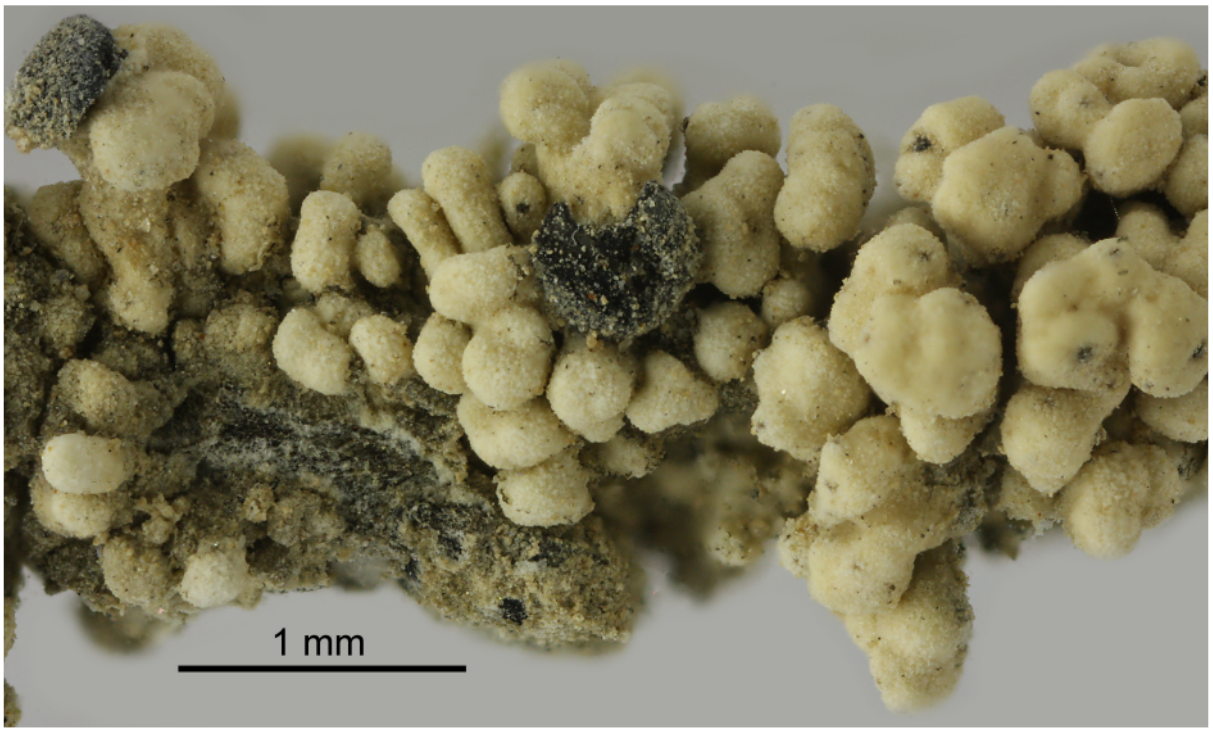


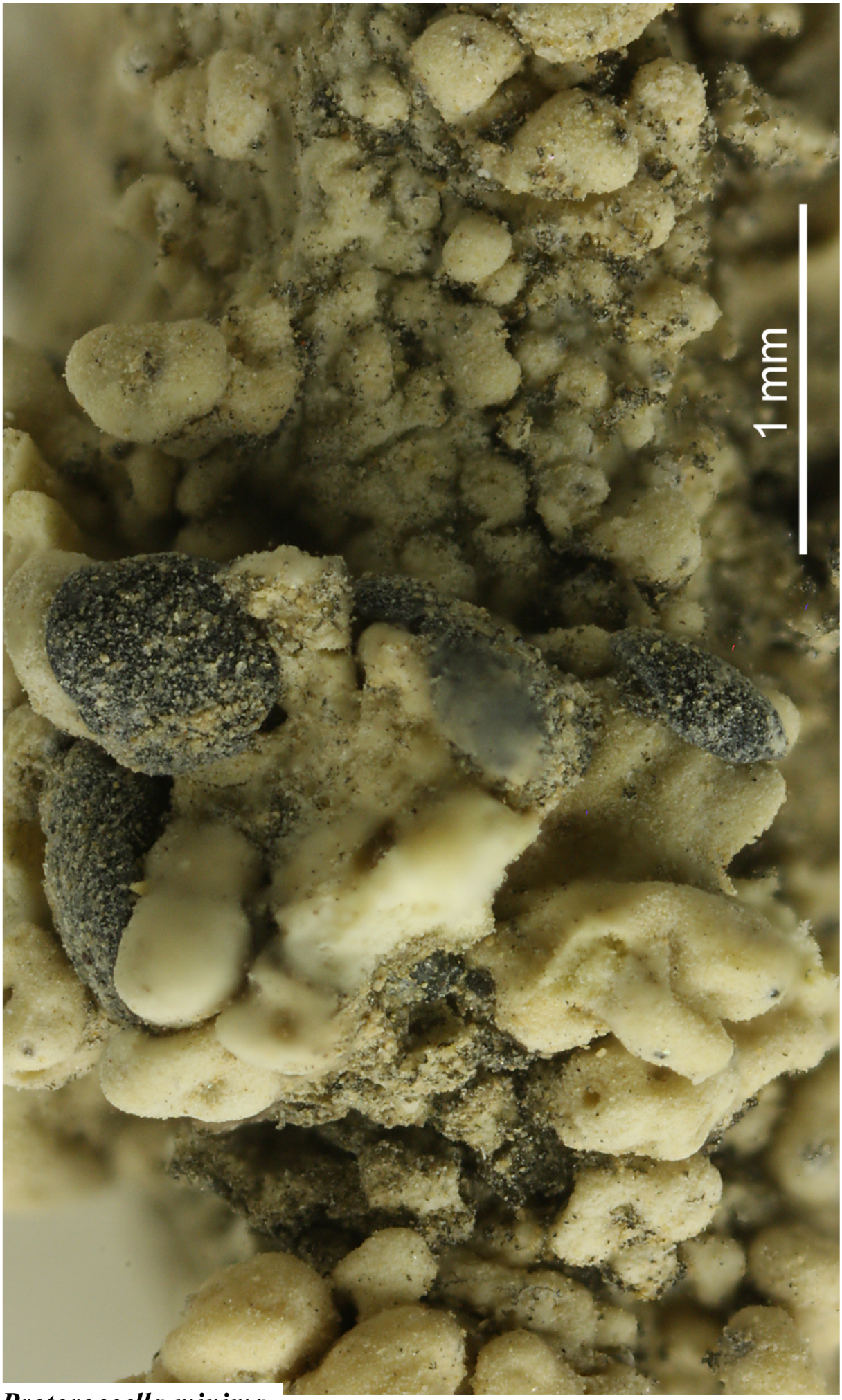
Pentagenella gracillima

Protoroccella minima (R. Sant.) Follmann (2001)
Roccella minima R. Sant. (1944)

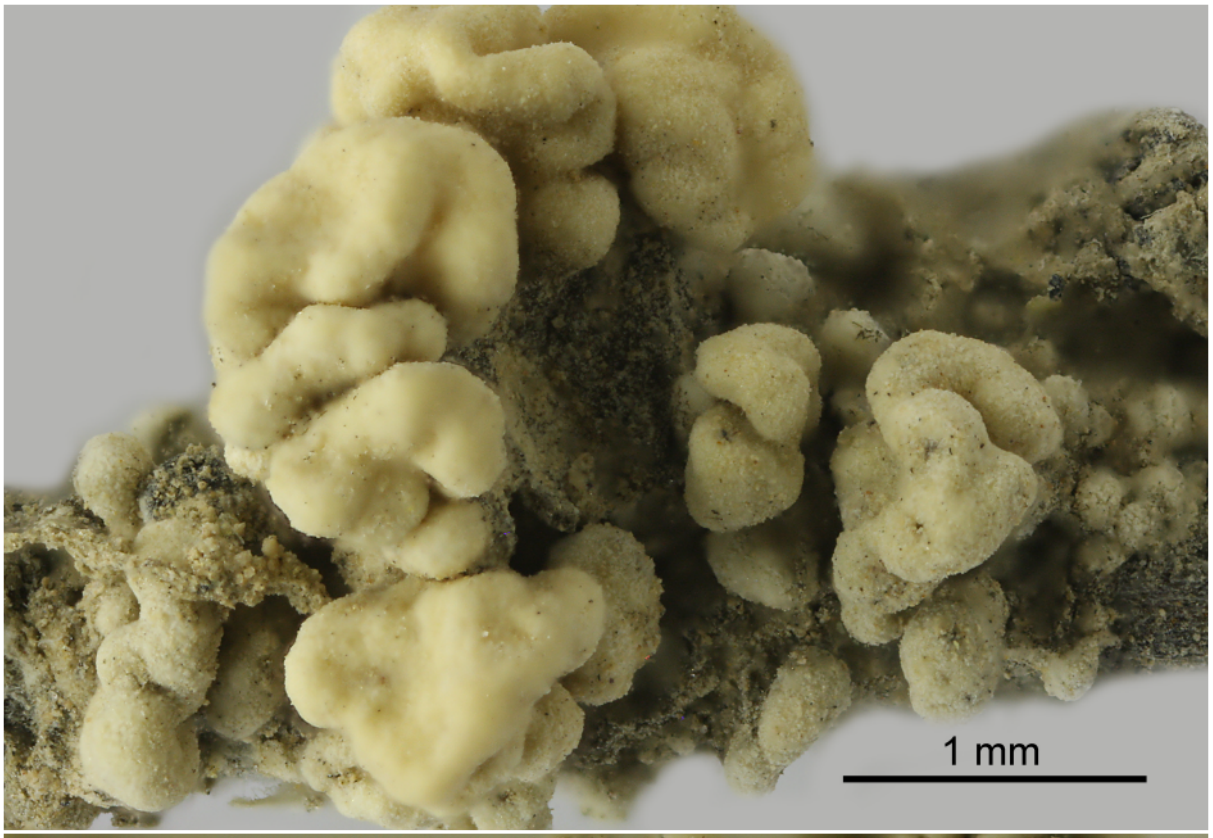
Thallus corticolous, whitish, not sorediate, texture soft, crustose squamulose to nearly pulvinate, surface dull, medulla internally lax or hollow. Cortexhyphae intricate branched. Apothecia round. Hypothecium brown to black. Ascospores hyaline, 4-septate, (16–)20–25 × 2.5–4.5 ìm. Cortex C –, K + yellow, Pd + yellow, medulla C –, IKI + blue, major substance psoromic. – Chile.

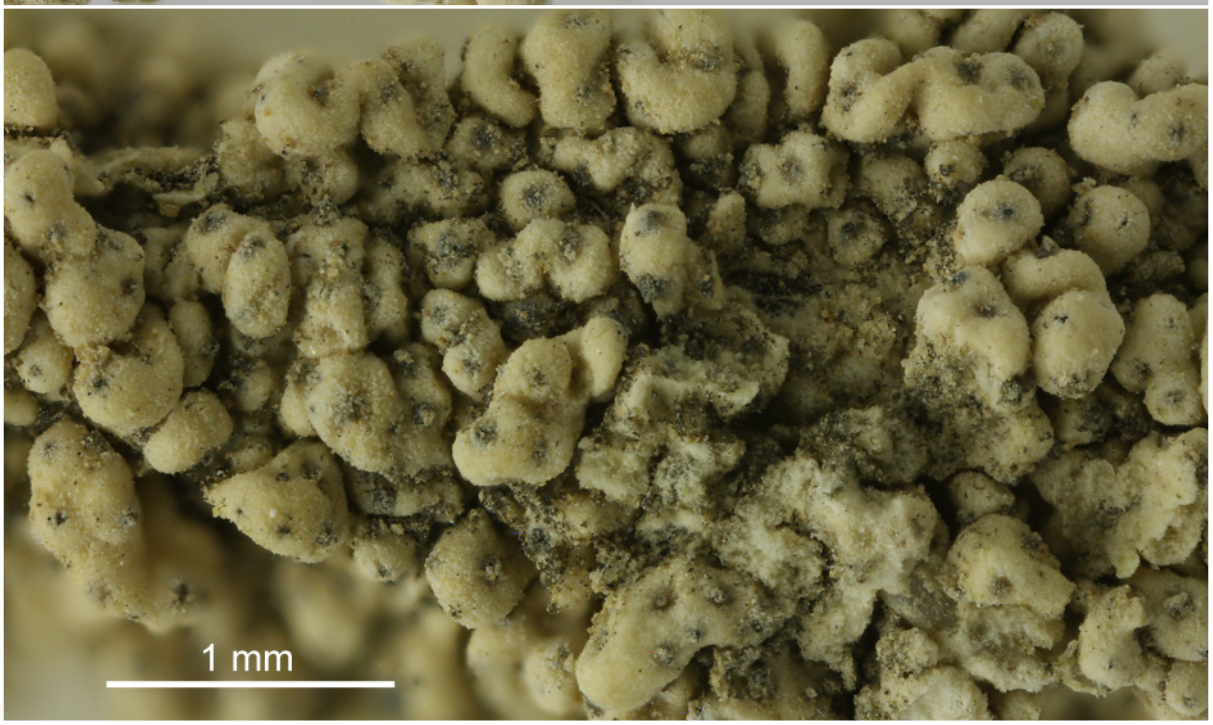
Chile, Antofagasta, Paposo north of Taltal, upper fog-belt, on somewhat sheltered, weather-beaten branches of dry shrubs in a steep crevice, about 600 m elevation, W-SW exposition, generally very rare, but in this favourable habitat relatively numerous. Leg. G. Follmann Dec. 1991, det. Follmann. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 443. [9991]



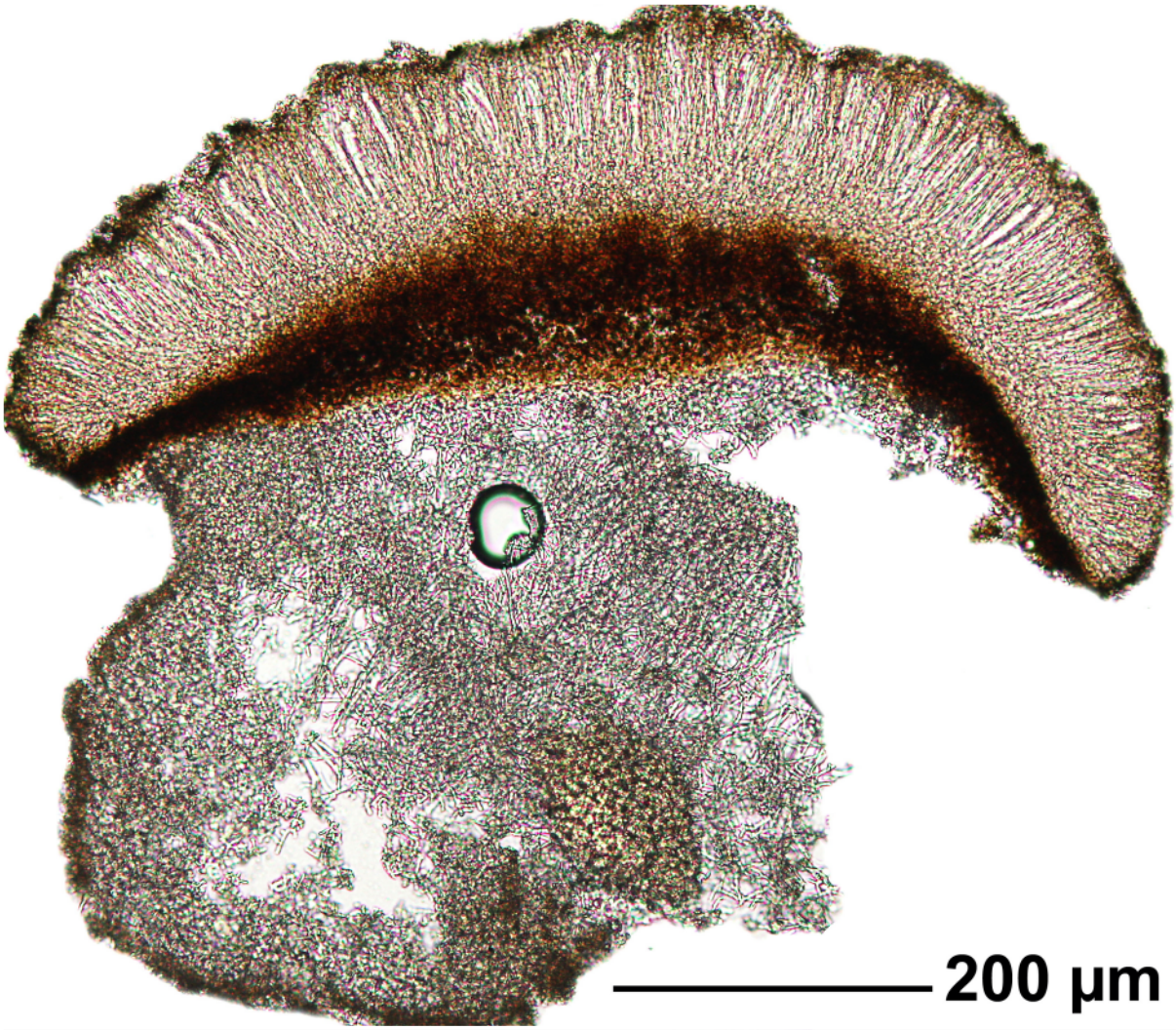


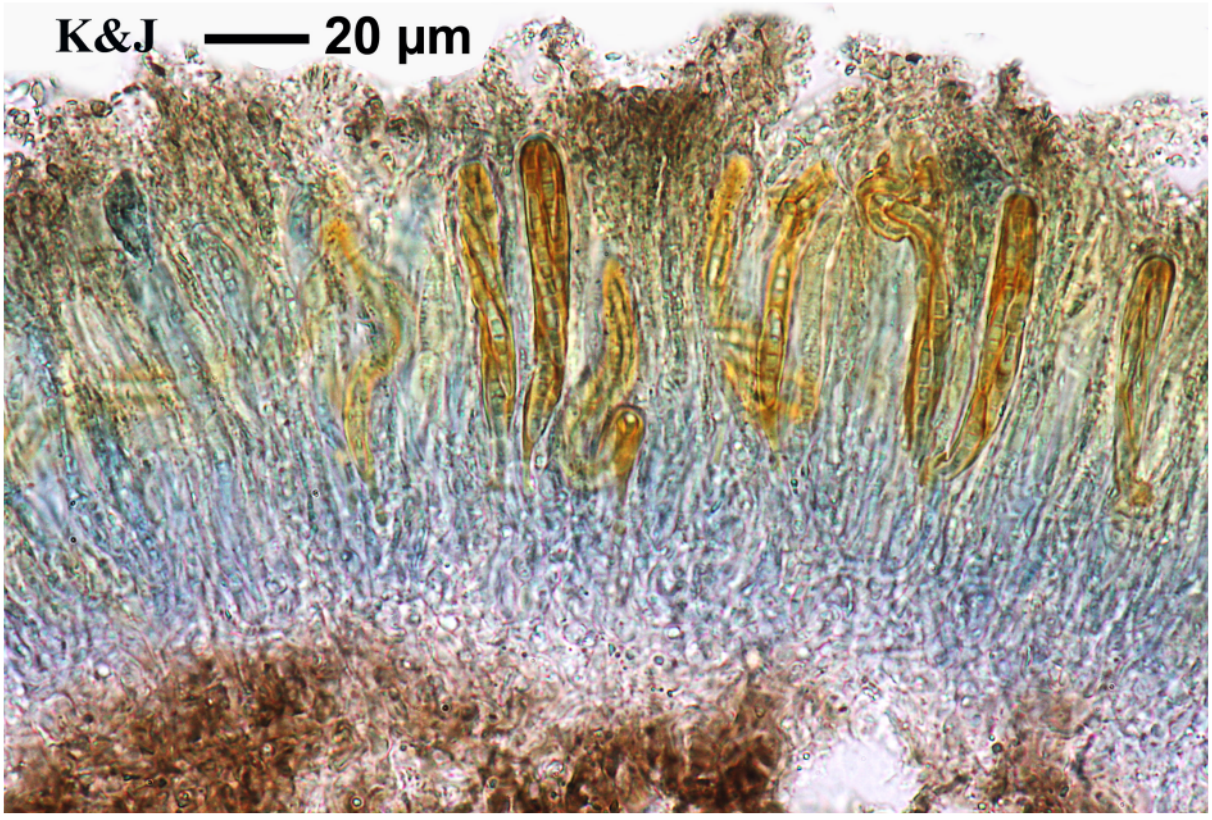
Protoroccella minima



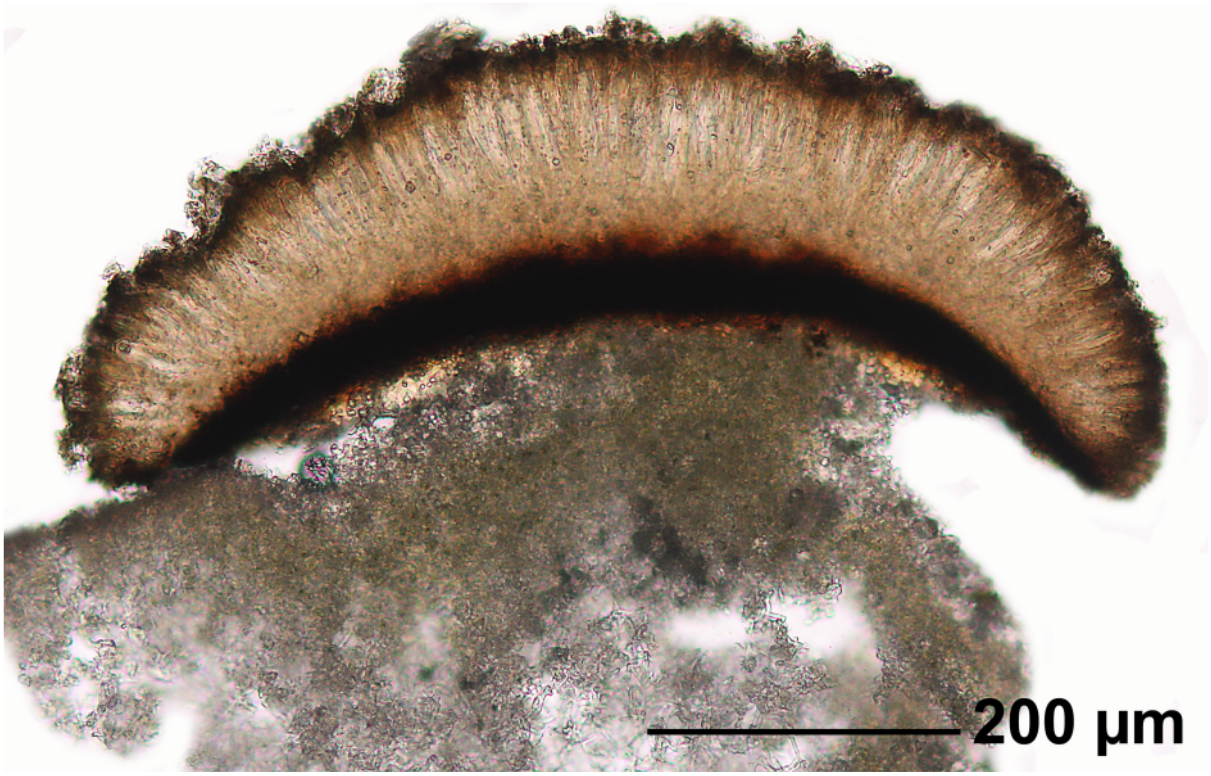


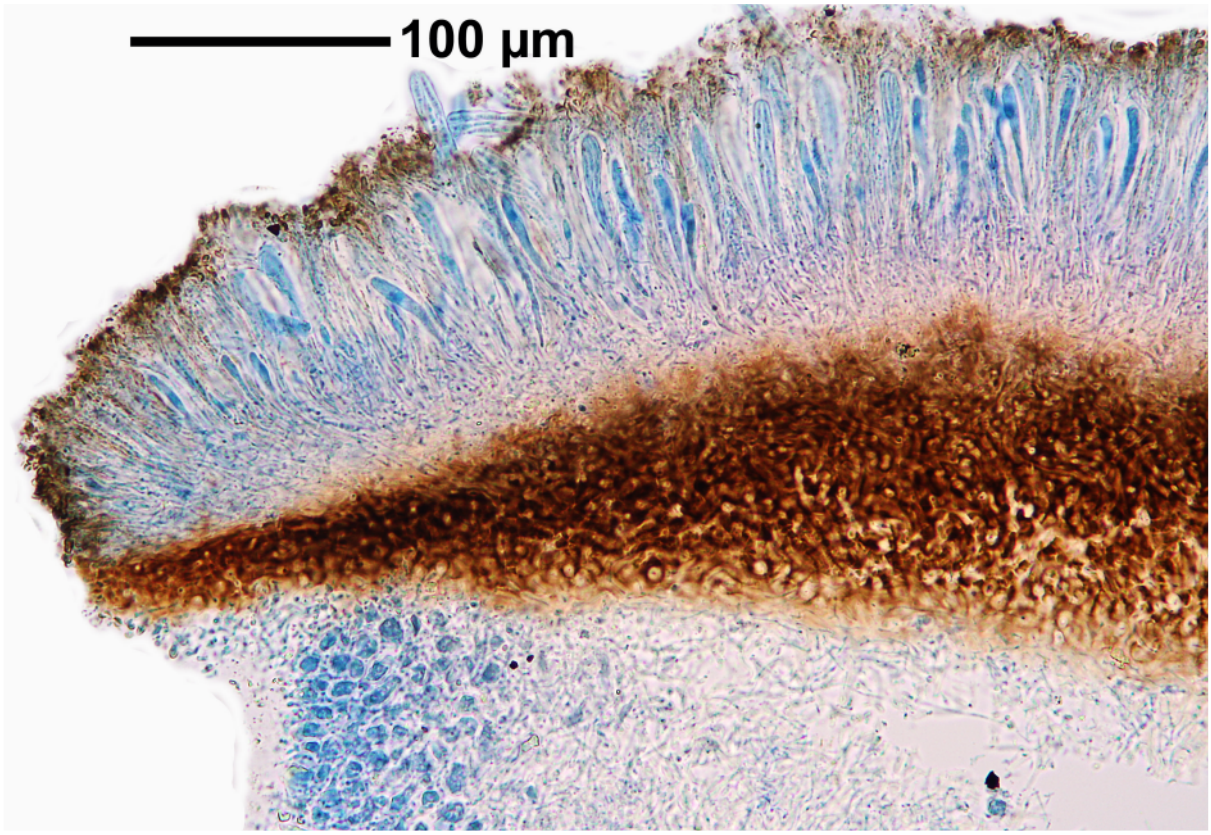
Protoroccella minima





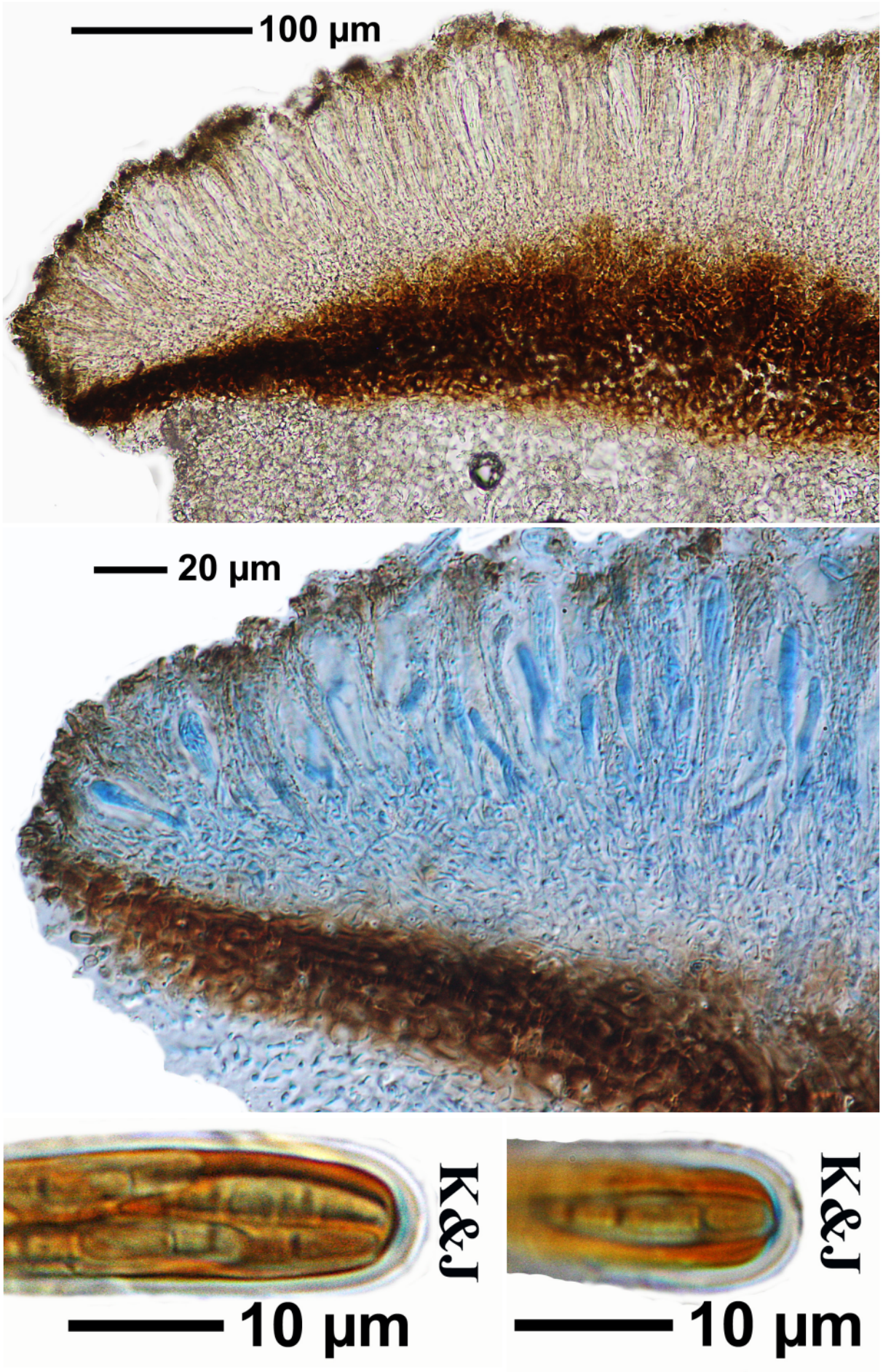
Protoroccella minima



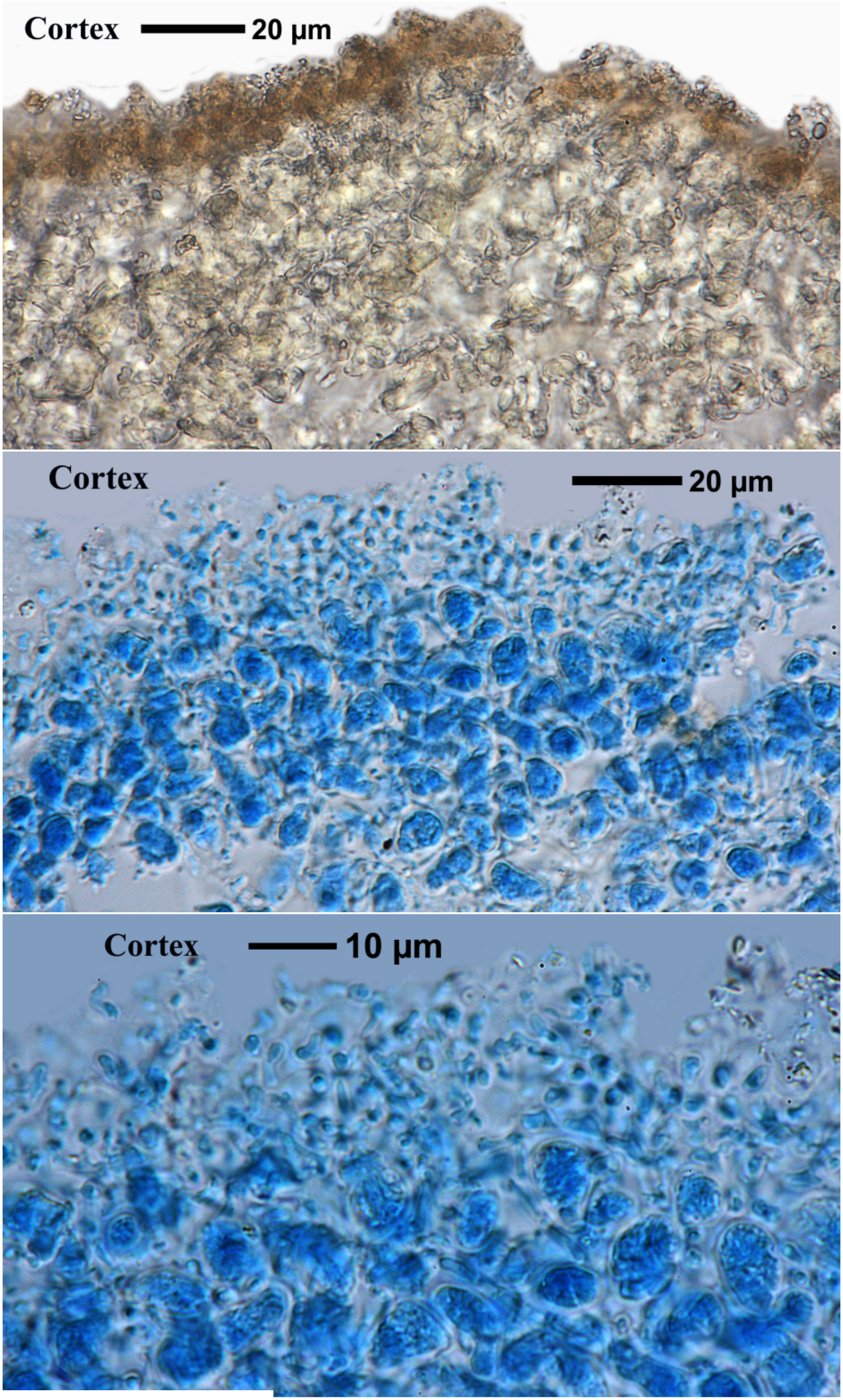




Protoroccella minima



Protoroccella minima



Protoroccella minima

Roccella africana Vain. (1901)
Roccella podocarpa Vain. (1901)
Roccella subpodicellata (Vain.) Follmann & Huneck (1974)
Roccella subpodicellata f. *complanata* (Vain.) Follmann & Huneck (1974)
Roccella tinctoria var. *subpodicellata* Vain. (1901)
Note. *Roccella tinctoria* sensu most authors.

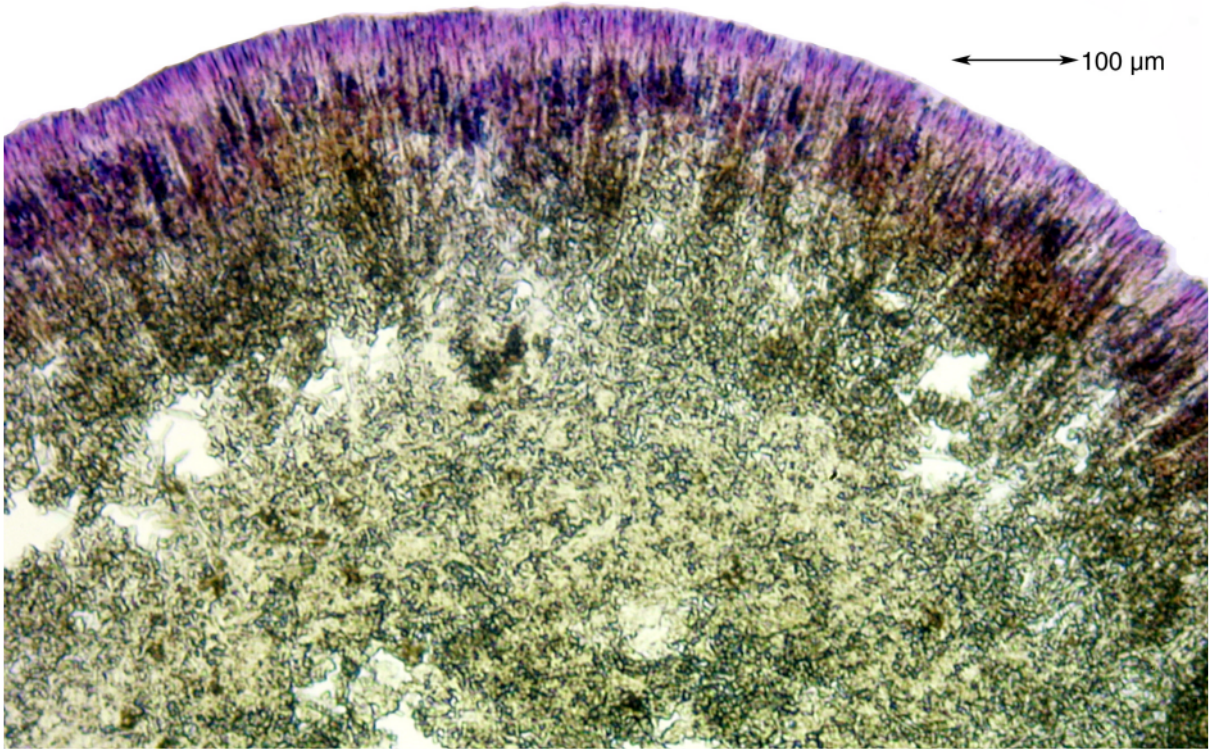
Thallus saxicolous, grey to brown, rarely sparsely sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex palisade plectenchyma. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 18–25 × 3–5 µm. Cortex C + red, K + yellow, Pd –, subcortex C + red, medulla C –, IKI –, major substances erythrin, lecanoric, roccellic. – Angola, Namibia, S. Africa, Madagascar, Madeira.

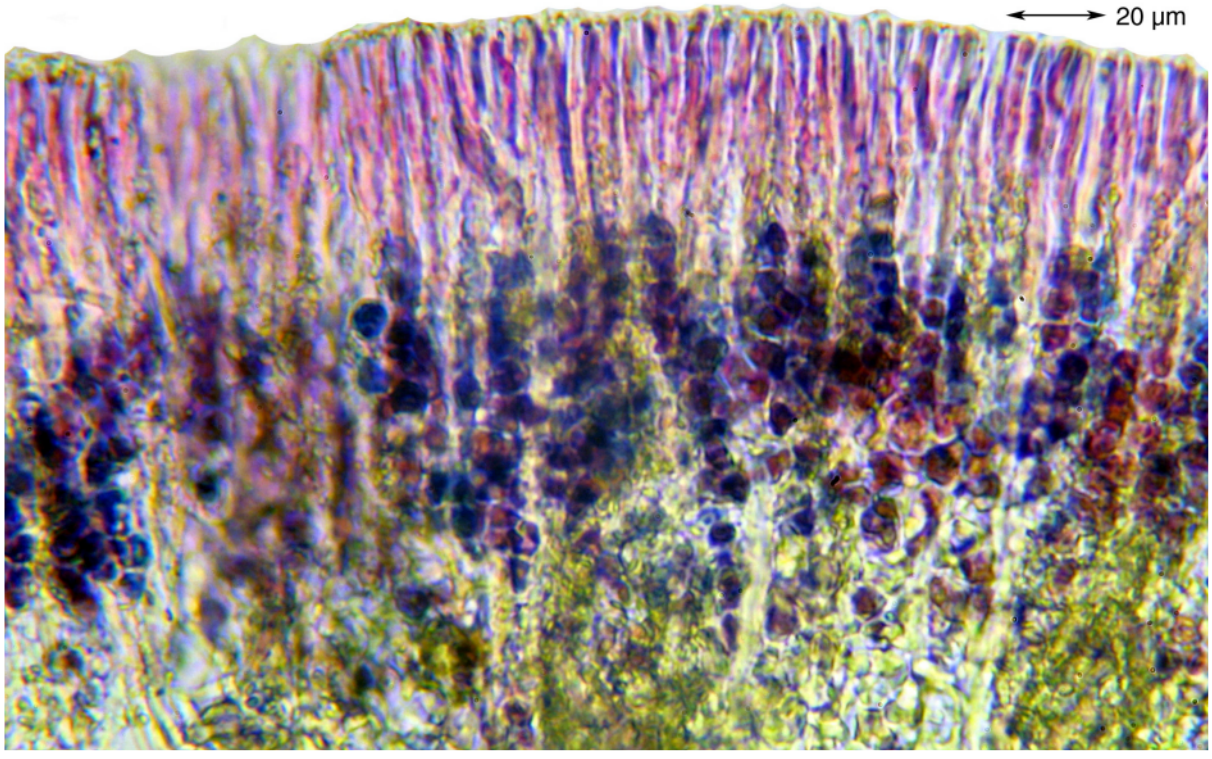
PORTUGAL, MADEIRA: Ponta de S. Lourenco bei Prahinha östlich Canical, windgefegte Lavablöcke, N 32°44.959, W 16°42.521, 111 m, Leg. Schumm 17.04.2001. [8701]



***Roccella* africana**





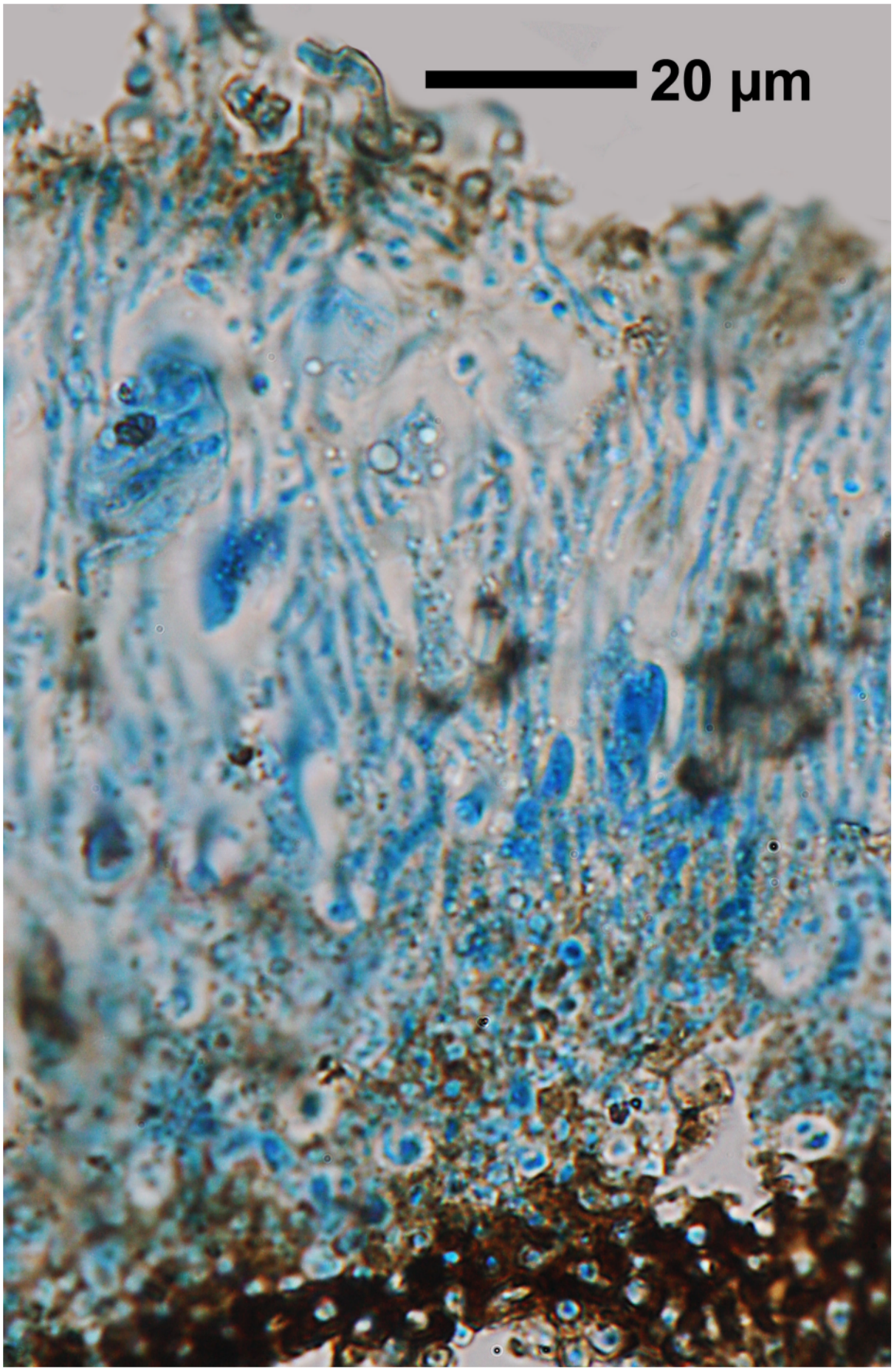


Roccella africana

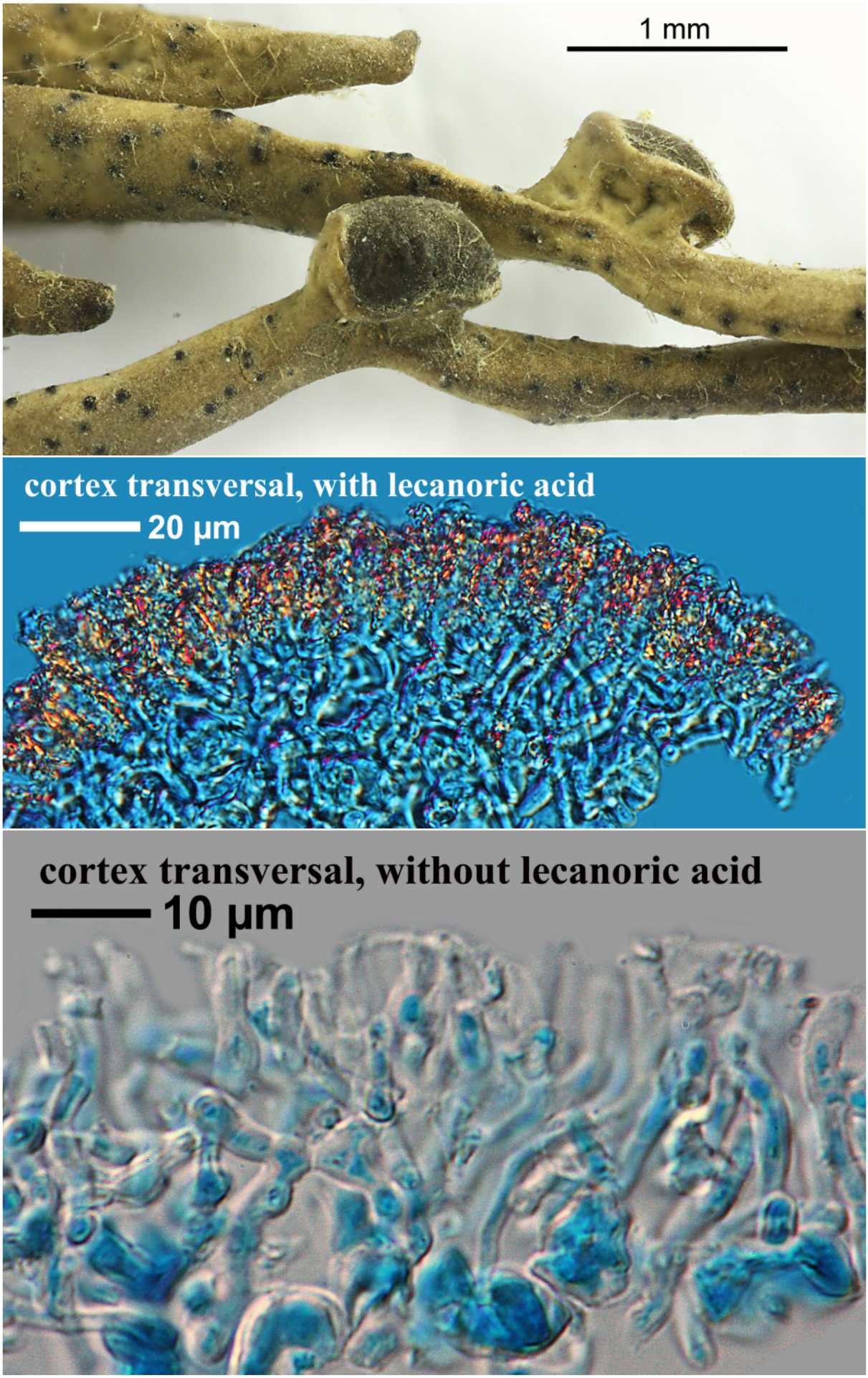
Roccella africana Vain.

Madagascar, Isalo mountains, prov. Fianarantsoa, on rocks. Leg. unknown, det. Aptroot 1986. [ABLsnMad]

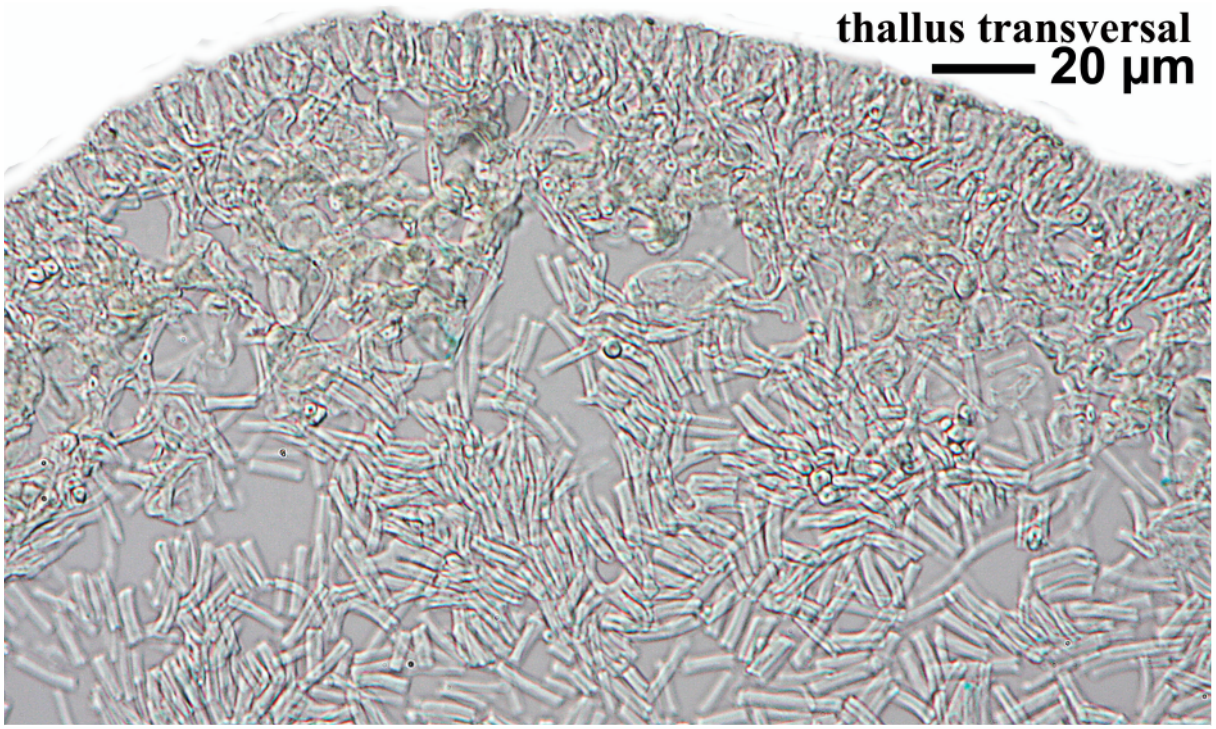


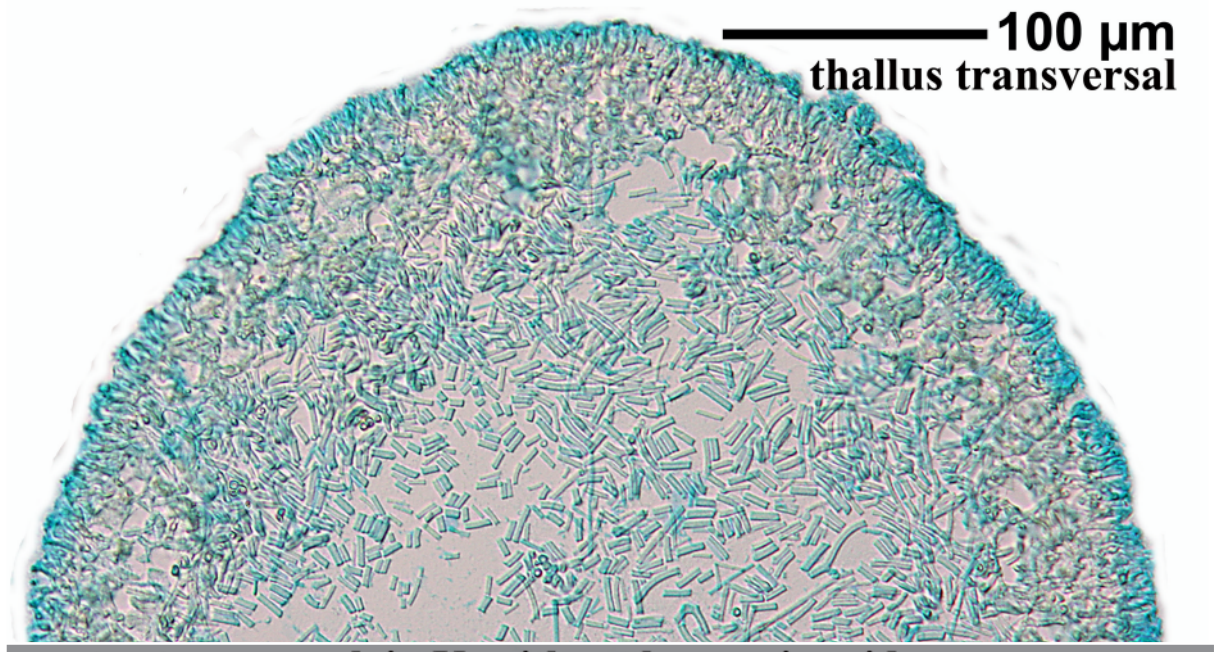


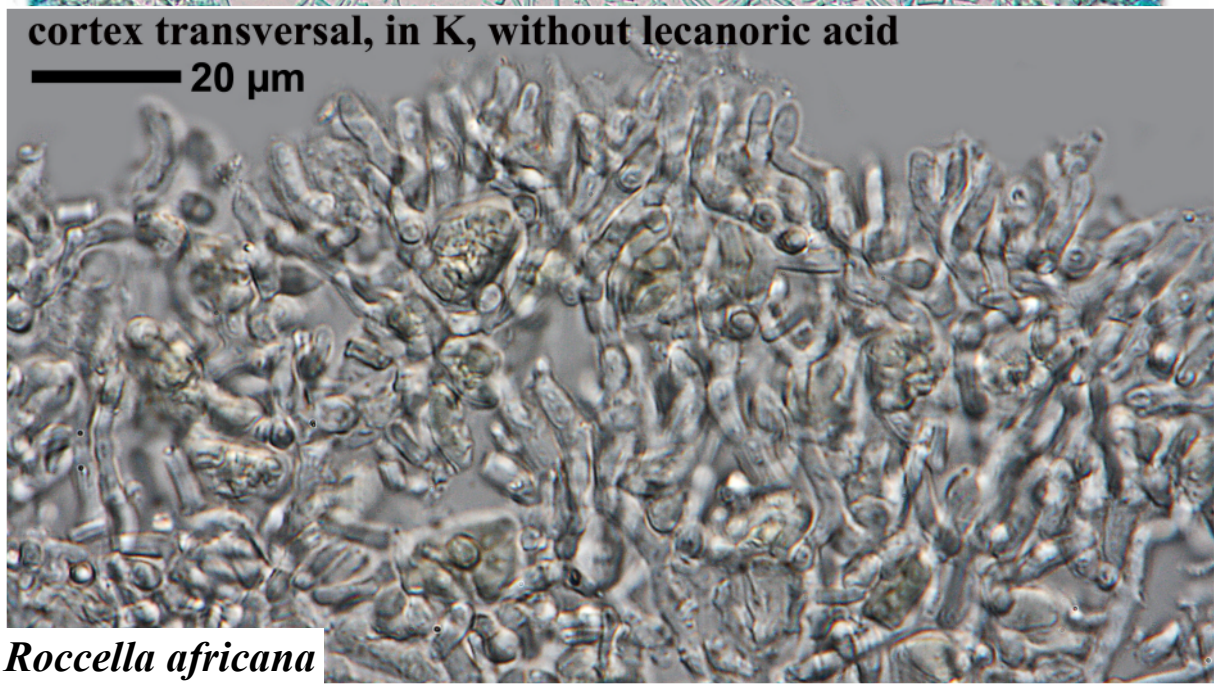
Roccella africana



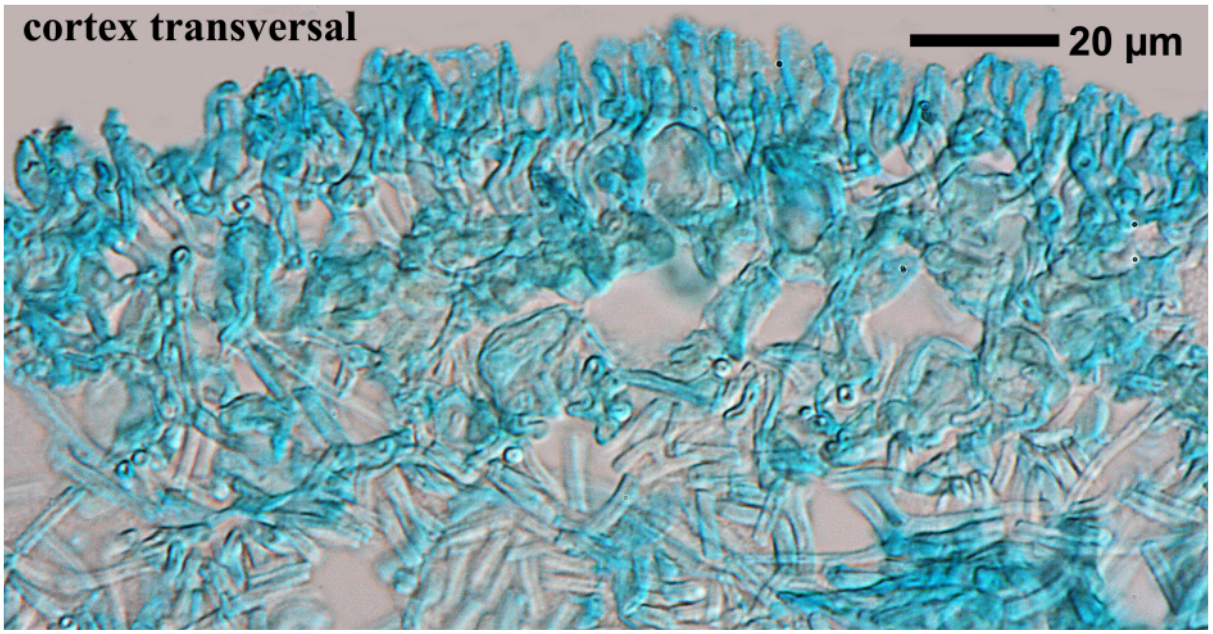
Roccella africana

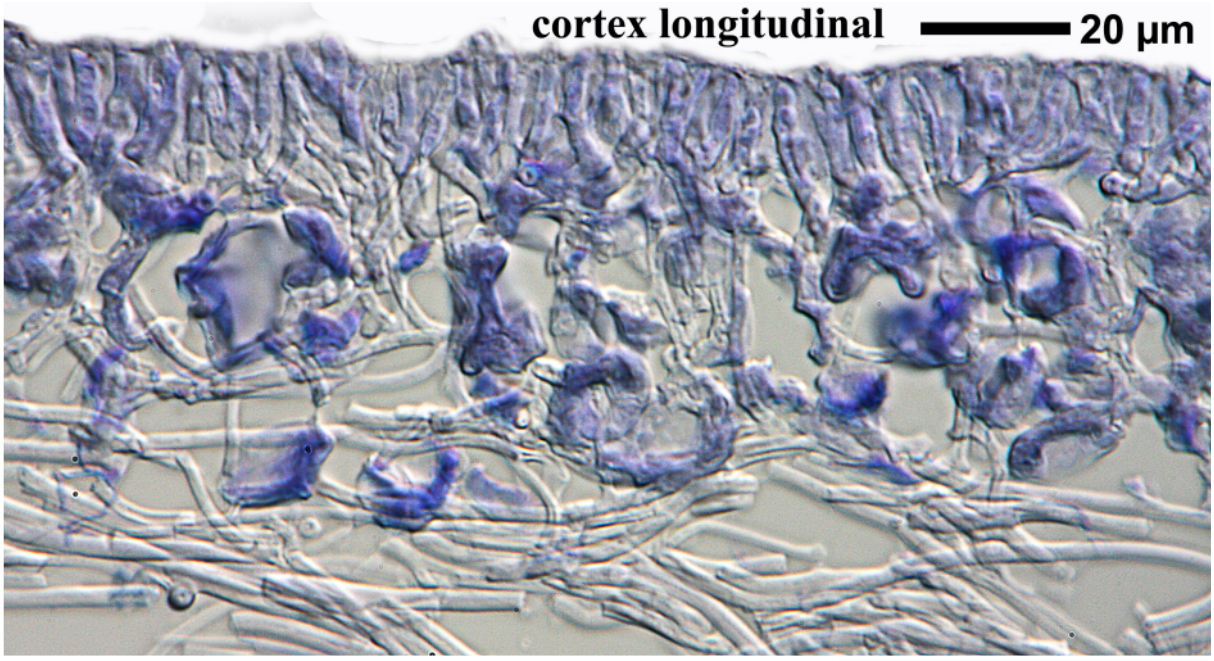


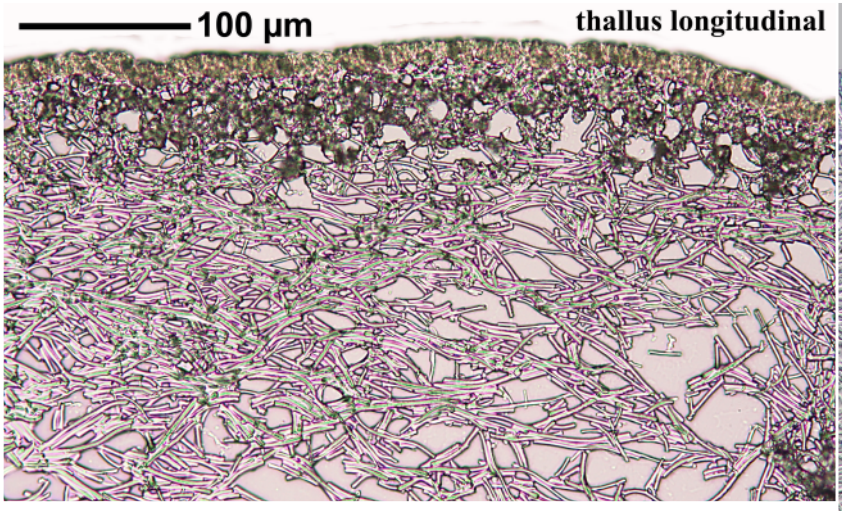


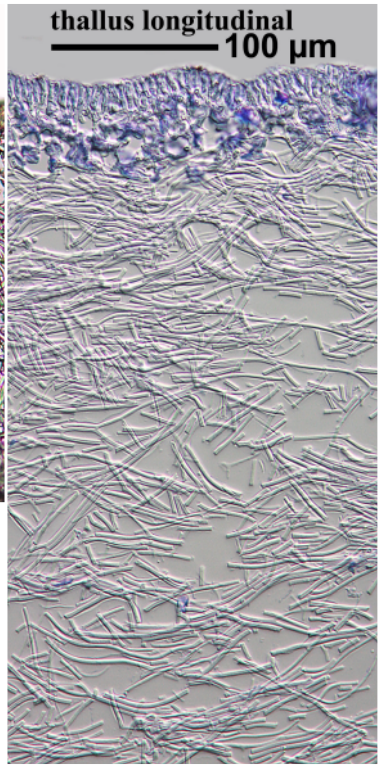


Roccella africana

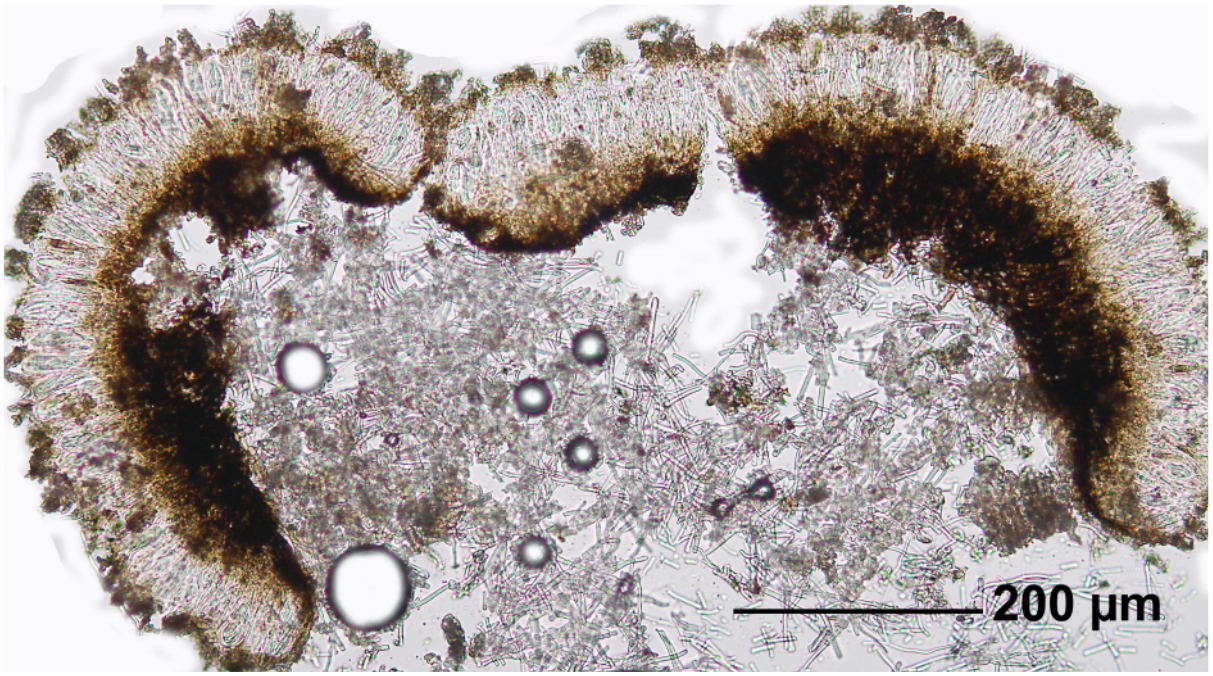


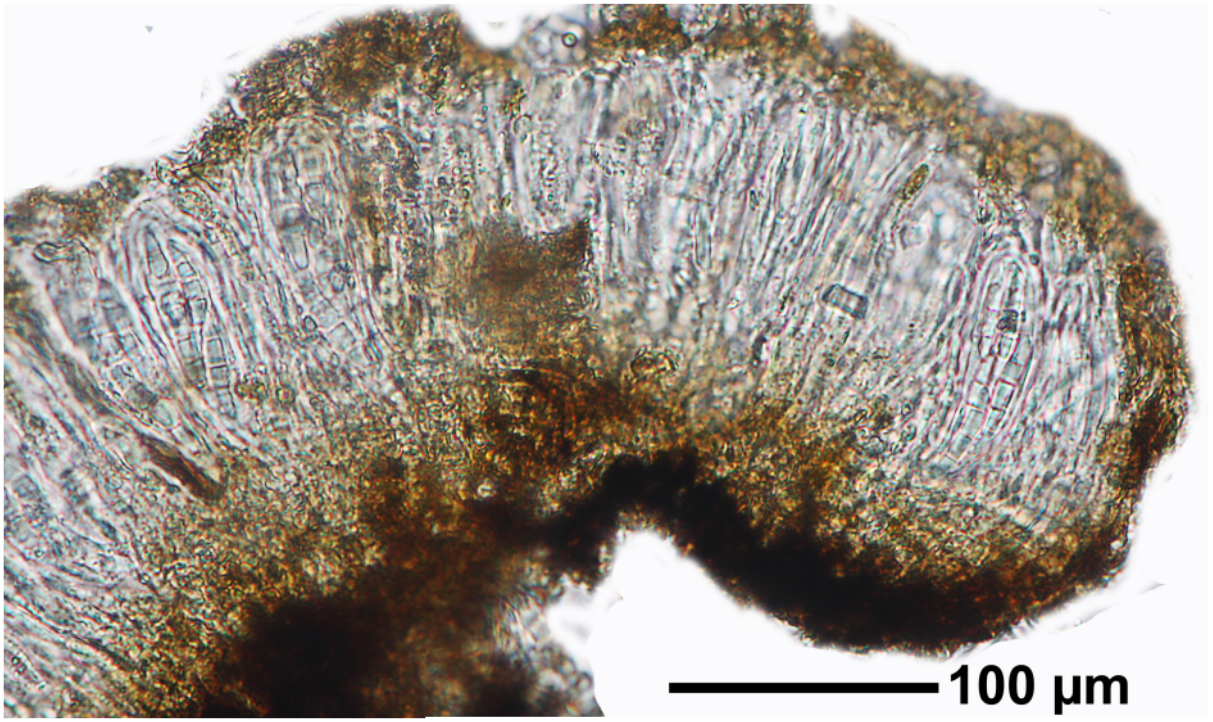


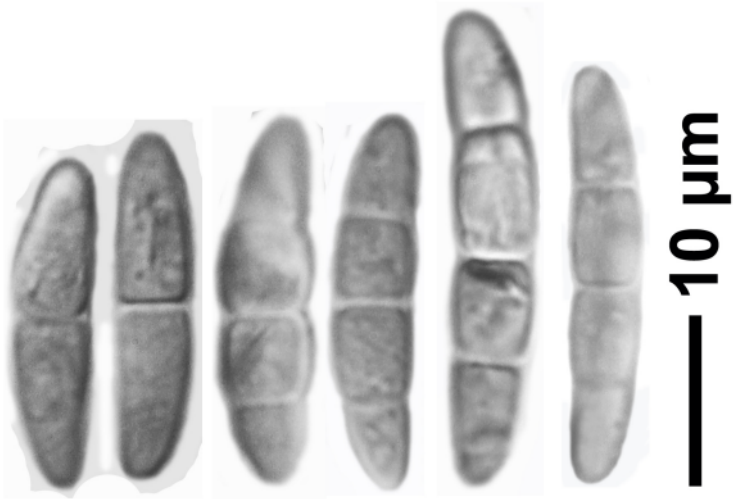




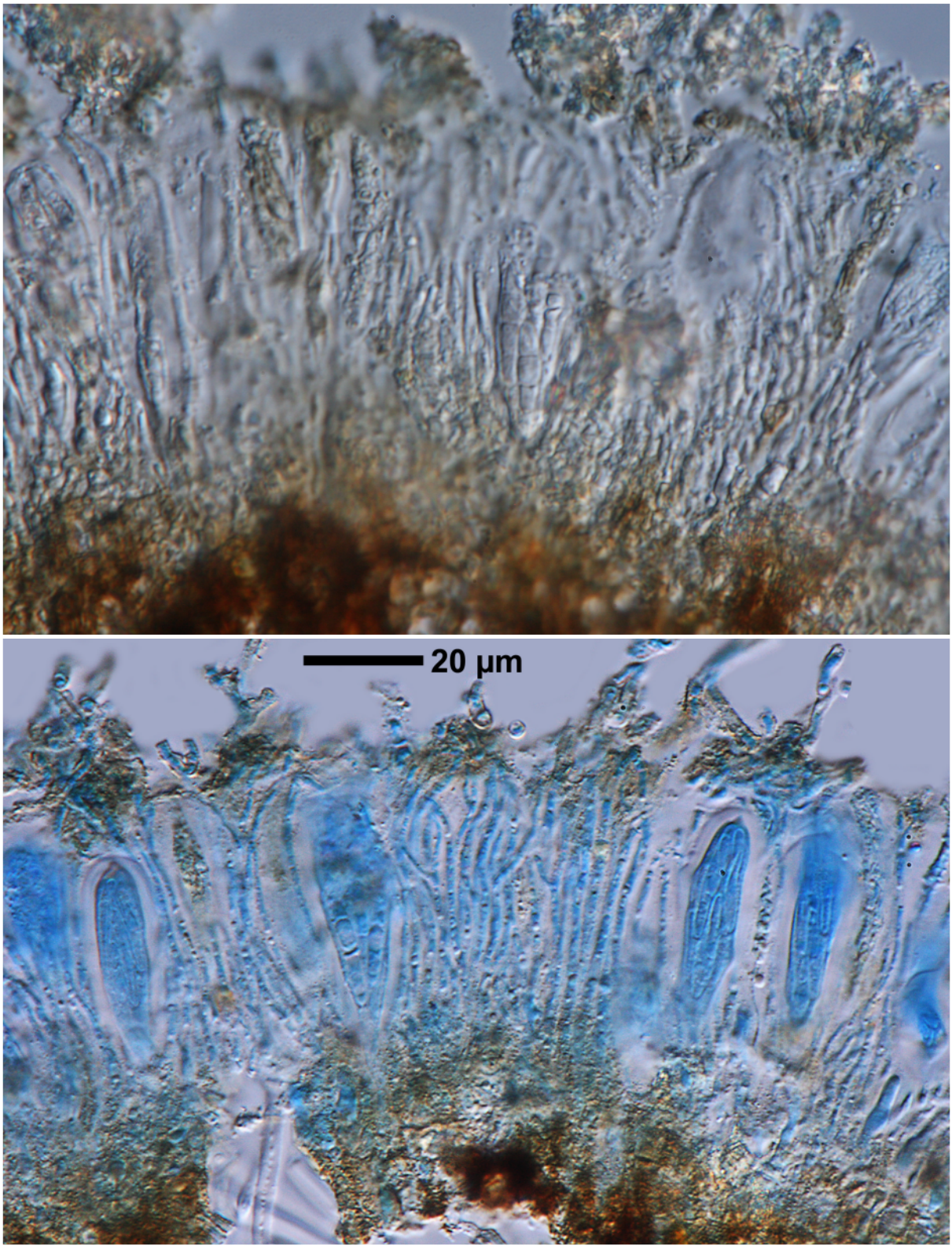
Roccella africana







Roccella africana

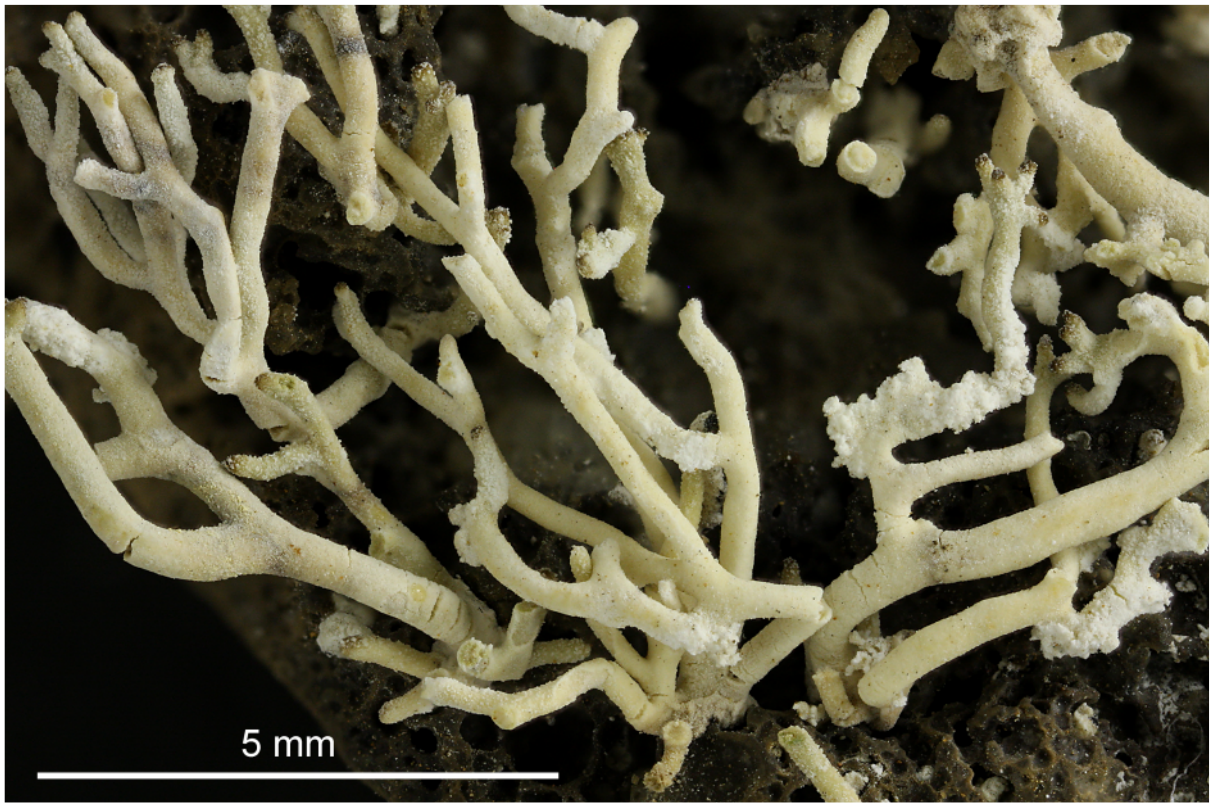


Roccella africana

Roccella albida Tehler (2009)

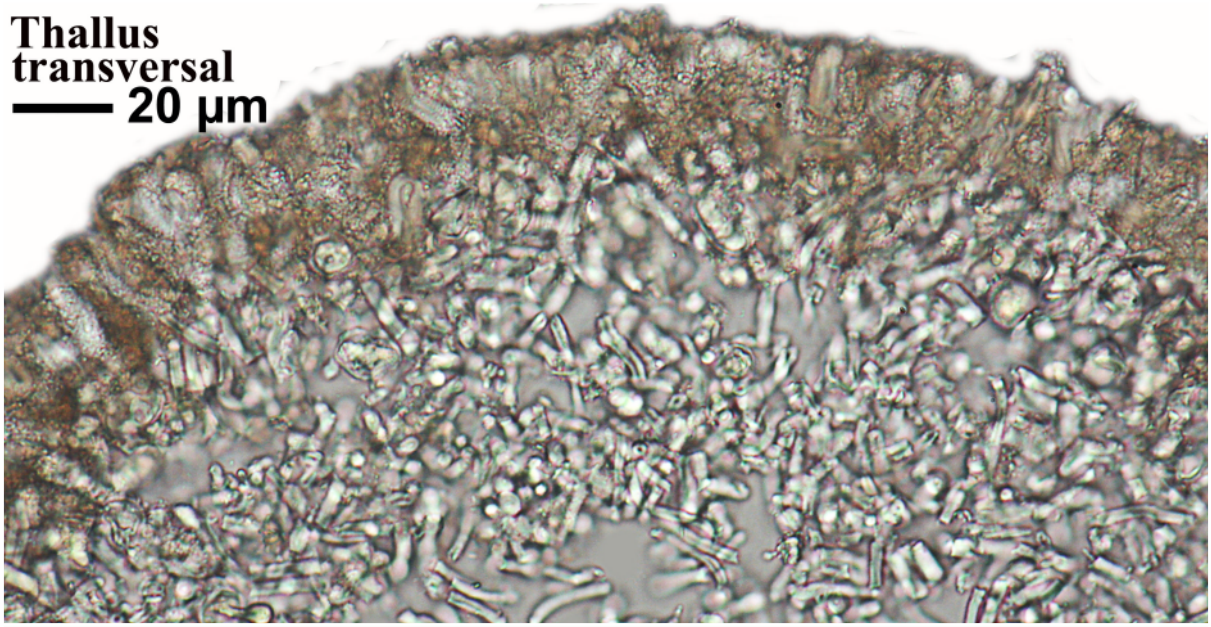
Thallus saxicolous, white, sorediate or not, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex more or less palisade plectenchymateous. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 22–26 × 5–6 µm. Cortex C + red, K –, Pd – or + orange, subcortex C –, medulla C –, IKI+ violet, soralia if present C –, major substances erythrin, lecanoric, protocetraric. – Galapagos.

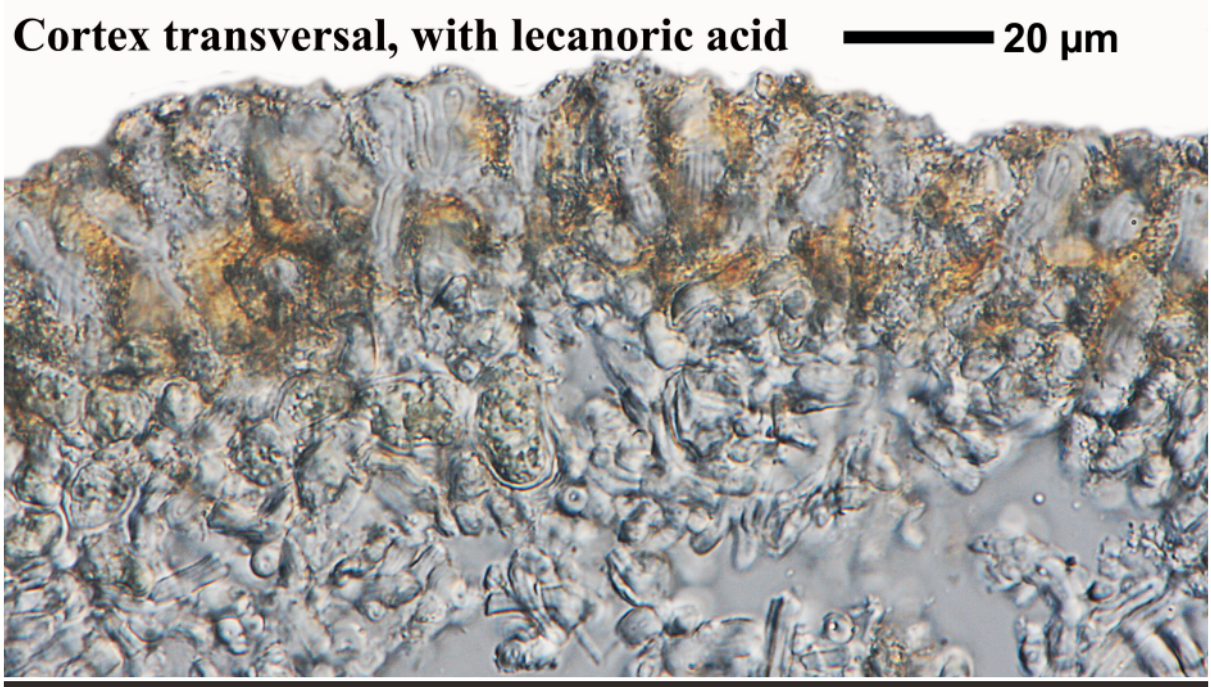
Ecuador, Galápagos Islands, Isabela Island, Cerro Alcedo, highest cinder cone along the trail going up the E-slope. Arid lowlands, basalt outcrops, at the bottom scattered Bursera graveolens trees and shrubs of Castela galapageia on lava, 0°23’37” S, 91°01’31” W, 250 m. Leg. et det. A. Aptroot 10.03.2006. [ABL64997]

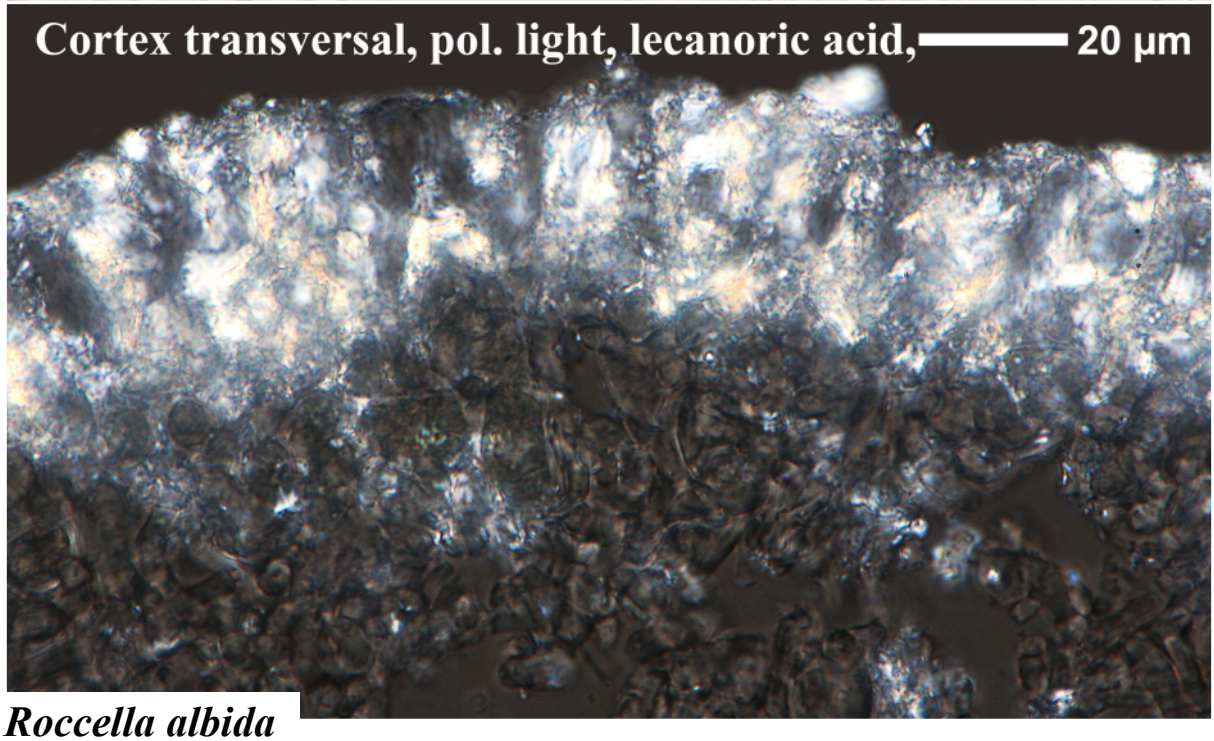




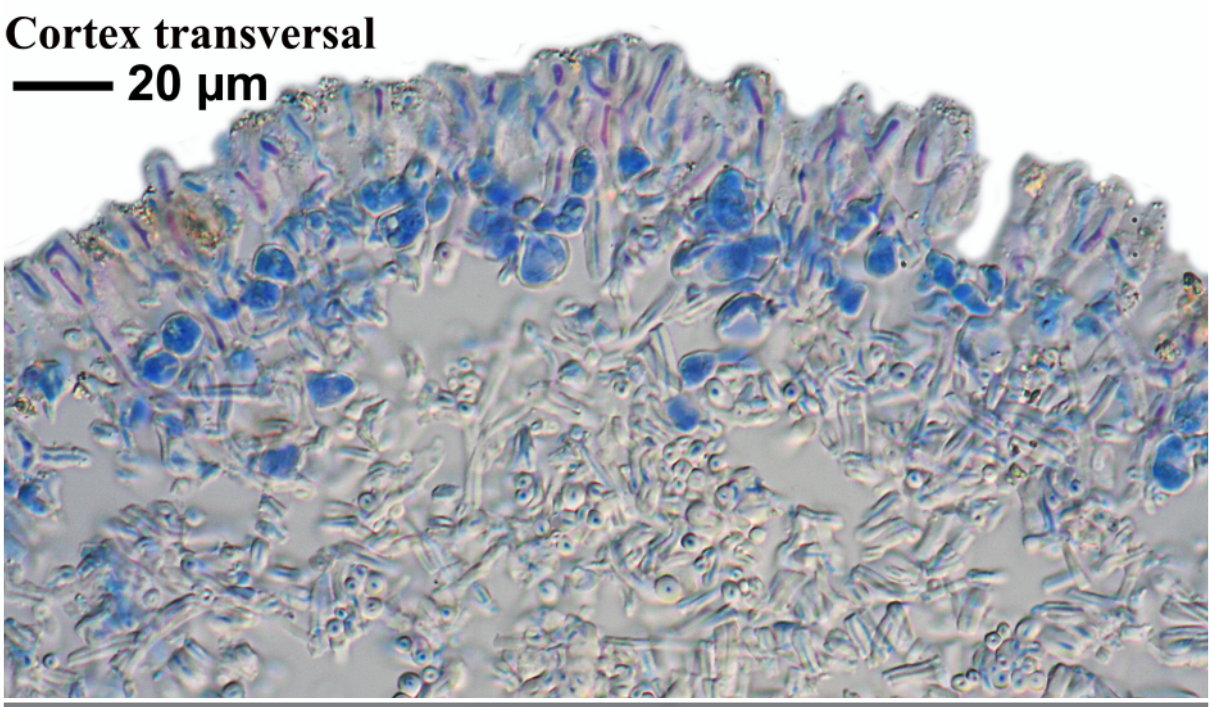
Roccella albida

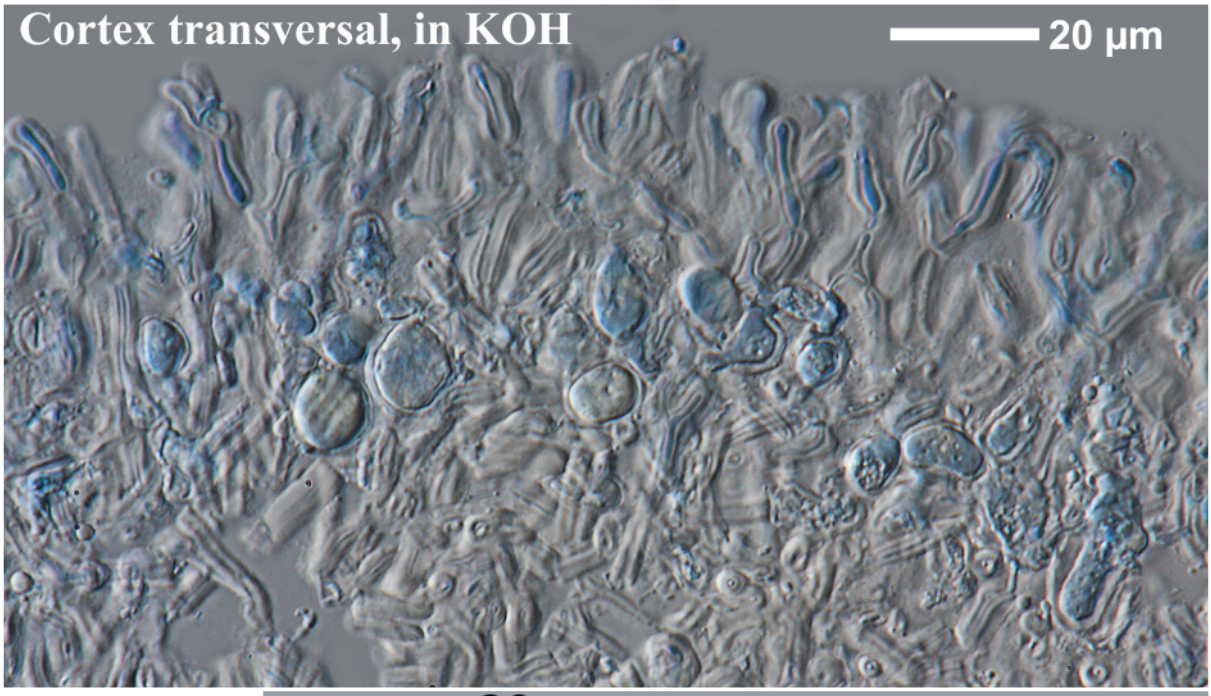


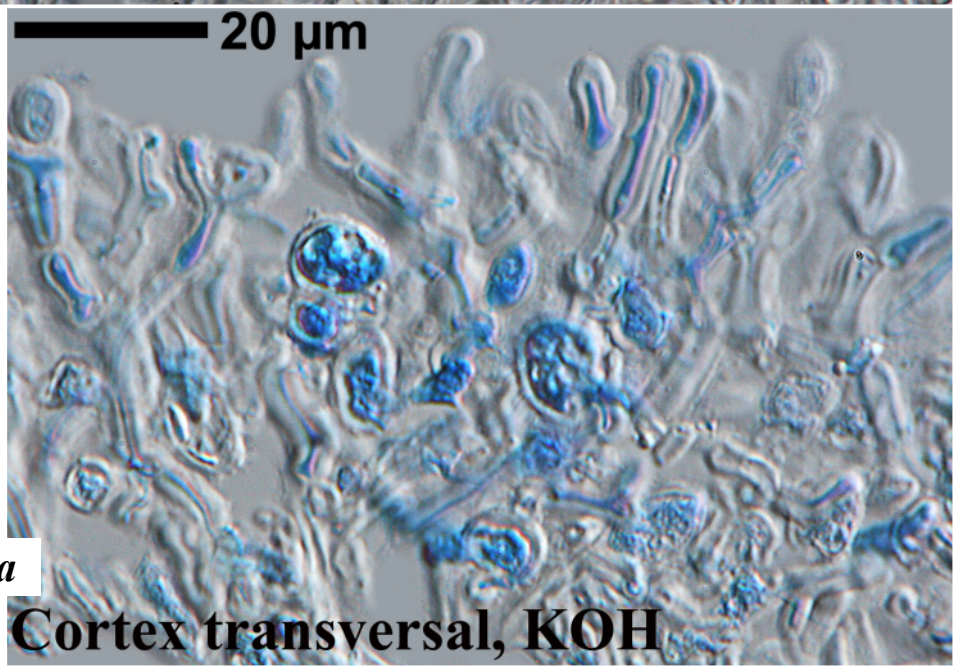




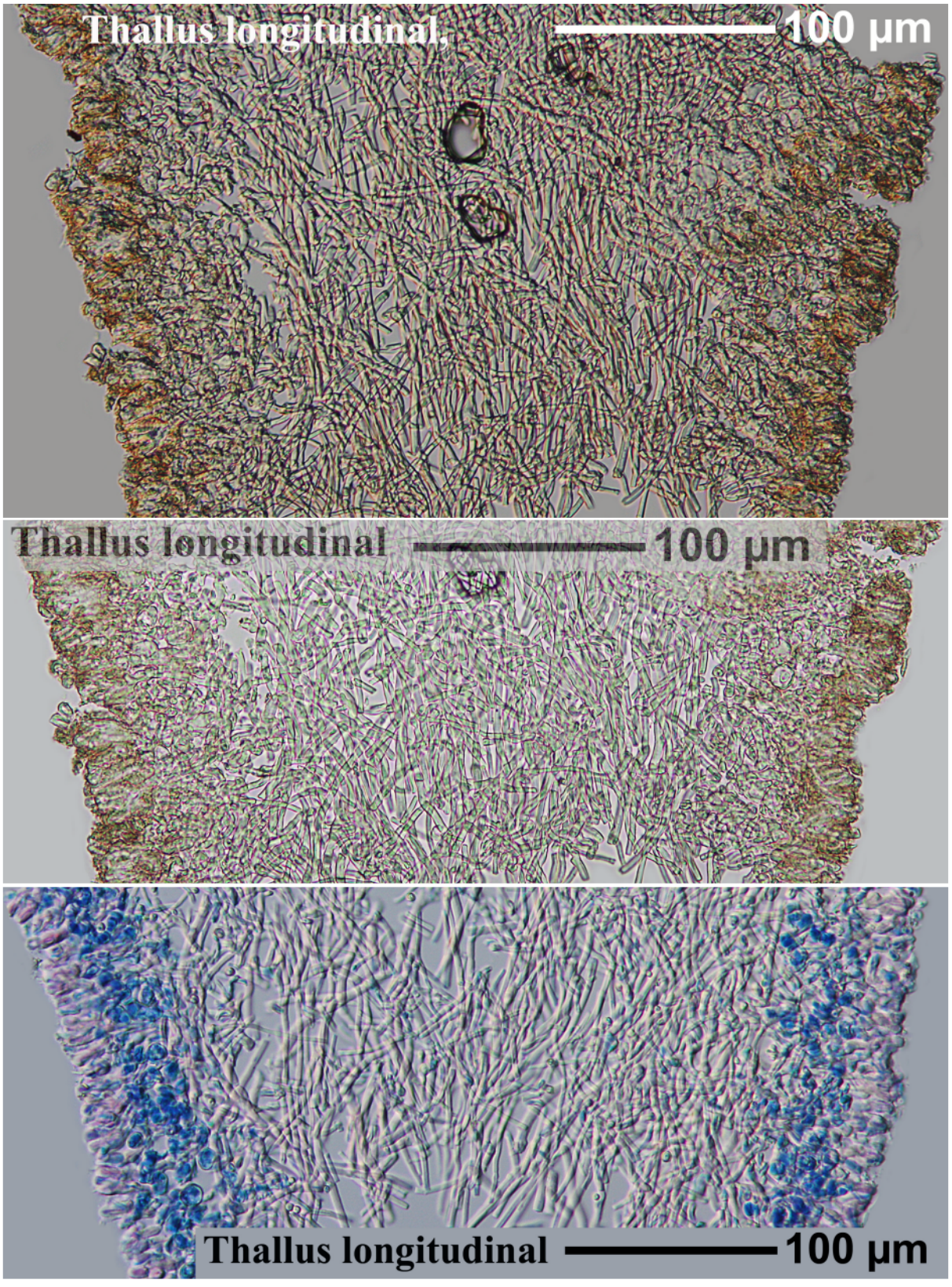
Roccella albida



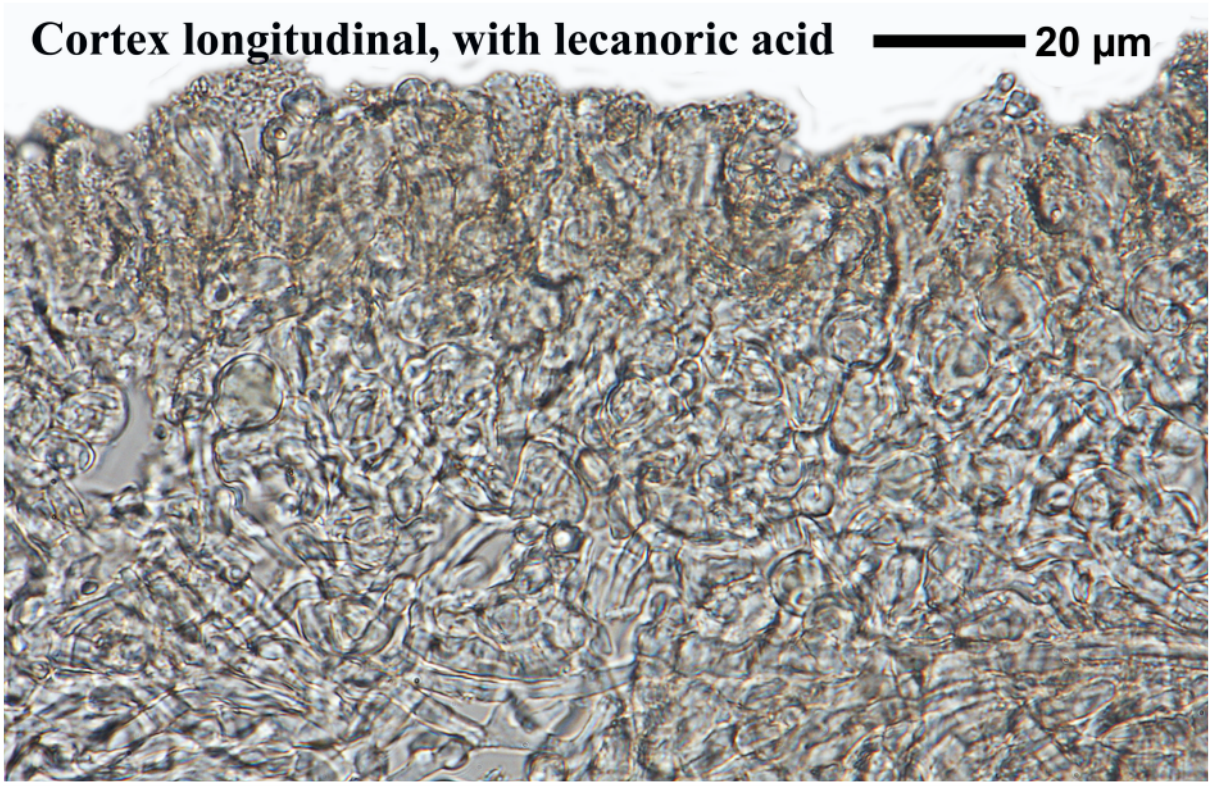


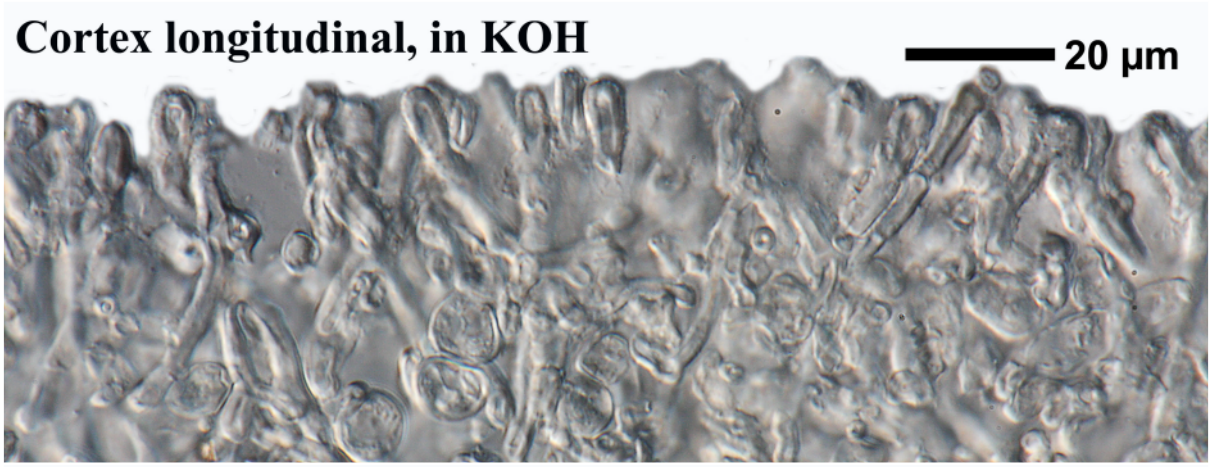


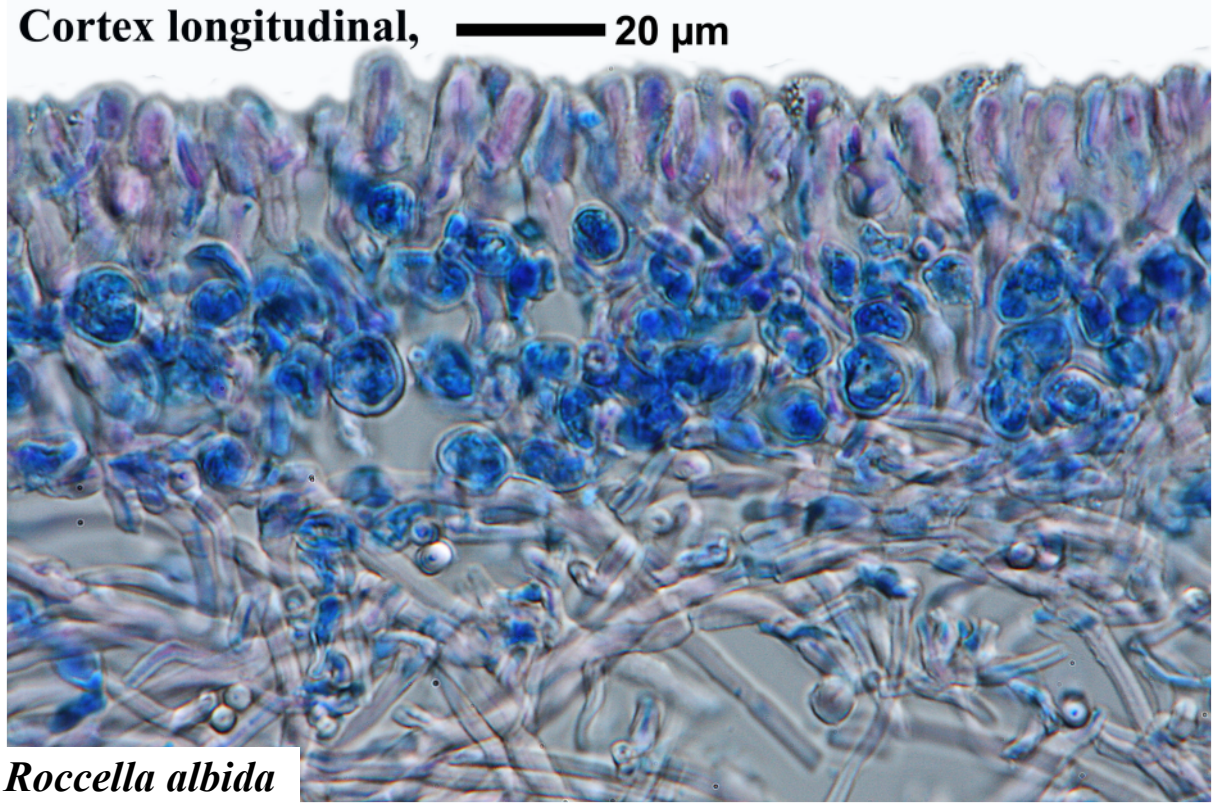
Roccella albida



Roccella albida







Roccella albida

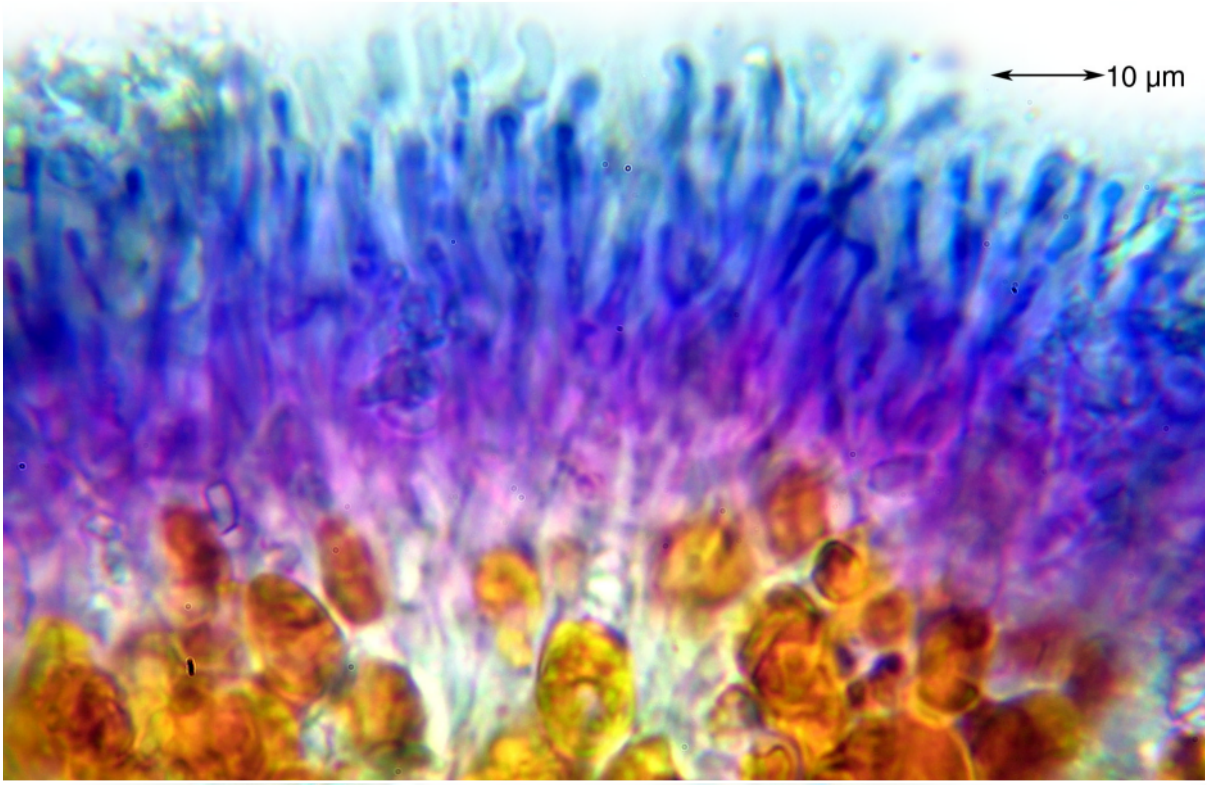
Roccella allorgei Abbayes (1947)

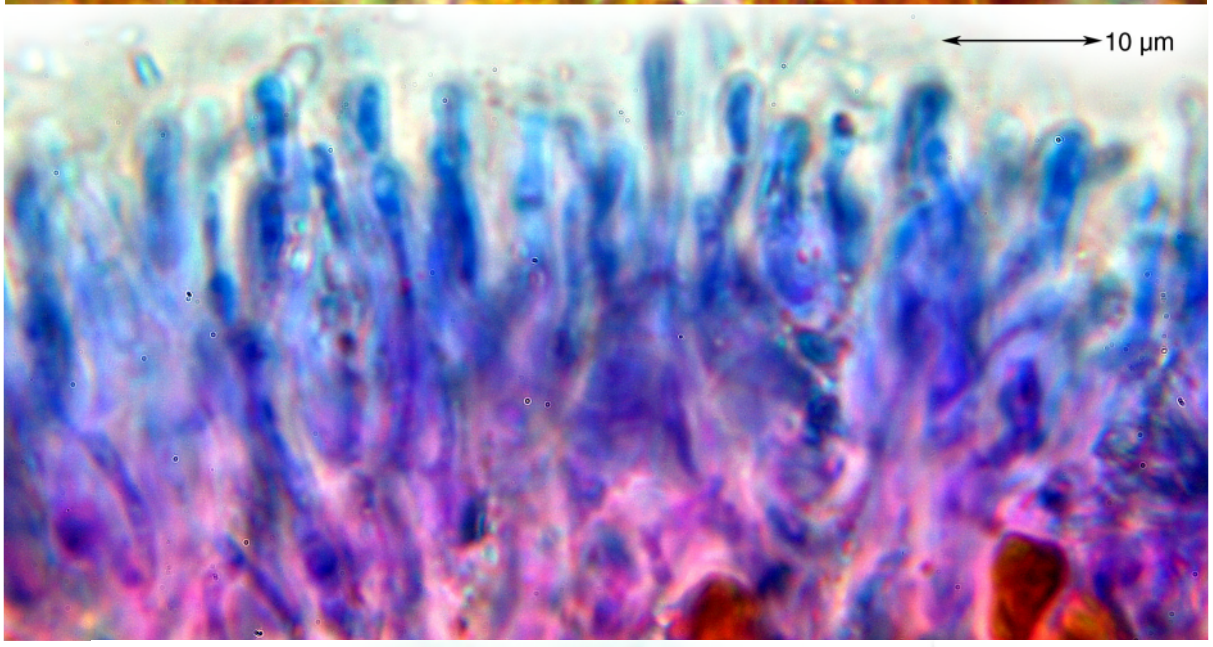
Thallus saxicolous, brown, sorediate or not, texture firm, flattened at the basis then cylindrical, surface smooth, holdfast internally white to brown. Cortex intermediate type. Apothecia unknown. Cortex C + red, K + pink, Pd –, subcortex C –, medulla C –, IKI+ violet, soralia if present C + red, major substances erythrin, lecanoric. – Azores, Madeira, Portugal.

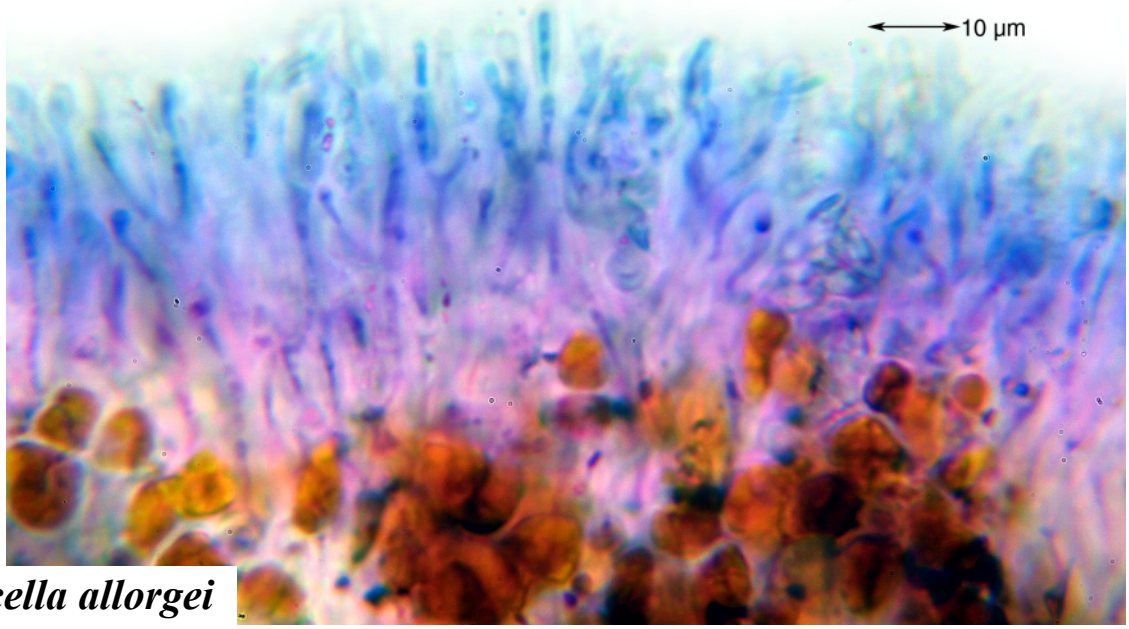
Portugal, Azoren, Terceira, beim Hotel Terceira Mar, 38°39.347' N, 27°13.924' W, ca. 8 m, Lavafelsen an der Küste, leg. Aptroot & Schumm 14.07.2008, det. Schumm 30.07.2008. [14133]











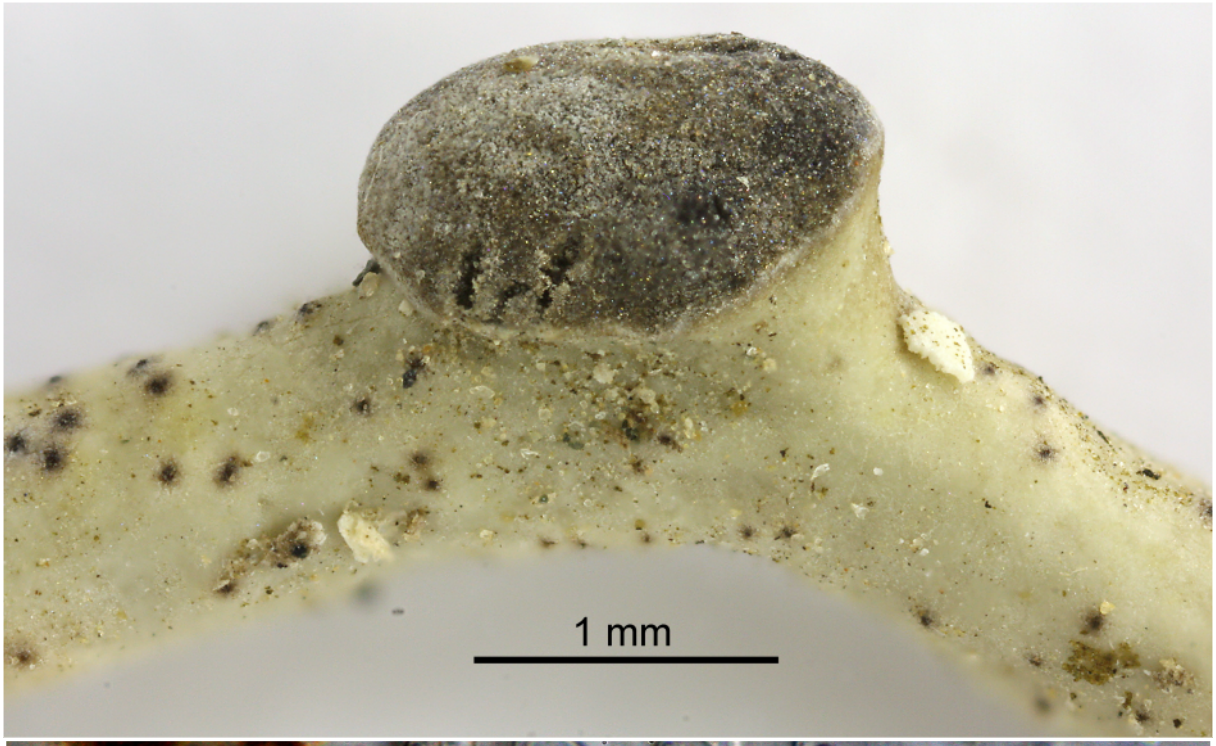
Roccella allorgei

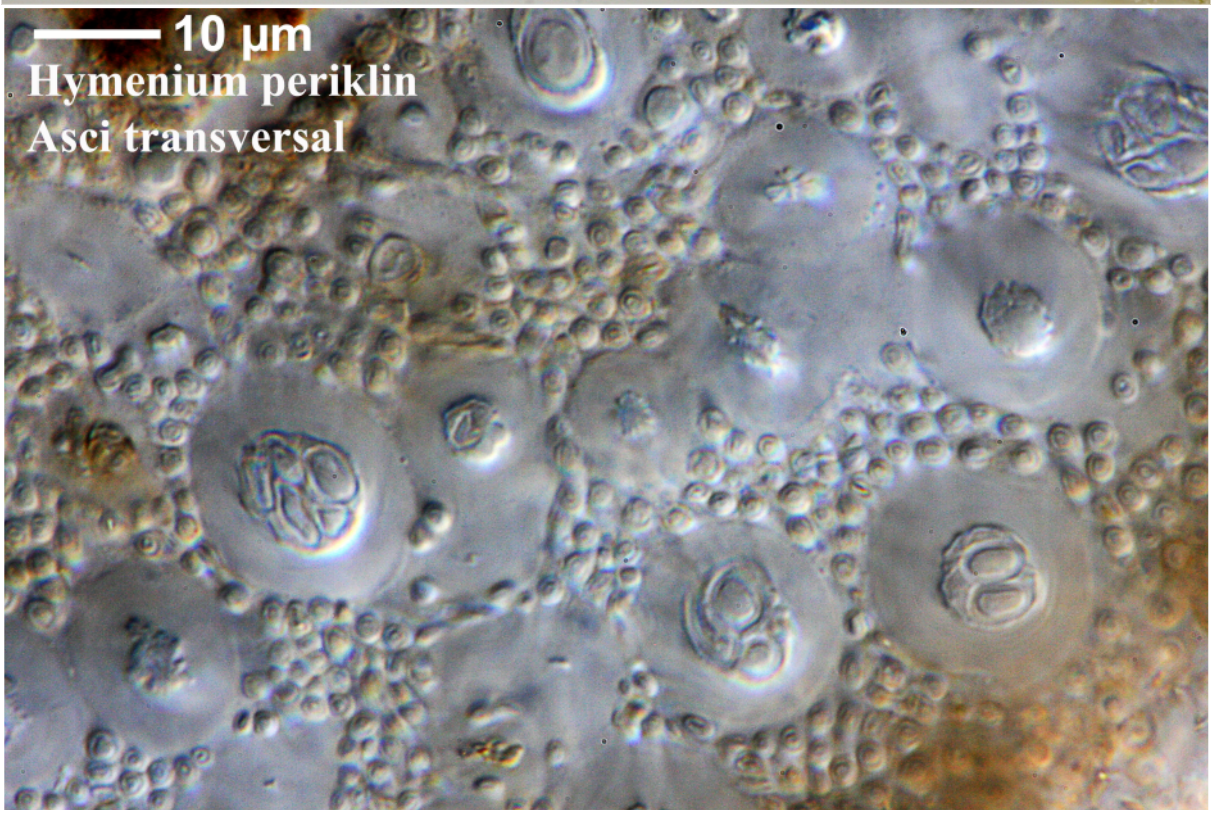
Roccella bajasurensis Tehler (2009)

Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface smooth, holdfast internally yellow. Cortex palisade plectenchyma. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–28 × 4–6 µm. Cortex C –, K –, Pd –, IKI –, subcortex C –, medulla C –, IKI + violet, major substances lichesterinic, protolichesterinic. – Baja California.

Mexico, Baja California Sur: Punta Lobos, 4 km S of the town, Todos Santos, 23°25’ N, 110°17’ W, ca. 30 m, on rocks. Leg. T.H.Nash #16.925, 26. May 1979. Lichenes Exsiccati A.S.U. Nr. 92. [ASU92]

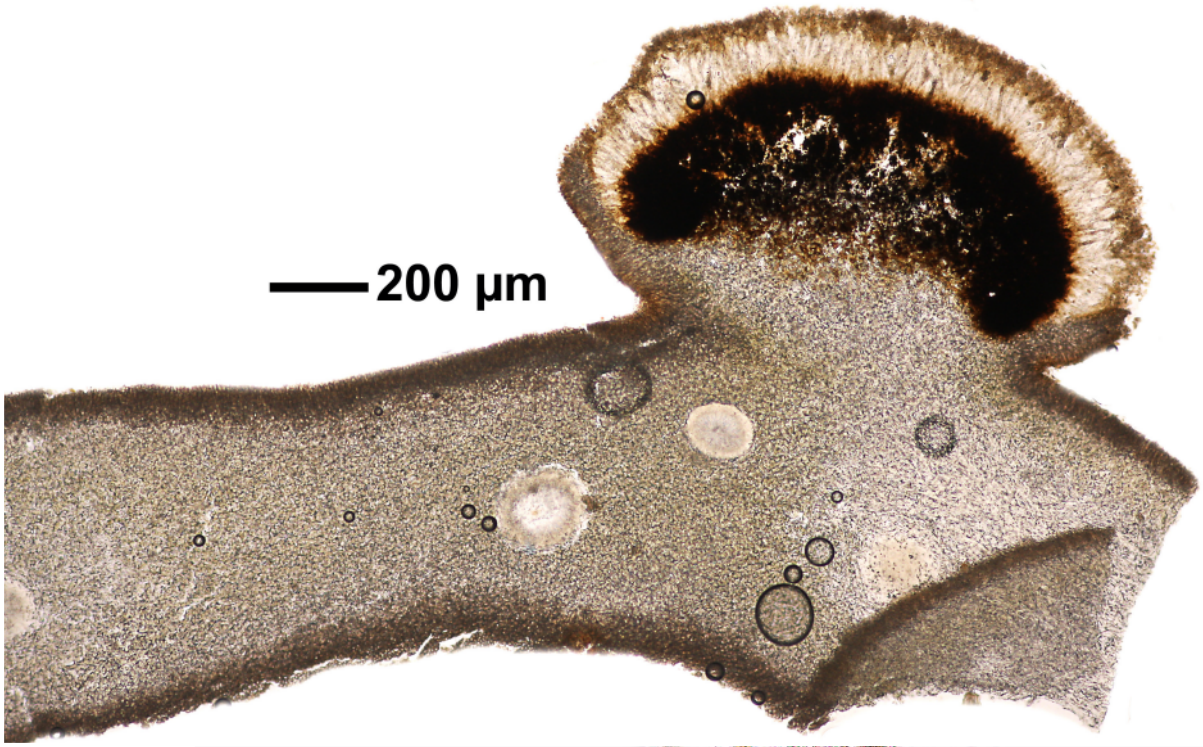


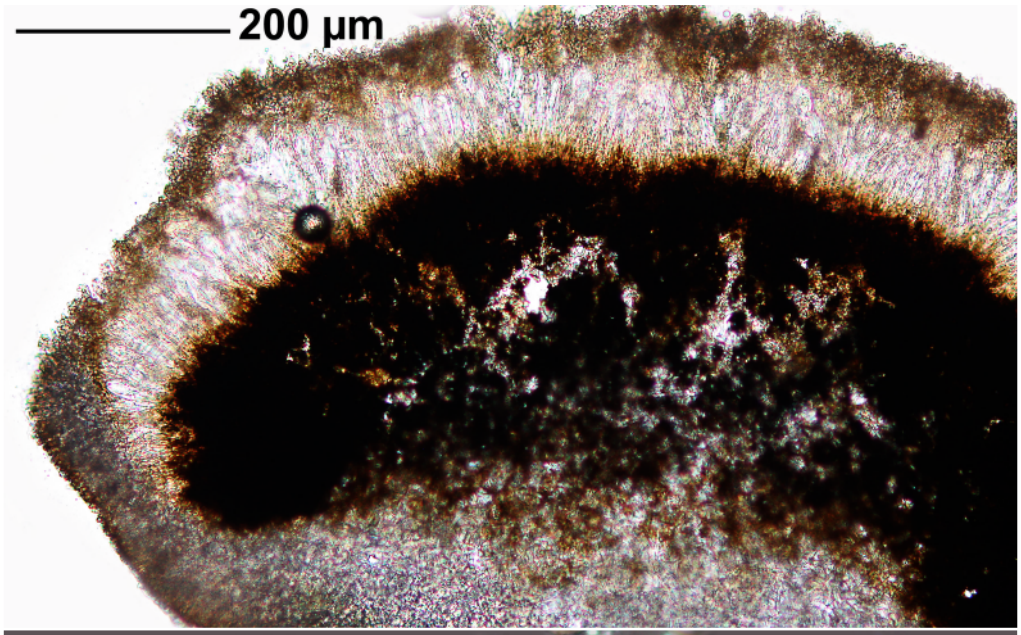


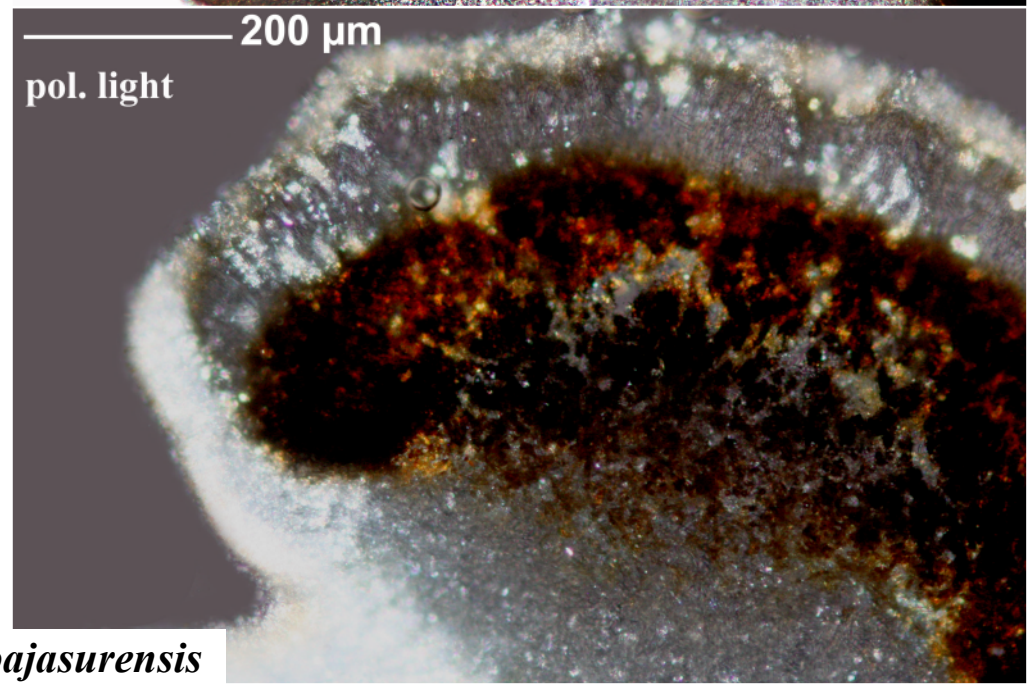




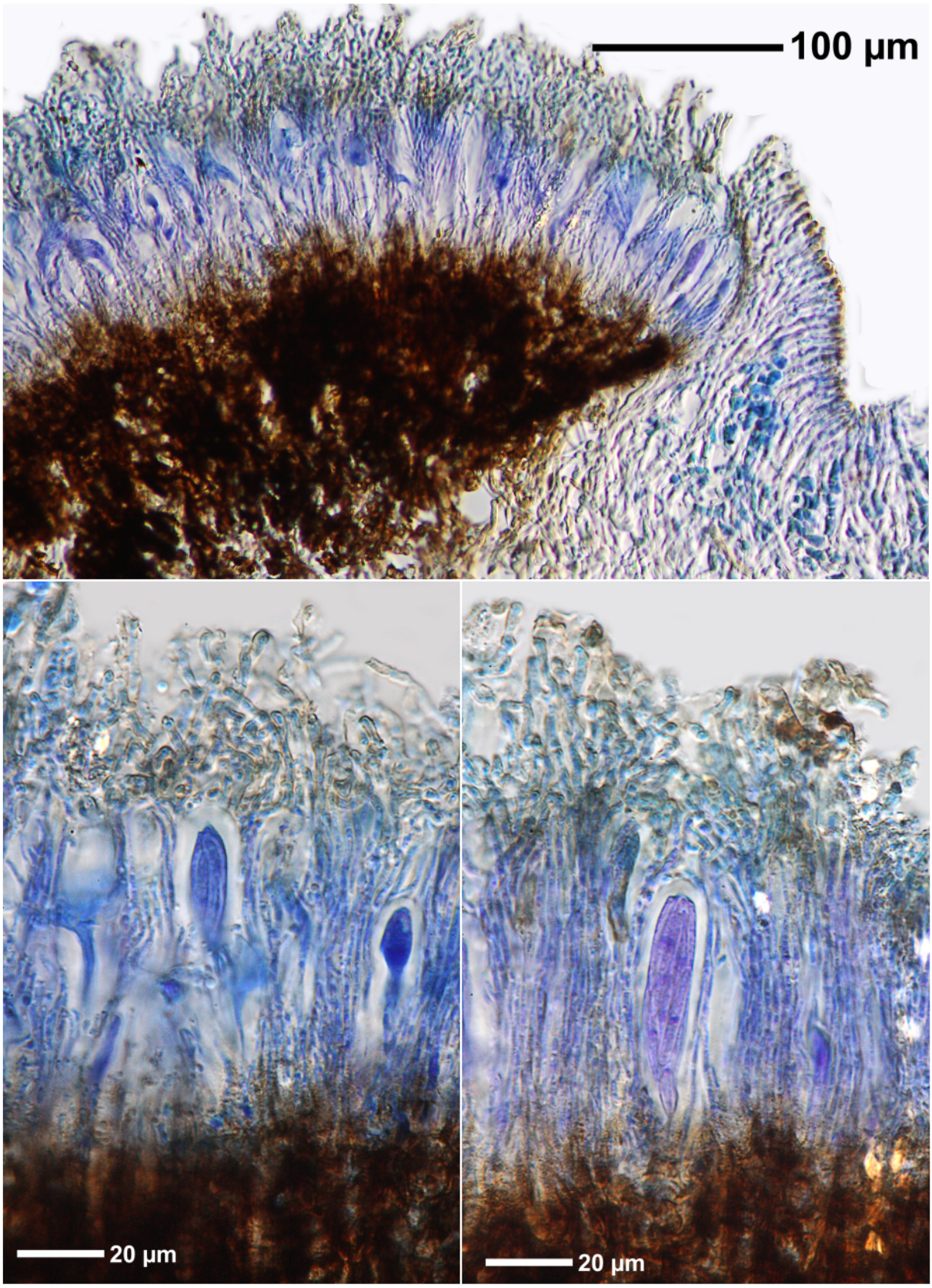
Roccella bajasurensis



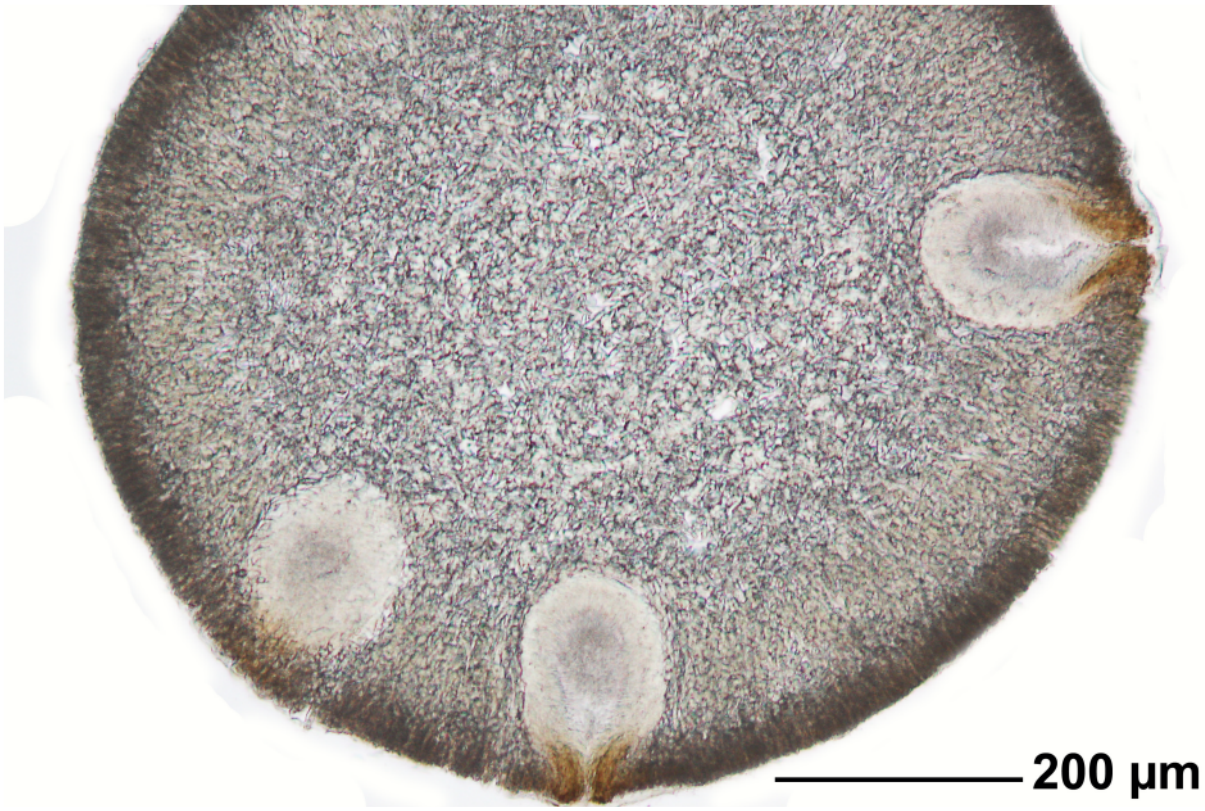




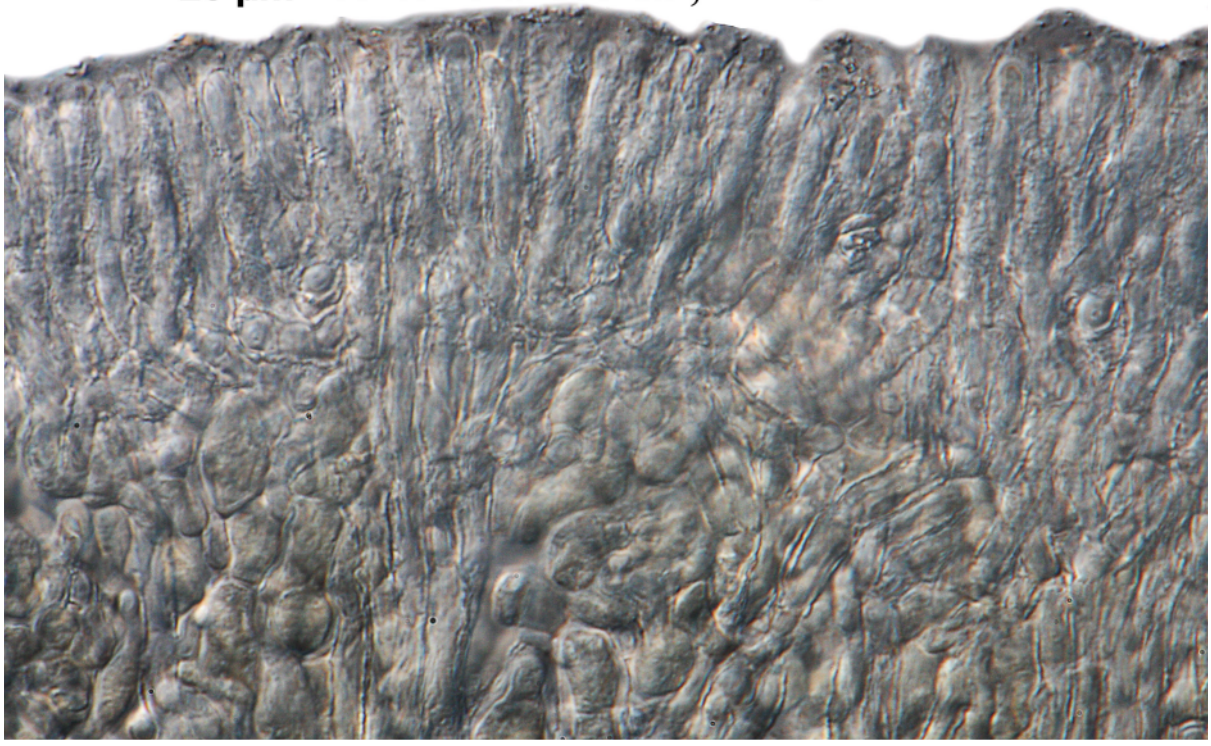
Roccella bajasurensis



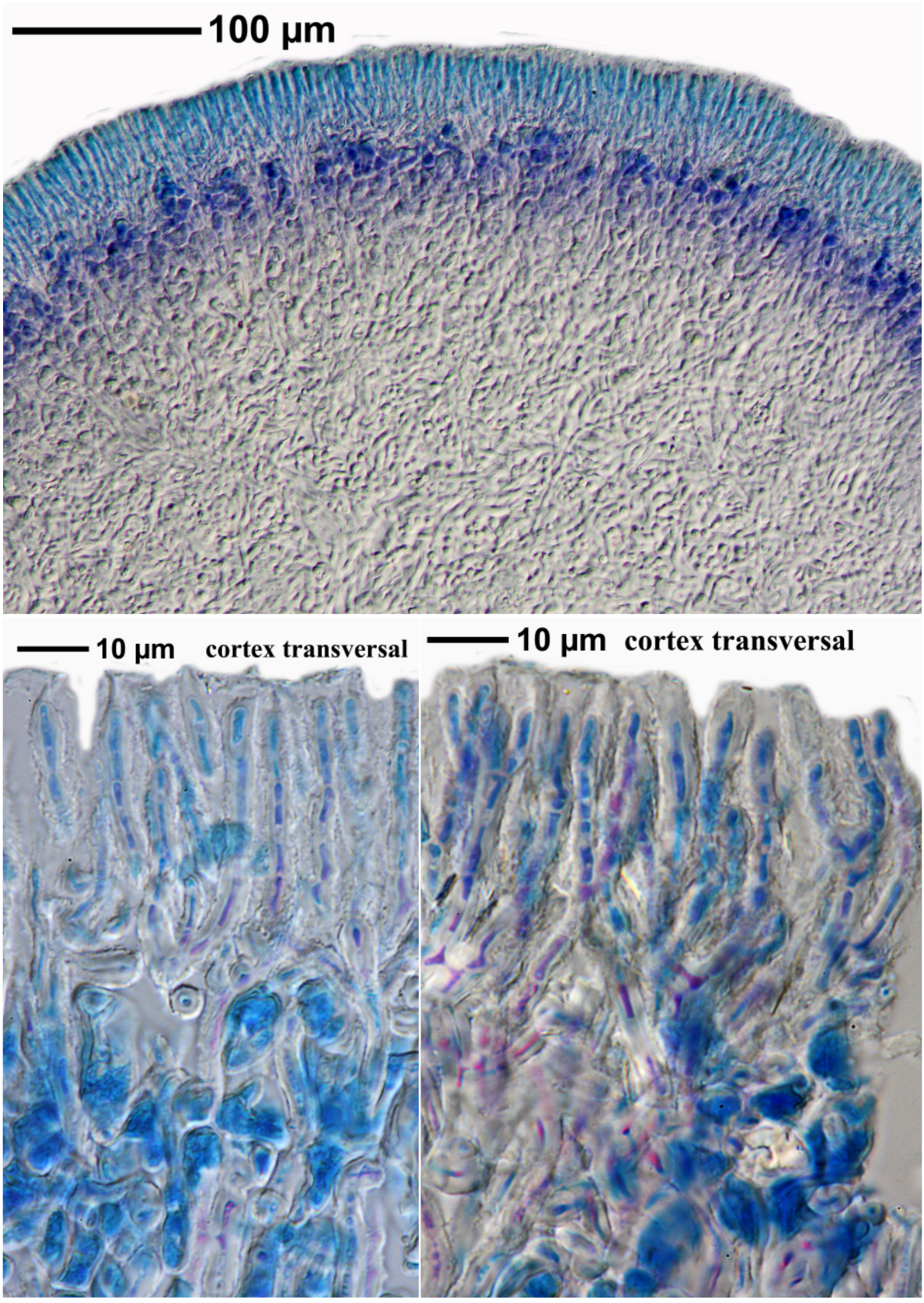
Roccella bajasurensis



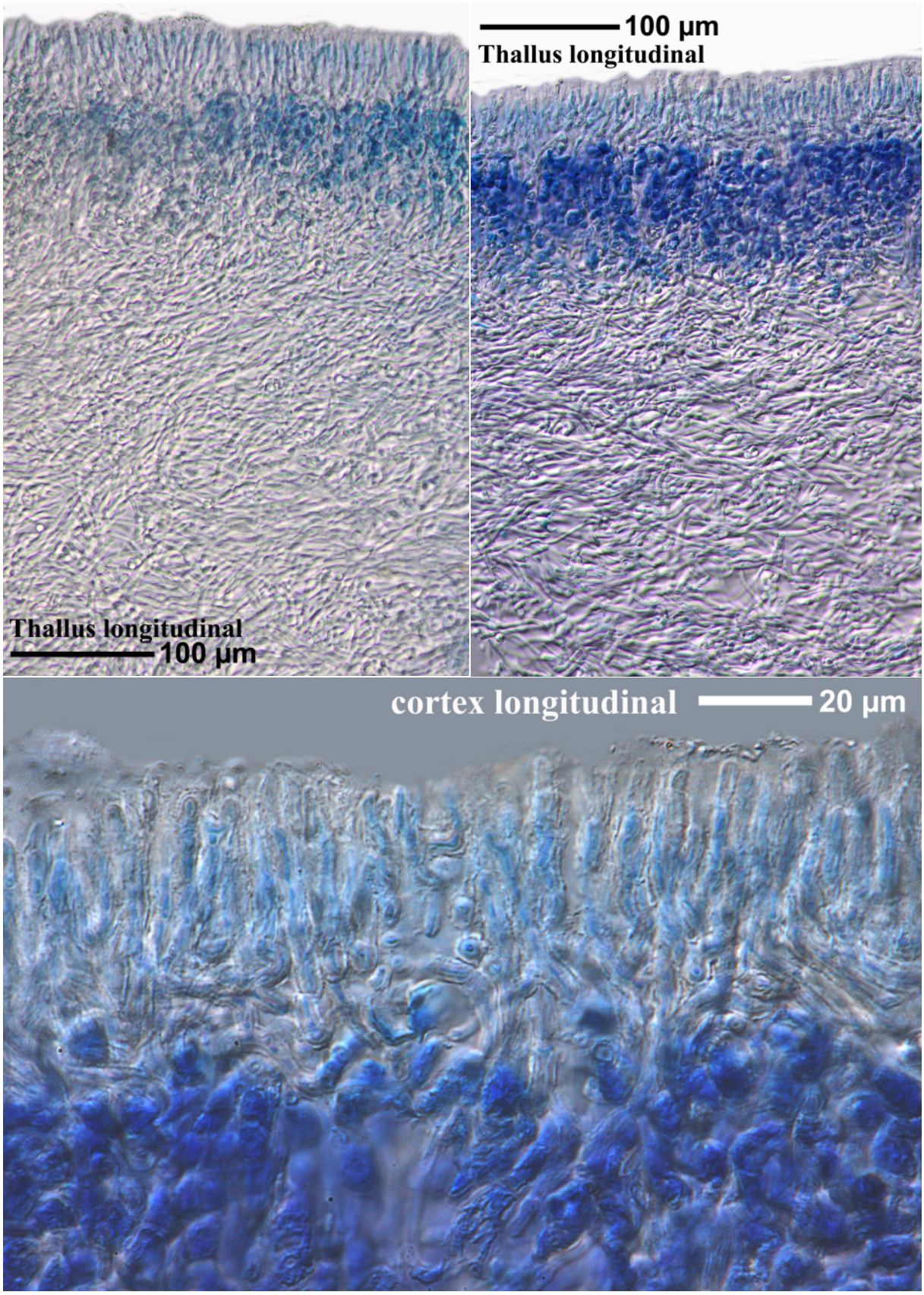
20 µm cortex transversal, in KOH



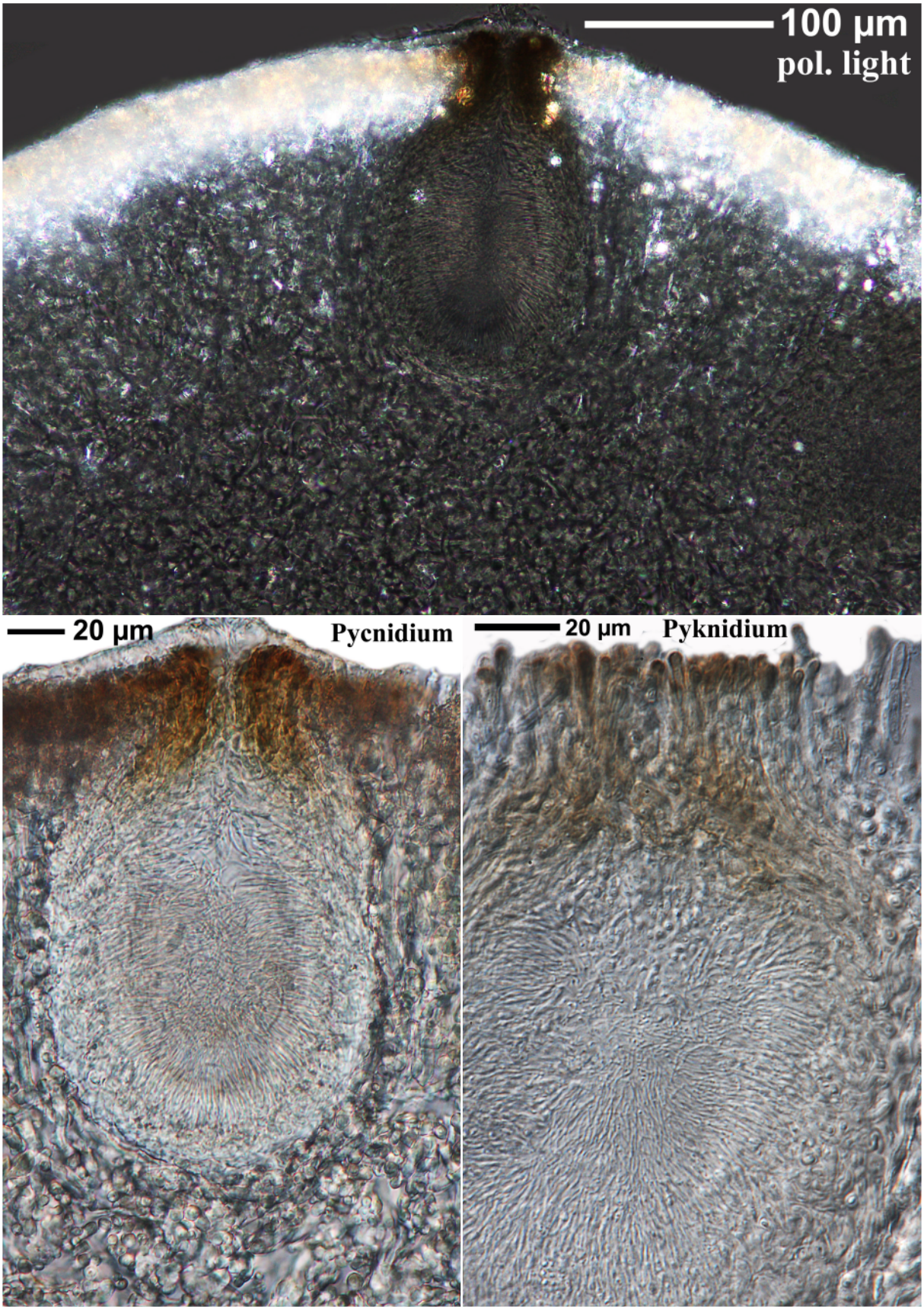
Roccella bajasurensis



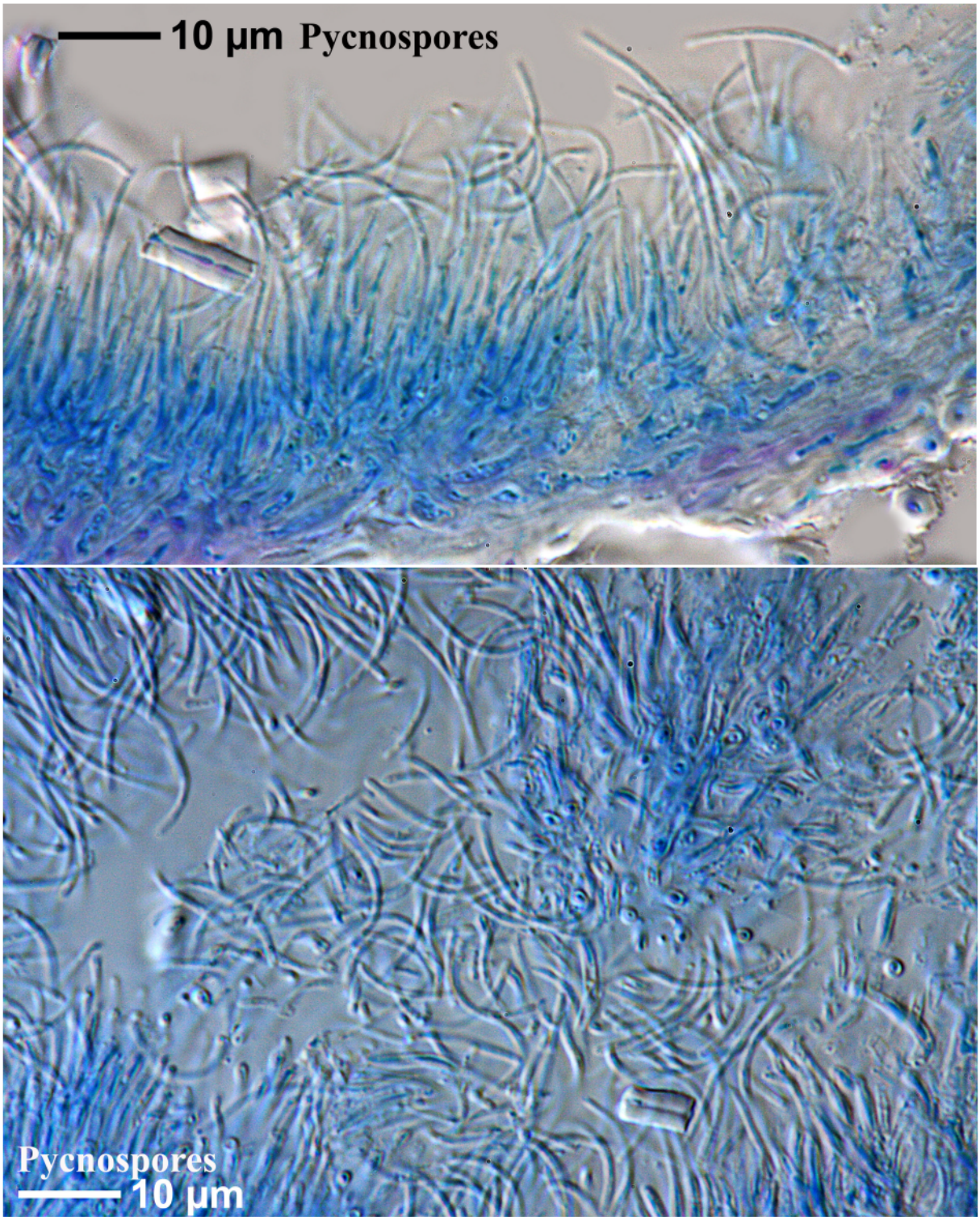
Roccella bajasurensis



Roccella bajasurensis



Roccella bajasurensis

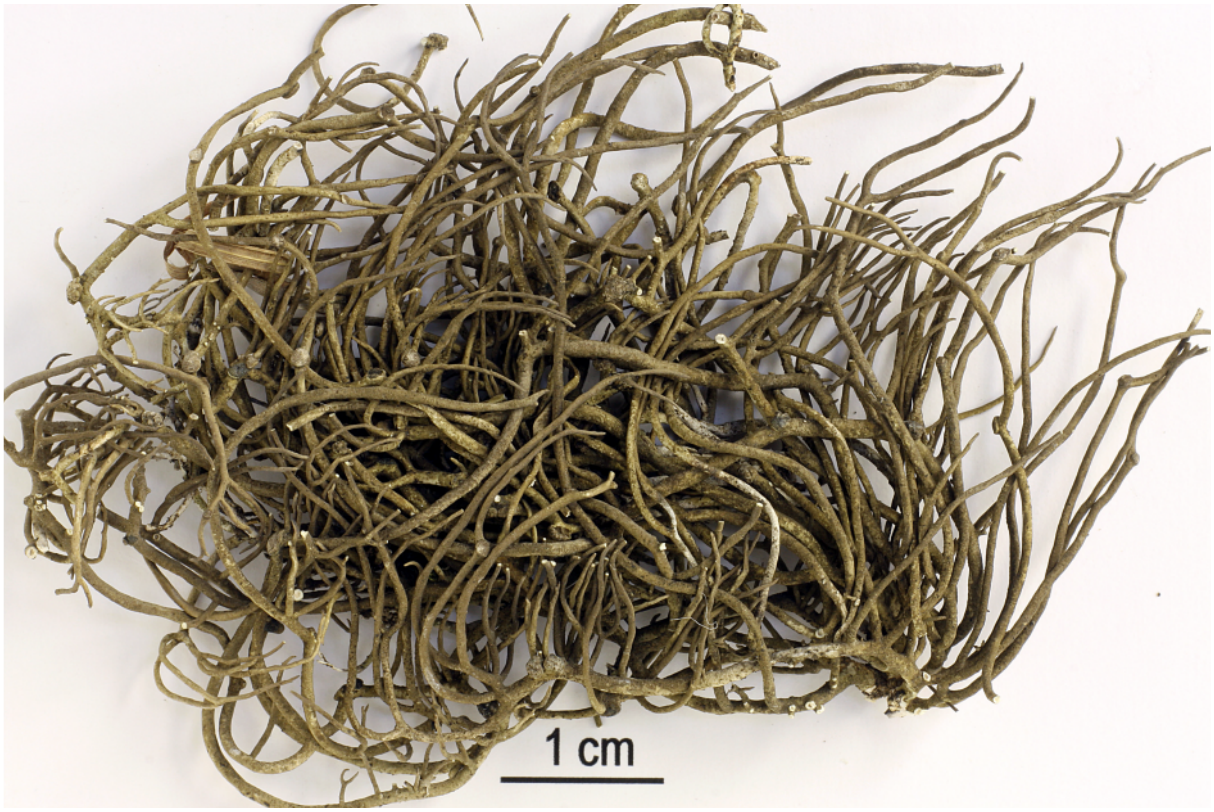


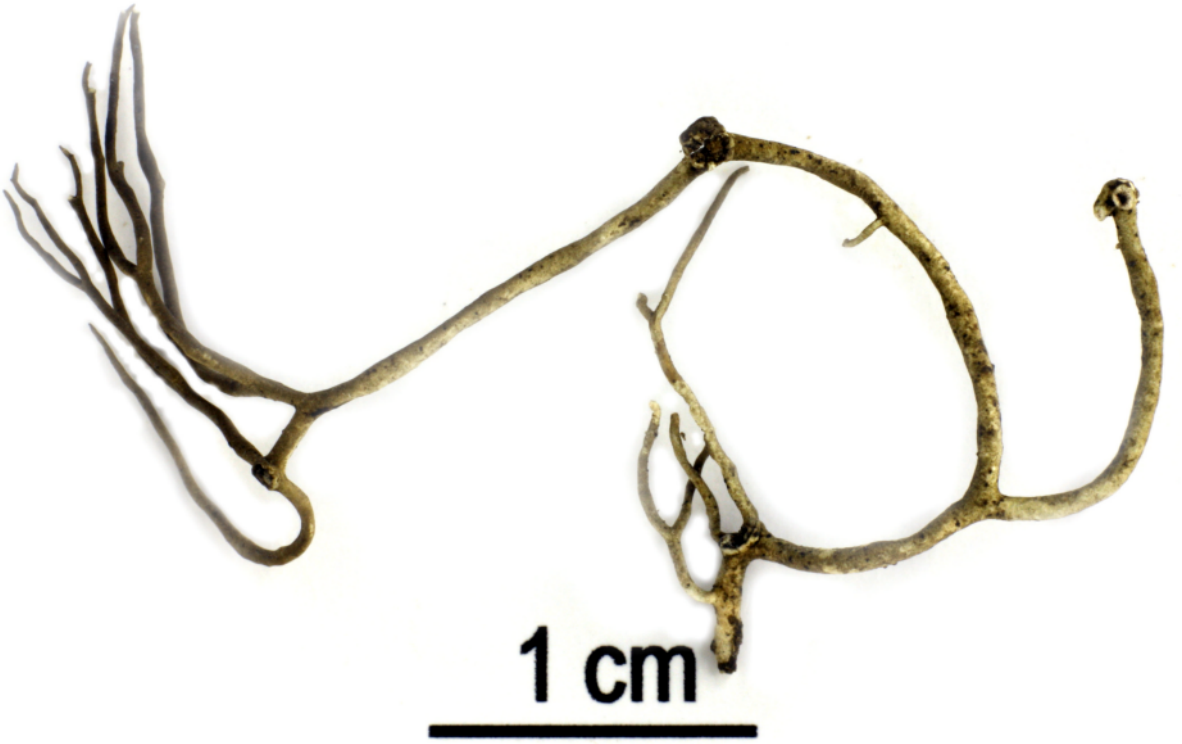
Roccella bajasurensis

Roccella balfourii Müll. Arg. (1882)
Roccella hertelii Mies & M. Schultz (2004)

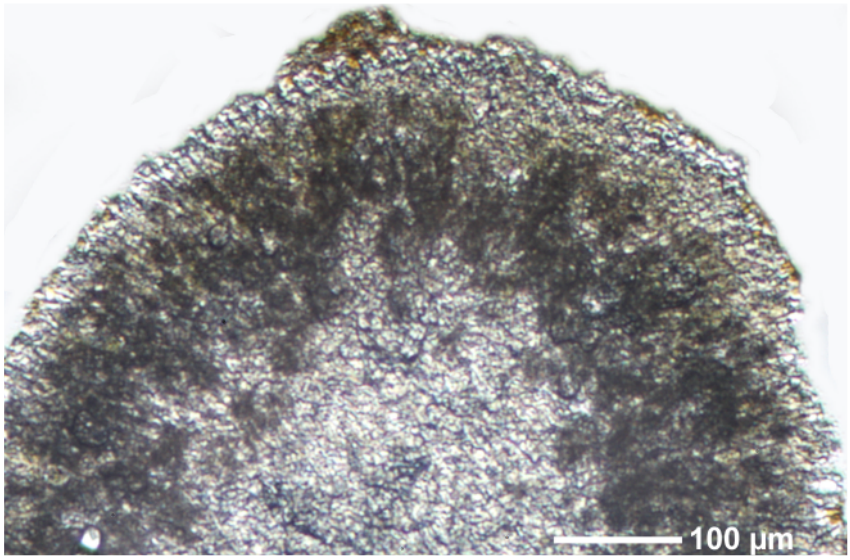
Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex branched type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 23–28 × 4–6 µm. Cortex C + red, K –, Pd –, subcortex C + red, medulla C –, IKI + violet, major substances erythrin, lecanoric, roccellic. – Socotra & Oman.

Yemen, Socotra (Hadramaut Gov.), Aduno pass above Wadi Kishn, montane evergreen woodland with boulders, c- 1000 m, on granite, c. 12°34’20’’N, 54°02’40’’E, leg. 26.03.2002 M.Schultz, det. 18.06.2004 M.Schultz (as *Roccella hertelii*) [MS 14298d]

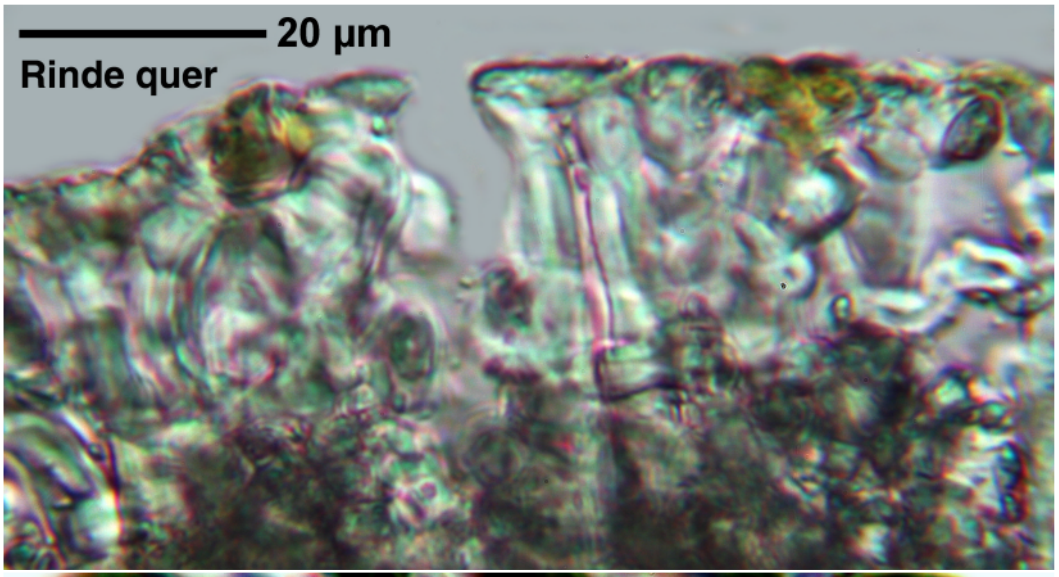


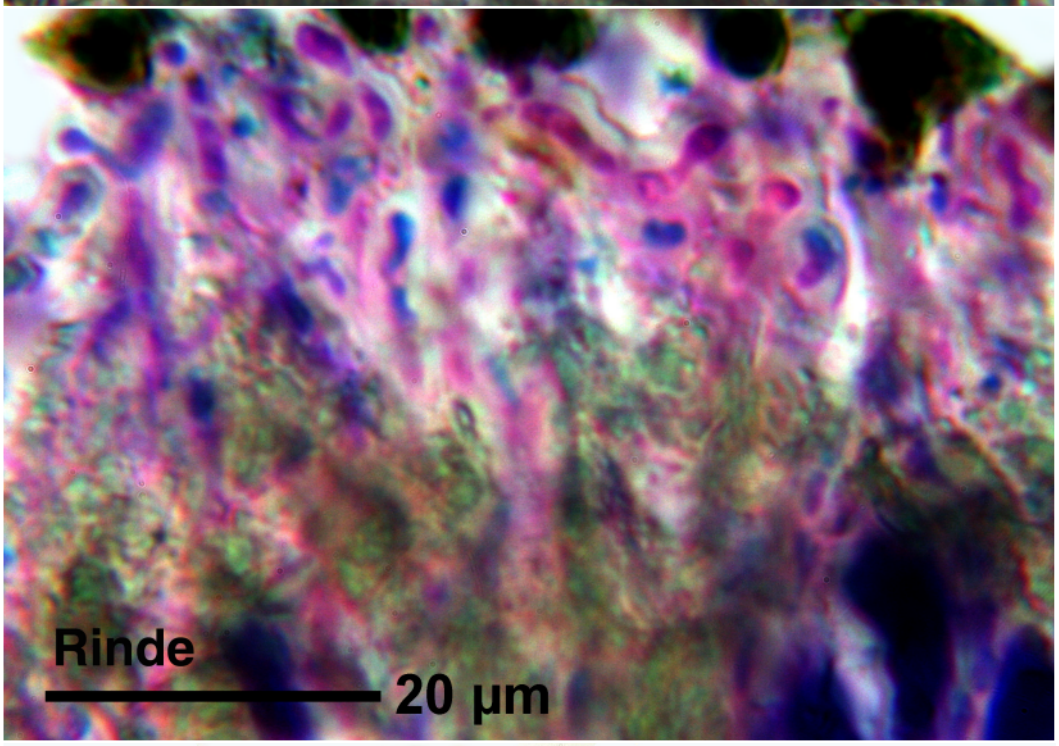


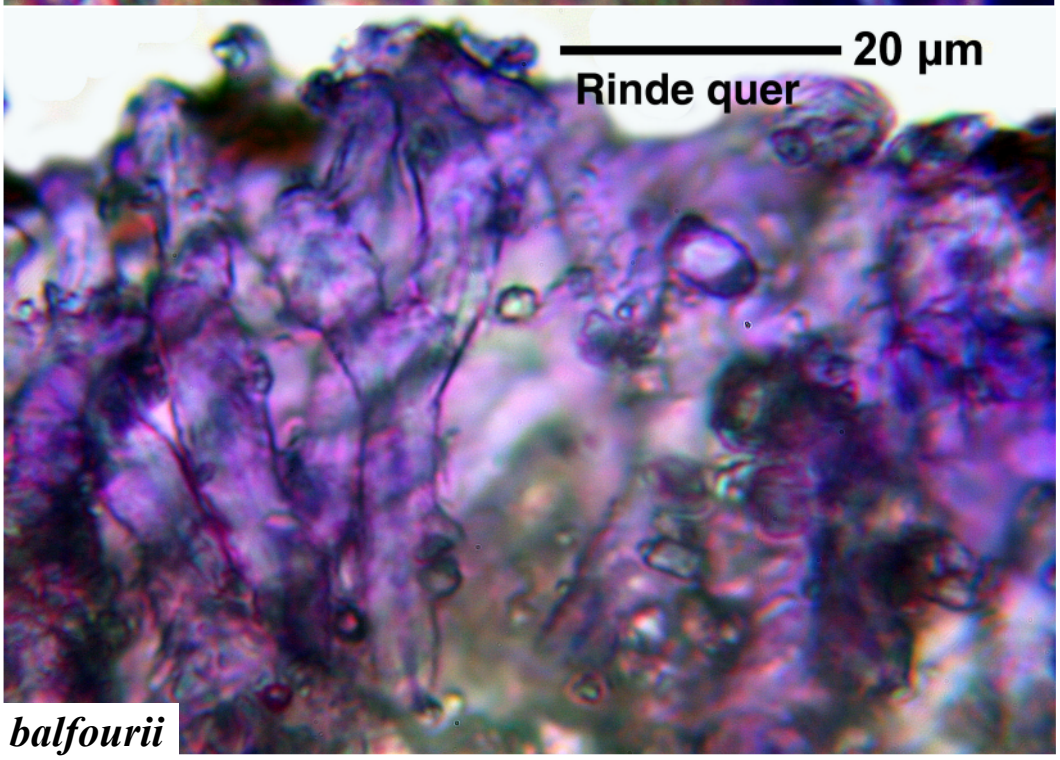




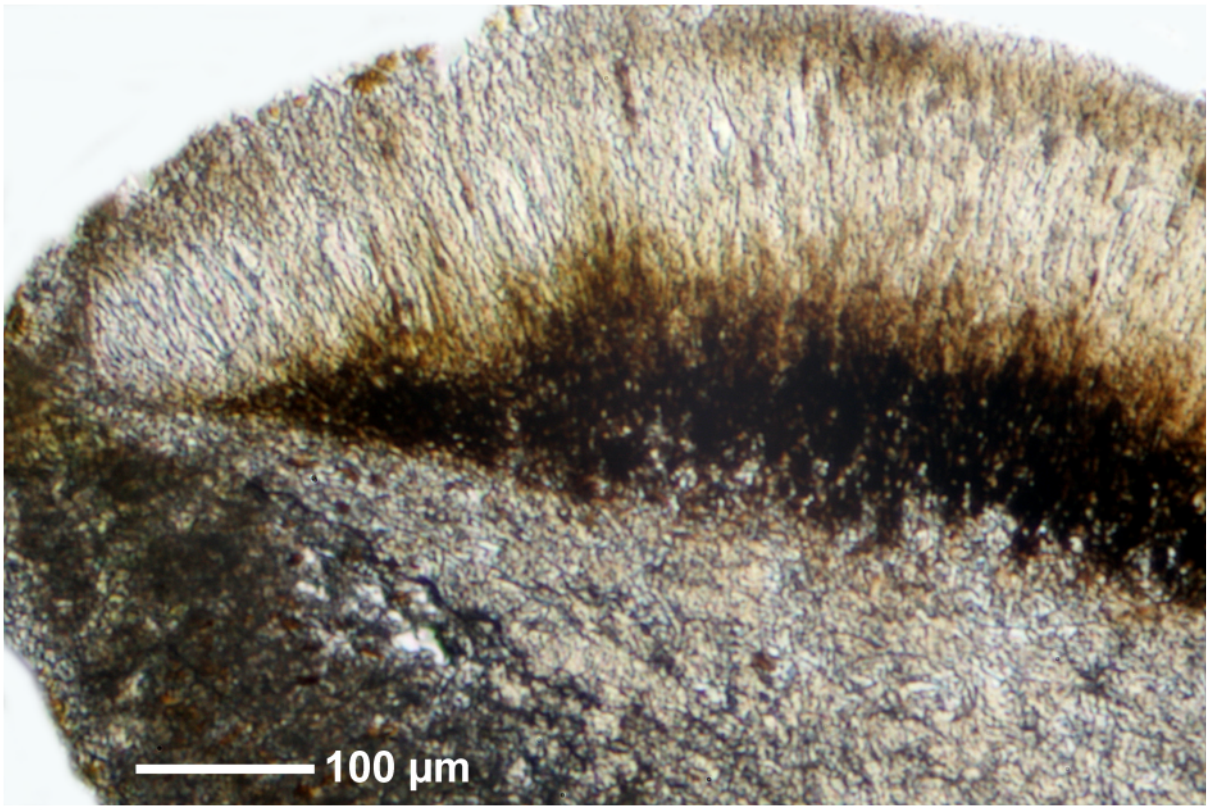
Roccella balfourii



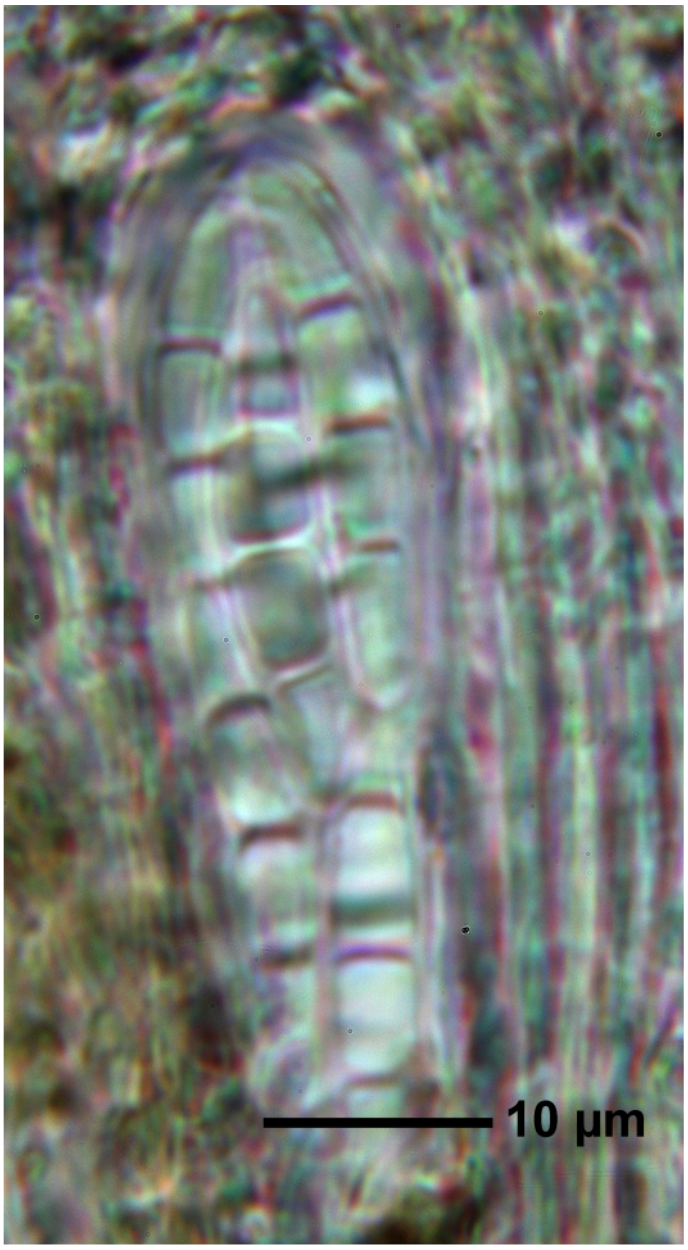




Roccella balfourii







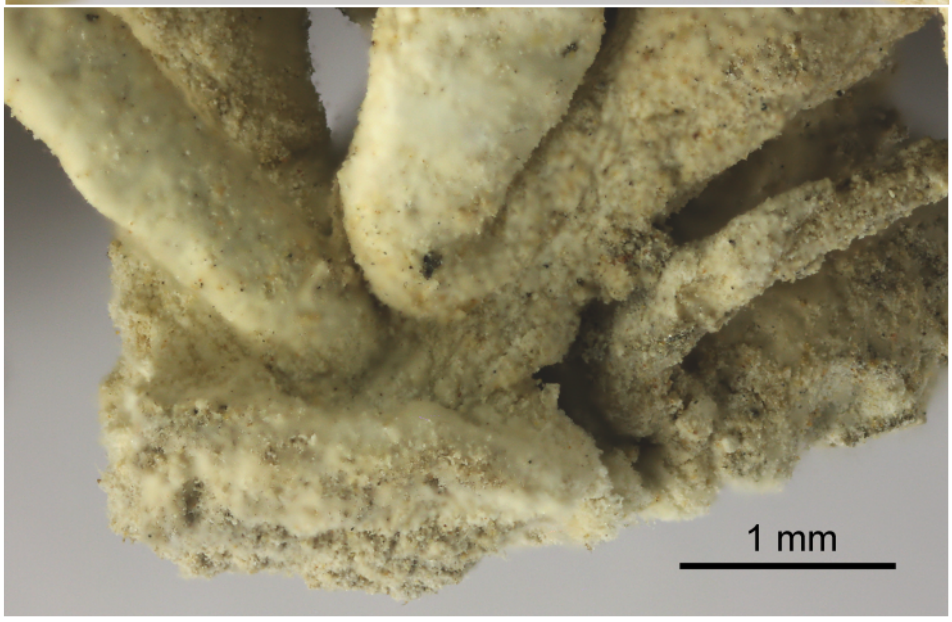
Roccella balfourii

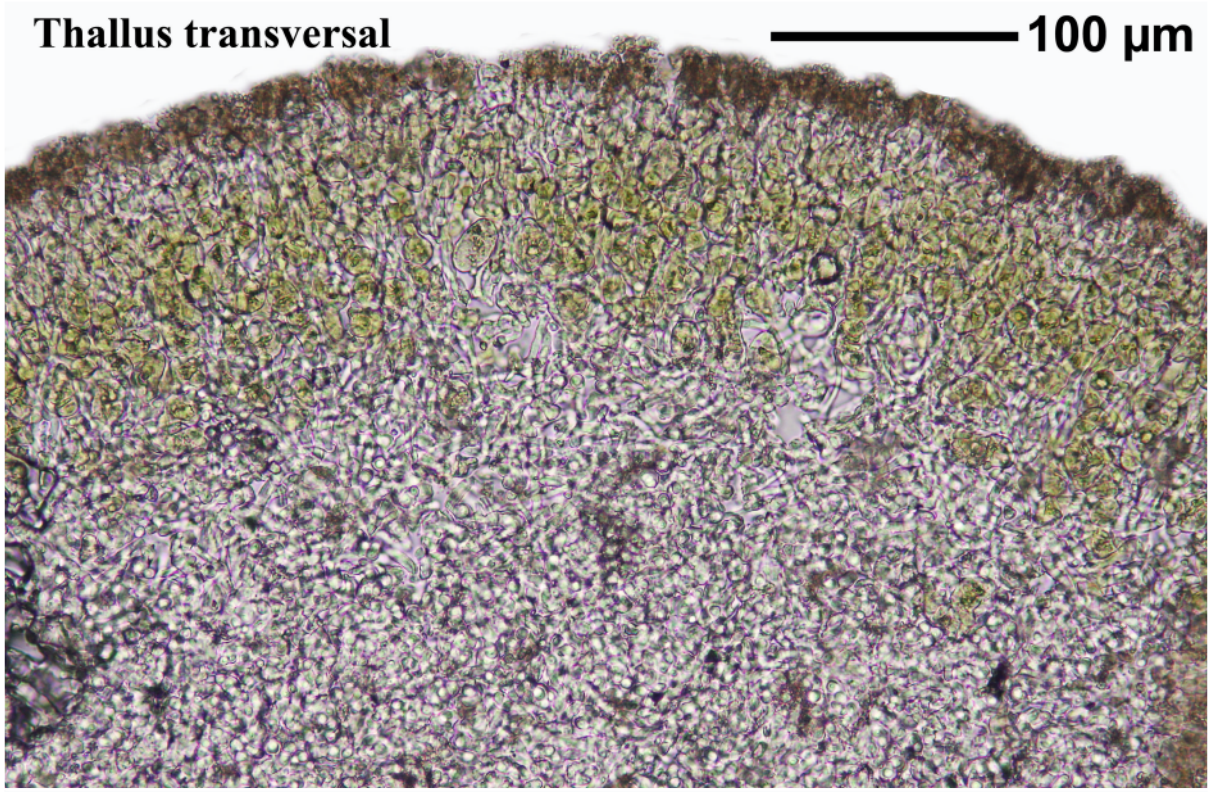
Roccella balfourii Müll. Arg.

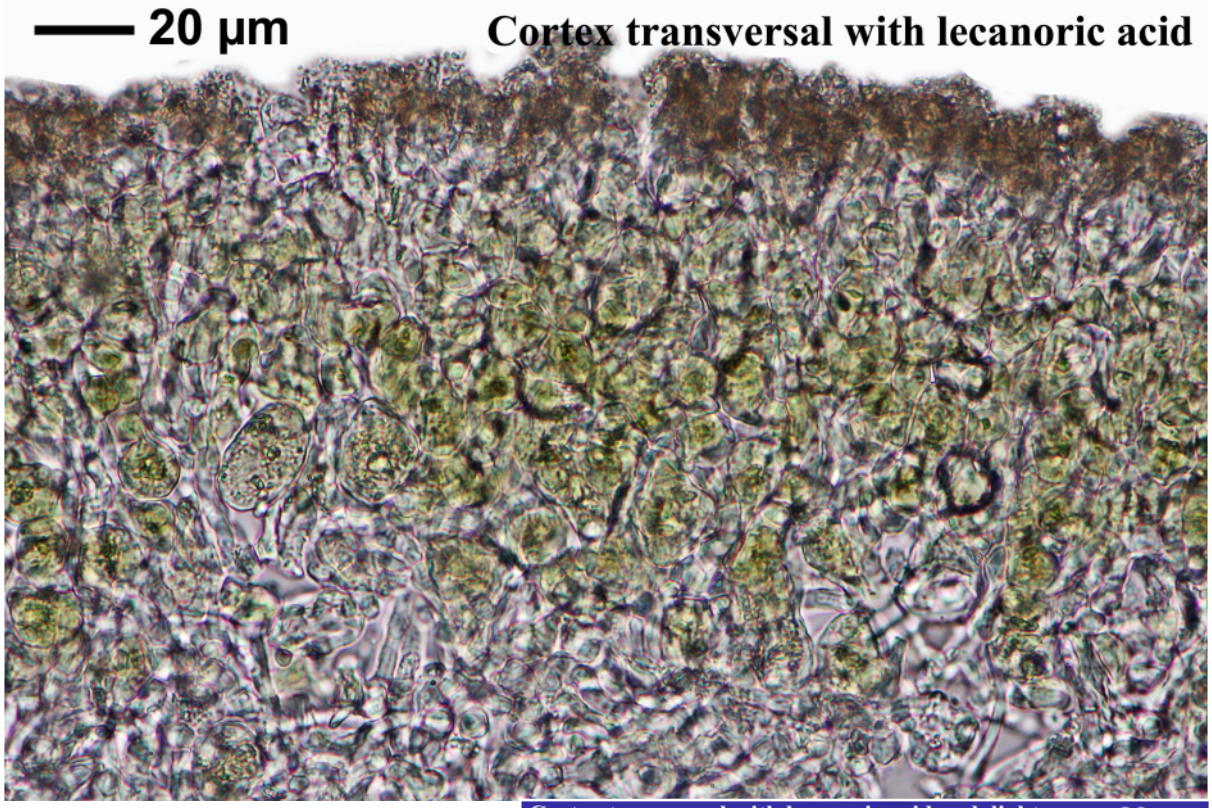
[OM91-247], Oman, on north-exposed limestone rock, fog-semidesert on South Masirah Island, alt. 25 m, leg. Dieter Rappenhöner 9.7.1991, det. H.J.M. Sipman.

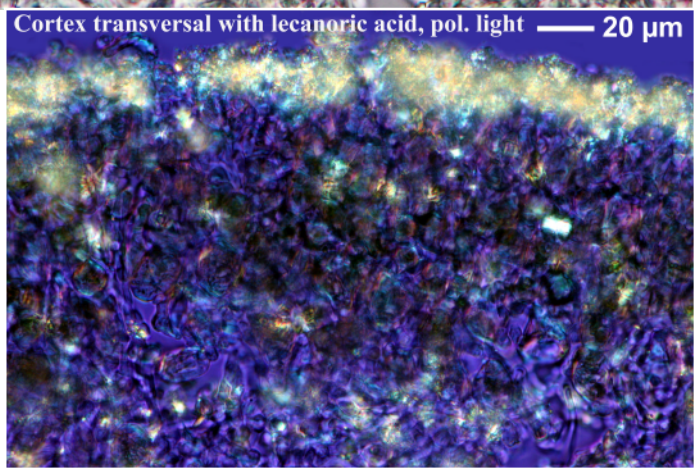




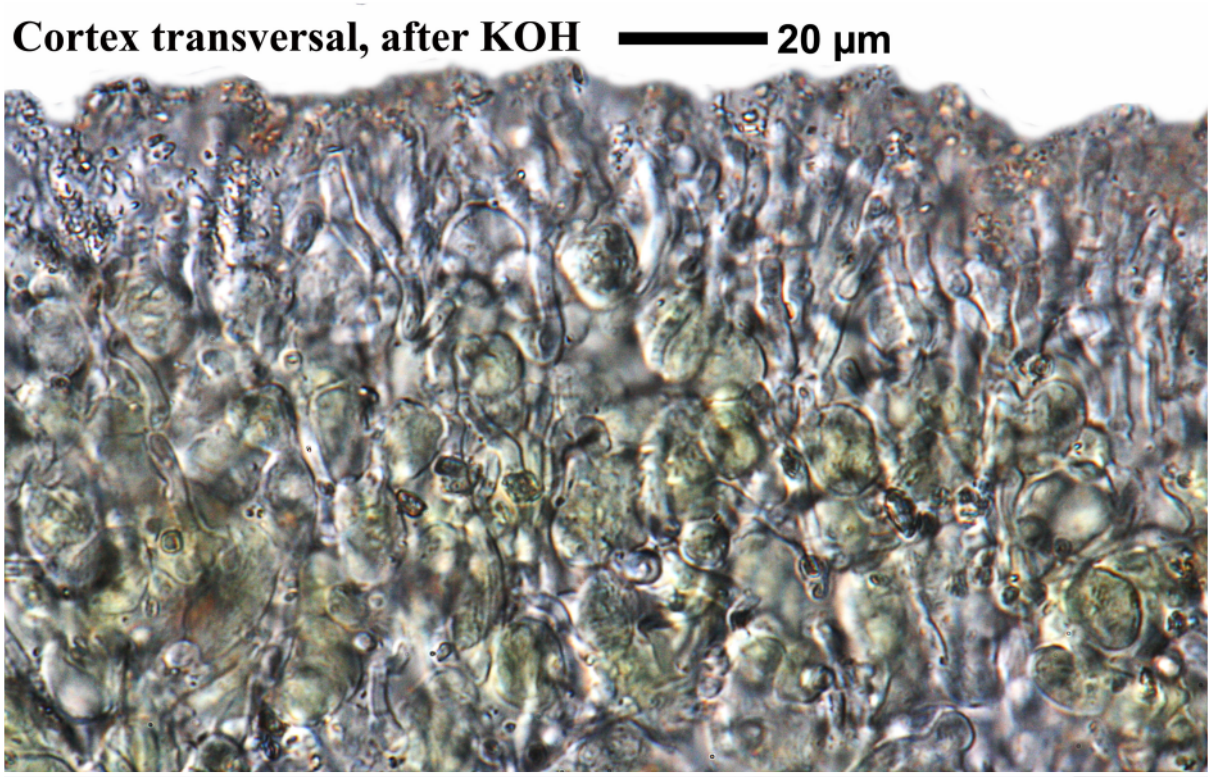


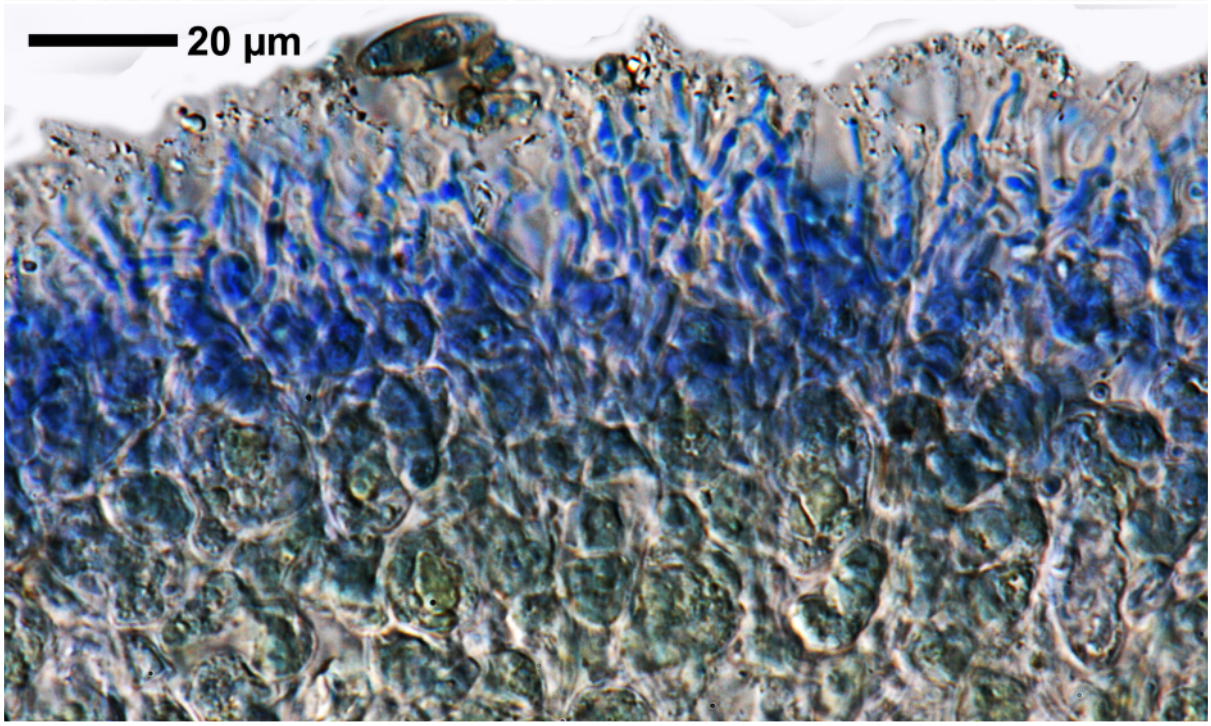


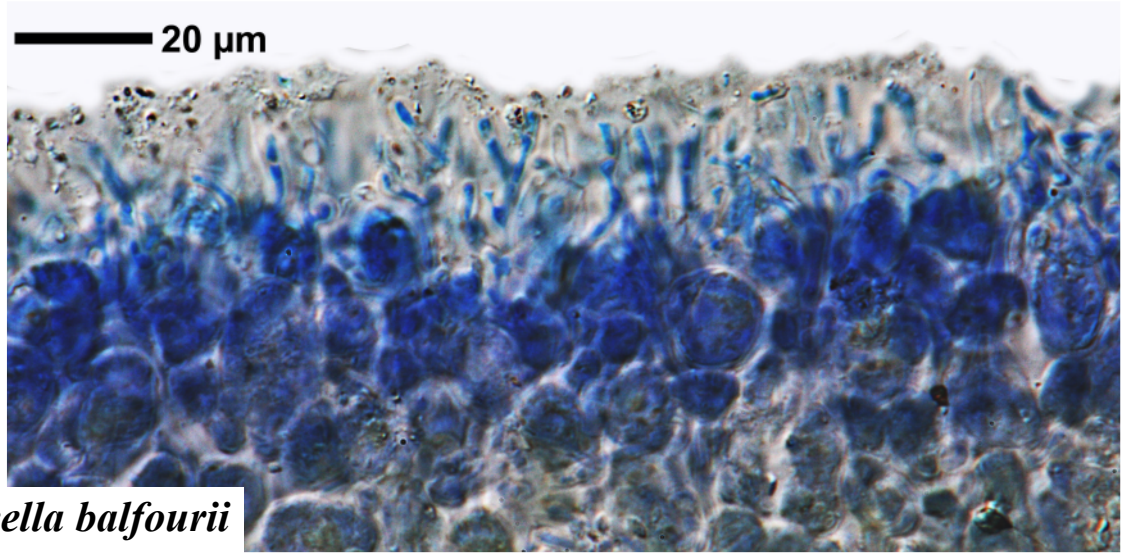




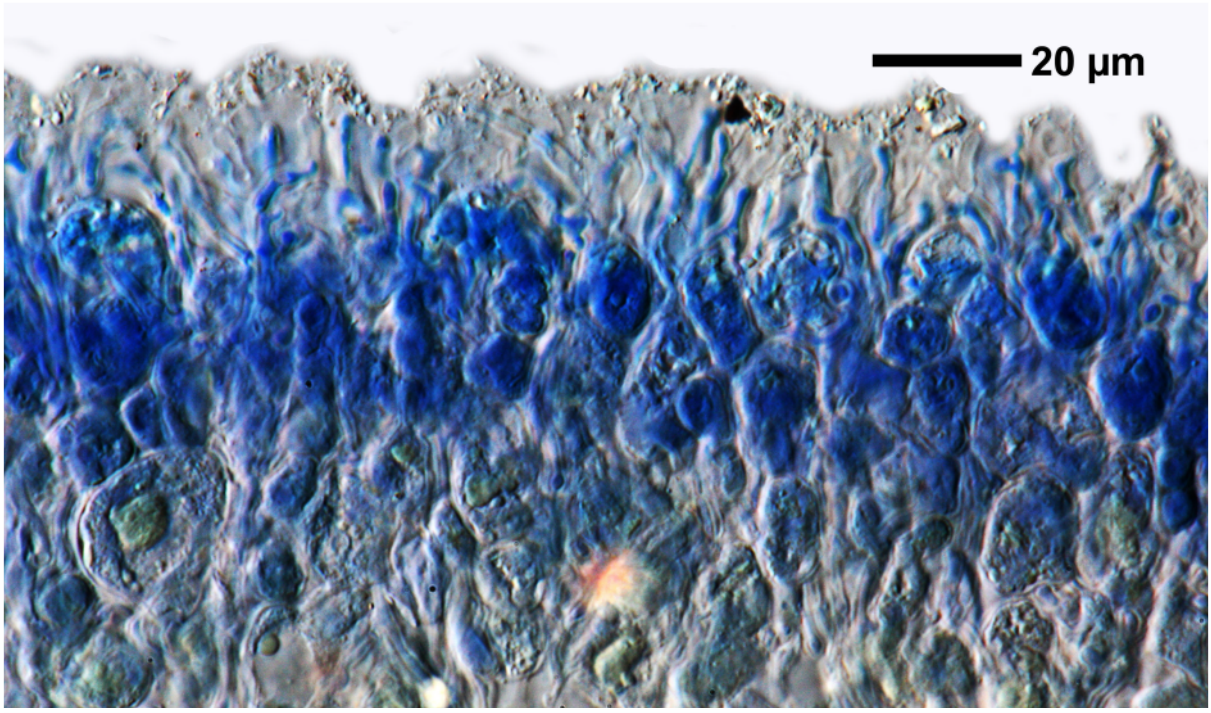
Roccella balfourii



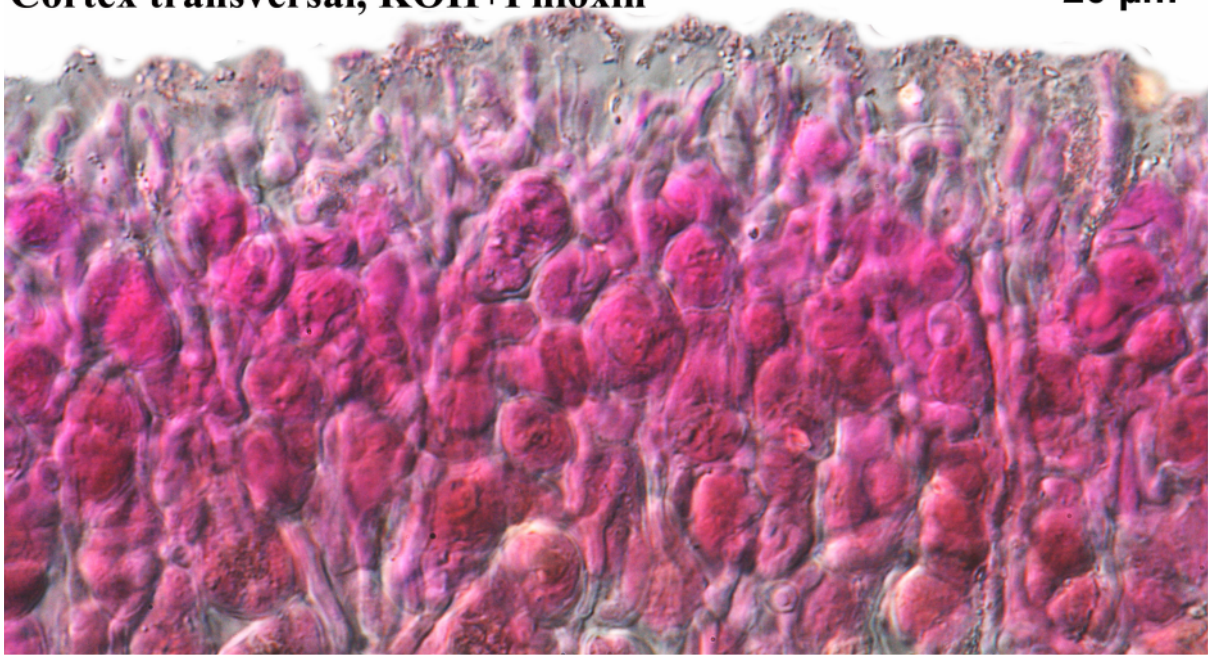




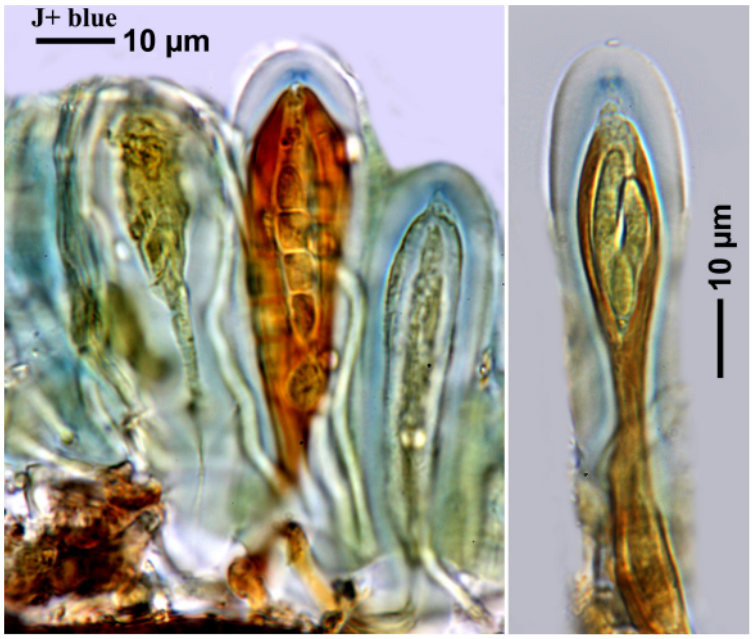
Roccella balfourii



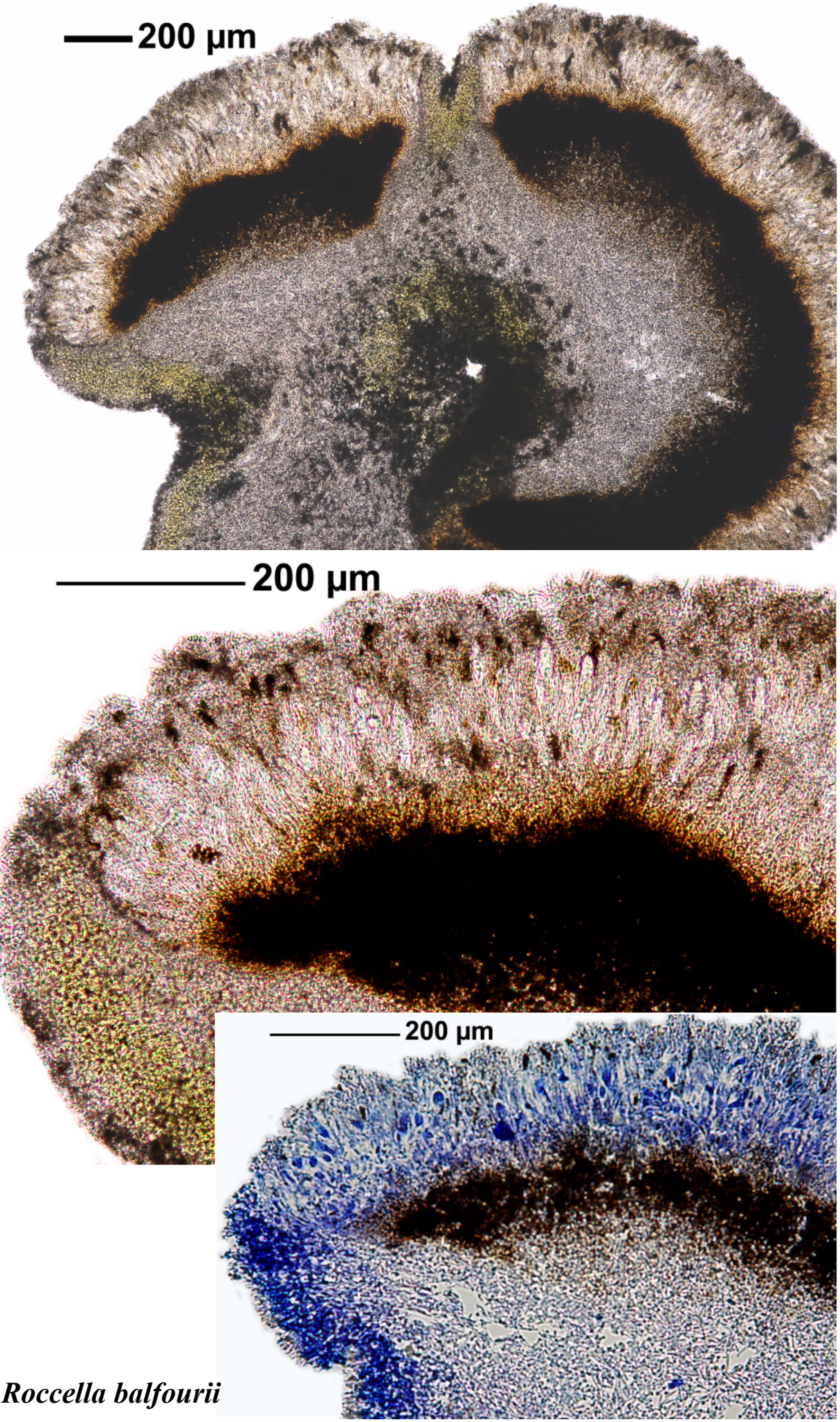
Cortex transversal, KOH+Phloxin



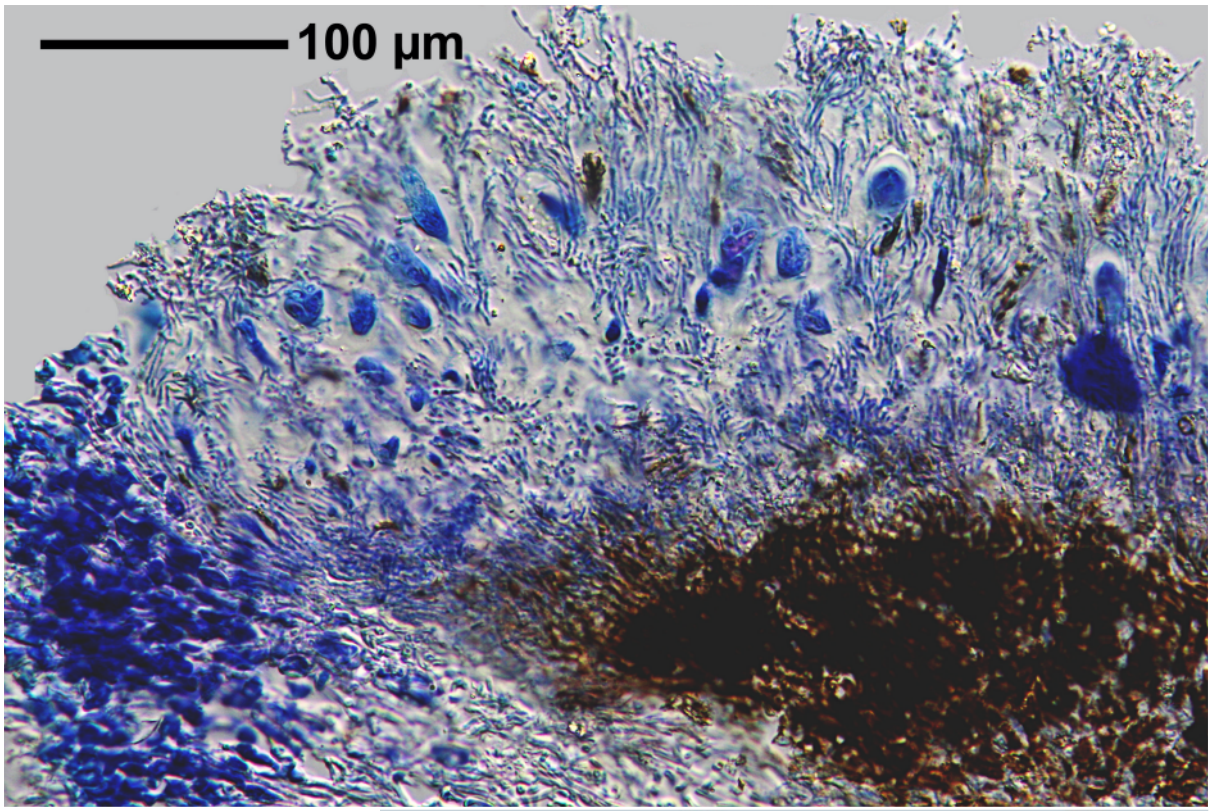


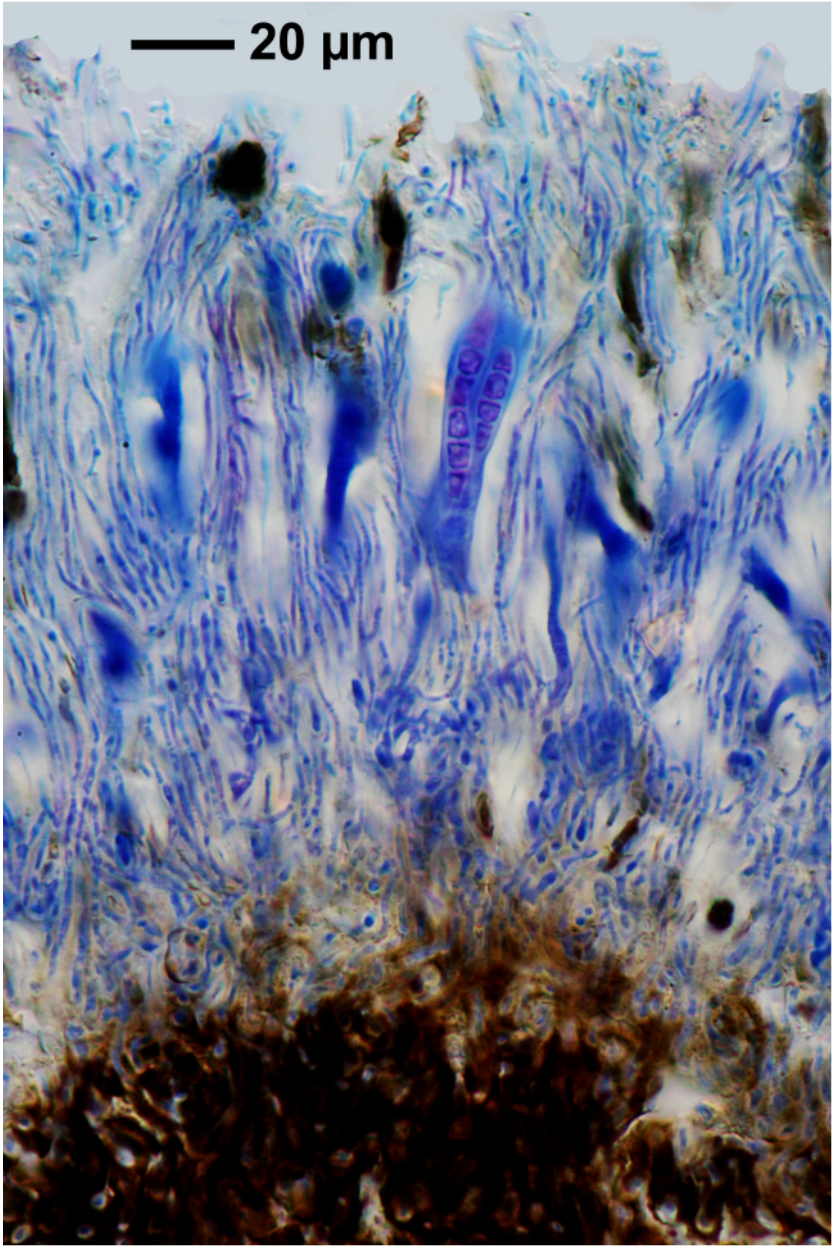


Roccella balfourii



Roccella balfourii



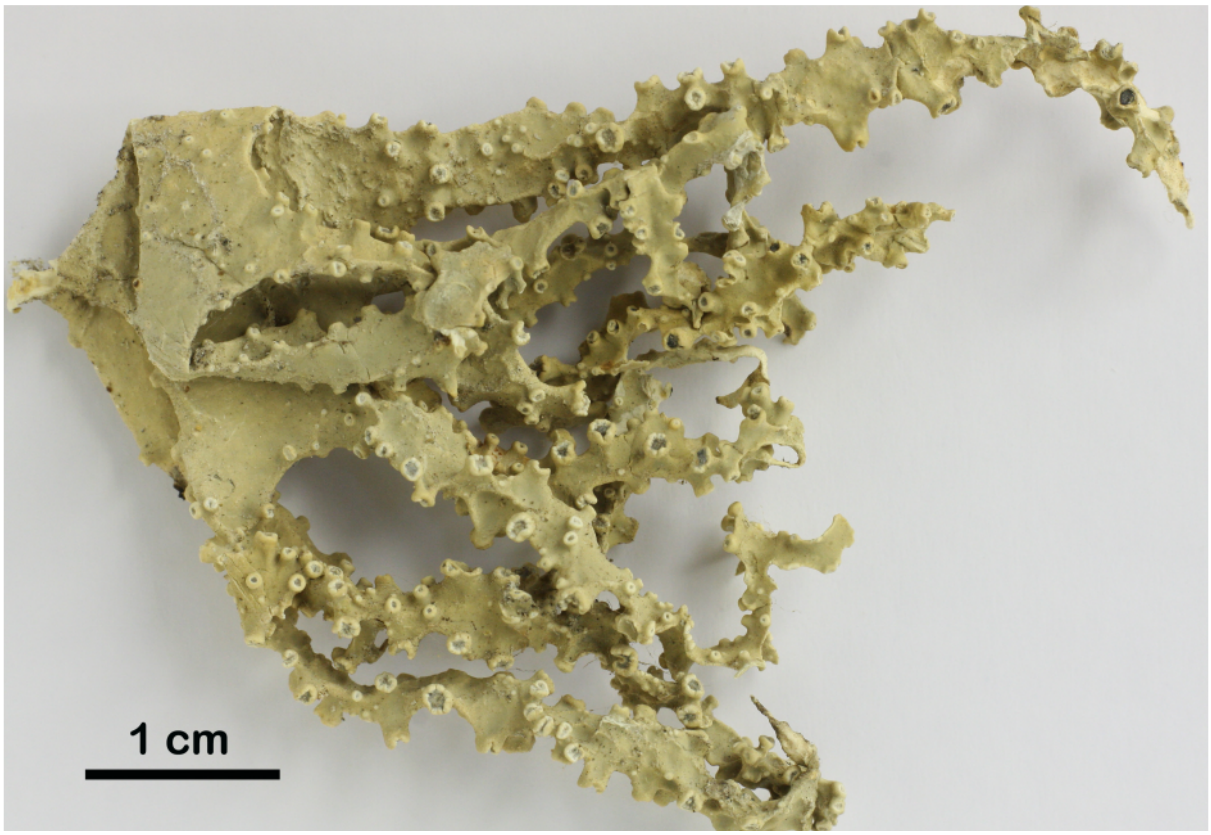


Roccella balfourii

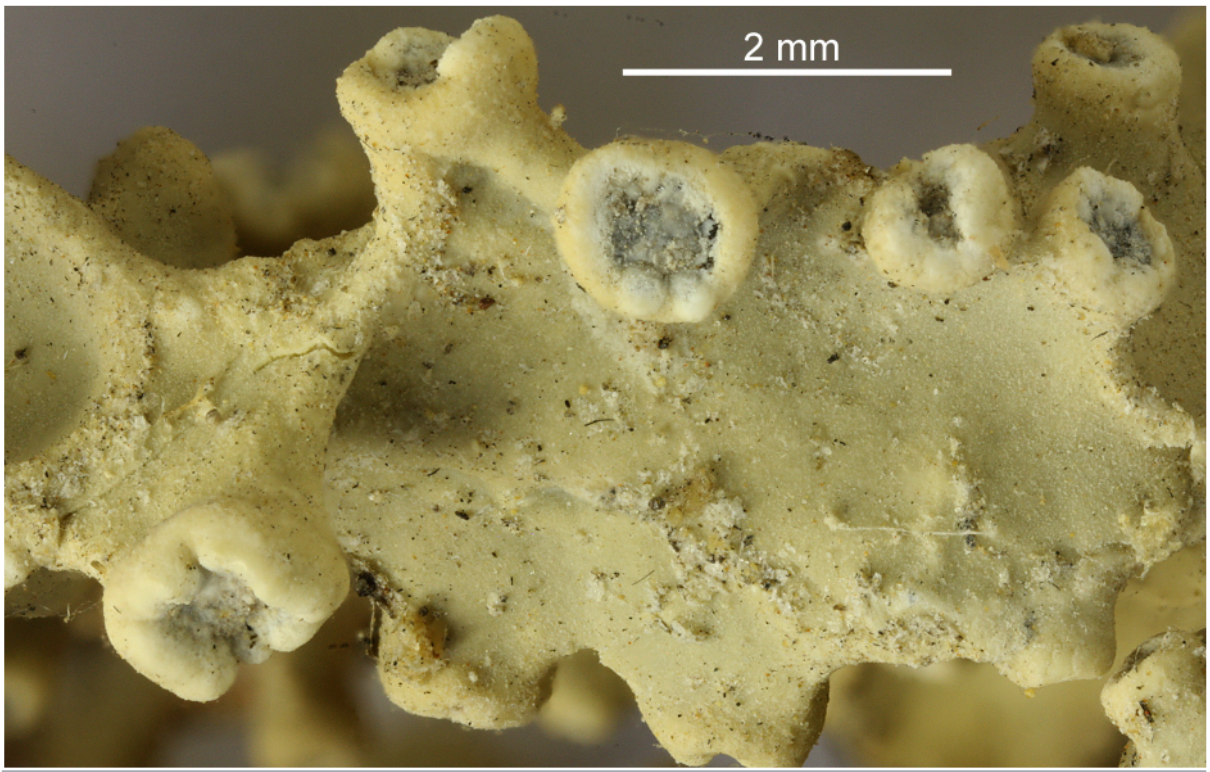
Roccella belangeriana D.D. Awasthi (1981)

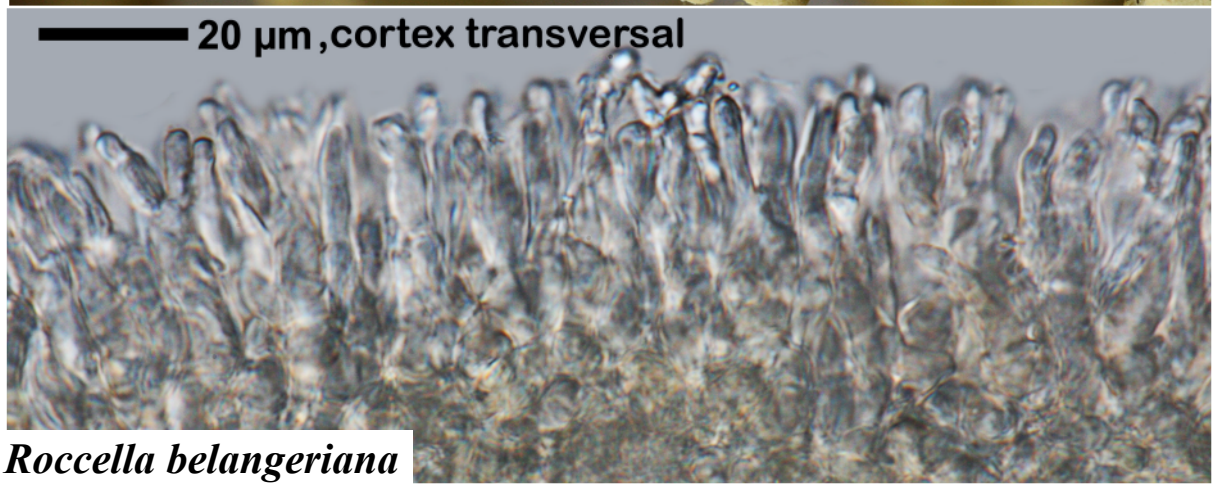
Thallus corticolous, grey, not sorediate, texture soft, applanate, surface ridged, holdfast internally yellow. Cortex intermediate to palisade plectenchymateous. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 25–26 × 3–4 µm. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, IKI+ violet, major substances erythrin, lecanoric. – India, Sri Lanka, Socotra, Madagascar.

Madagascar, St. Augustin, 25 km S of Tulear, coastal area with bush, on Adansonia, 43°46’ E, 23°29’ S, 0 m. Leg. A. Aptroot & R. Hensen 24.04.1984, det. A. Aptroot 2010. [ABL12575]

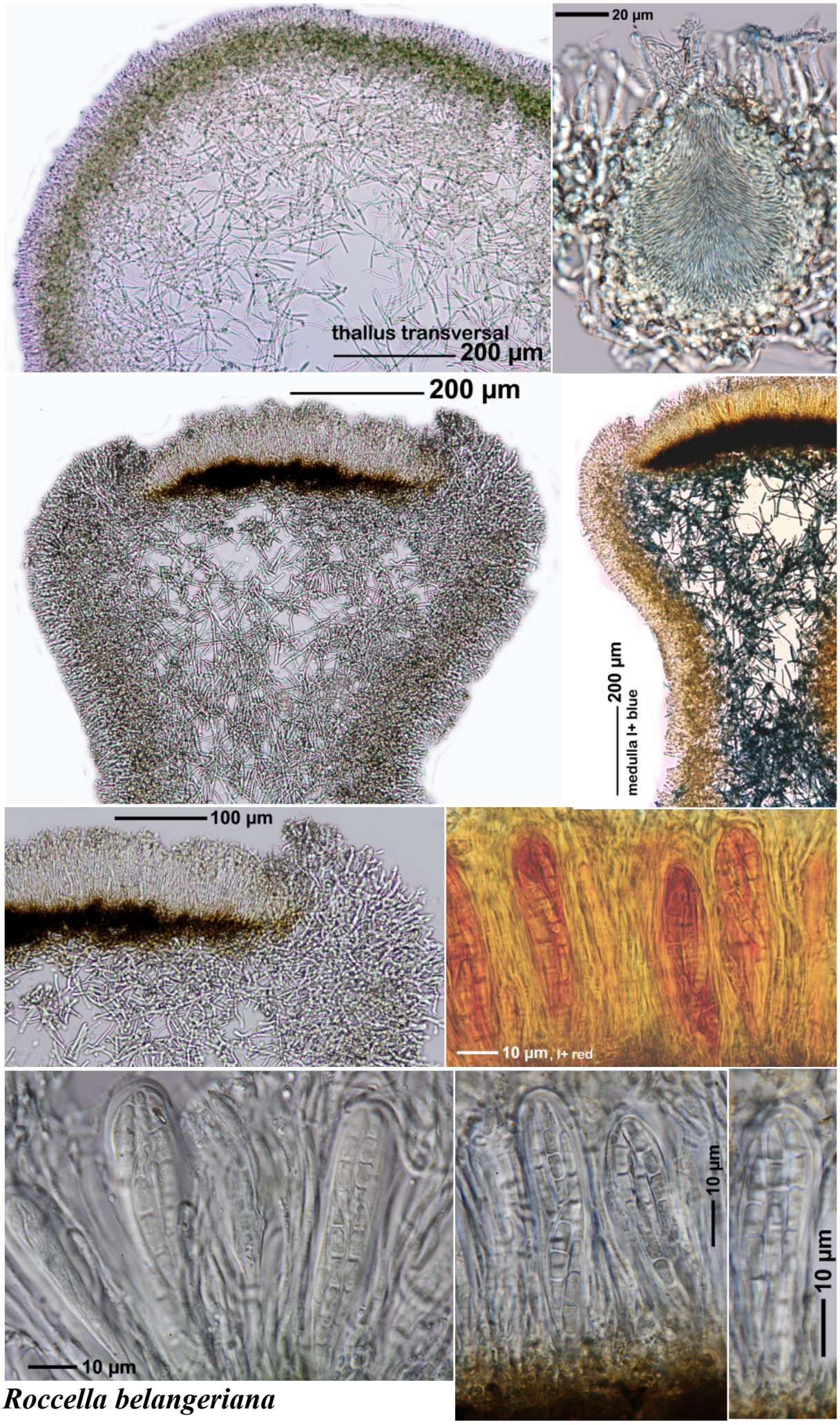








Roccella belangeriana

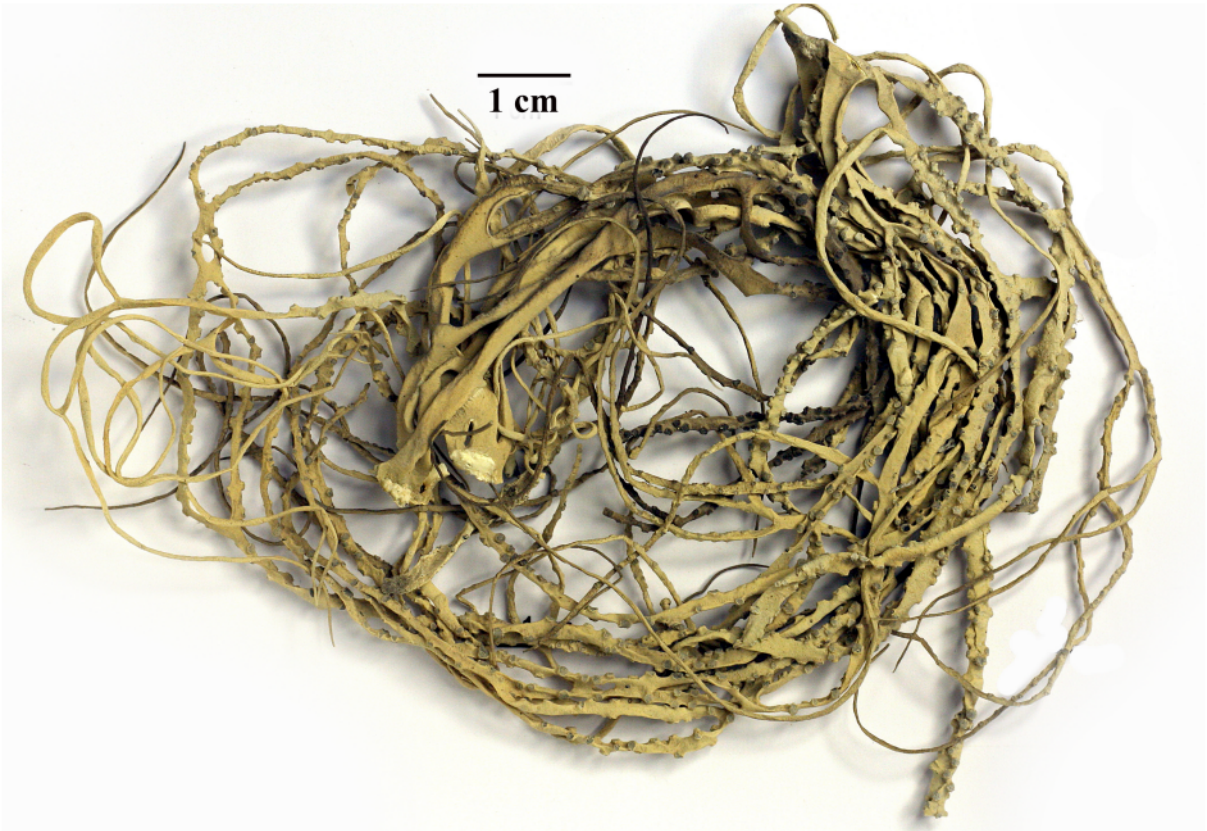


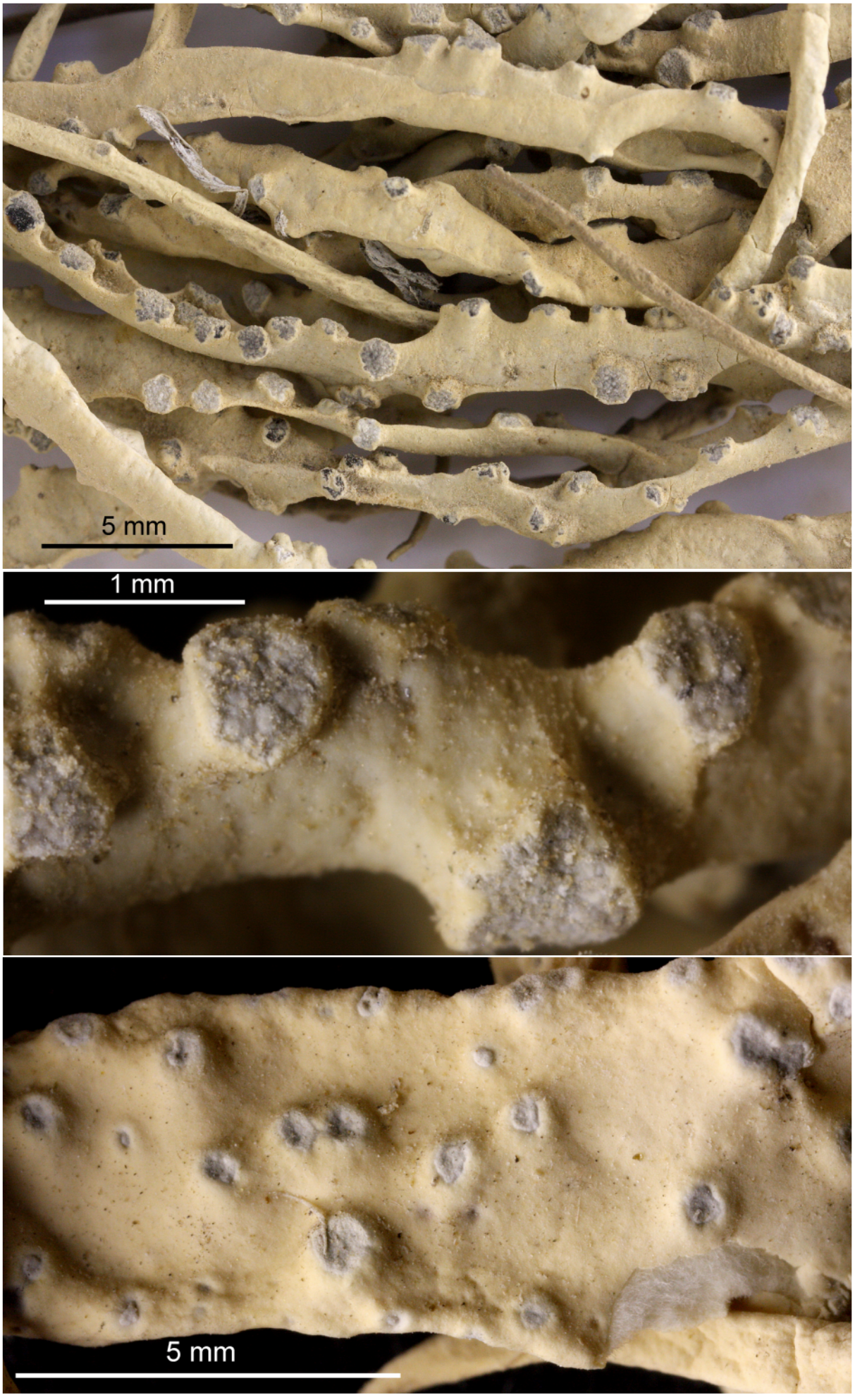
Roccella belangeriana

Roccella decipiens Darb. (1897)
Roccella cacticola Darb. (1897)
Roccella fimbriata Darb. (1935)

Thallus saxicolous, grey, not sorediate, texture firm, applanate, surface smooth, holdfast internally yellow to brown. Cortex palisade plectenchyma. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 23–27 × 5–7 µm. Cortex K –, C + red, KC + red, Pd –, subcortex K –, C + red, KC –, P –, medulla K –, C –, KC –, Pd –, IKI+ violet, major substances erythrin, ± lecanoric. – Mexico, California.

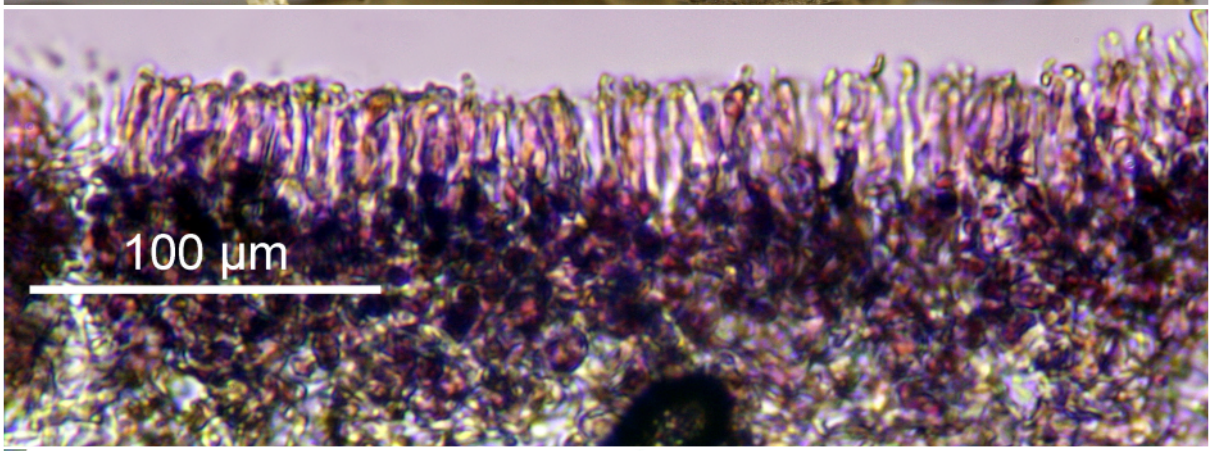
Mexico: Baja California Sur, Cape San Lucas Province, Punta Lobos south of Todos Santos, nest-like at eye-level in thickets of larger spiny shrubs, 5-10 m elevation, NW-SW exposition, gregarious. Leg. G. Follmann & M. Schulz Jan 1989. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 448 (as *Roccella fimbriata*). [14012]

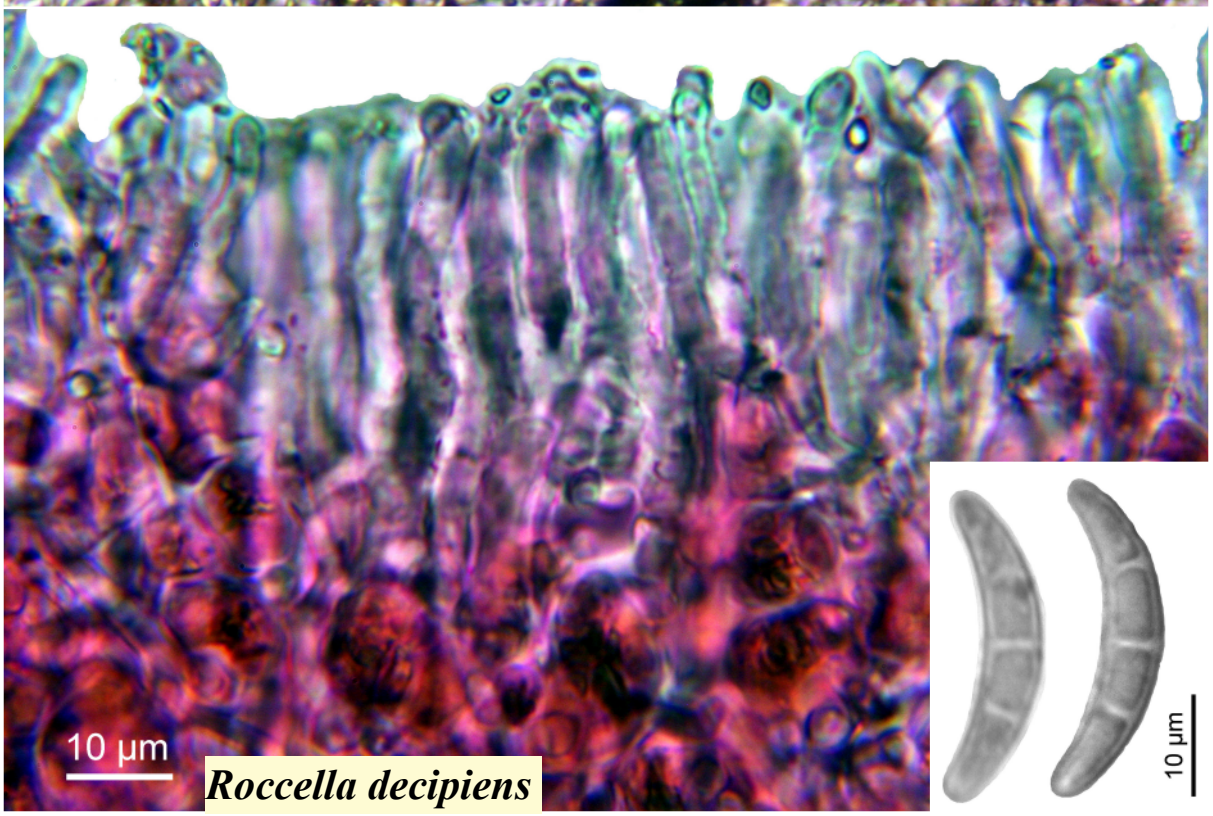




Roccella decipiens





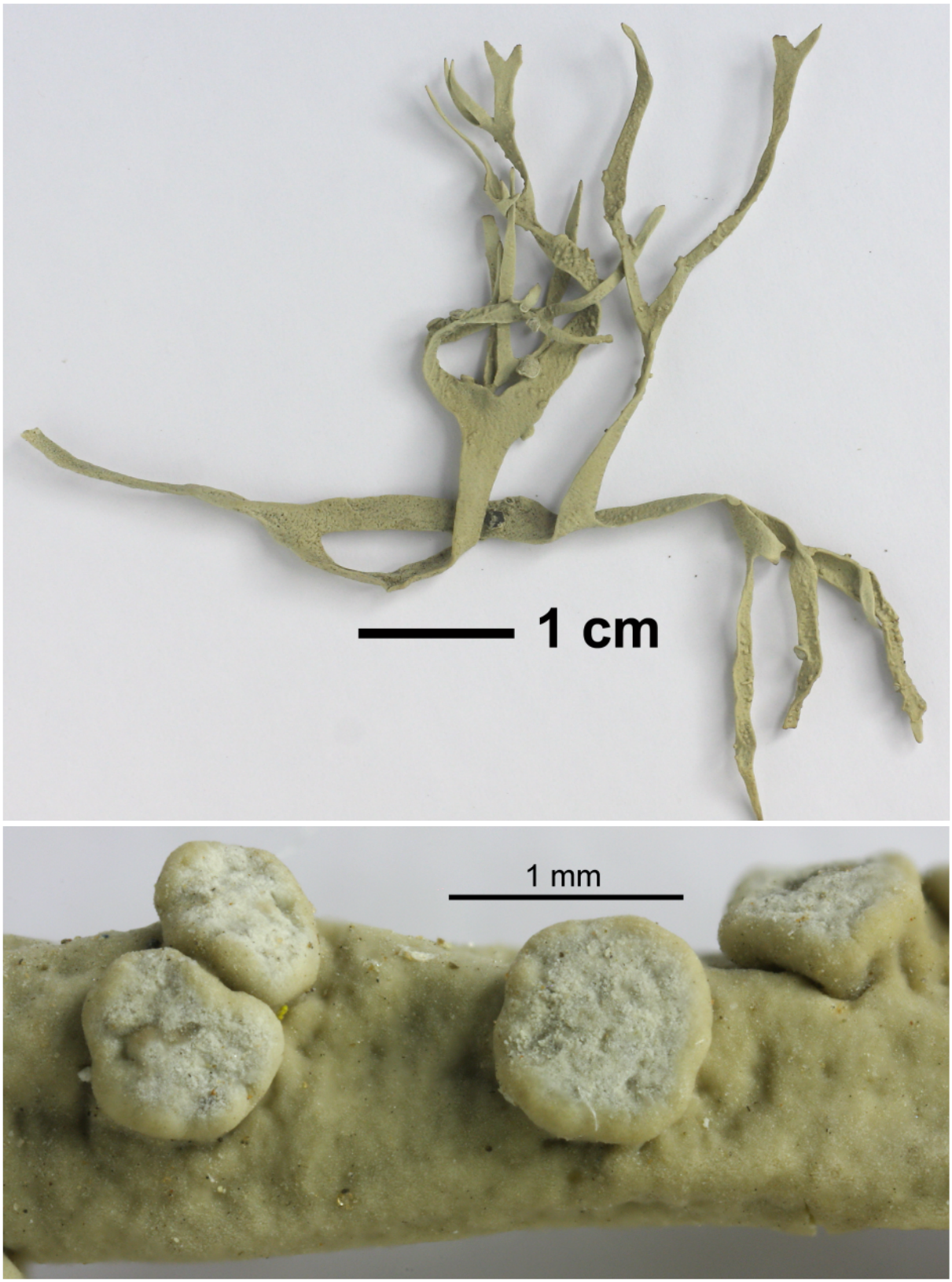


Roccella decipiens

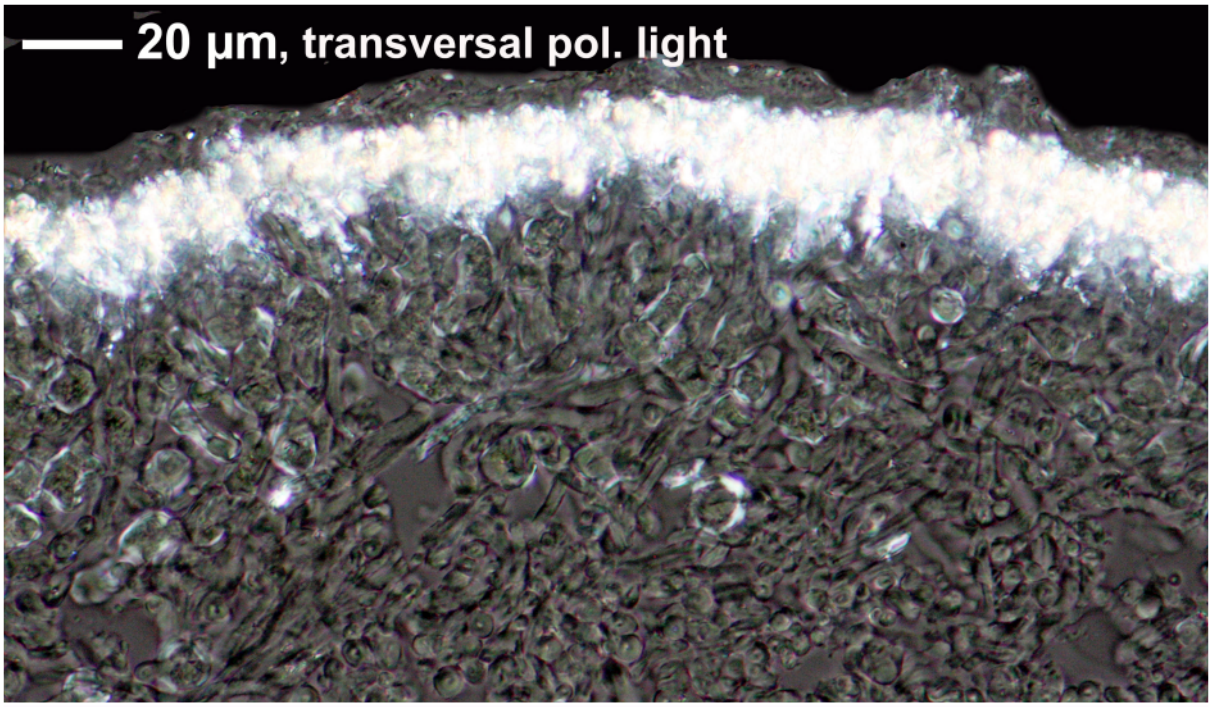
Roccella decipiens Darb.

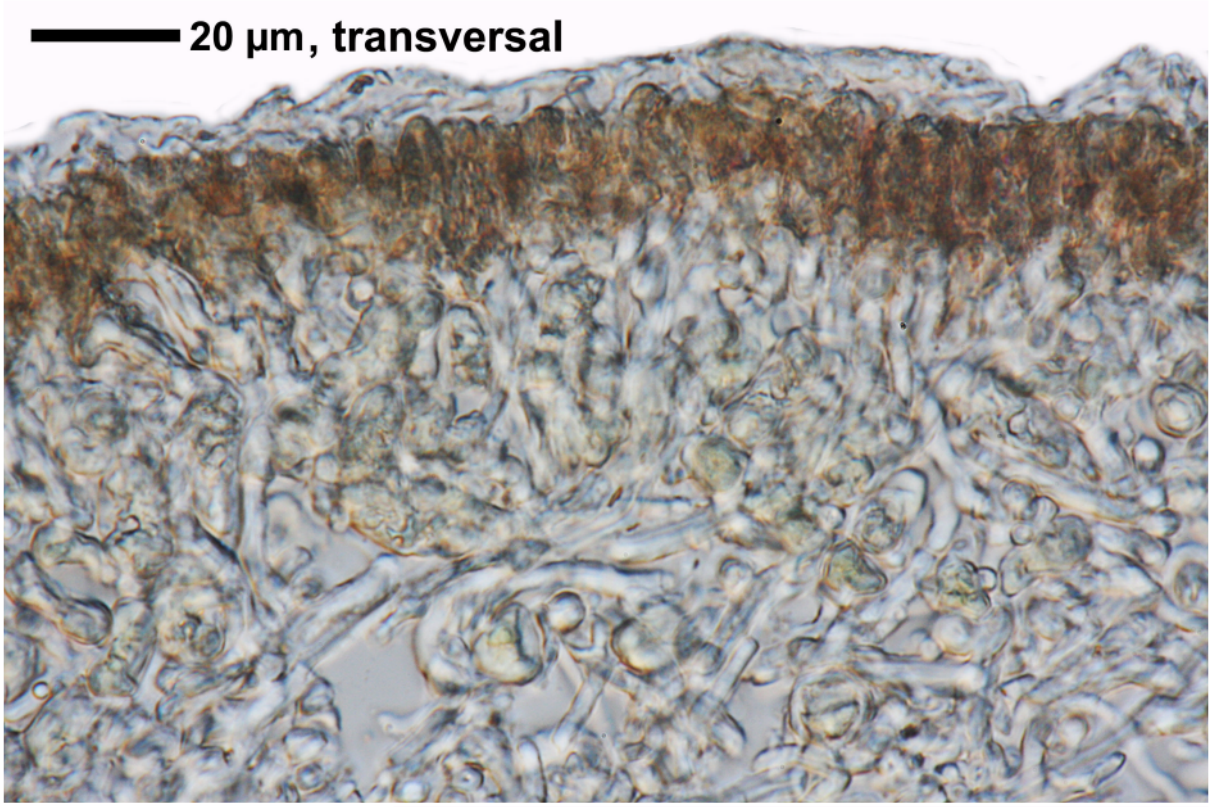
Mexico, Baja California, Cerro Kenton between Bahia Falsa and Bahia San Quintin, coastal scrub community (Aesculus californica, Ambroisia, Euphorbia misera, Jatropha, Lycium, etc.), 20-100 m, basalt area, 30°28'N, 116°00'W. Leg. A. & M. Aptroot 4. Jan. 1989, det. A. Aptroot. [ABL24403]

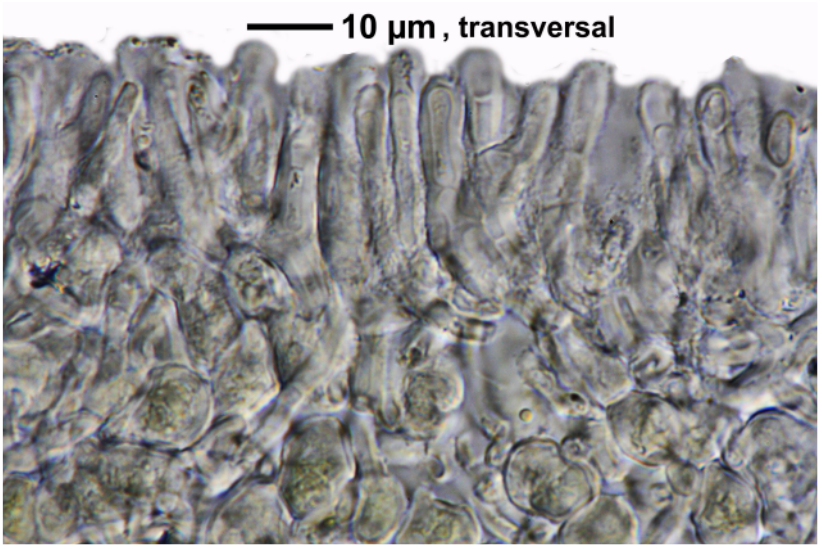




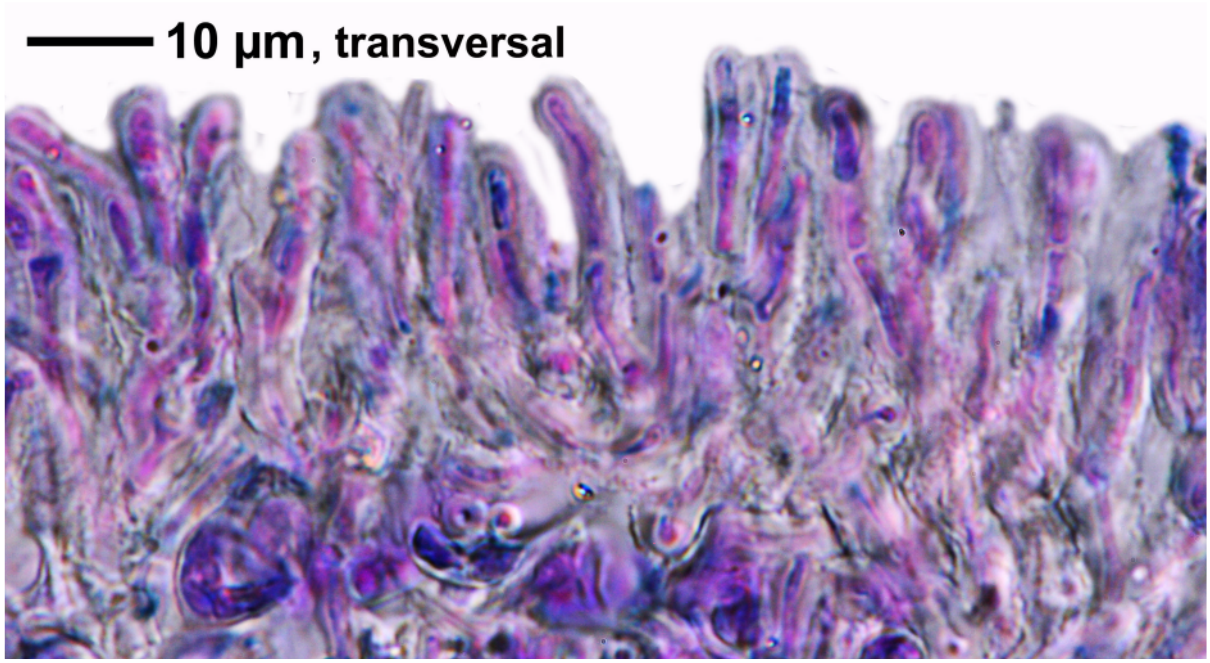
Roccella decipiens

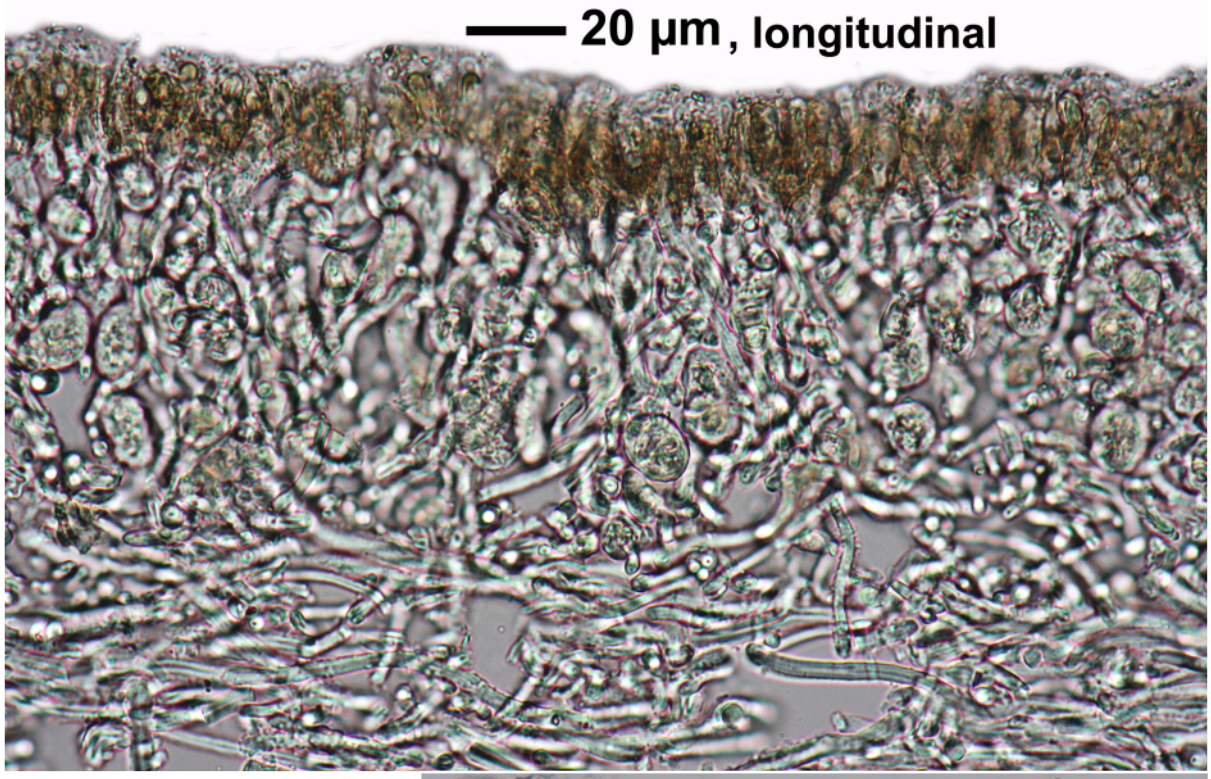


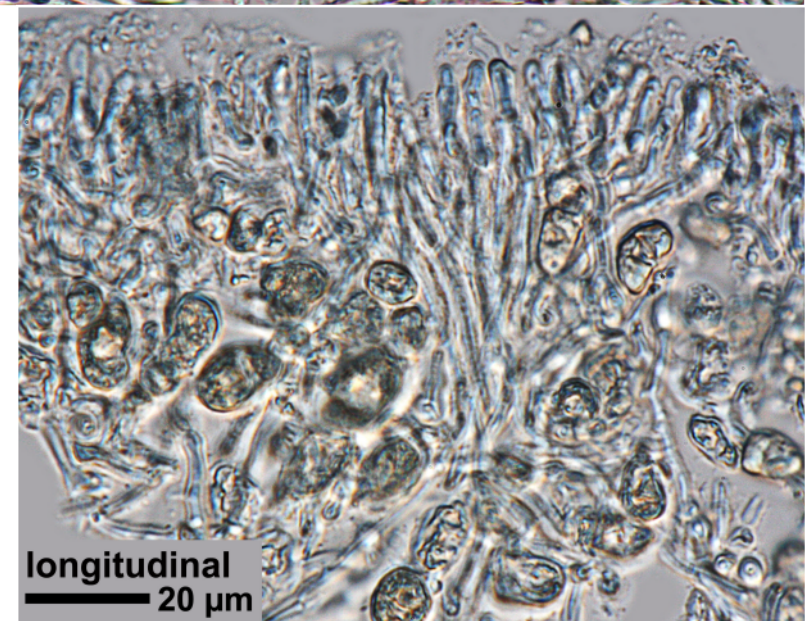




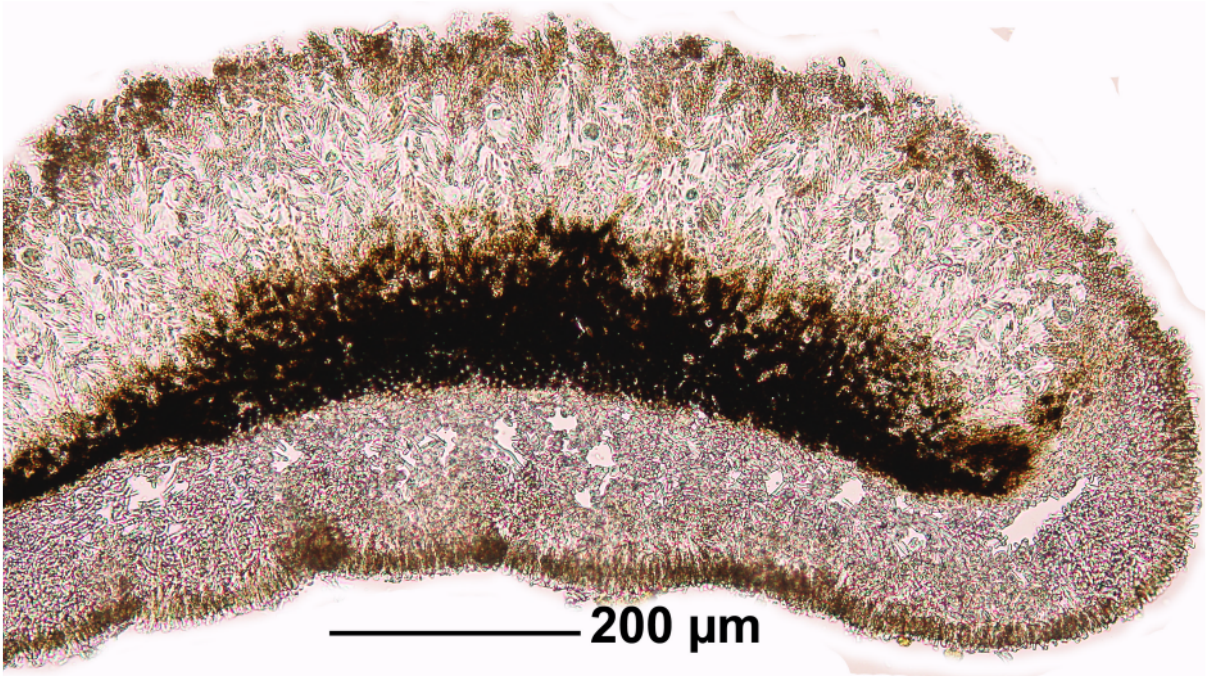
Roccella decipiens

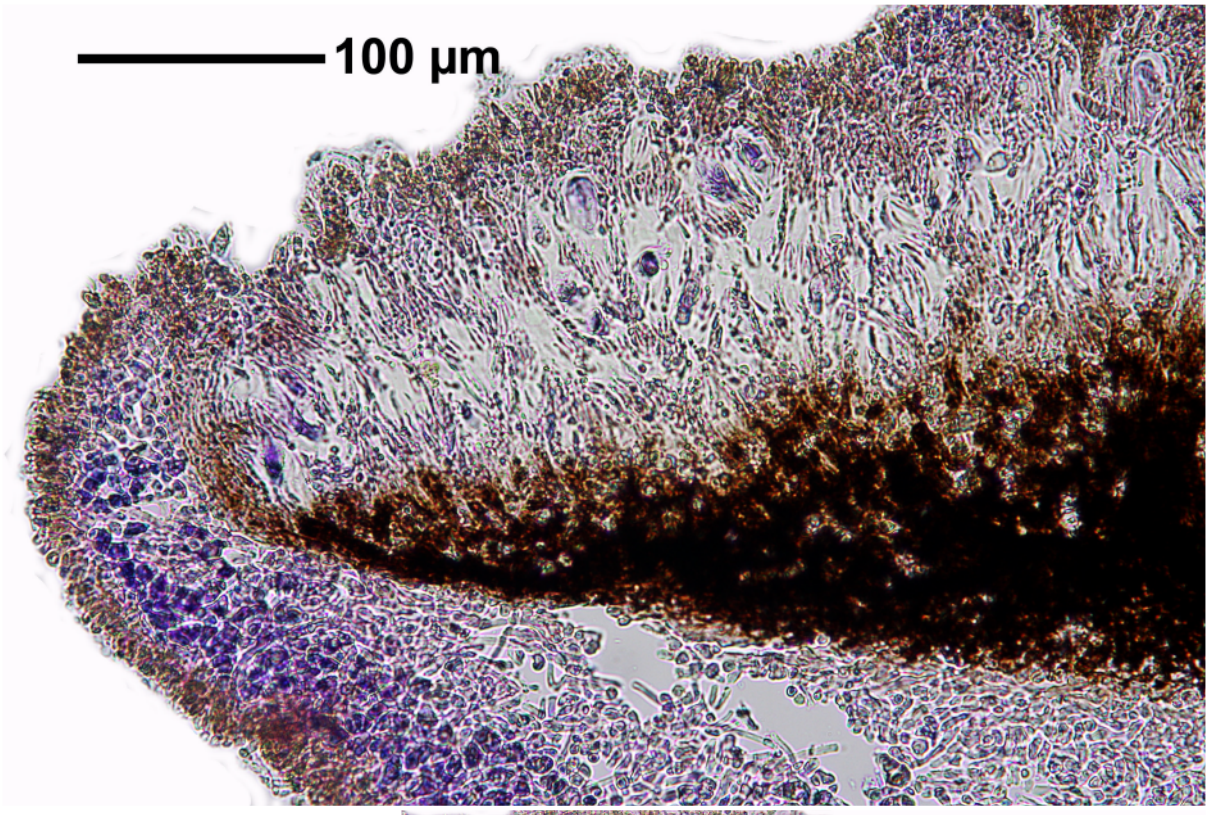




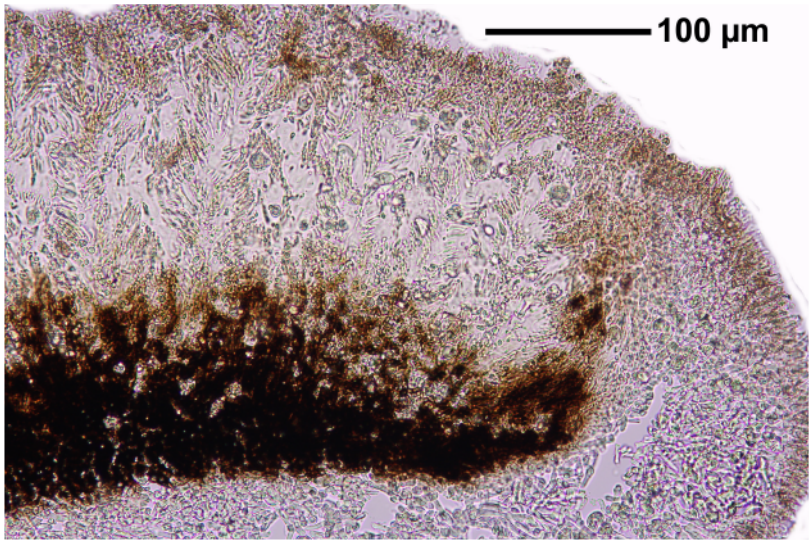


Roccella decipiens









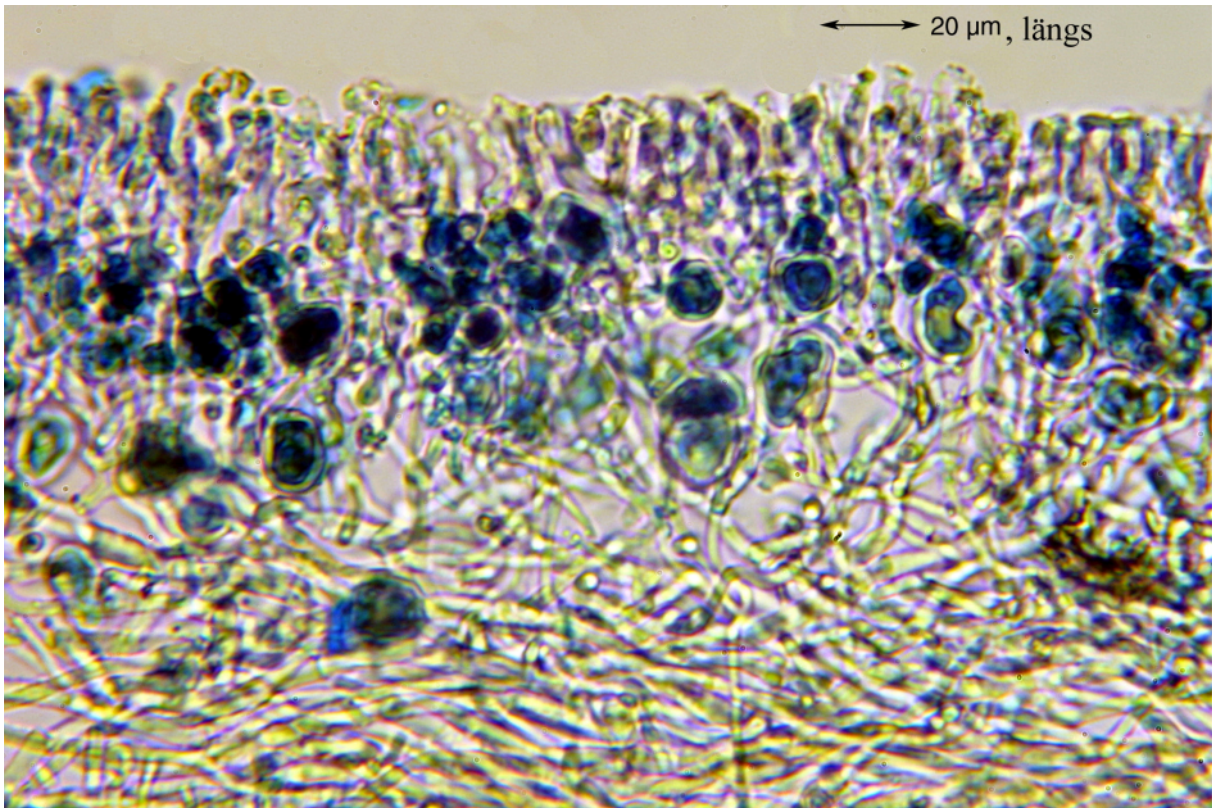
Roccella decipiens

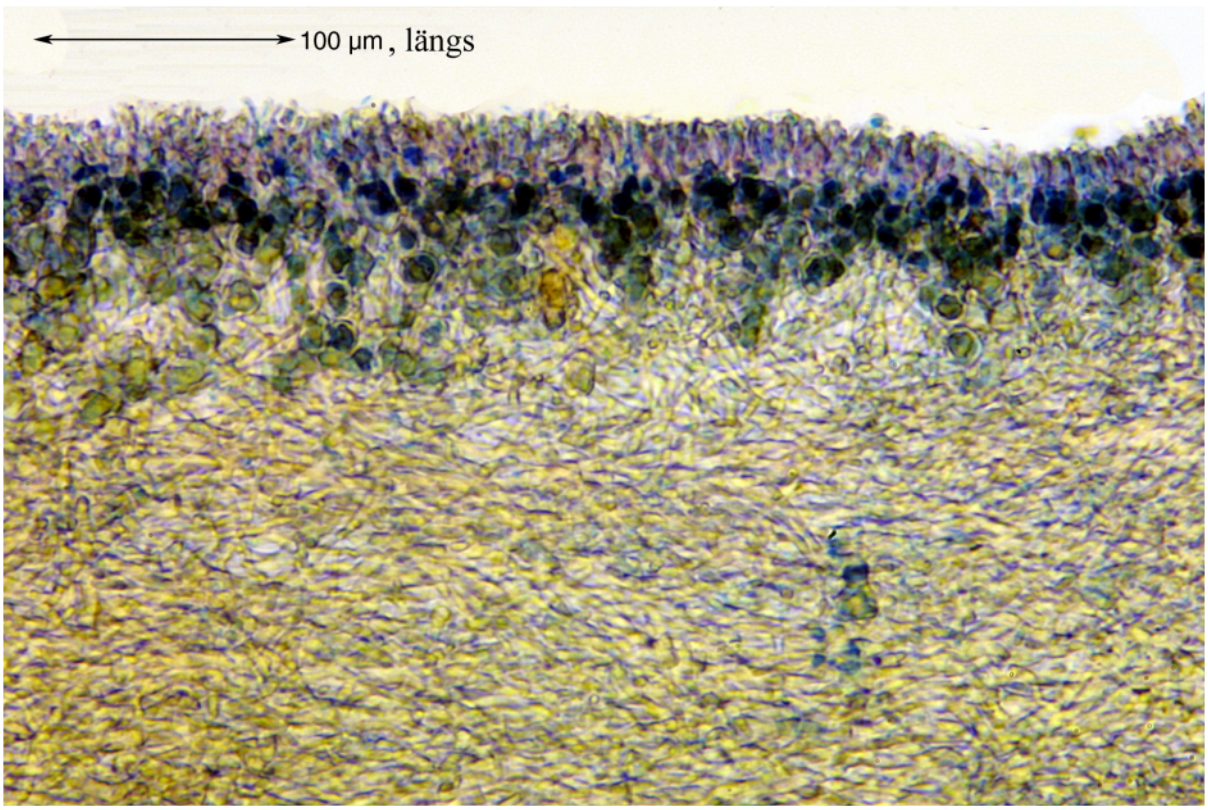
Roccella elisabethae Tehler (2004)
Note: *Roccella arnoldii sensu* most authors

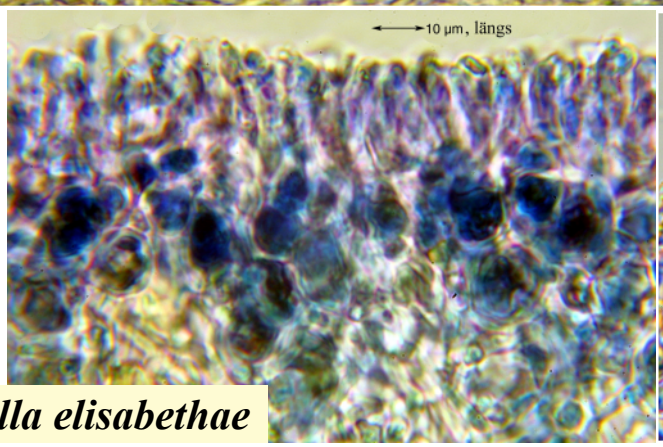
Thallus saxicolous, brown, sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex more or less palisade plectenchyma. Apothecia unknown. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, K –, P –, IKI+ violet, soralia C + red, major substance lecanoric. – Azores, Madeira, Canary Isles, W. Mediterranean Europe.

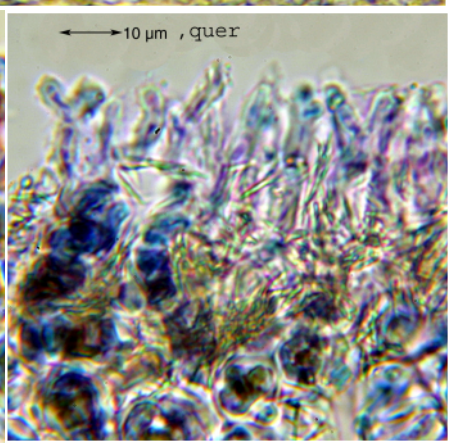
Spanien, Gran Canaria, Barranco de Los Tilos südlich Moya; N 28°04.766, W 15°35.935, Höhe 620 m. Leg et det. Schumm 16.12.1999. [5254]









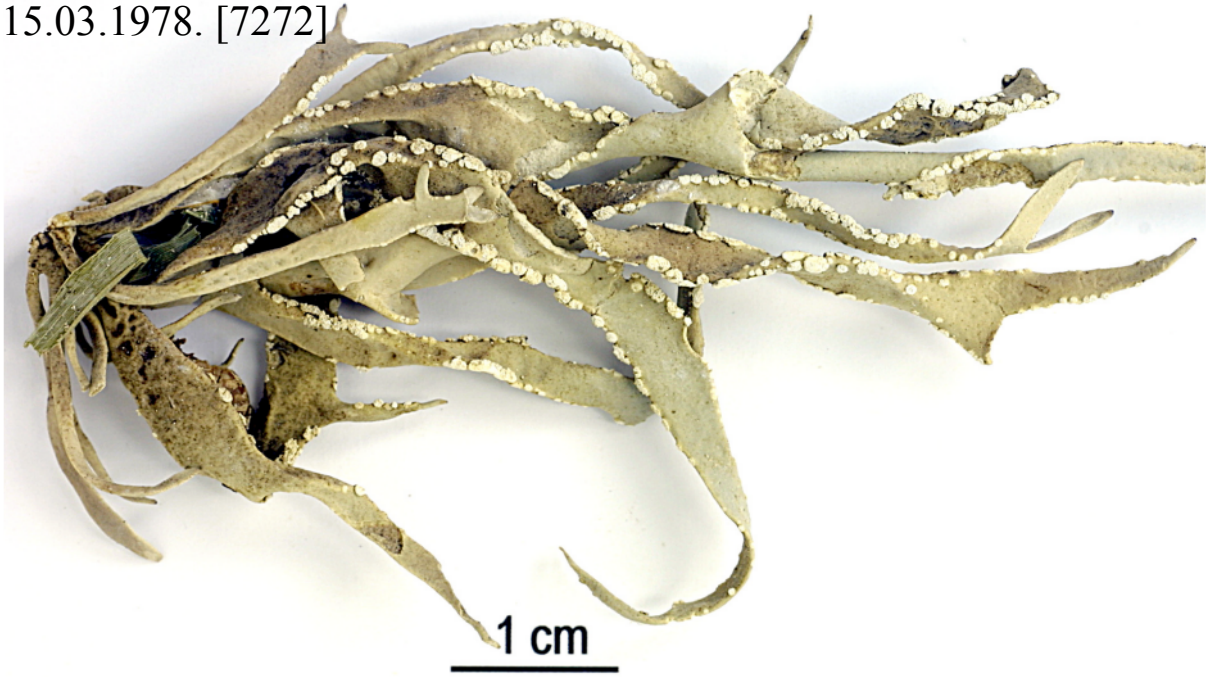


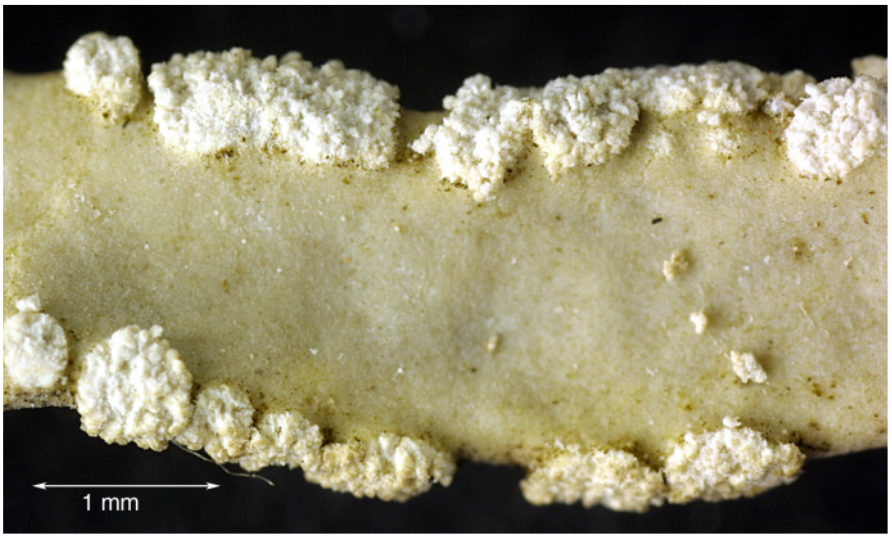
Roccella elisabethae

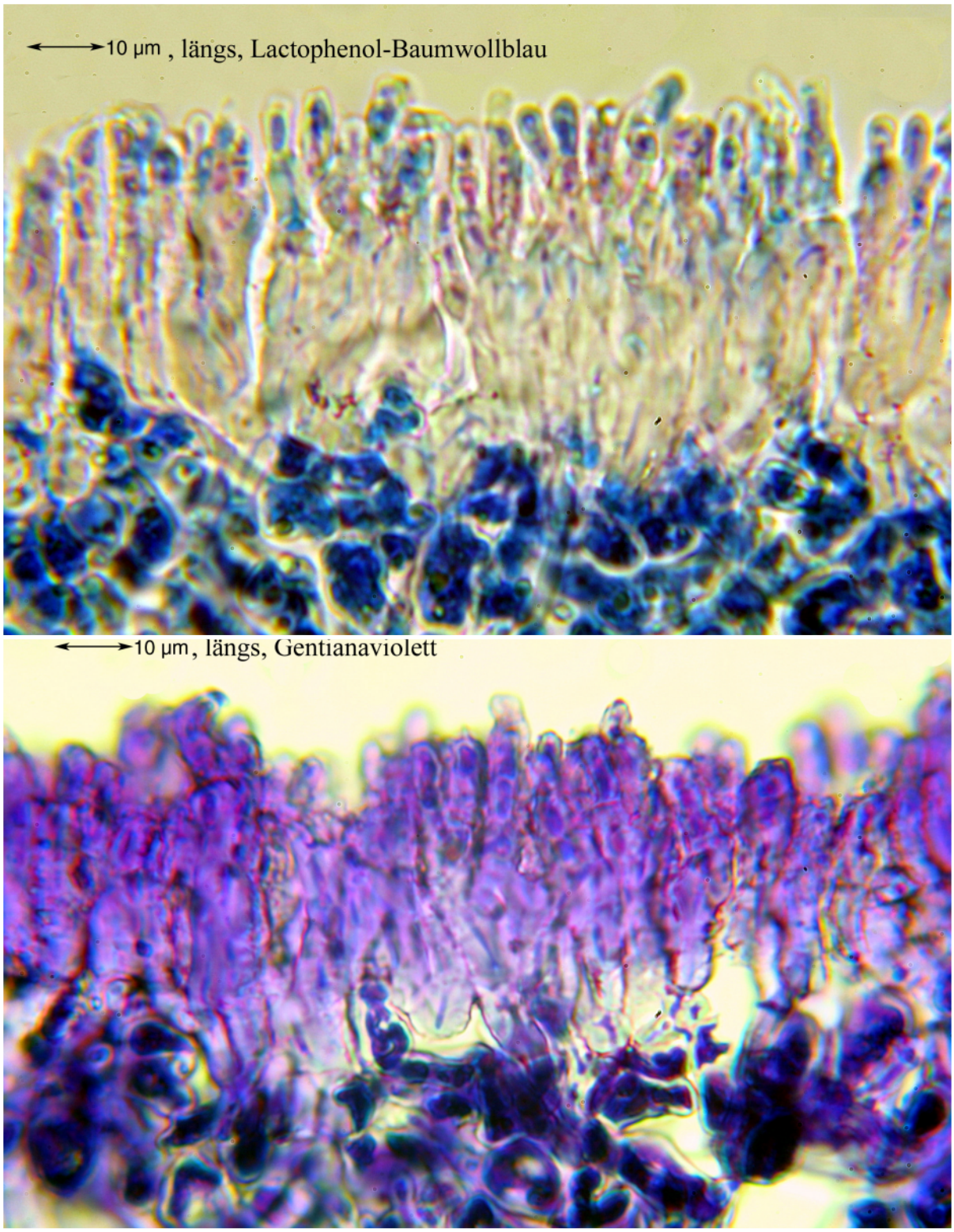
Roccella fuciformis (L.) DC. (1805)
Roccella fuciformis f. *ensiformis* Vain. (1924)
Roccella fuciformis var. *arborea* DC. (1805)
Roccella fuciformis var. *elongata* C. Bolle ex Darb. (1898)
Roccella fuciformis var. *palmetta* Darb. (1898)
Roccella tinctoria var. *fuciformis* (DC.) Bab. (1839)

Thallus saxicolous, rarely corticolous, grey, sorediate, texture firm, applanate, surface smooth, holdfast internally white to brown. Cortex palisade plectenchyma. Apothecia rare, round. Hypothecium black. Ascospores hyaline, 3-septate, 20–27 × 5–9 µm. Cortex C –, K –, Pd –, subcortex C –, medulla C –, IKI+ violet, soralia C + red, major substances erythrin, lepraric. – Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe.

Spanien, Kanarische Inseln, Teneriffa, Puerto de la Cruz, nahe der Hotelanlage La Romantica, auf Mauern. Leg. et det Schumm 15.03.1978. [7272]







Roccella fuciformis

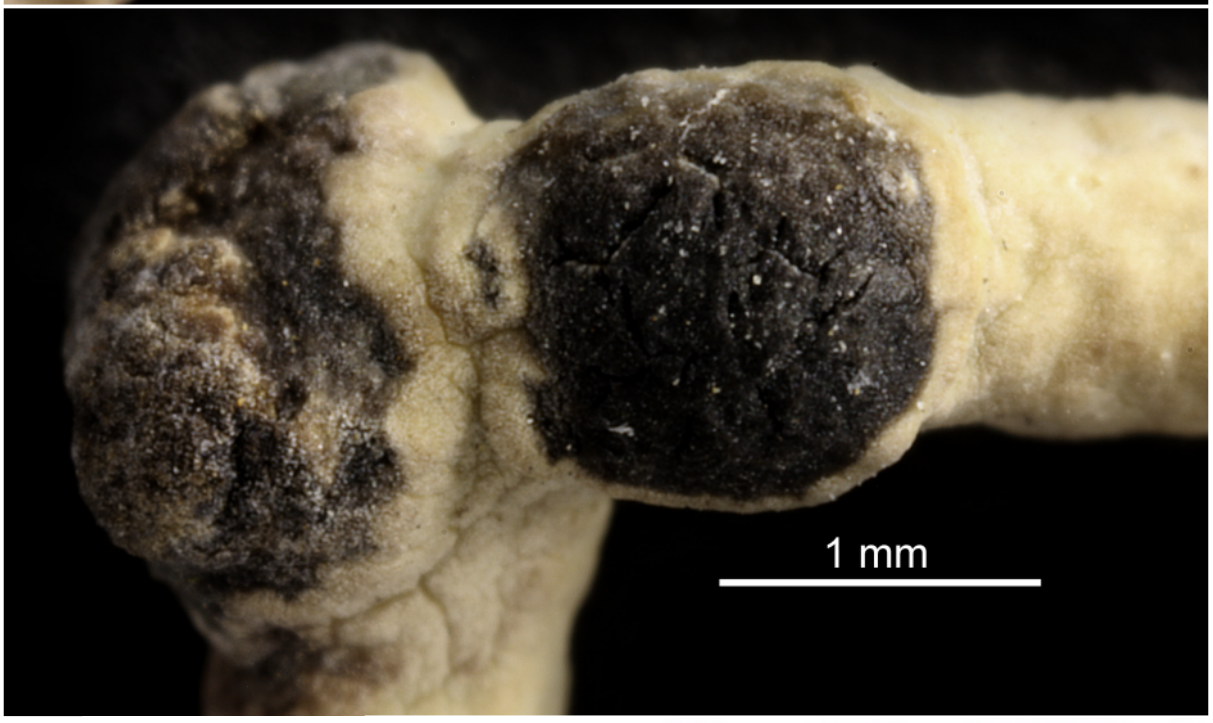
Roccella galapagoensis Follmann (1968)
Roccella capitata Werner (2000)
Roccella colonii Follmann (2001)
Roccella fusca Werner (2000)
Roccella geniculata Follmann & B. Werner (2000)
Roccella obscurissima Follmann & B. Werner (1998)
Roccella scoparia Follmann ex Tehler (2007)

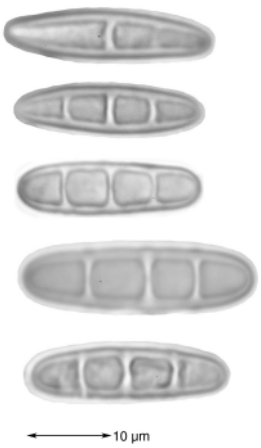
Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface reticulate, holdfast internally white to brown. Cortex palisade plectenchyma. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 22–28 × 5.5–7 µm. Cortex C + red or –, K – or + yellow, Pd – or + orange, subcortex C –, medulla C –, IKI –, major substances galapagin, ± erythrin, ± lecanoric, ± protocetraric, ± portentol. – Galapagos.

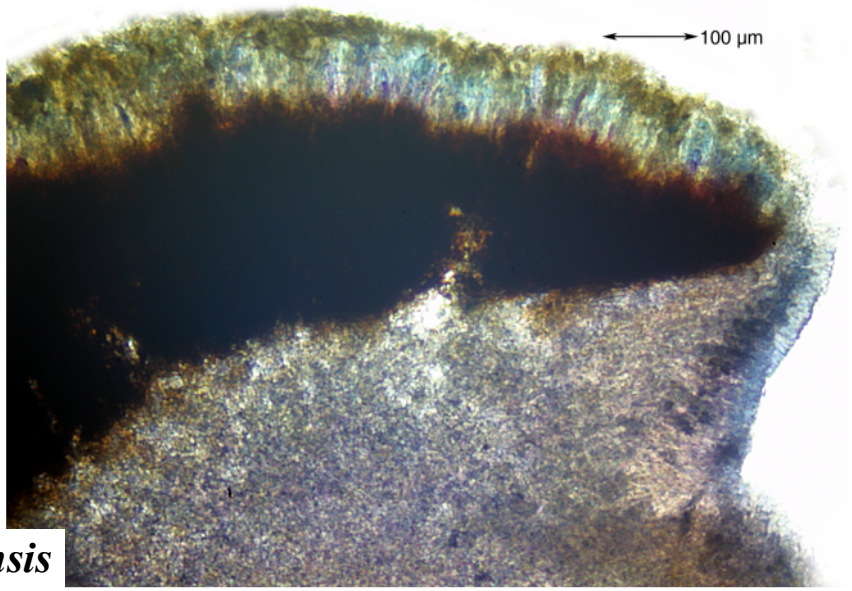
Ecuador, Galápagos Islands, Isabela Island, Cerro Alcedo, cinder cones along the trail going up the E-slope (ISA 23); arid lowlands, basalt outcrops, at the bottom scattered Bursera graveolens trees and shrubs of Castla galapageia, 0°23’40’’S, 91°1’18’’ W, alt. 190 m. Leg. A. Aptroot 10.03.2006. [ABL64718]



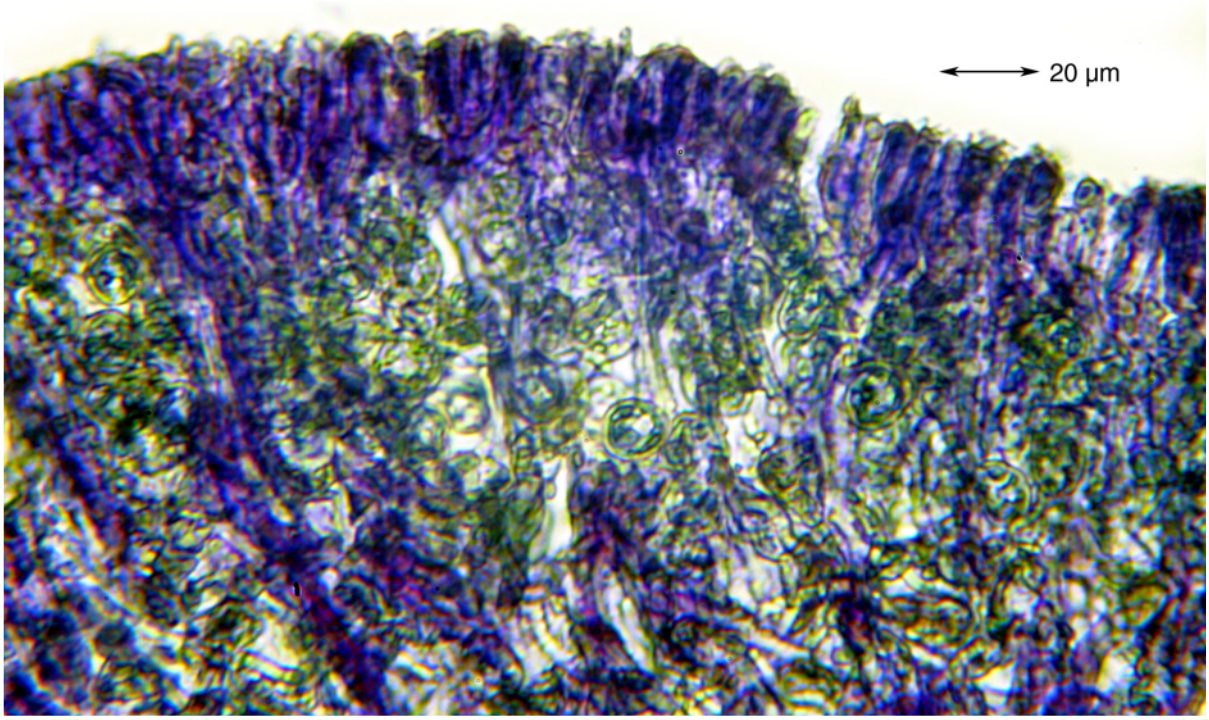


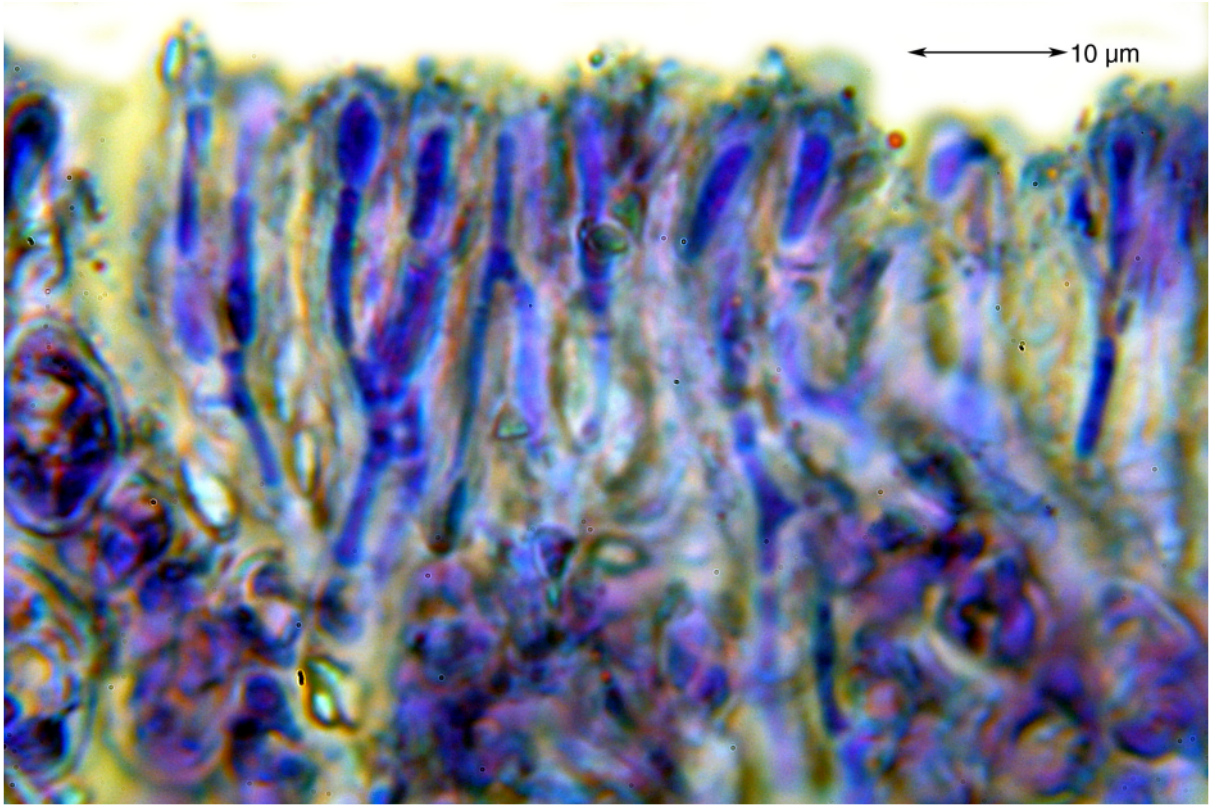




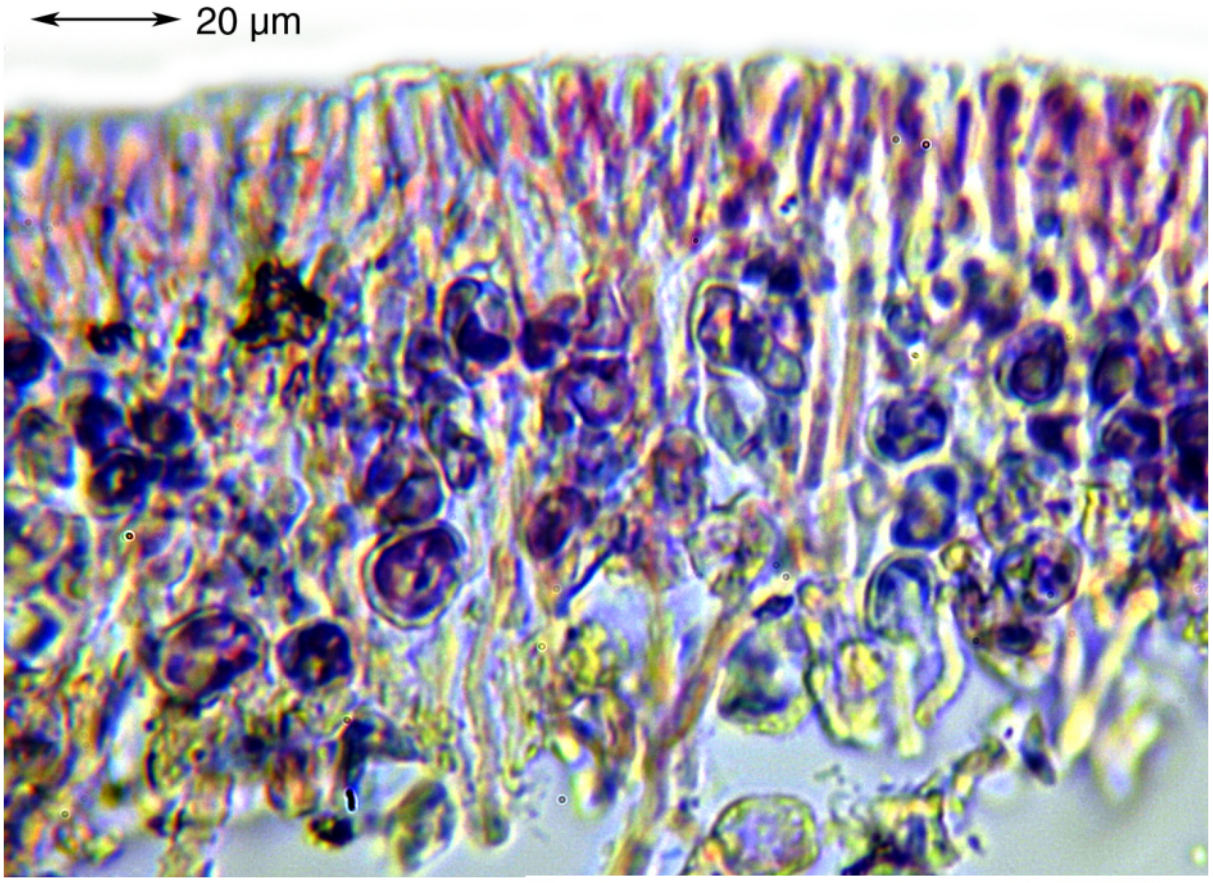


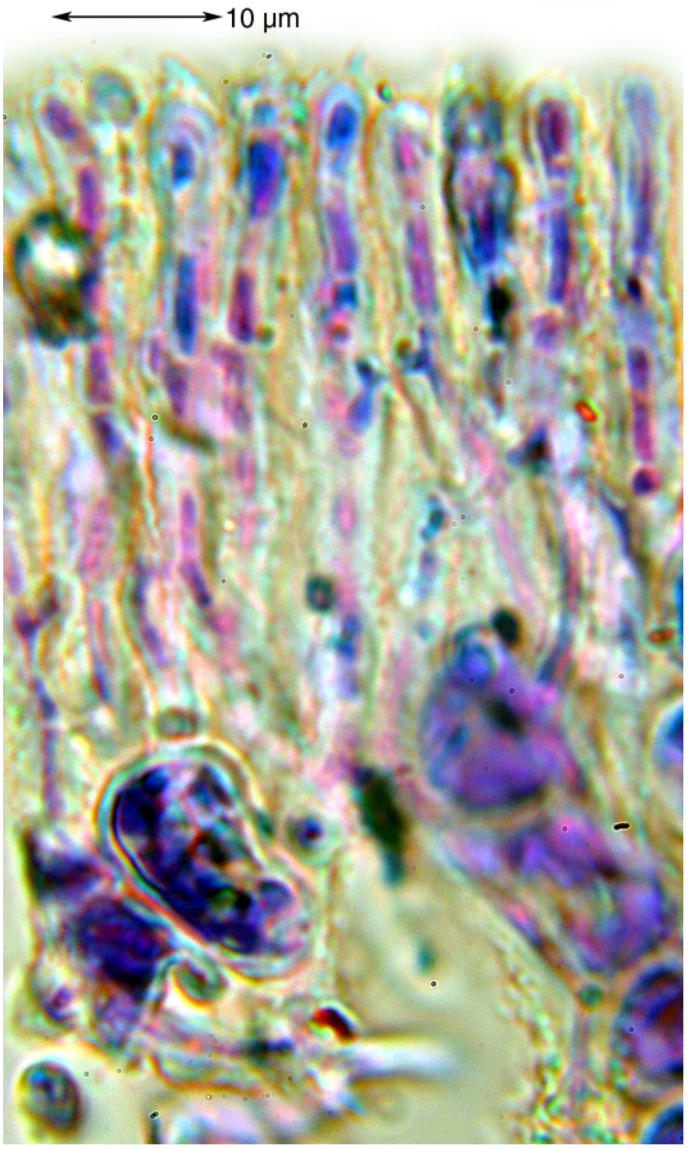
Roccella galapagoensis





Roccella galapagoensis





Roccella galapagoensis

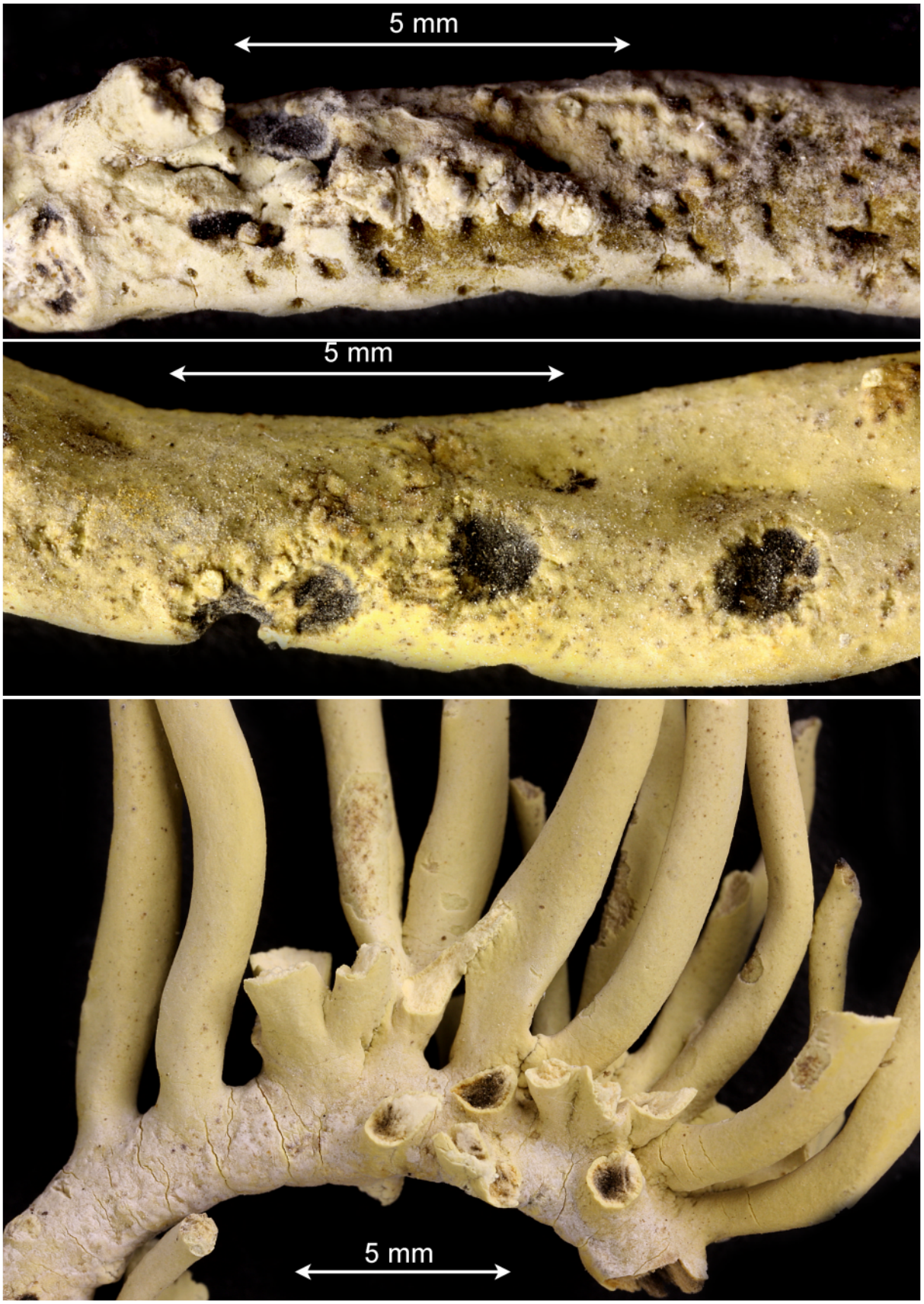
Roccella glebaria B. Werner & Follmann (2000)

Thallus saxicolous, olive, not sorediate, texture firm, cylindrical, inflated with constricted bases at the branching points, surface pitted, holdfast internally white to brown. Cortex intermediate type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–25 × 6–9 µm. Cortex C –, K + yellow, Pd –, subcortex C –, medulla C –, IKI + violet, major substances galapagin, protocetraric. – Galapagos (only on one or two islands, both called Gardner).

Note: Synonymized by TEHLER et al. (2009) with *R. galapagoensis*, but differing in cortex anatomy, pitted surface structure and inflated branches with constricted bases.

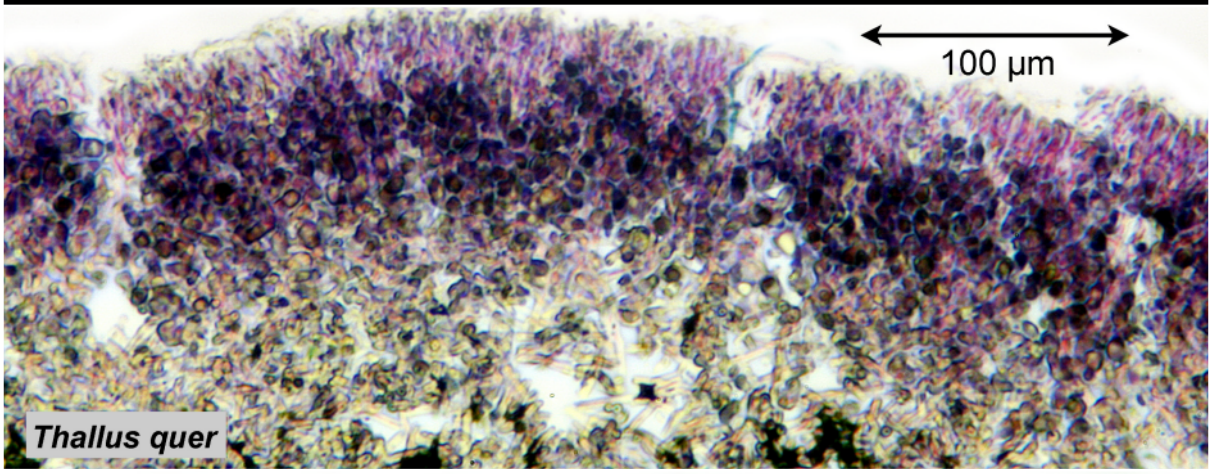
Galapagos Islands, Isla Gardner near Española. Leg. H. Jäger, det. A. Aptroot. [ABLsnGal]

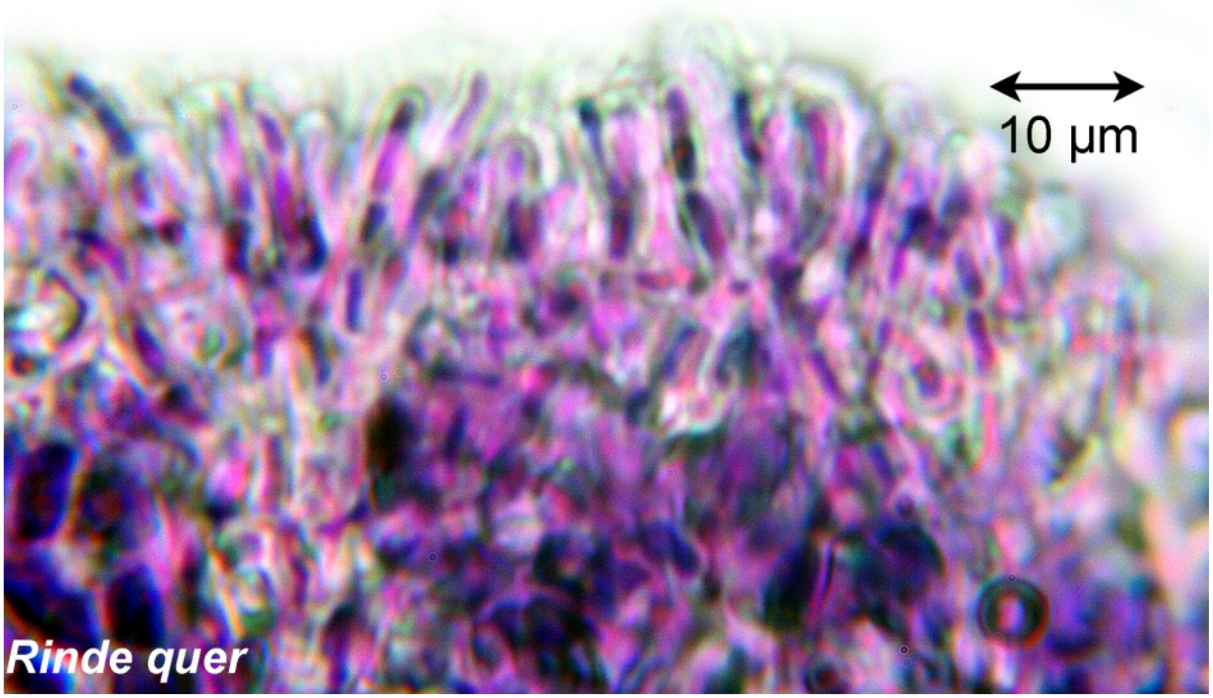




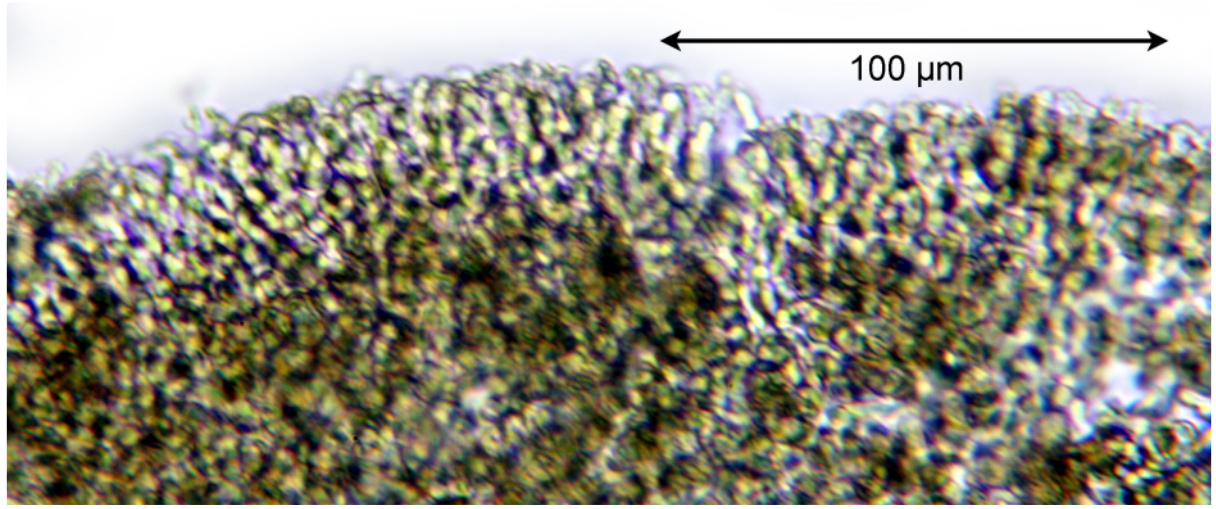
Roccella glebaria

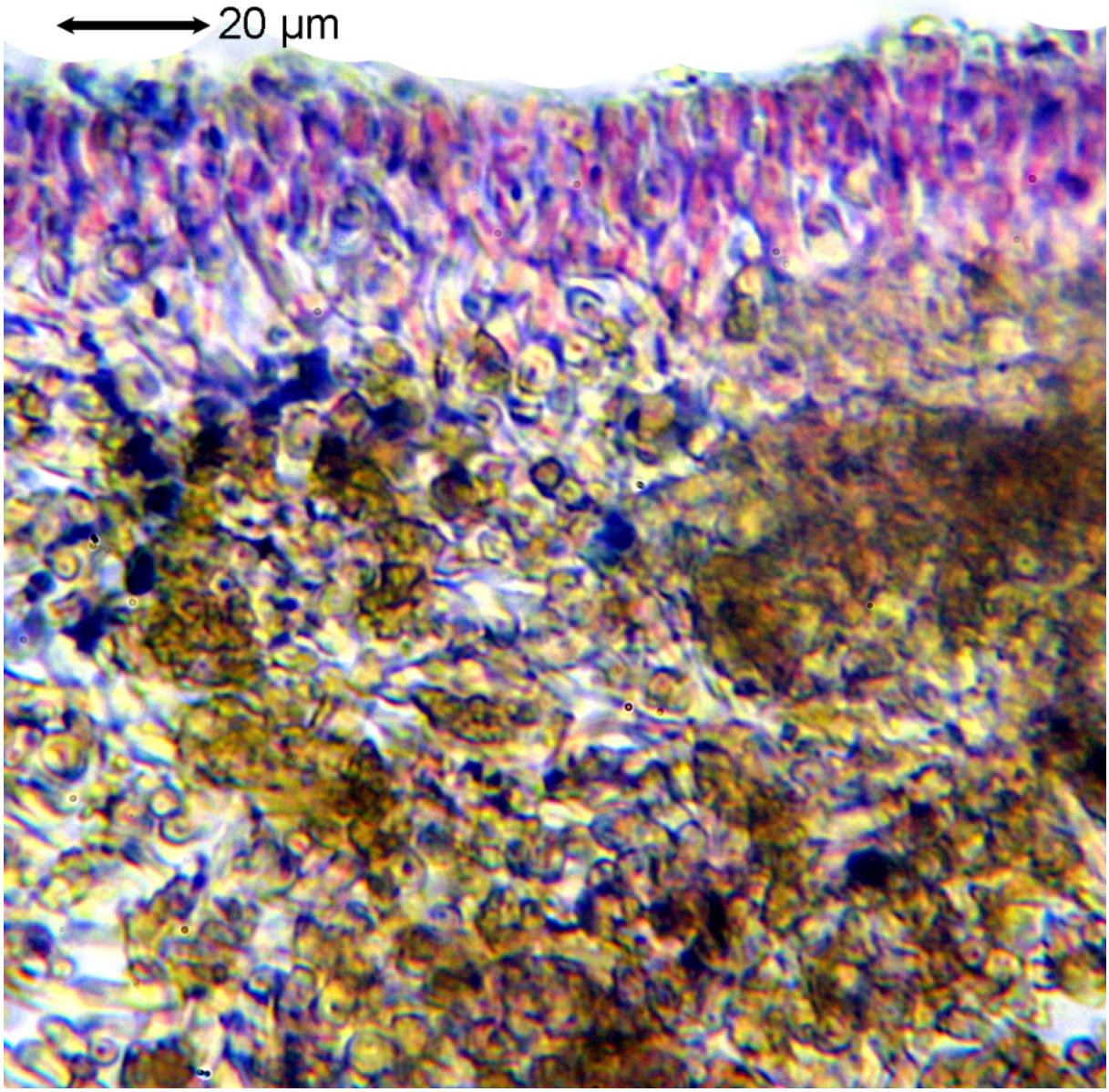






Roccella glebaria



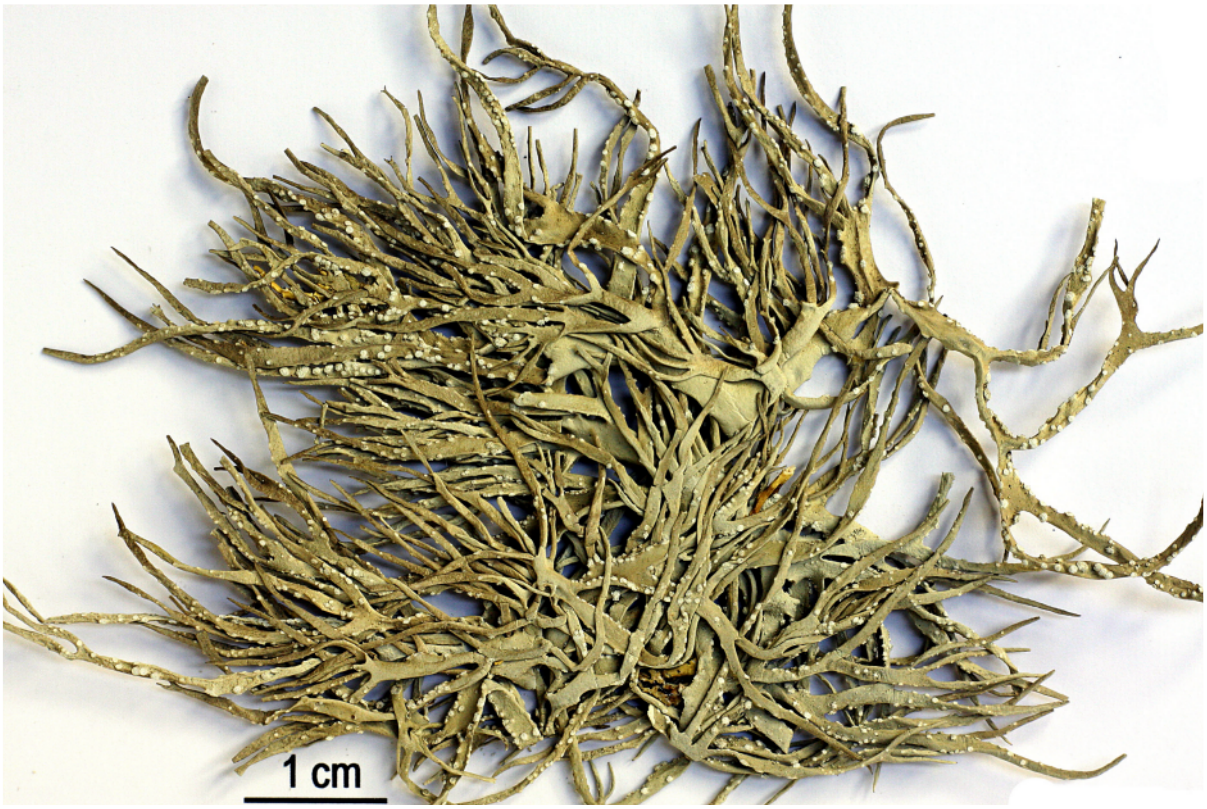


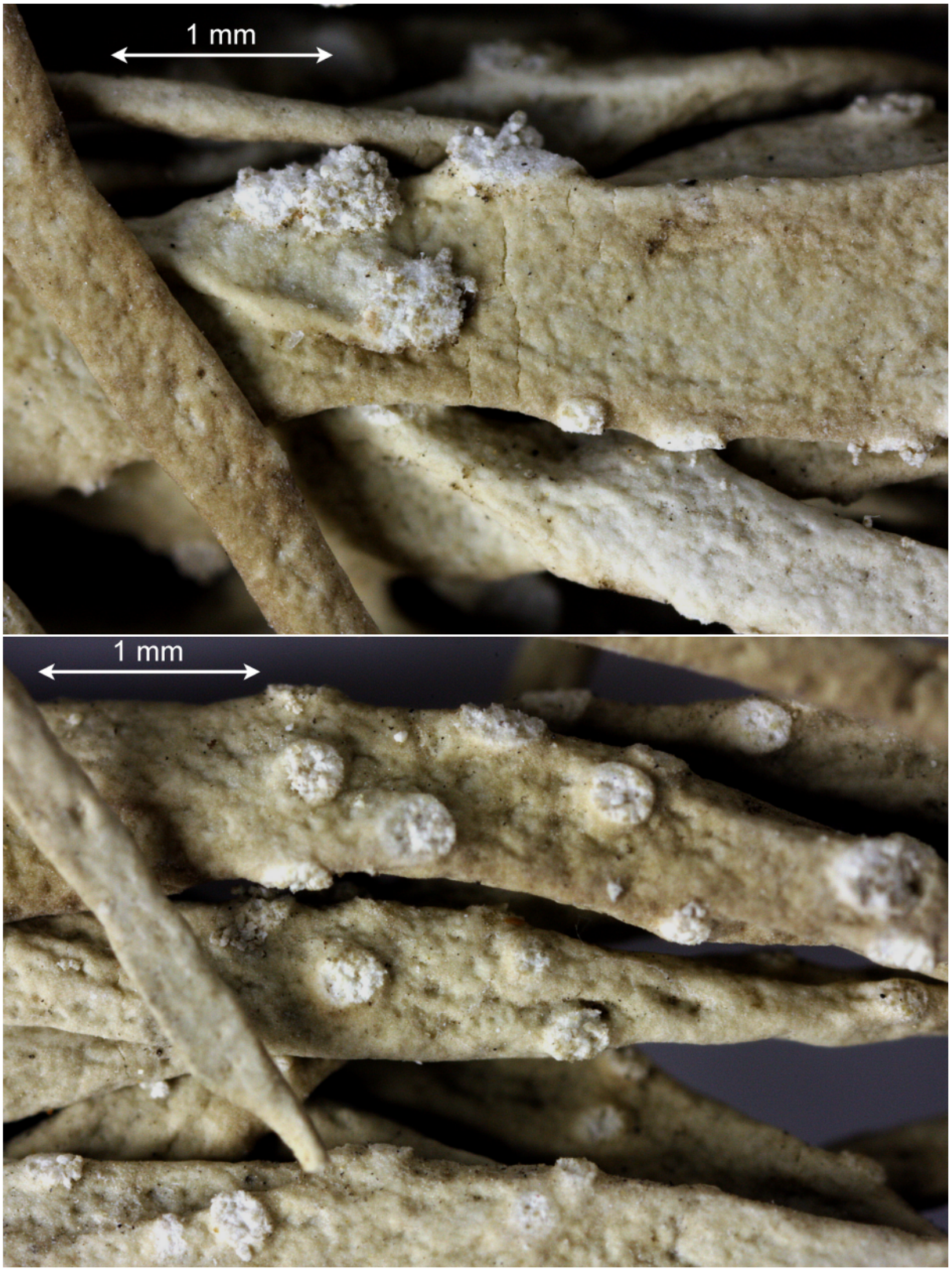
Roccella glebaria

Roccella gracilis Bory (1828)
Roccella americana Darb. (1898)
Roccella babingtonii var. *difficilis* (Darb.) B. Werner (2000)
Roccella difficilis Darb. (1898)
Roccella fruticosa Leunis & Frank (1886)
Roccella humboldtiana Follmann (2001)
Roccella mexicana Vain. (1926)
Roccella montagnei var. *argentina* Kremp. ex Darb. (1898)
Roccella montagnei var. *peruensis* Kremp. (1877)
Roccella montagnei var. *peruviensis* Kremp. in Müll. Arg. (1879)
Roccella peruensis (Kremp.) Darb. (1898)
Roccella ramalinoides Bory (1828)
Roccella tinctoria var. *gracilis* van Hall ex Darb. (1898)

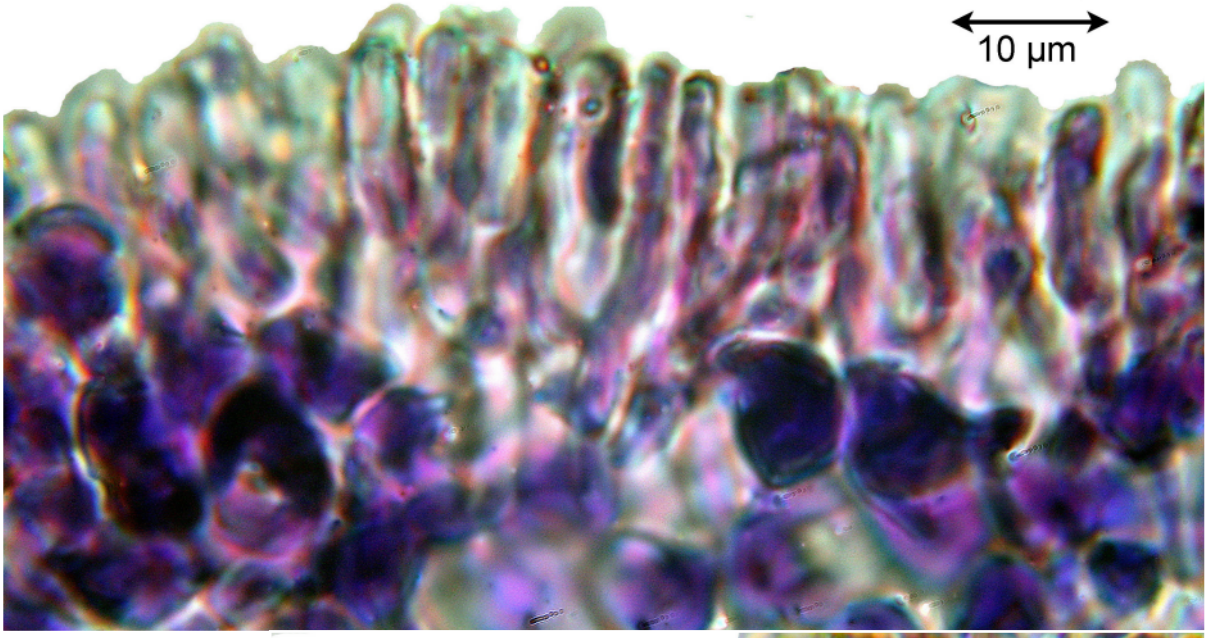
Thallus corticolous, grey, sorediate, texture soft, applanate, surface ridged, holdfast internally yellow. Cortex palisade plectenchymatous. Apothecia unknown. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, IKI+ violet, soralia C + red, major substances erythrin, lecanoric, ± roccellic. – Ecuador, Galapagos, Venezuela, many Caribbean Islands, Mexico, California.

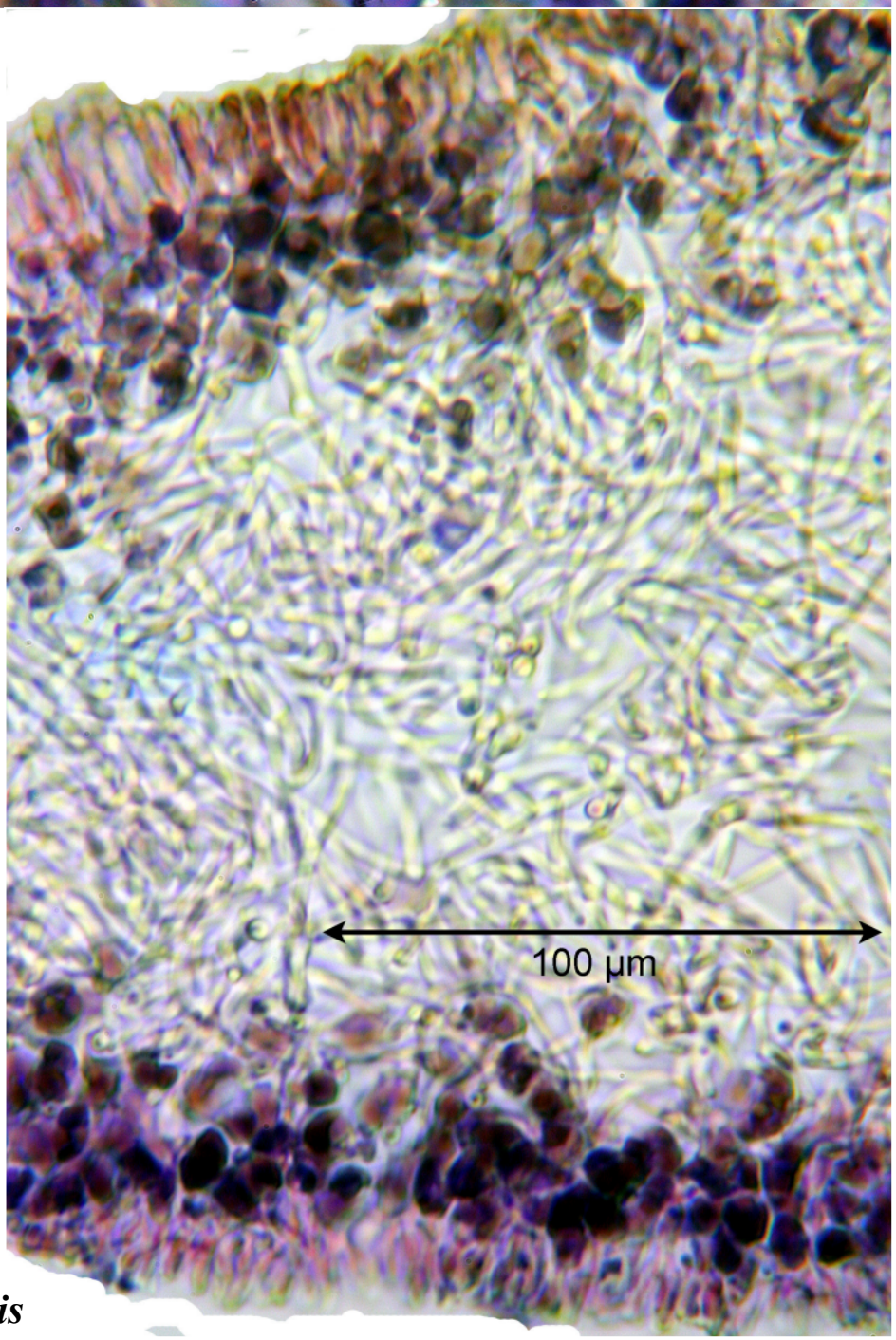
Mexico: Baja California. Coastal sand dune, area adjacent to El Soccorito Agave; on Ephedra; 30°19'5"N, 115°49'35"W, ca. 20 m. Leg. T.H. Nash III Nr. 40168 29. Dec. 1997, (as *Roccella babingtonii*). [9427]





Roccella gracilis



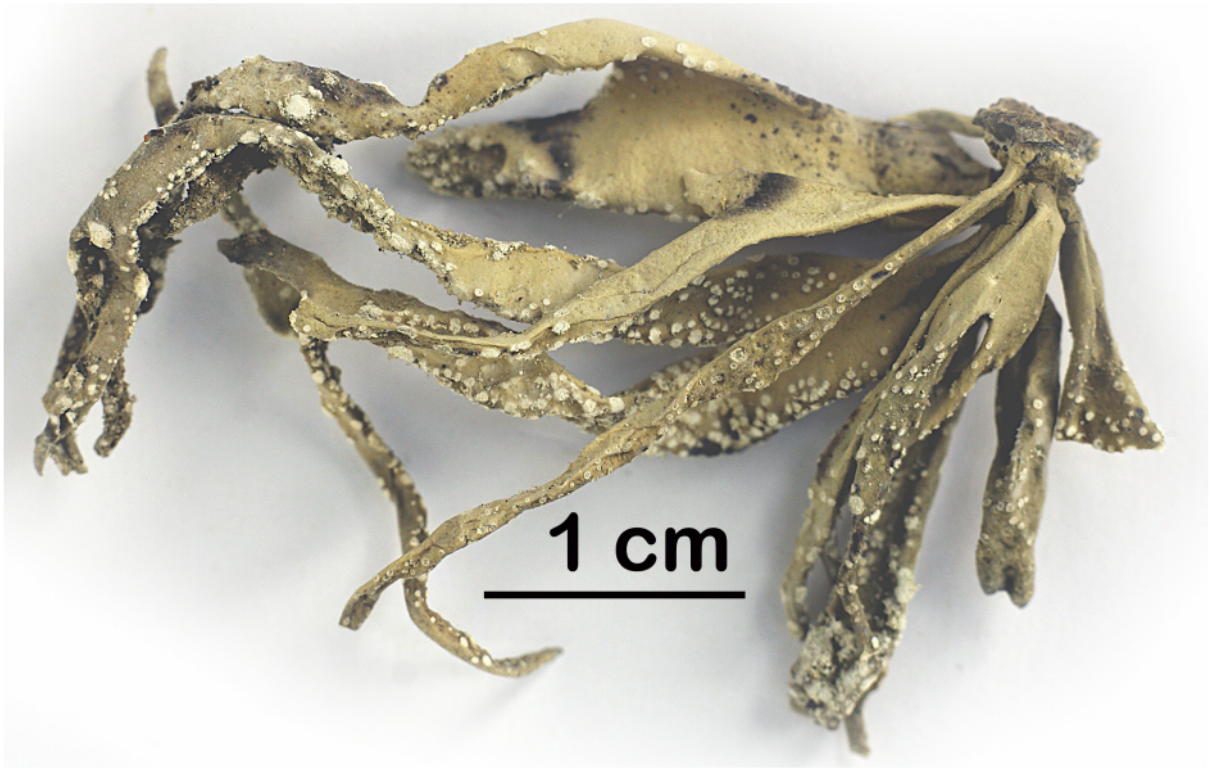


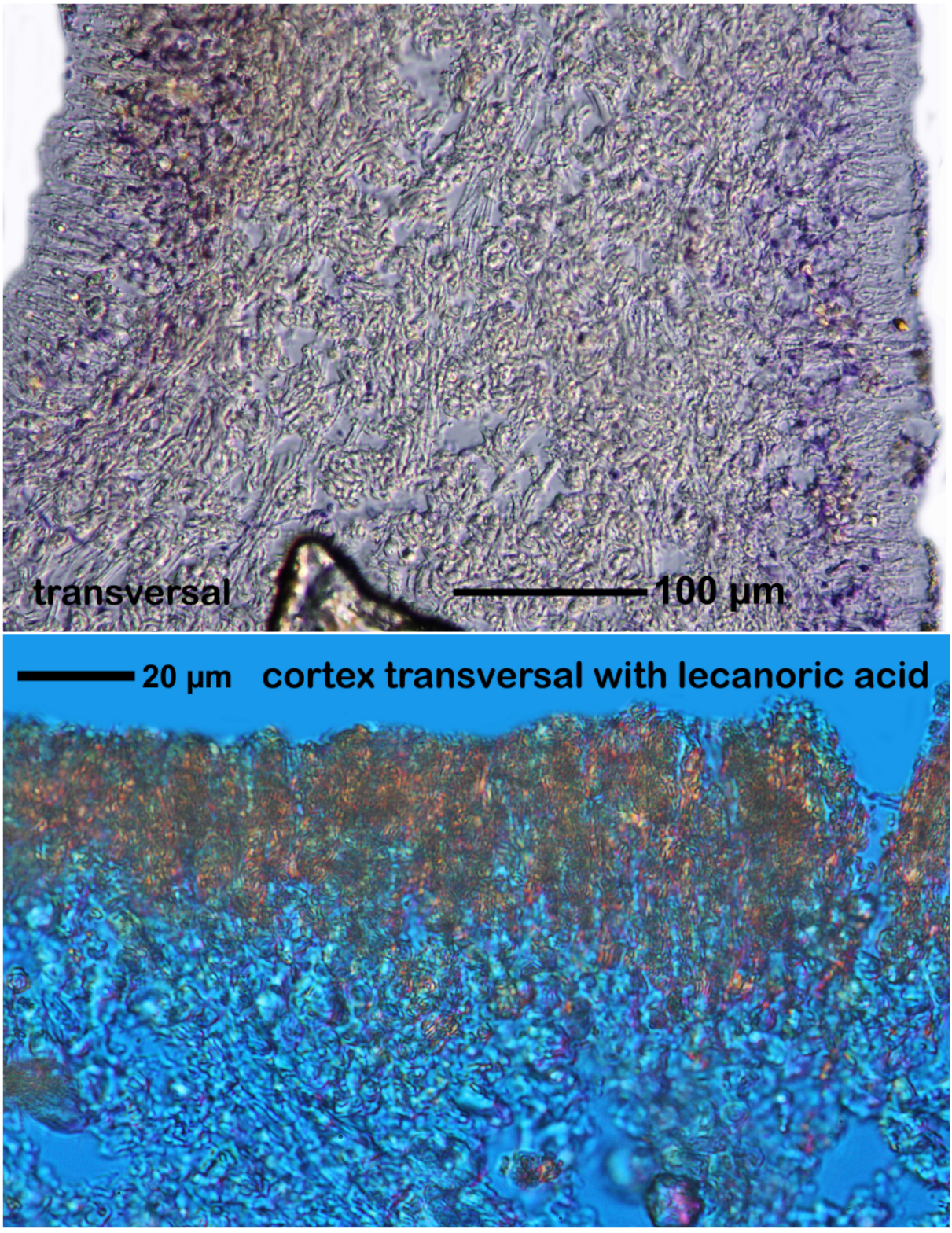
Roccella gracilis

Roccella gracilis Bory (1828)

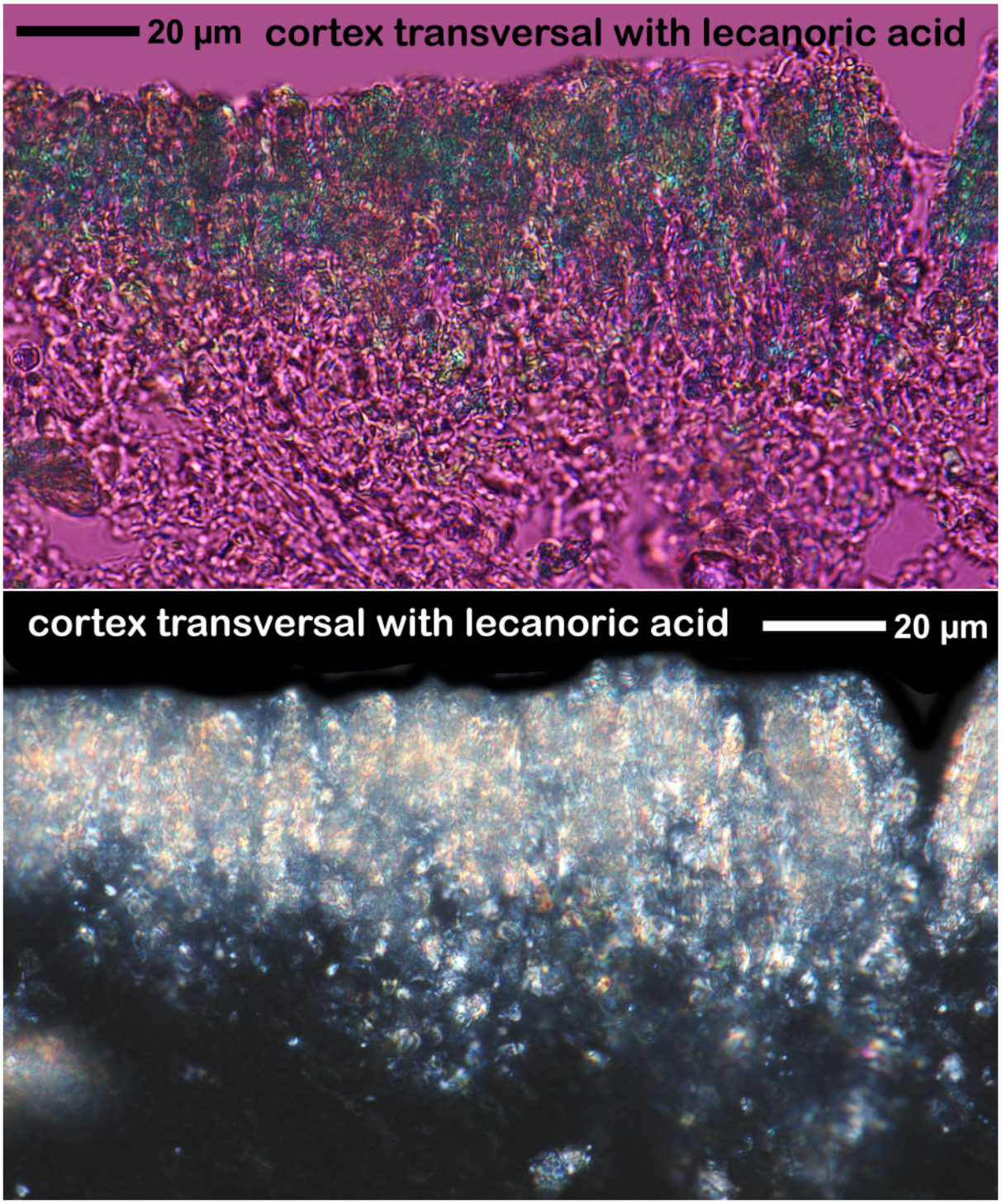
Ecuador, prov. Manabi, Pto. Lopez, coastal area with Cereus-savanna, 50 m. Leg. A.Aptroot & R.Hensen, 01.Aug. 1982. [ABL10583]



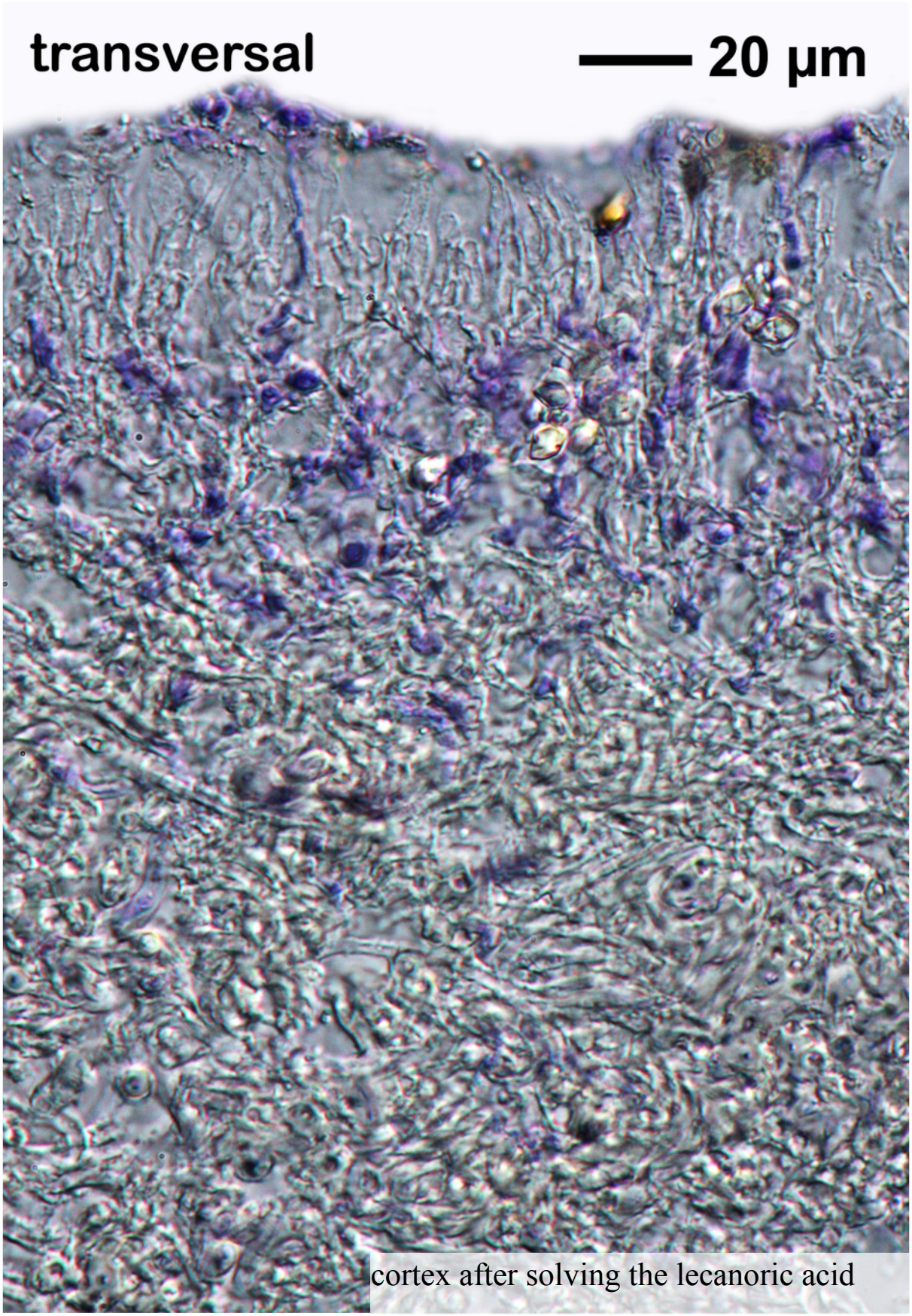




Roccella gracilis

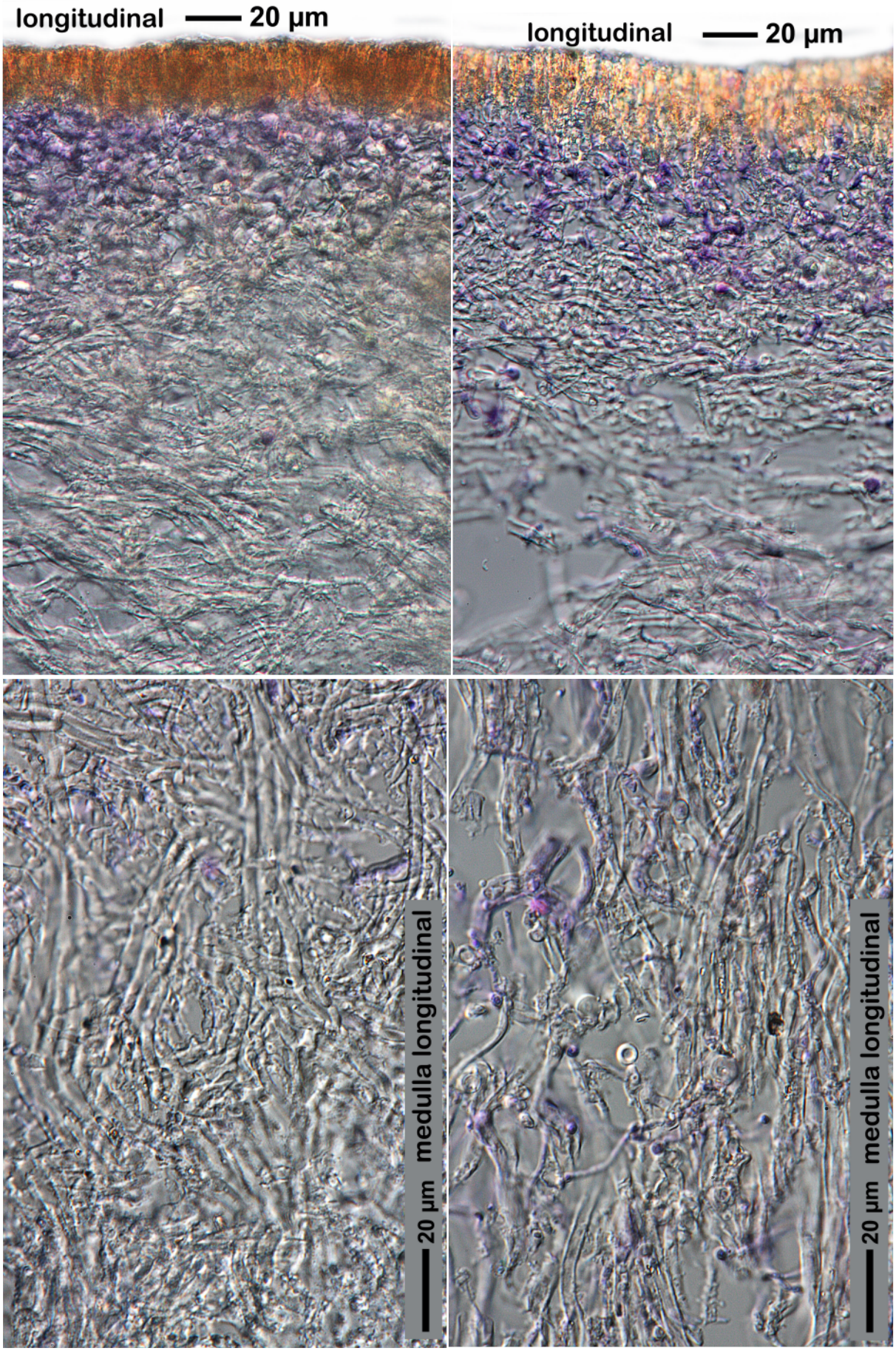


Roccella gracilis



cortex after solving the lecanoric acid

Roccella gracilis



Roccella gracilis

Roccella gracilis Bory (1828)

Mexico, Baja California, along Rte 1 in arroyo just N of Arroyo San Regis, southern Vizcaino Region of the Sonoran Desert (Bursera, Fouquieria diguetii, Yucca valida, etc.), post-batholithic sedimentary rock, 28°31'N, 114°03'W, 50 m, on Yucca. Leg. A. & M. Aptroot 6. Jan. 1989, det. A. Aptroot 1989. [ABL24635]

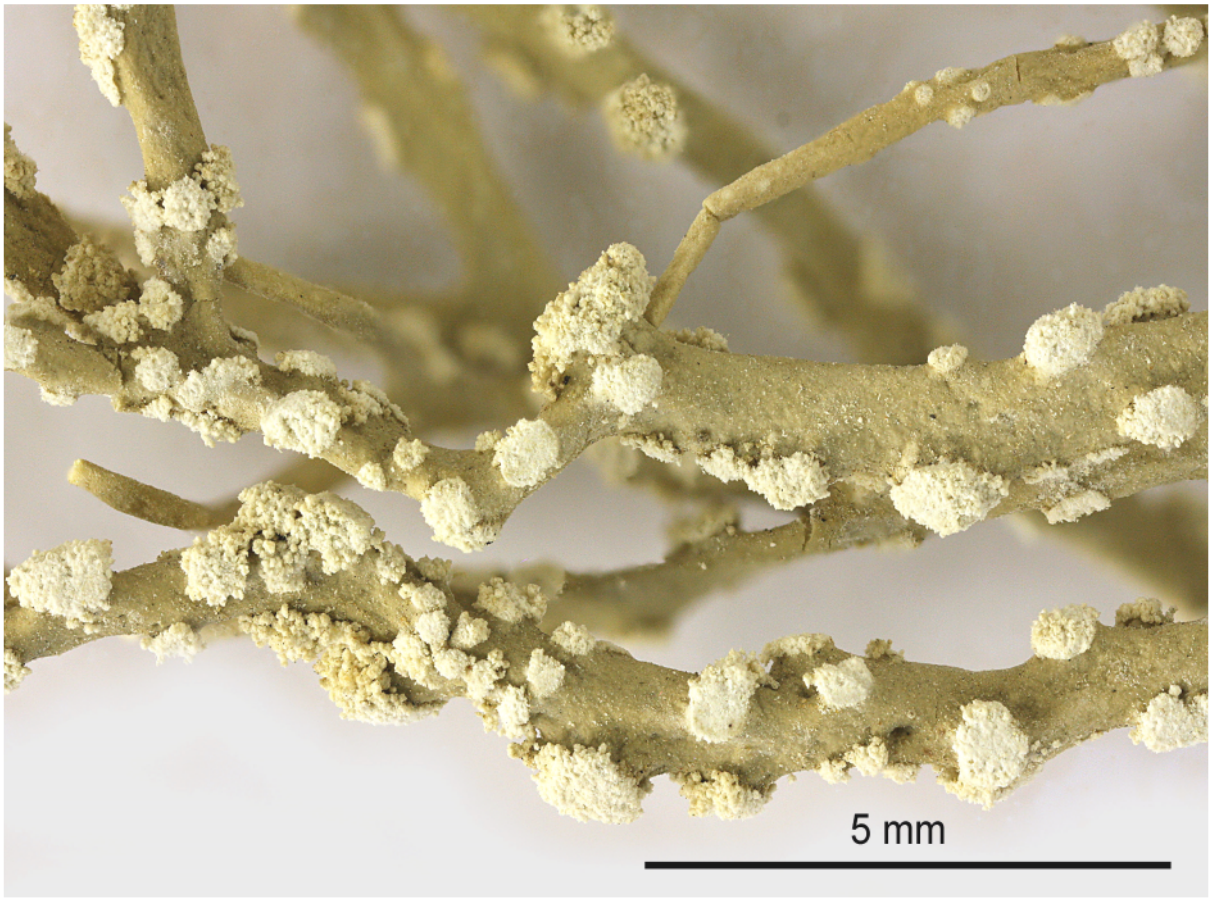




Roccella gracilis

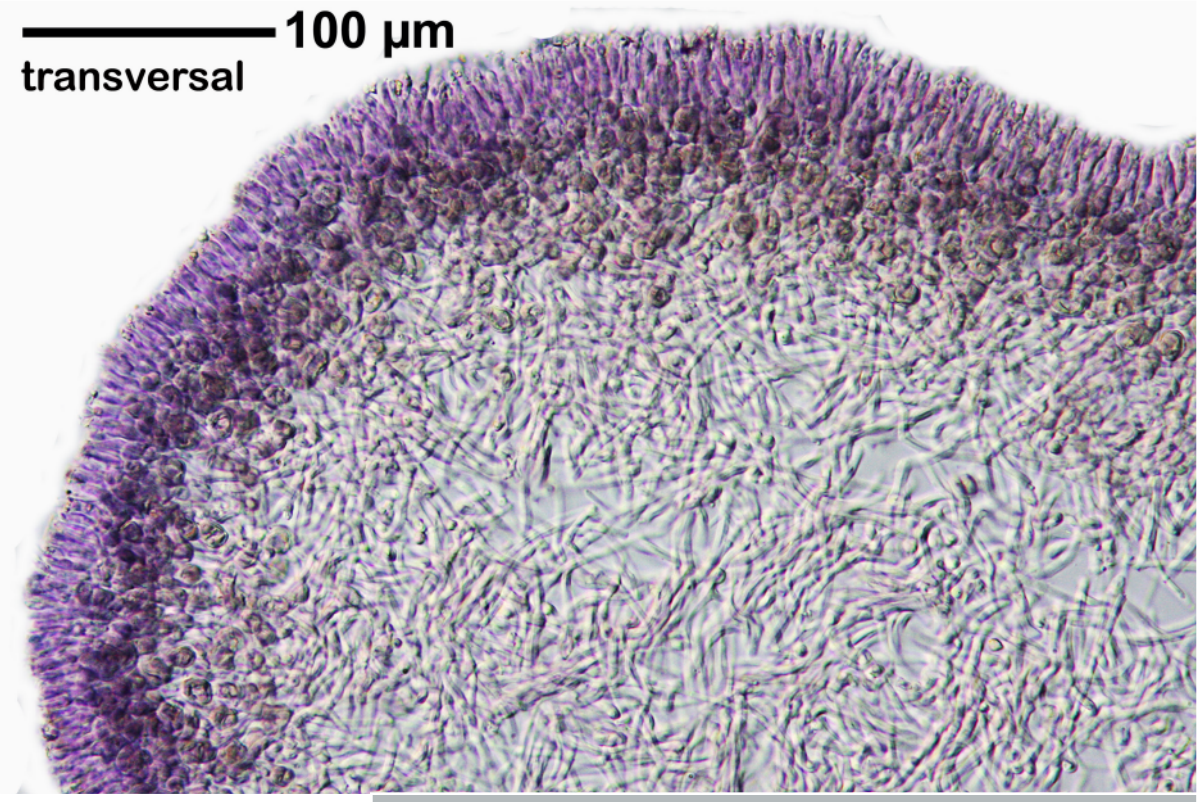


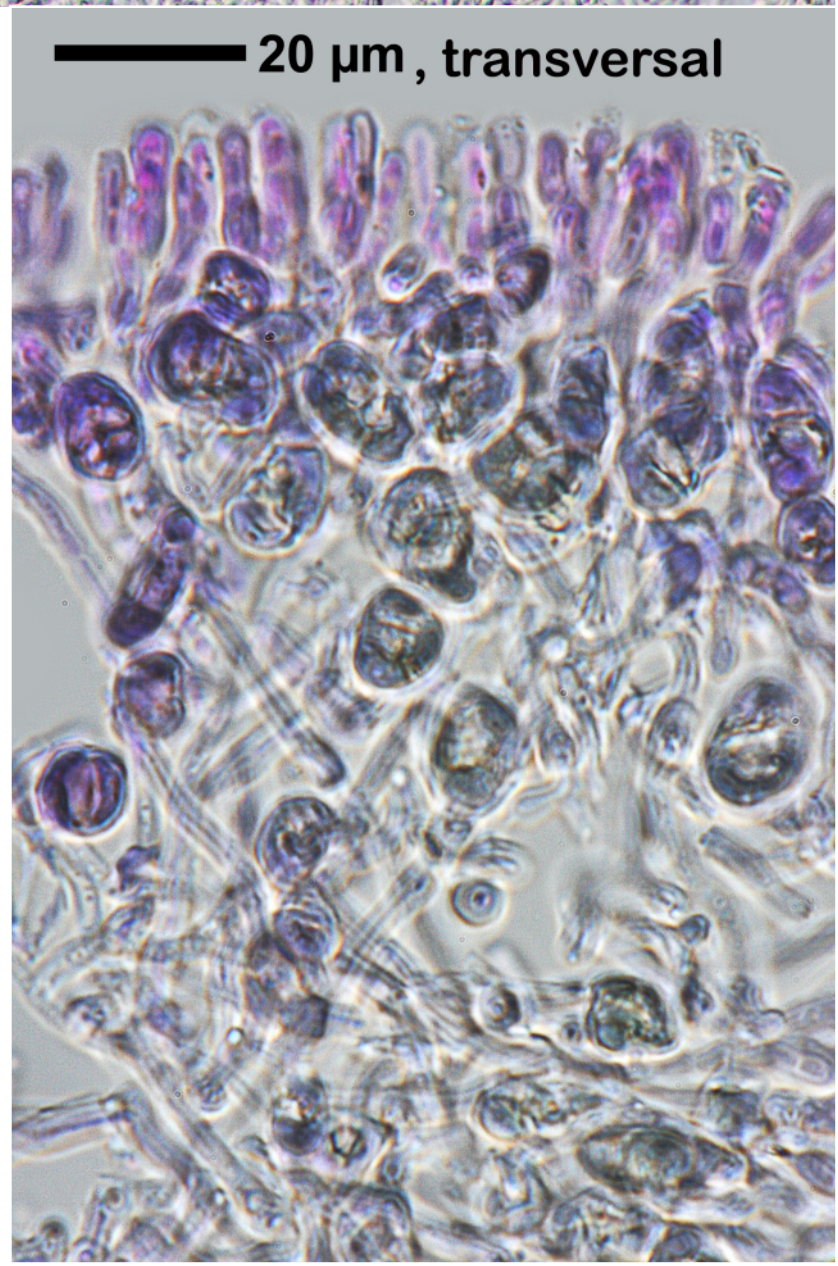
Roccella gracilis



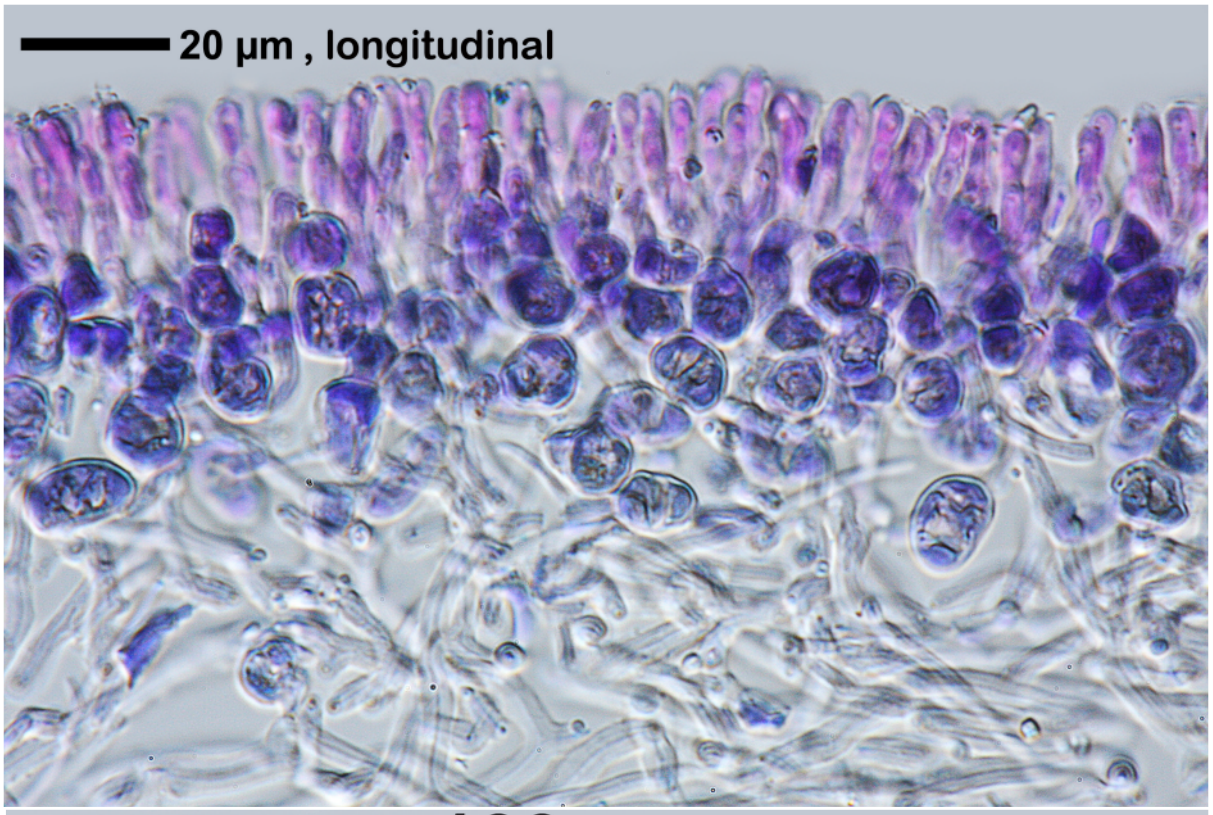


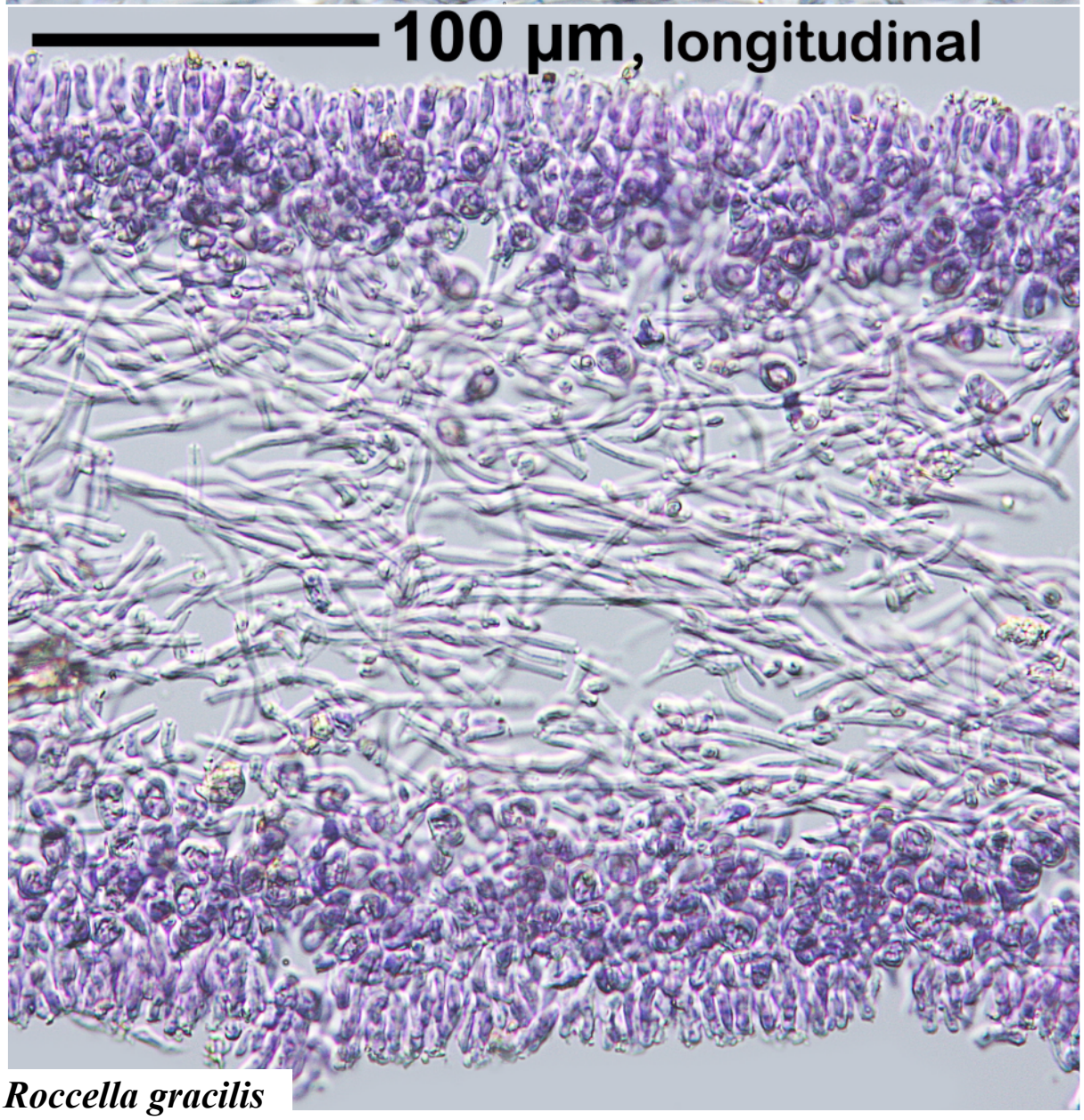
Roccella gracilis



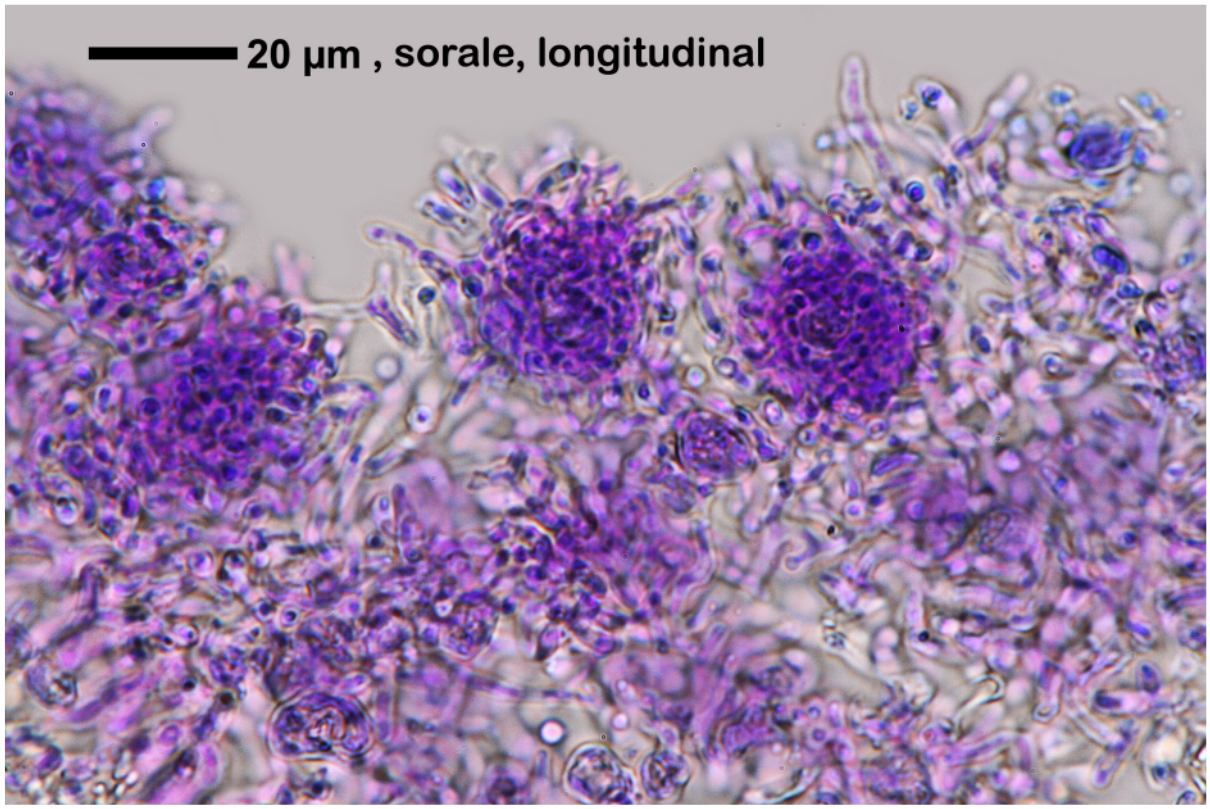


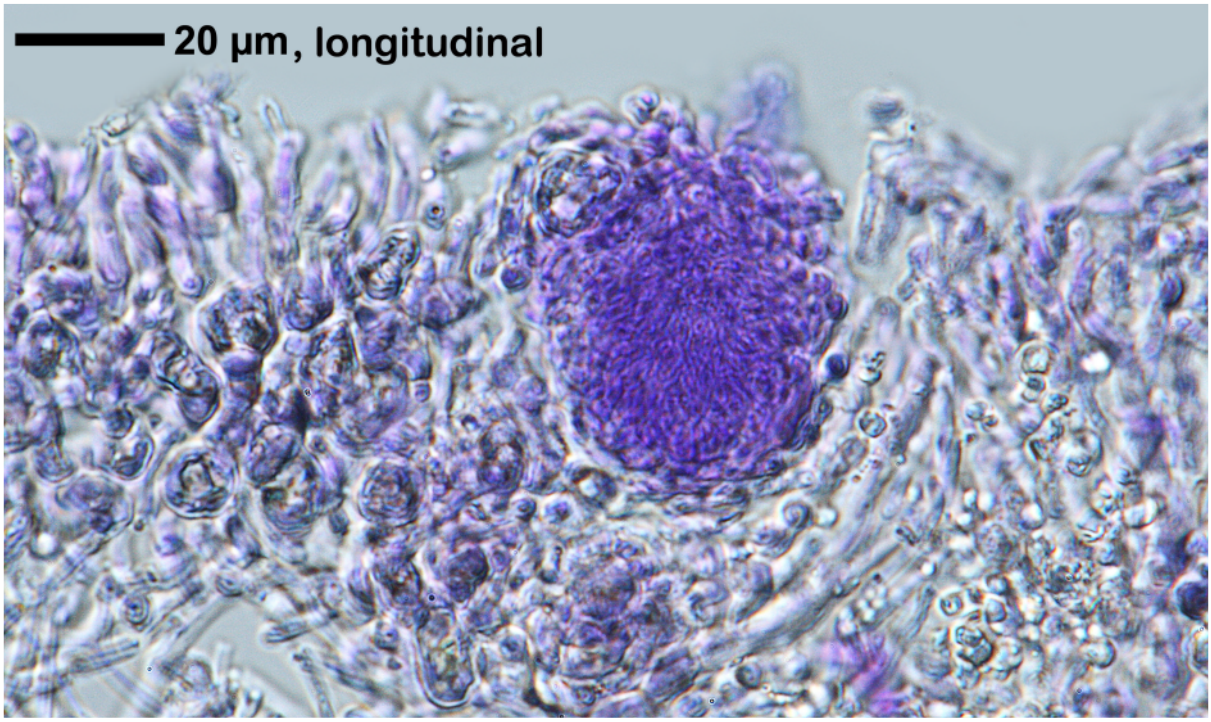
Roccella gracilis





Roccella gracilis



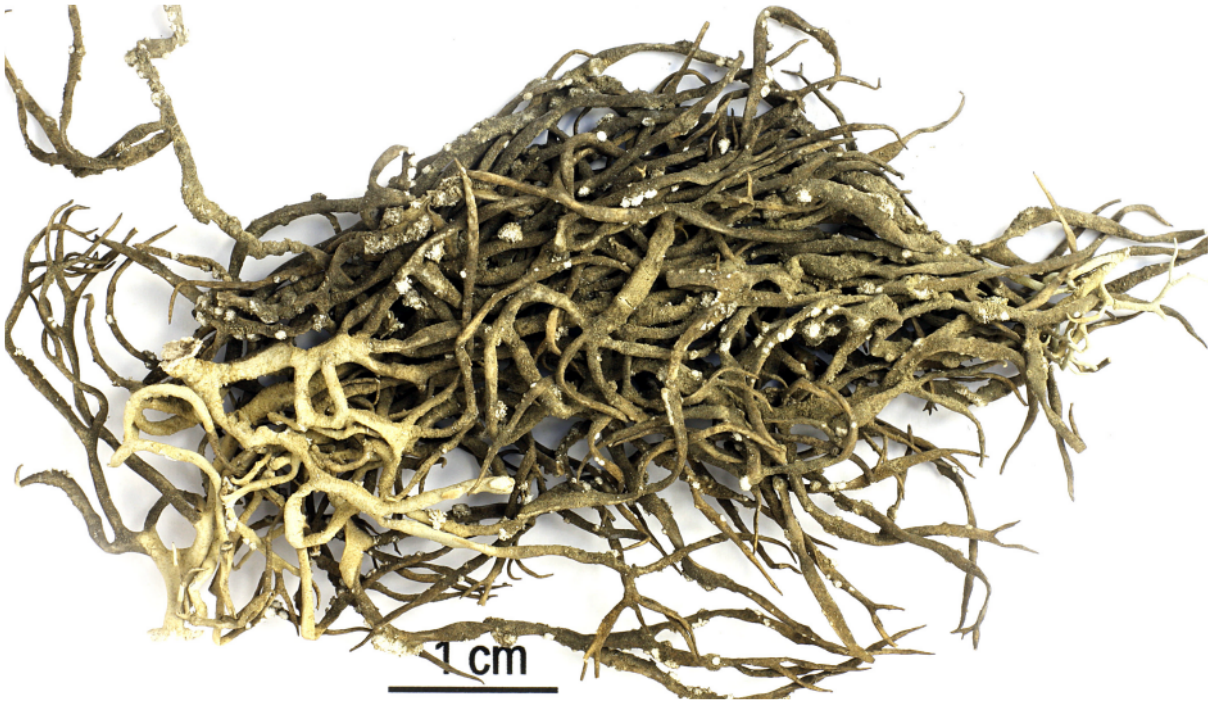


Roccella gracilis

Roccella linearis (Ach.) Vain. (1901)
Roccella fuciformis var. *gracilenta* Vain. ex Darb. (1898)
Roccella fuciformis var. *linearis* Ach. (1810)
Roccella linearis var. *guineensis* Vain. (1901)
Roccella linearis var. *hyperchromatica* Vain. (1901)
Roccella linearis var. *primaria* Vain. (1901)
Roccella mauritiana Darb. (1898)
Roccella montagnei var. *rigidula* Müll. Arg. (1879)
Roccella pattensis C.W. Dodge (1964)
Roccella pembensis C.W. Dodge (1964)

Thallus saxicolous, grey, sorediate, texture firm, angular, surface foveolate, holdfast internally white to brown. Cortex more or less a palisade plectenchyma. Apothecia unknown. Cortex C + red, K + yellow, Pd –, subcortex C –, medulla C –, P –, IKI + violet, soralia C + red, IKI –, Pd –, major substances erythrin, lecanoric. – Palaeotropic coasts from Papua New Guinea over India to W. Africa, Cape Verde Islands, Ascension, St Helena.

Papua New Guinea, Central prov., along the coast of the Hiritano Highway, Hisiu, Obo Mission, 100 km NE of Port Moresby, 146°39’ E, 9°02’ S, alt. 0-5 m. Leg. A.Aptroot 02.1987, det. A. Aptroot. [ABL17345]

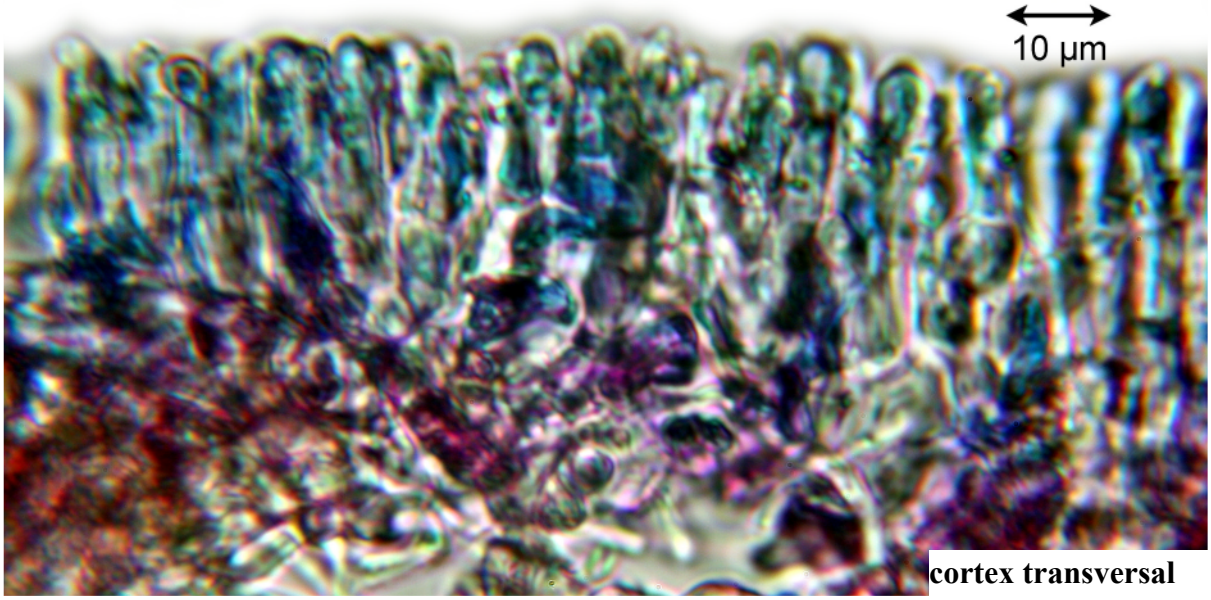






Roccella linearis





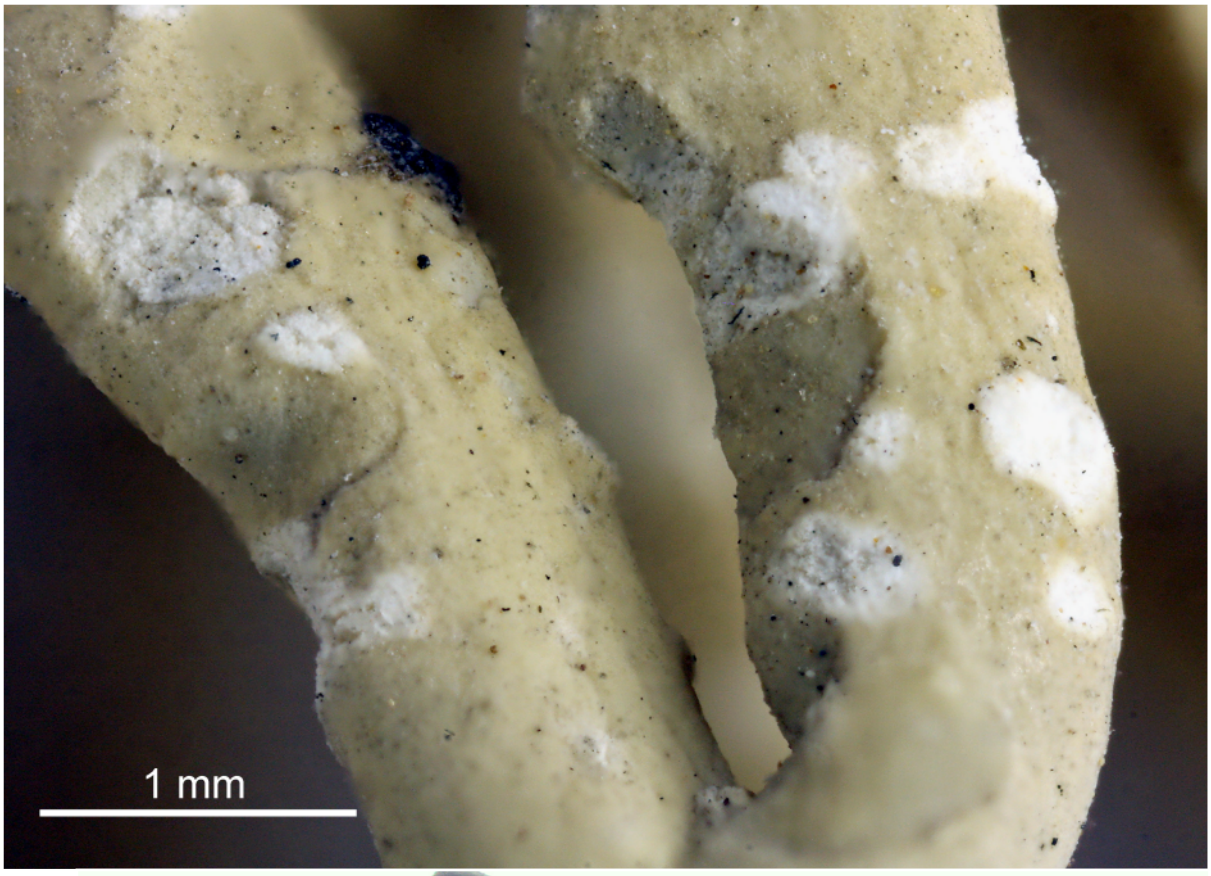
cortex transversal

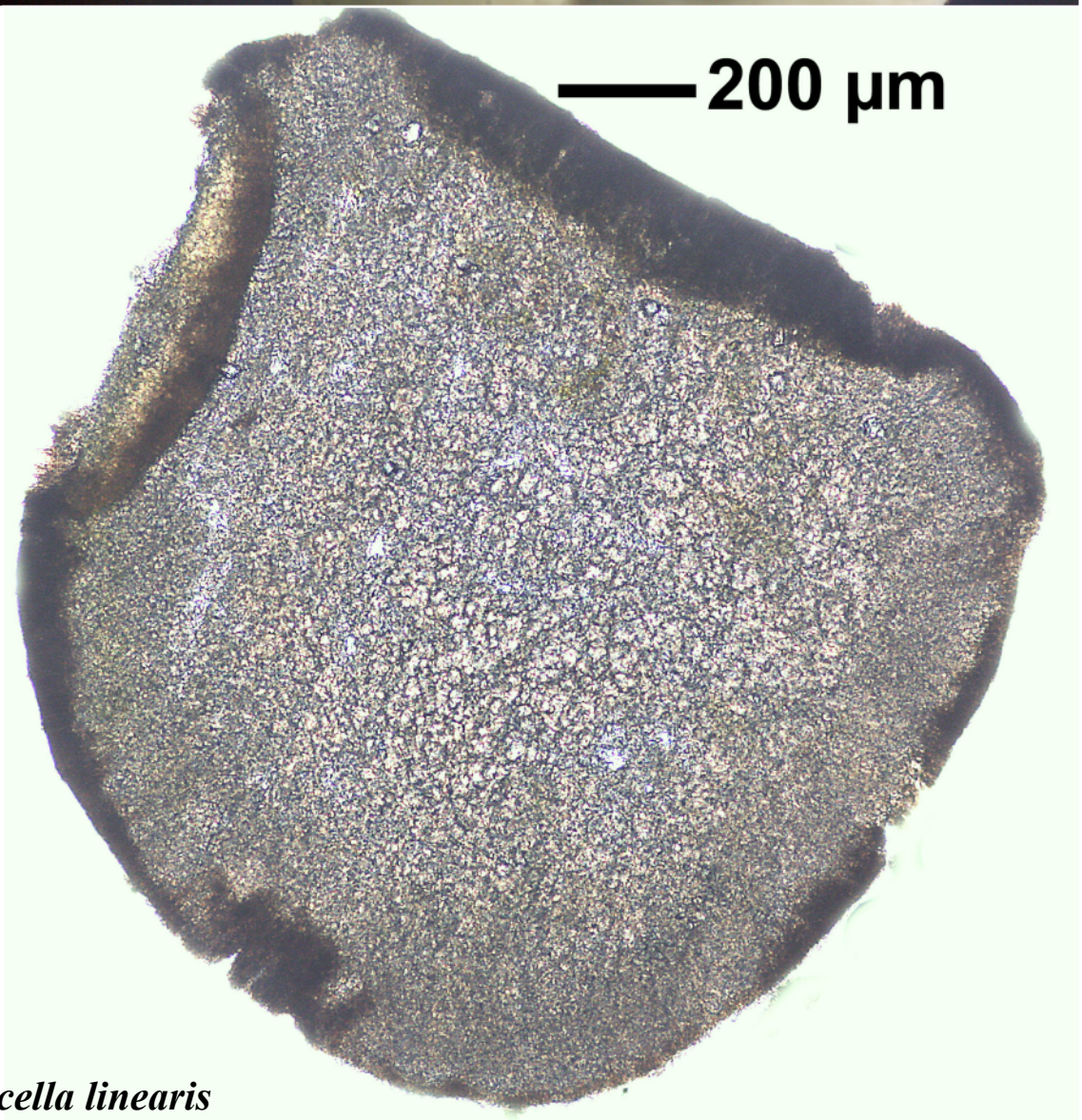
Roccella linearis

Roccella linearis (Ach.) Vain. (1901)

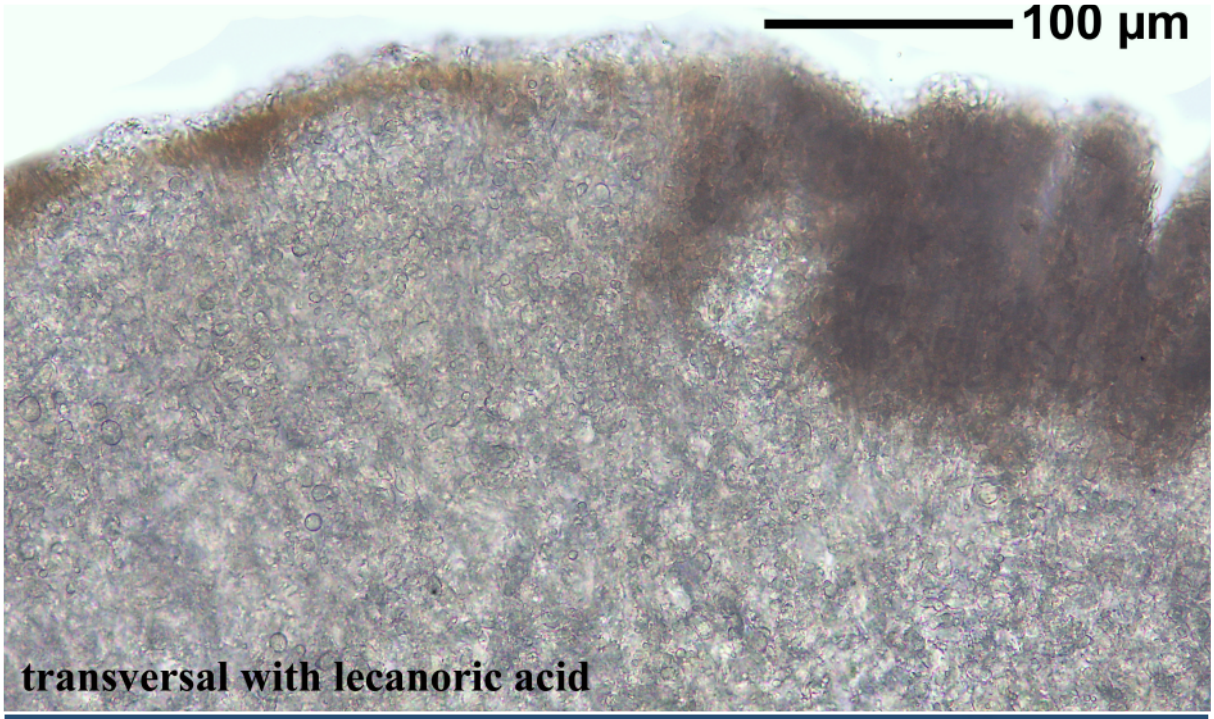
St. Helena (South Atlantic Is.), Prosperous Bay Plain, N slope of Dry Gut on track of runway at proposed fill; vertical basalt cliff, on rock; 15°57.641’ S, 5°39.080’ W (Astro Dos 71/4), alt. 280 m. Leg. A. Aptroot 17. OctE. 2006, det. A. Aptroot. [ABL66253]

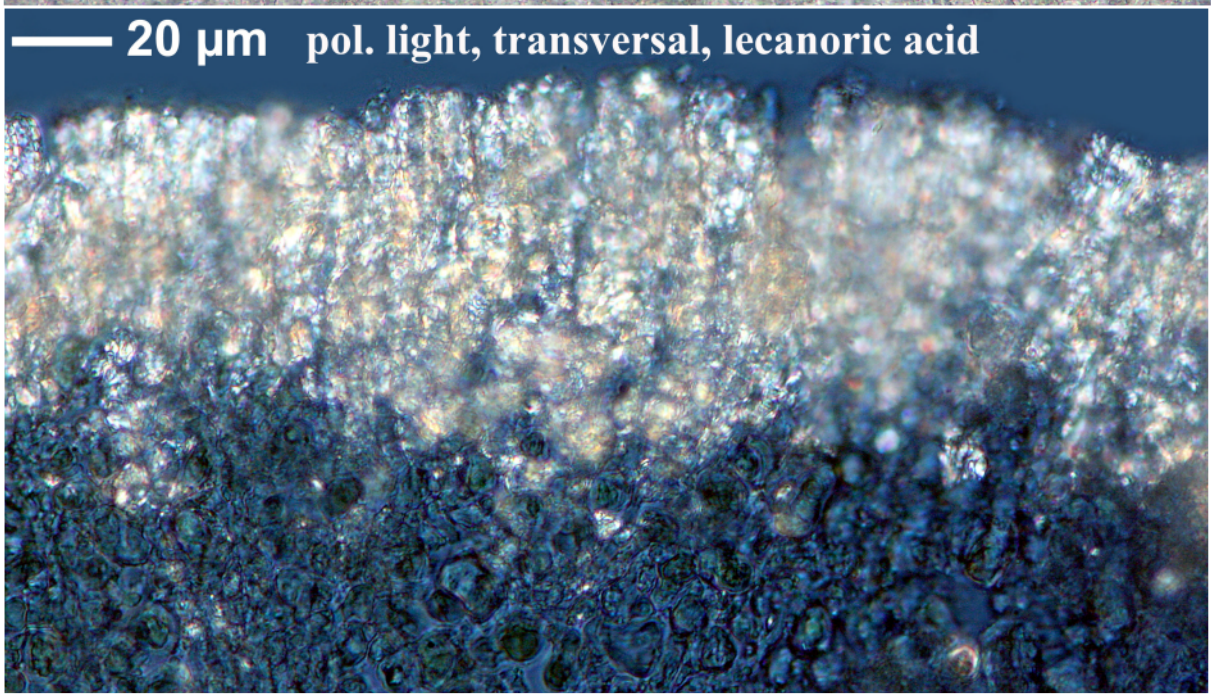


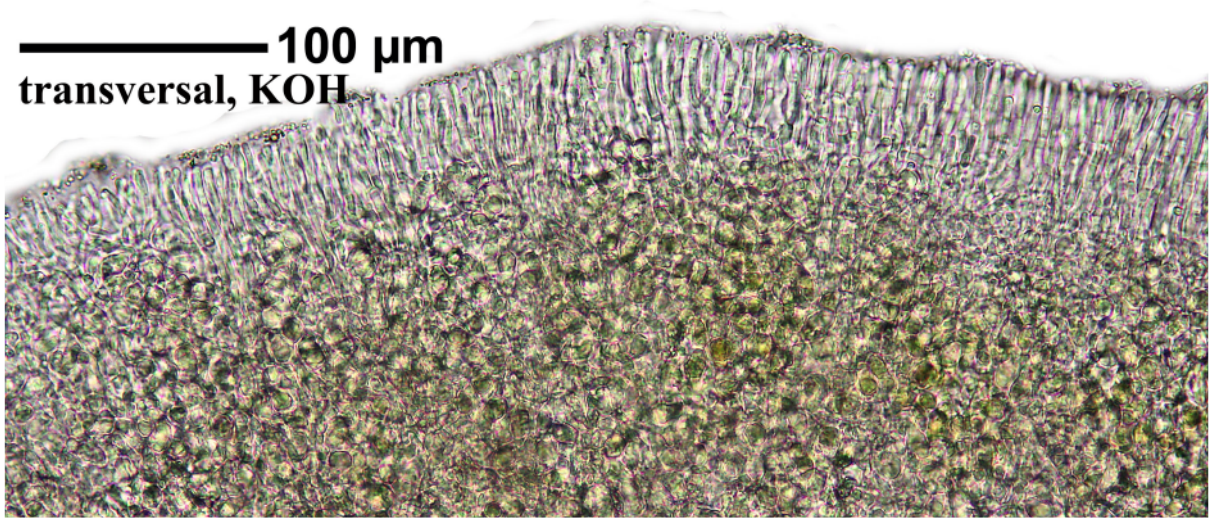




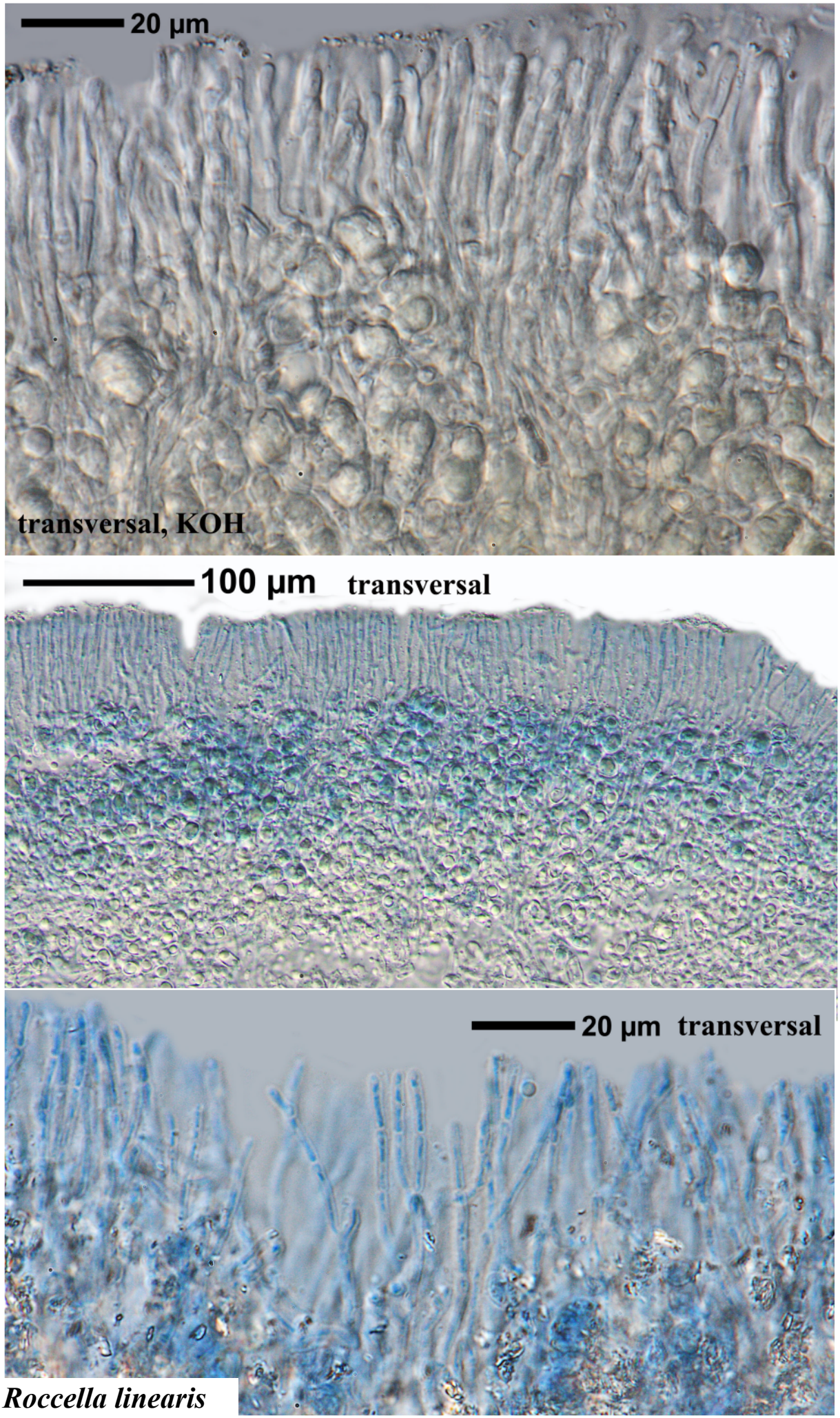
Roccella linearis



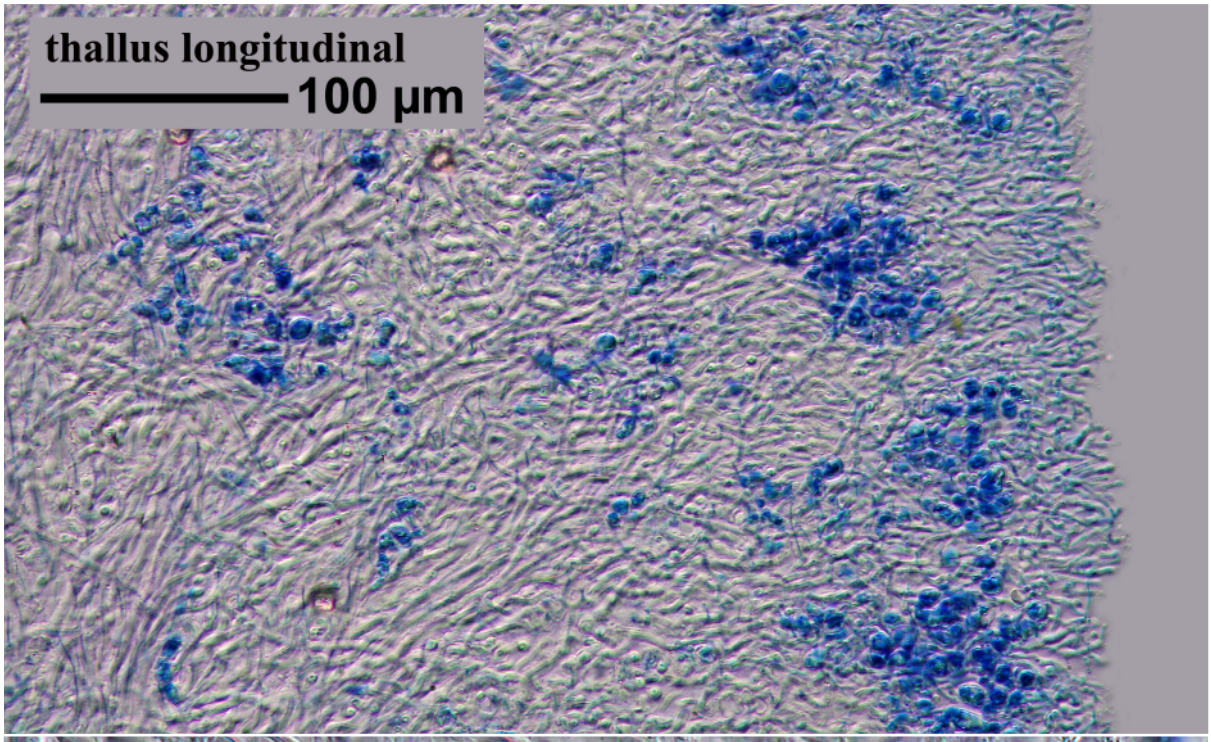


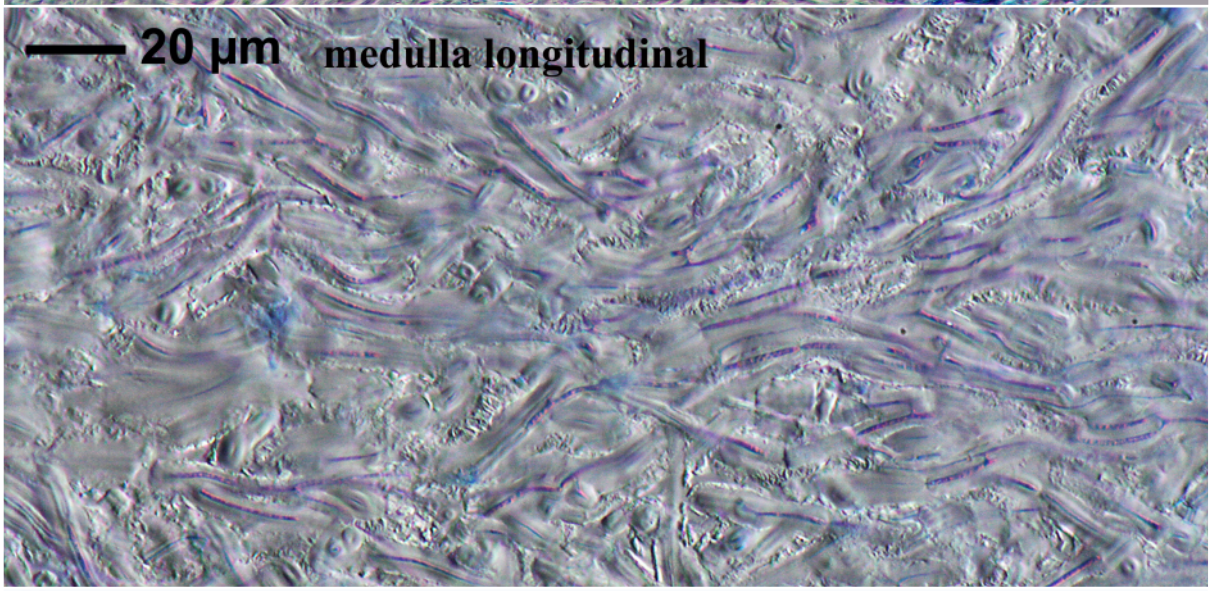


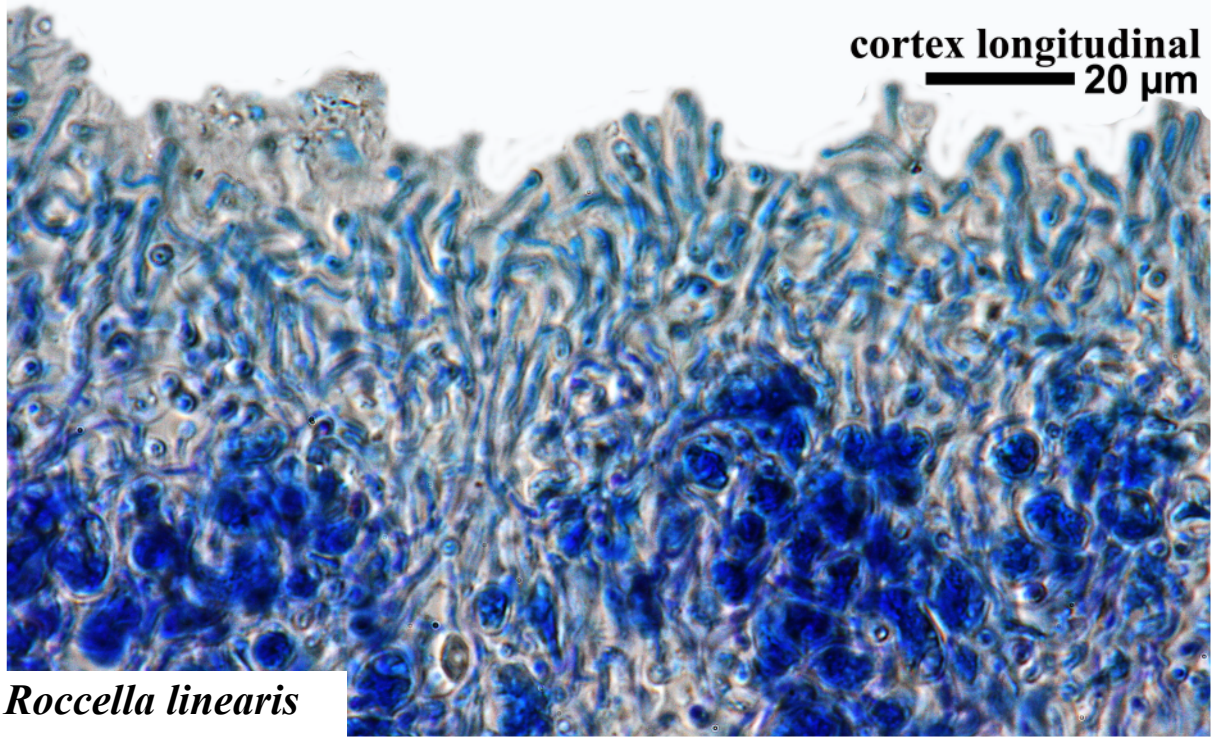
Roccella linearis



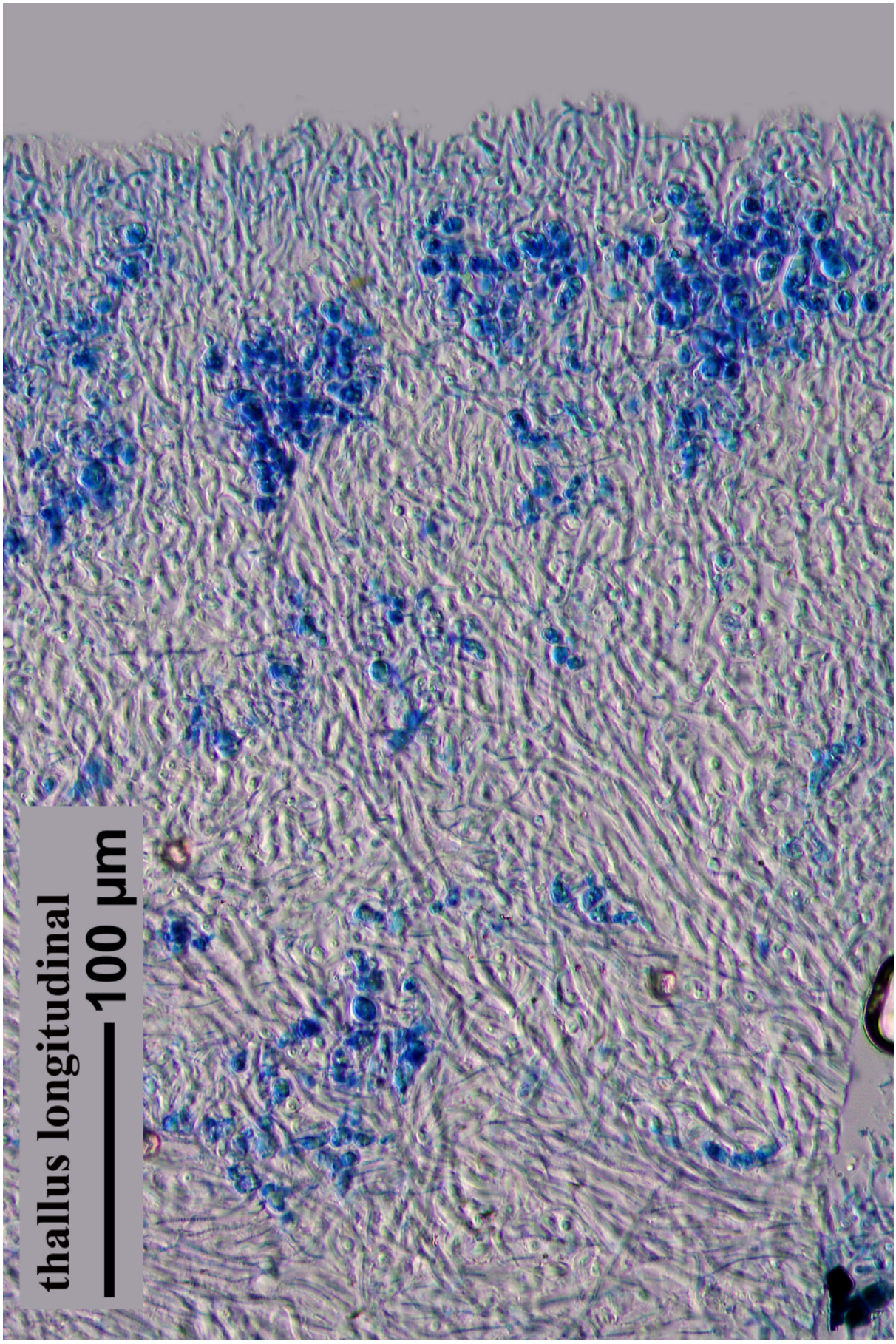
Roccella linearis







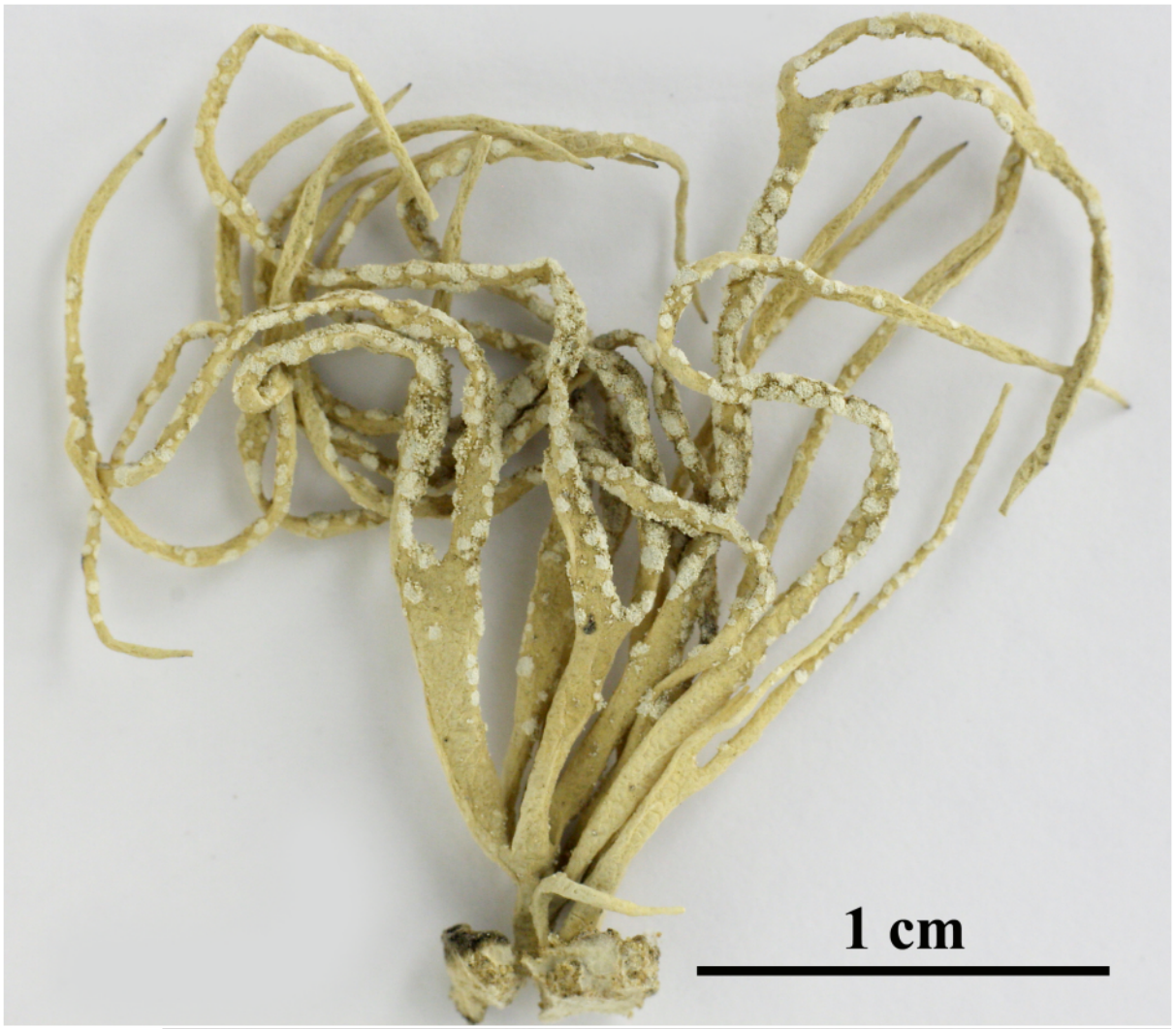
Roccella linearis



Roccella linearis

Roccella linearis (Ach.) Vain. (1910)

South Africa, Namibia, distr. Omaruru. Laguneberg, sandstone hill close to the sea in the Central Namib desert. On W-facing gravel slope. Alt. 75 m. Leg. H. Sipman 8. Jan. 1986, dupl. ex Nr. 19703 Mus. Bot. Berol. [B19703]



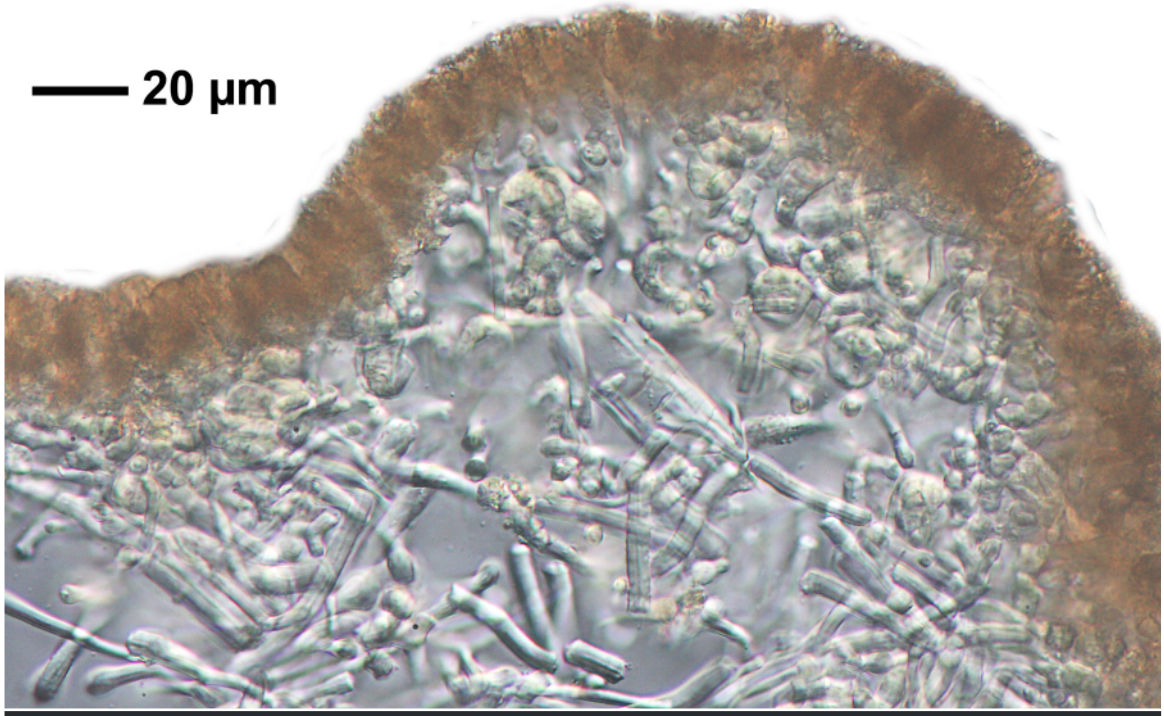


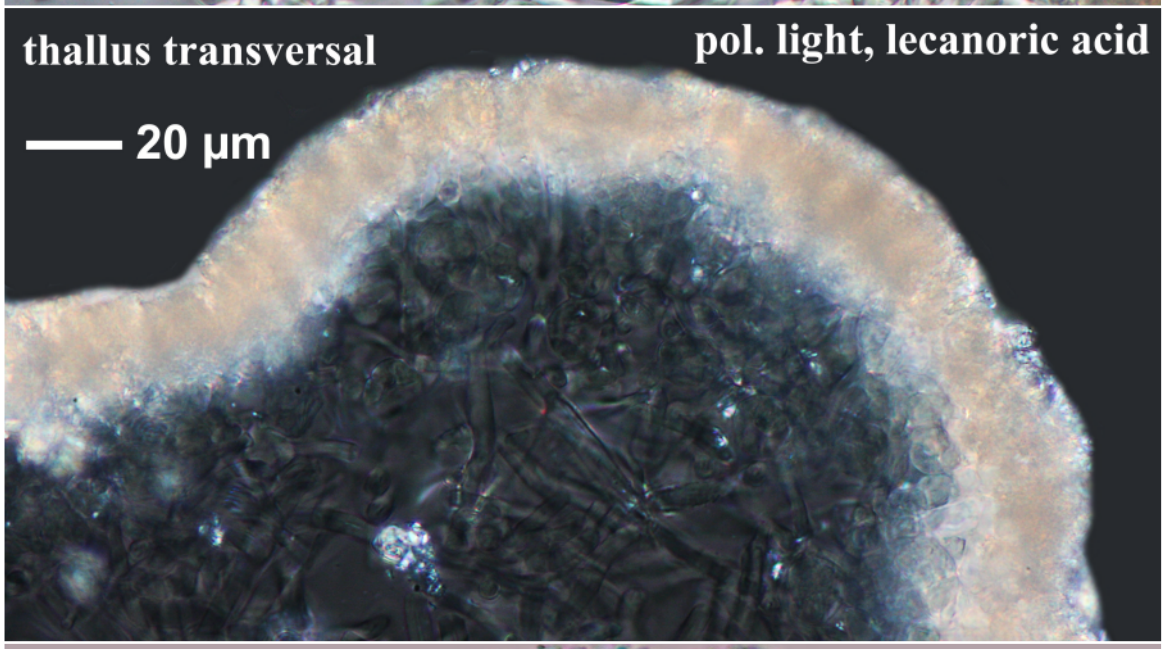


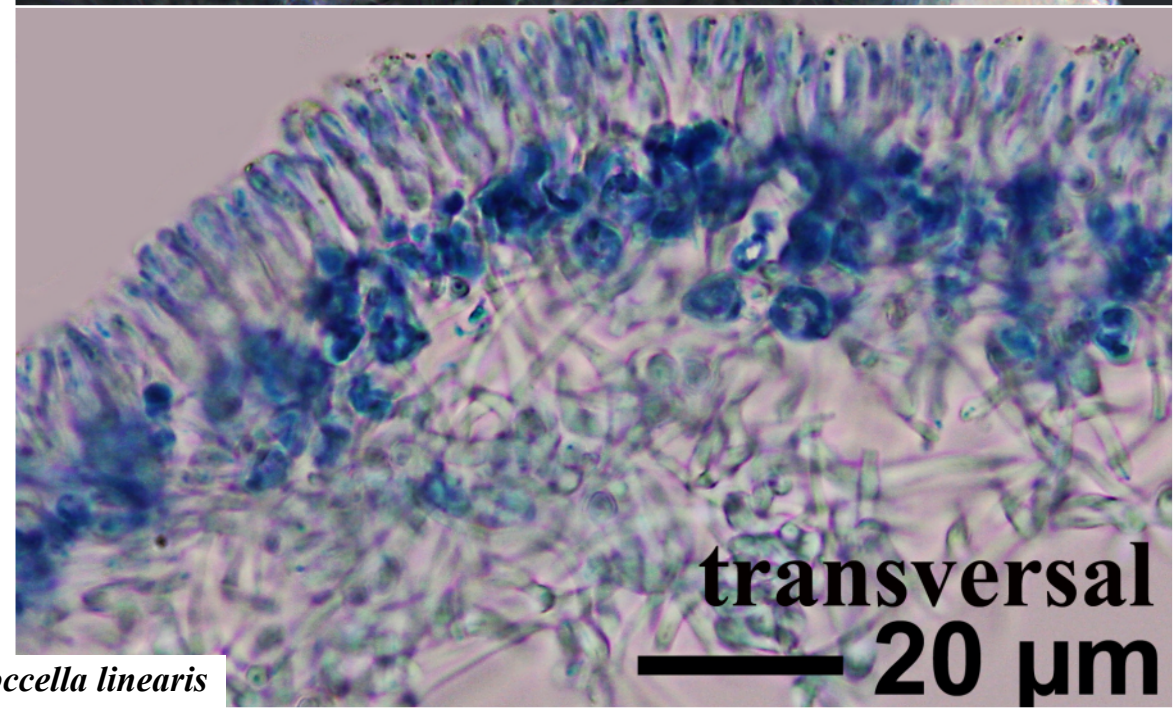
Roccella linearis



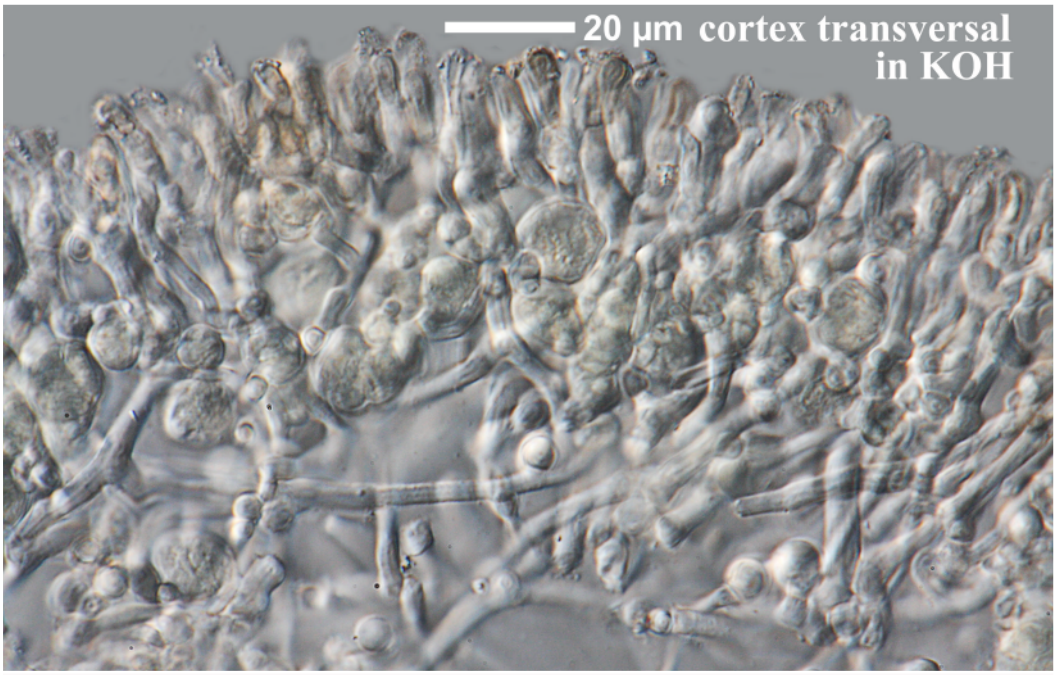
Roccella linearis

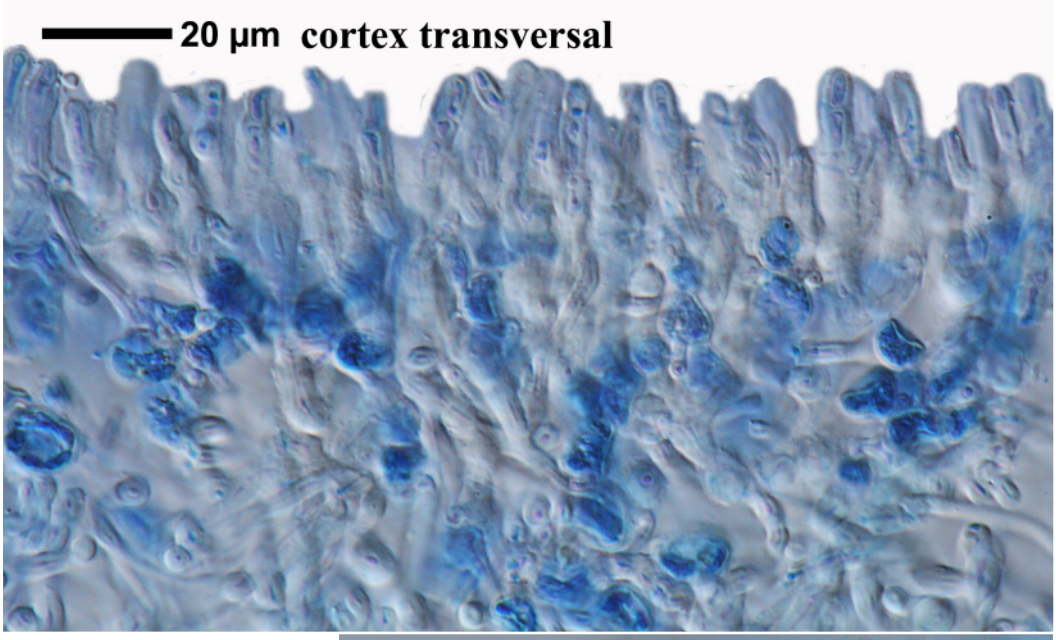


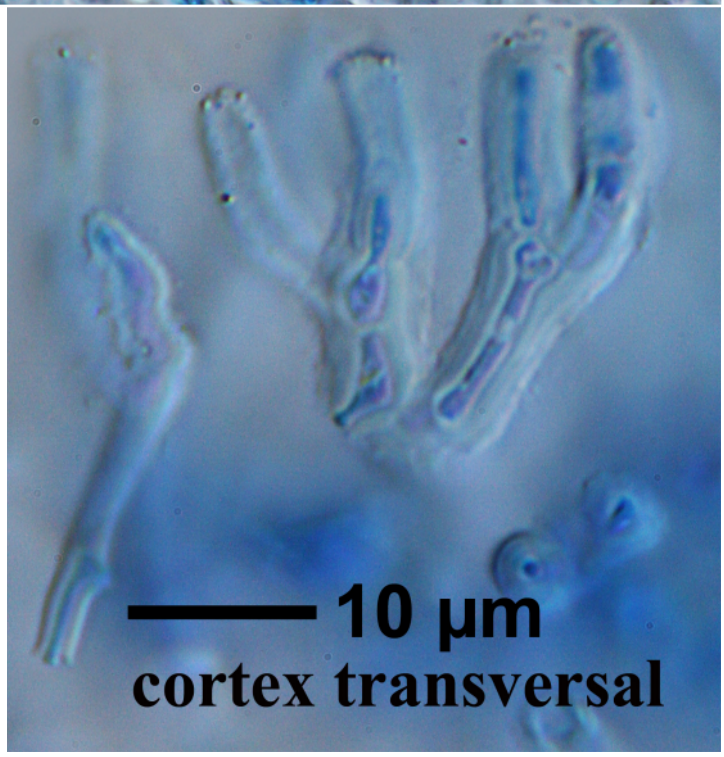




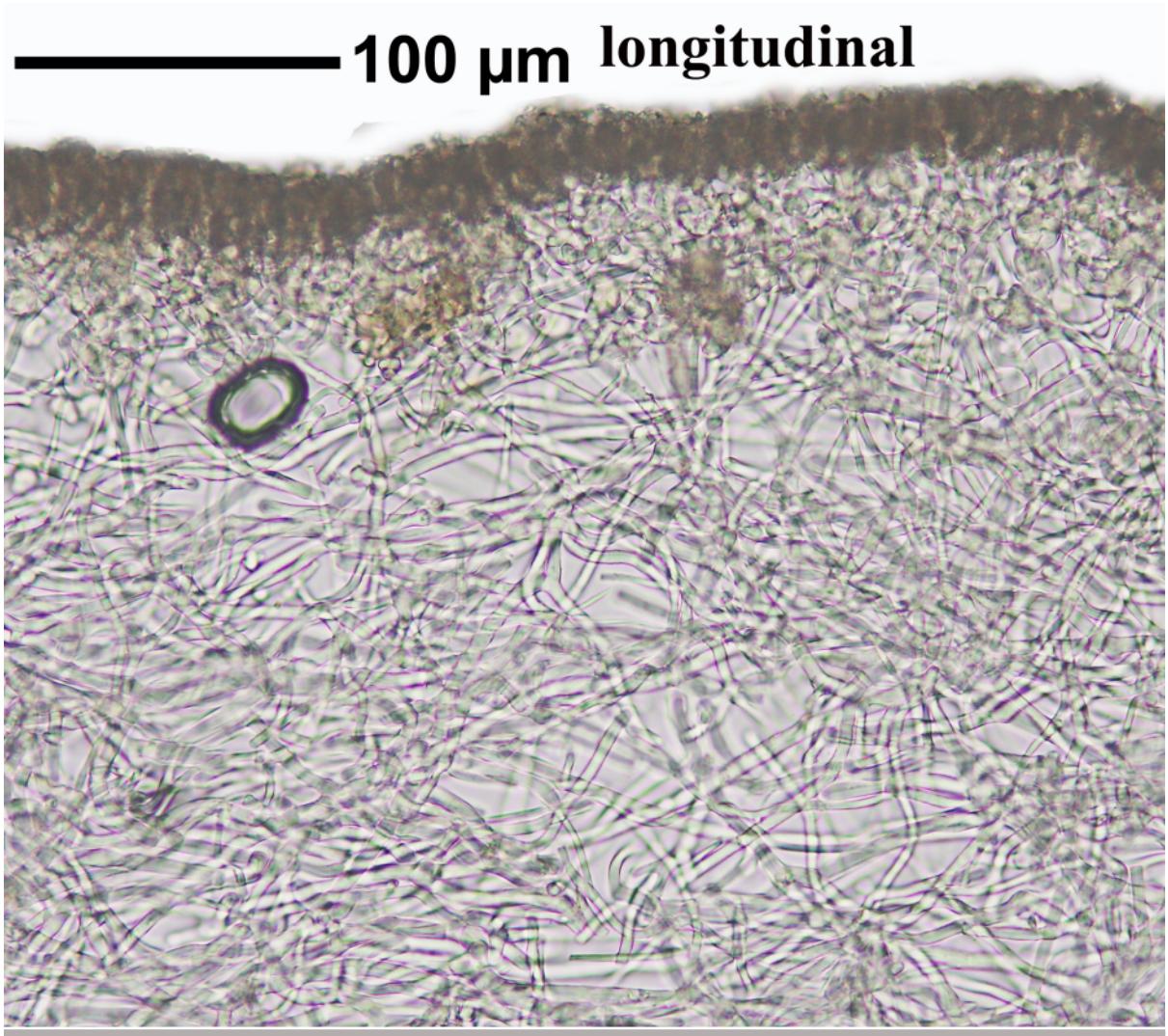
Roccella linearis

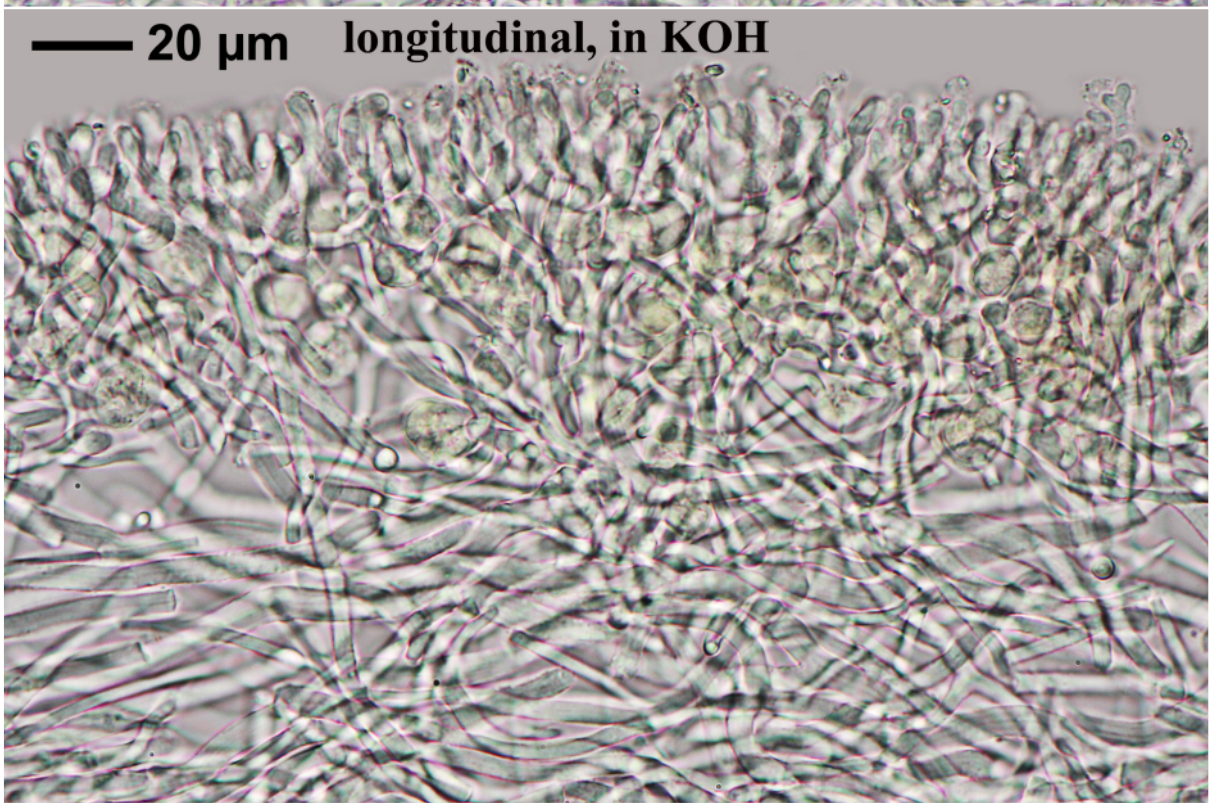




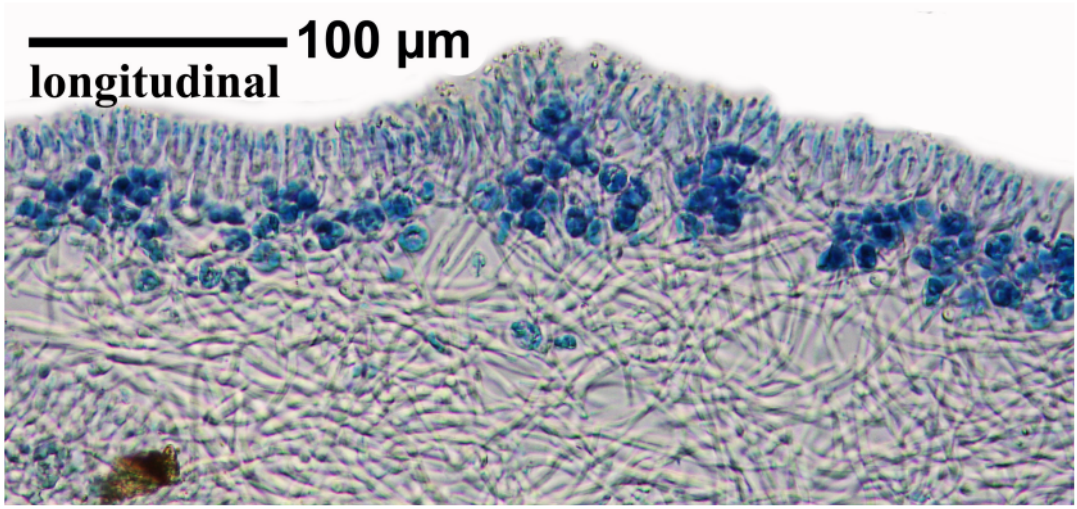


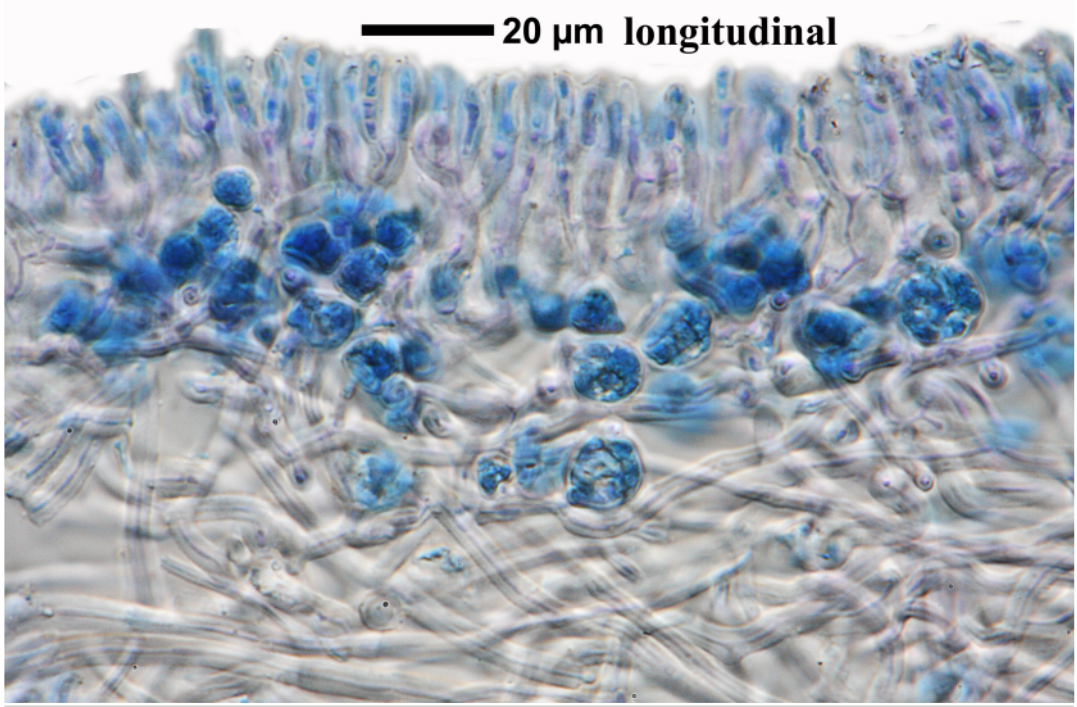
Roccella linearis

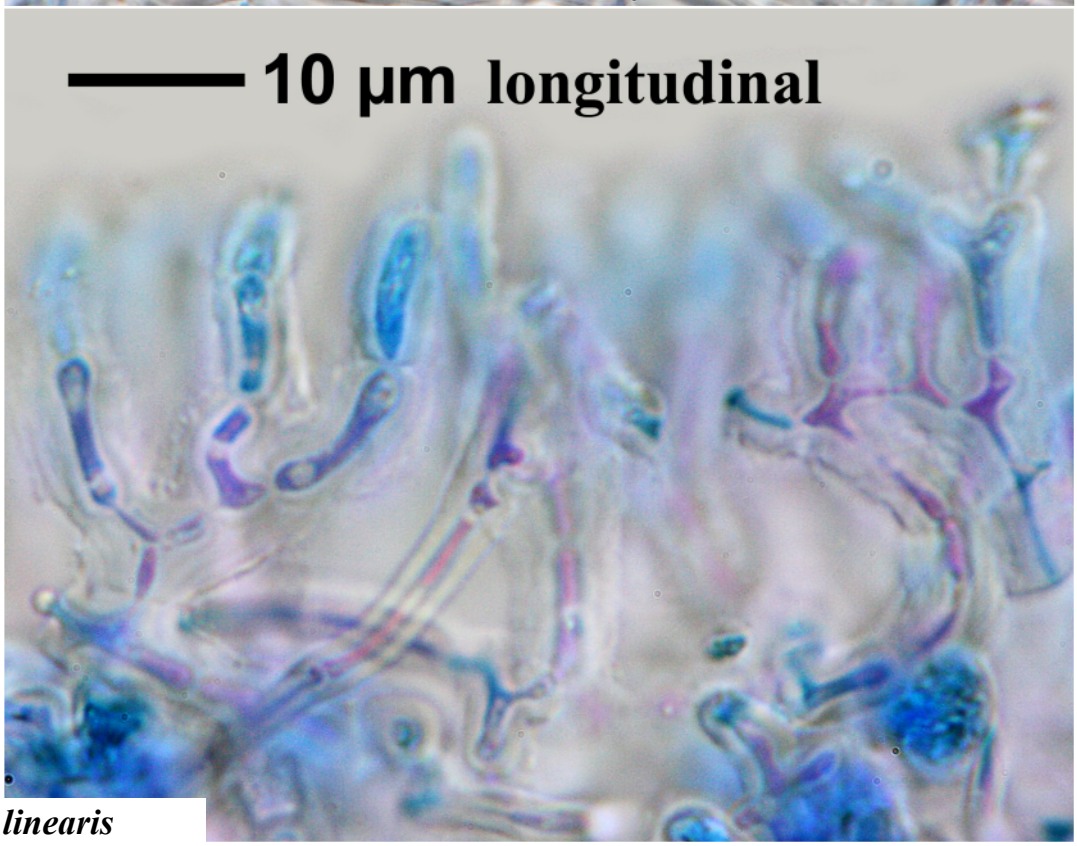




Roccella linearis







Roccella linearis

Roccella lirellina (Darb.) Follmann (1997)
Roccella tinctoria var. *cornuta* Hampe ex Darb. (1898)
Roccella tinctoria var. *dufouriaeformis* Hampe ex Darb. (1898)

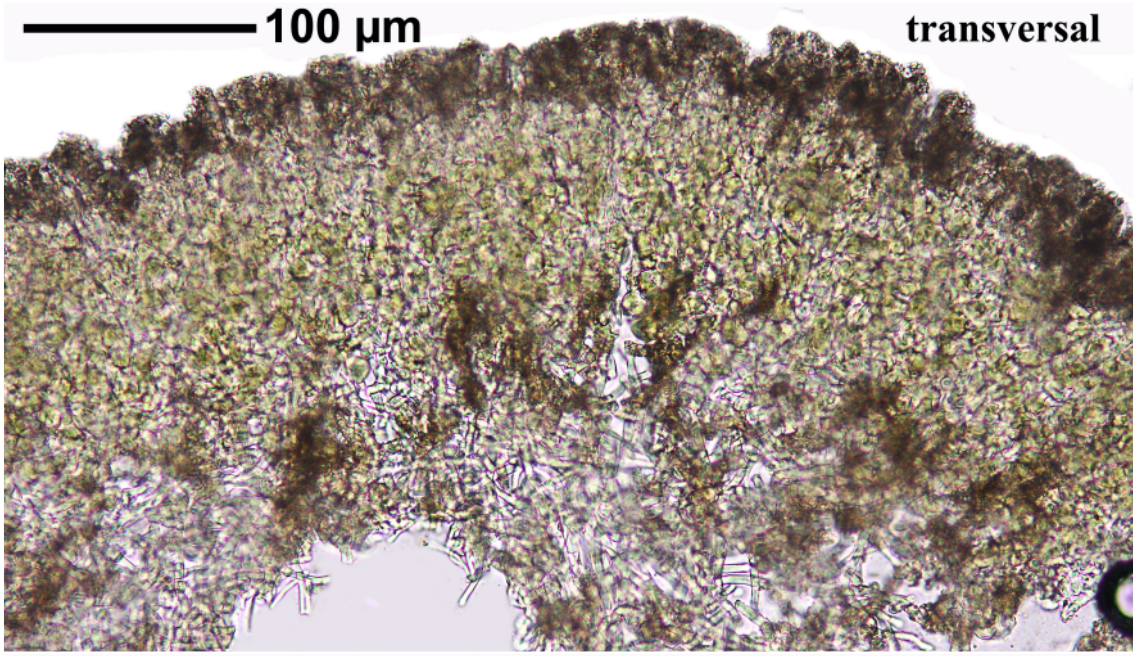
Thallus saxicolous, grey, sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex more or less palisade plectenchymateous. Apothecia unknown. Cortex C –, K –, Pd – or + orange, subcortex C + red at tips, Pd+ red, medulla C –, Pd + red, IKI+ violet, soralia C –, Pd –, major substances erythrin, lecanoric, protocetraric, roccellin, roccellic. – Peru.

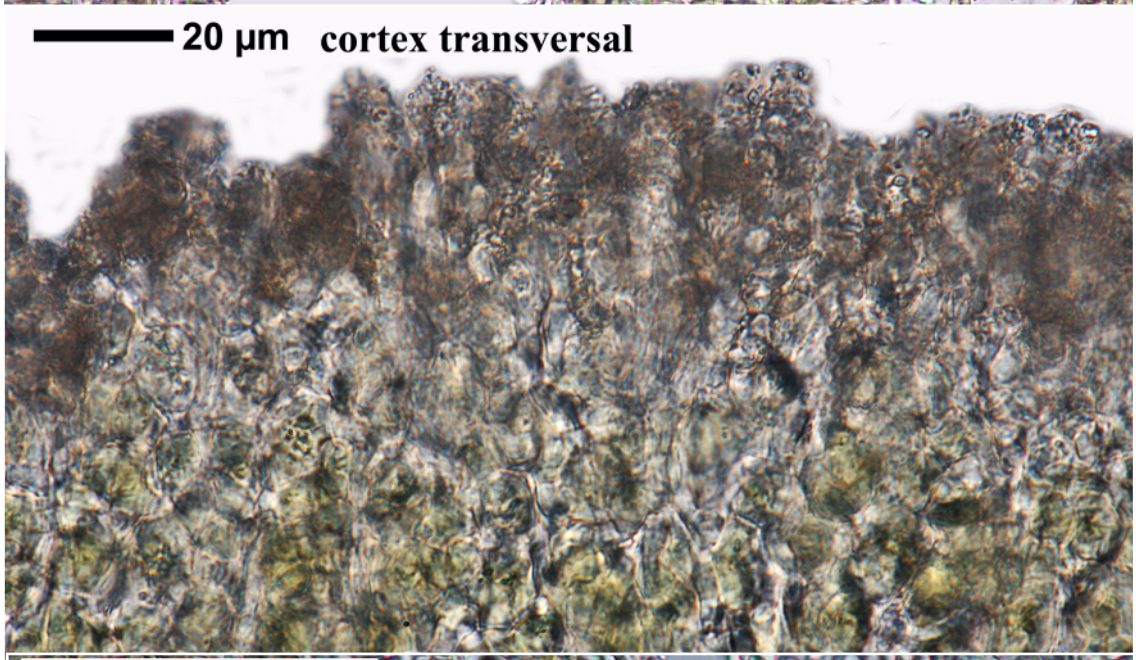
Peru, City of Lima, Chorillos Distr., SE edge of city; Morro Solar, an arid hill fronting on the ocean S of Playa Pescador; lichens poorly developed on scattered rocks and stones on steep slope facing northeast. Leg. W.A.Weber & J.Kohn 28 March 1978. Lichenes exsiccati distributed by the University of Colorado Museum, Boulder No. 580.

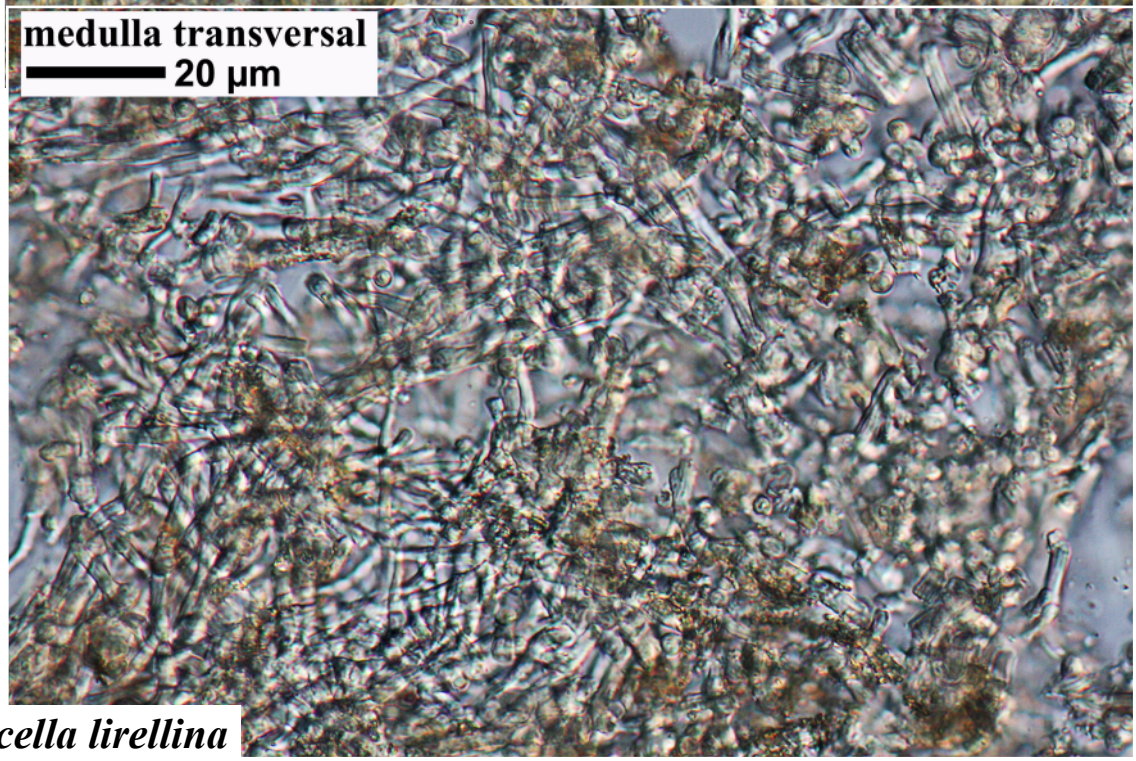




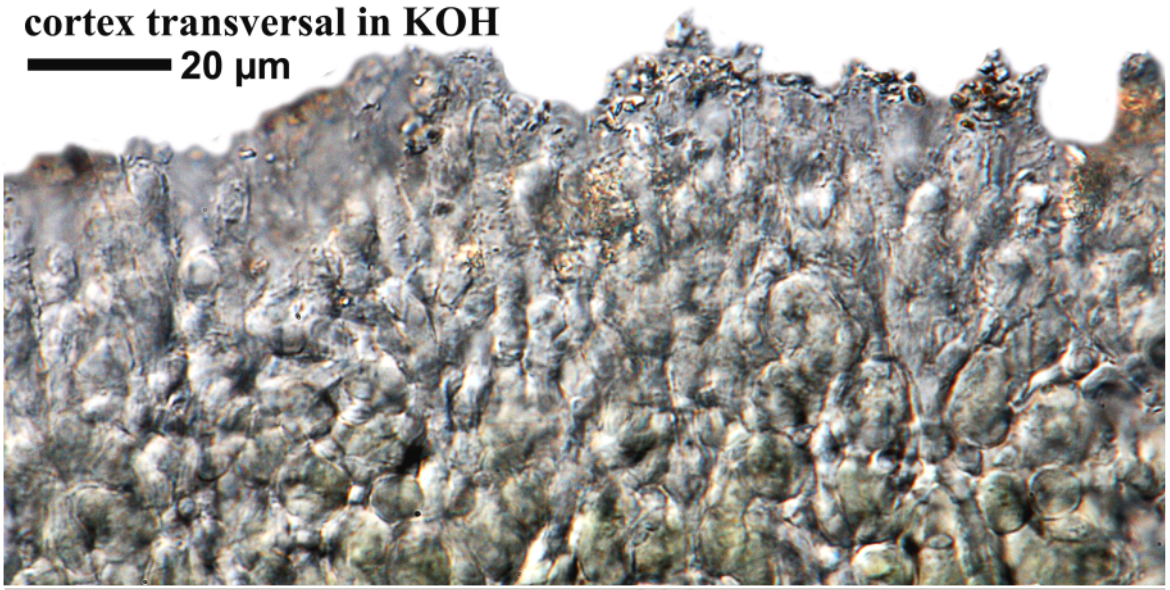
Roccella lirellina

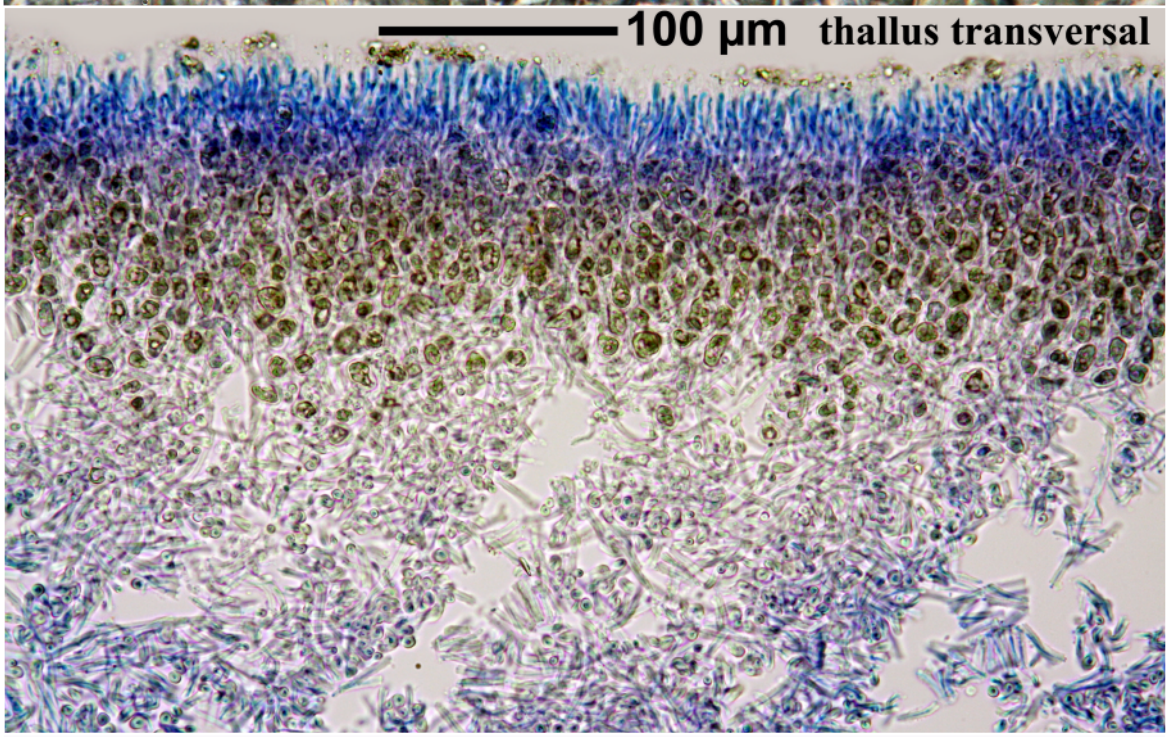


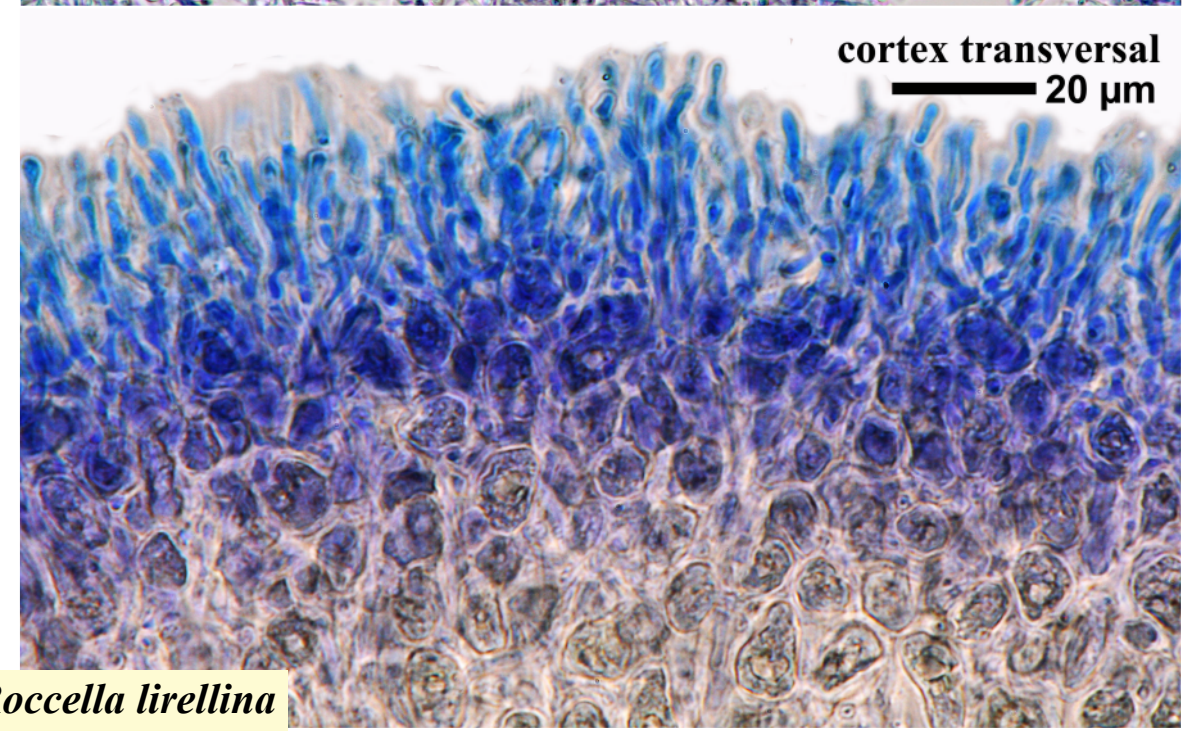




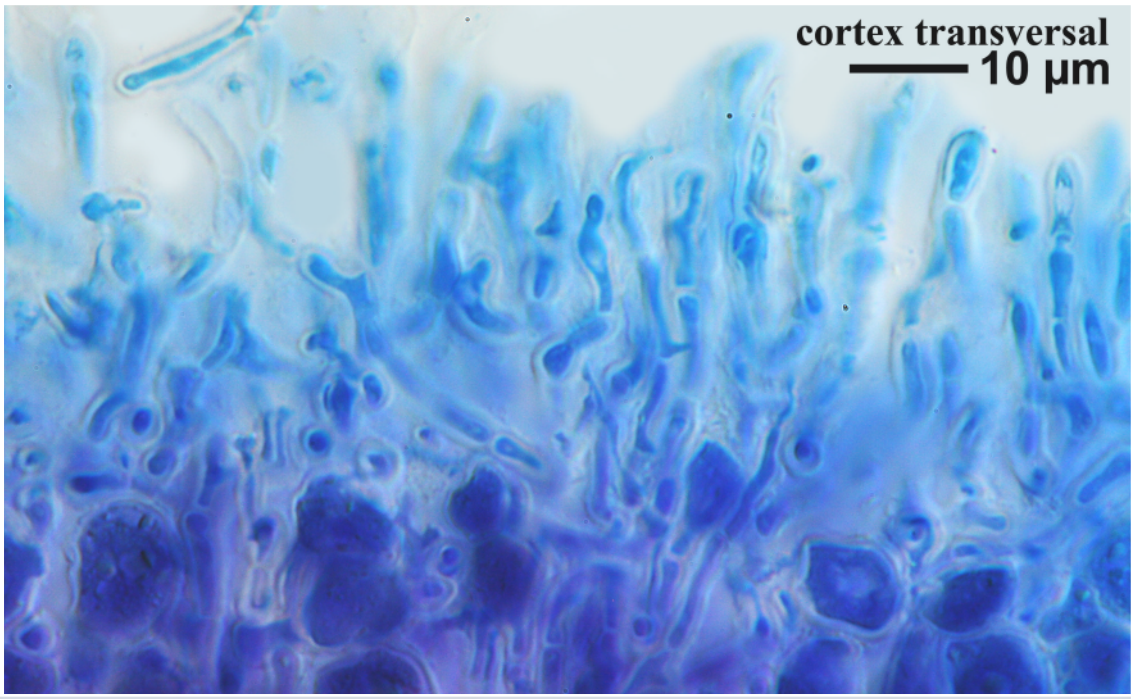
Roccella lirellina

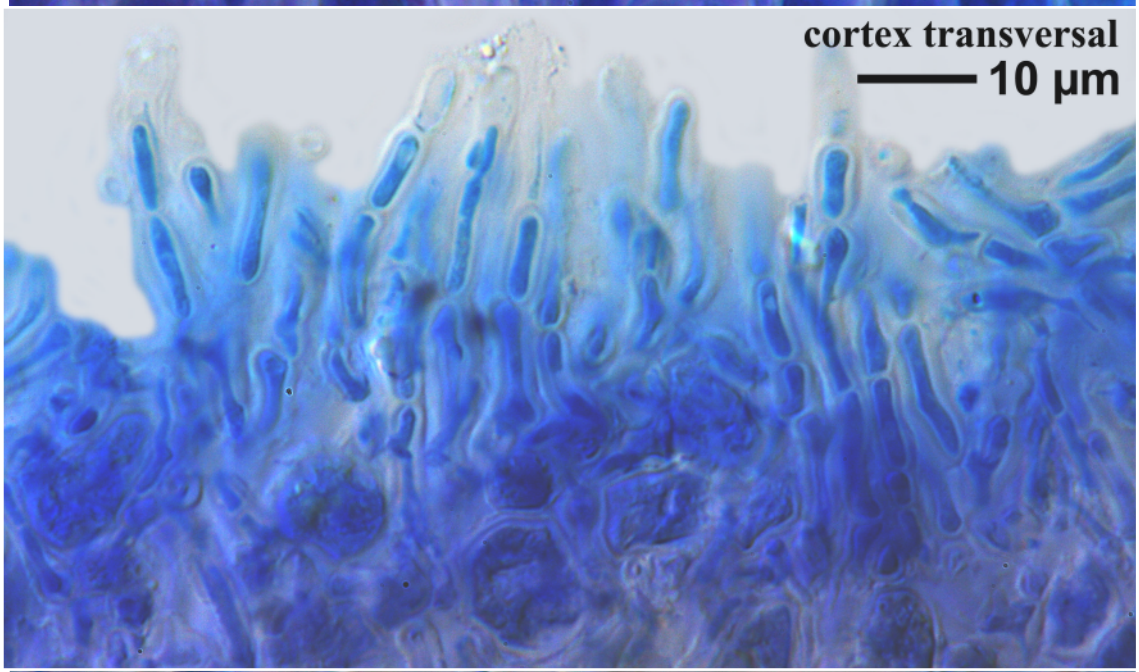


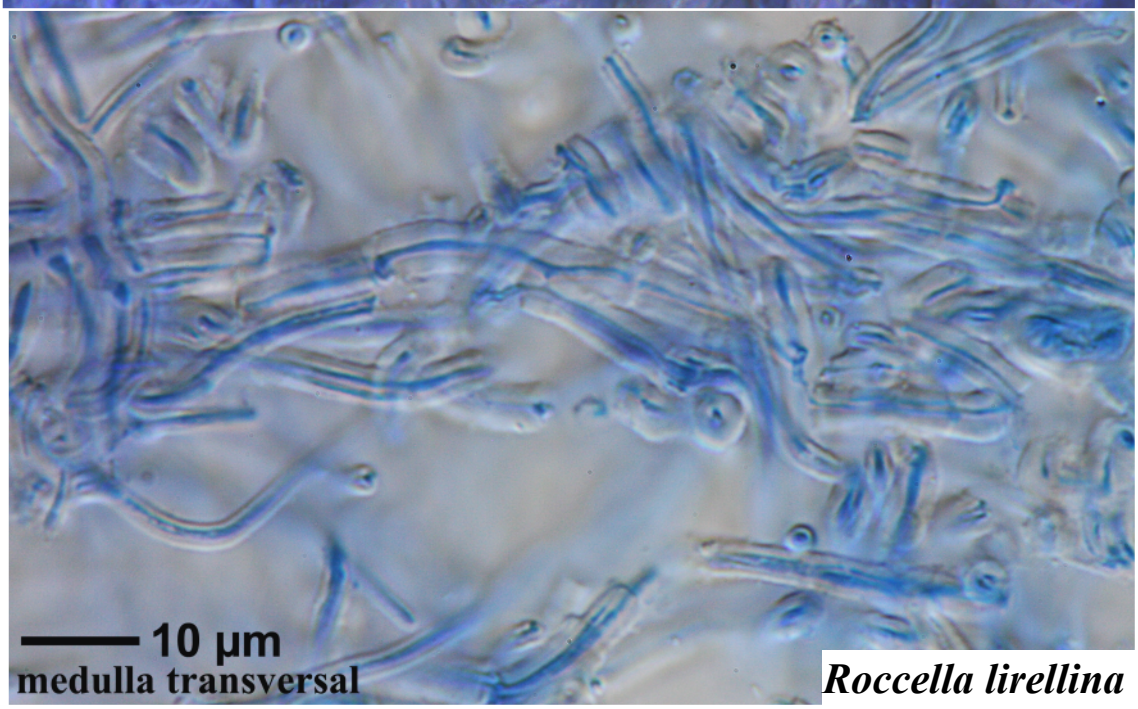




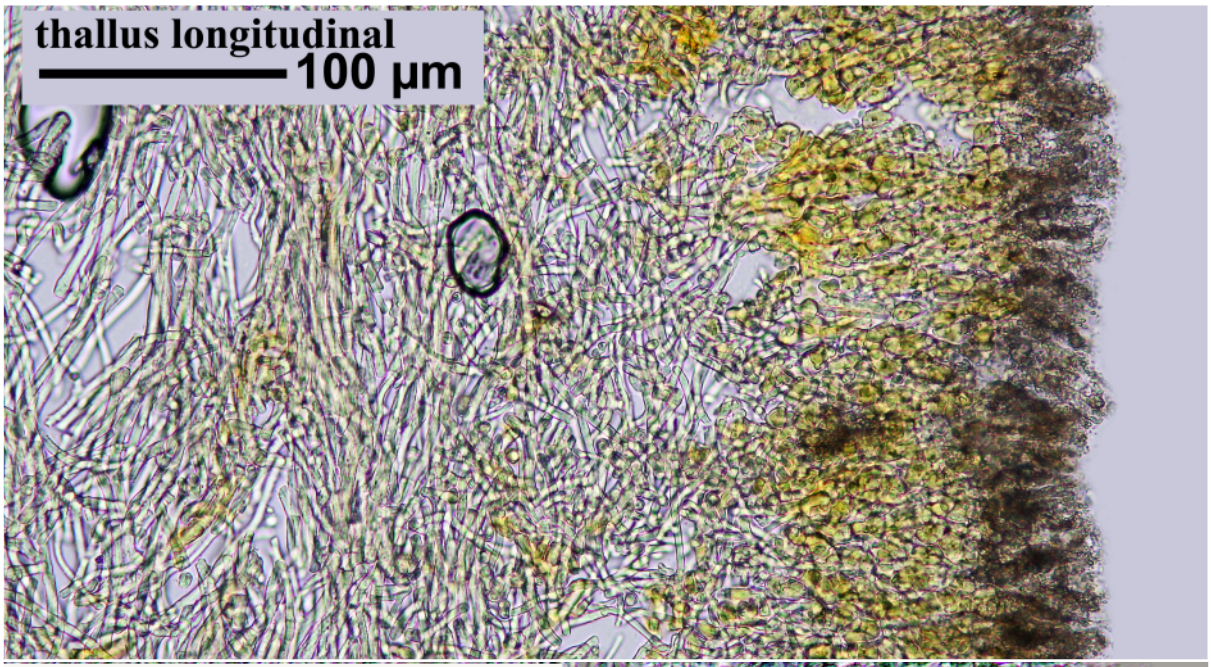
Roccella lirellina

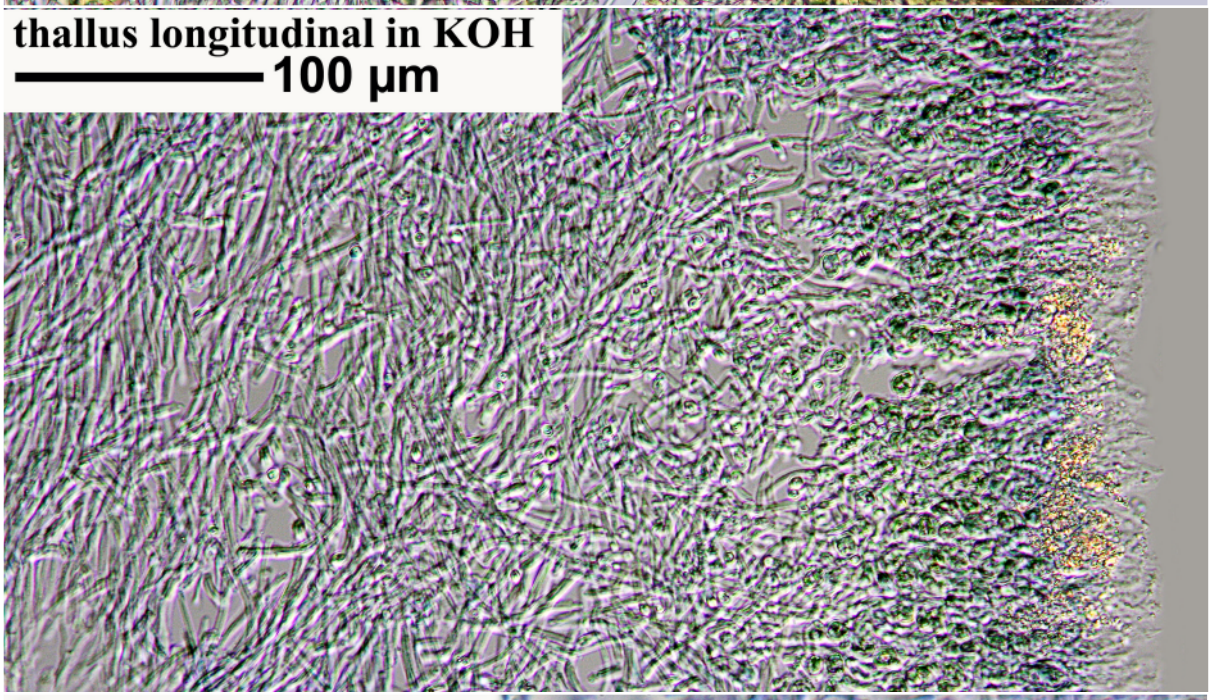


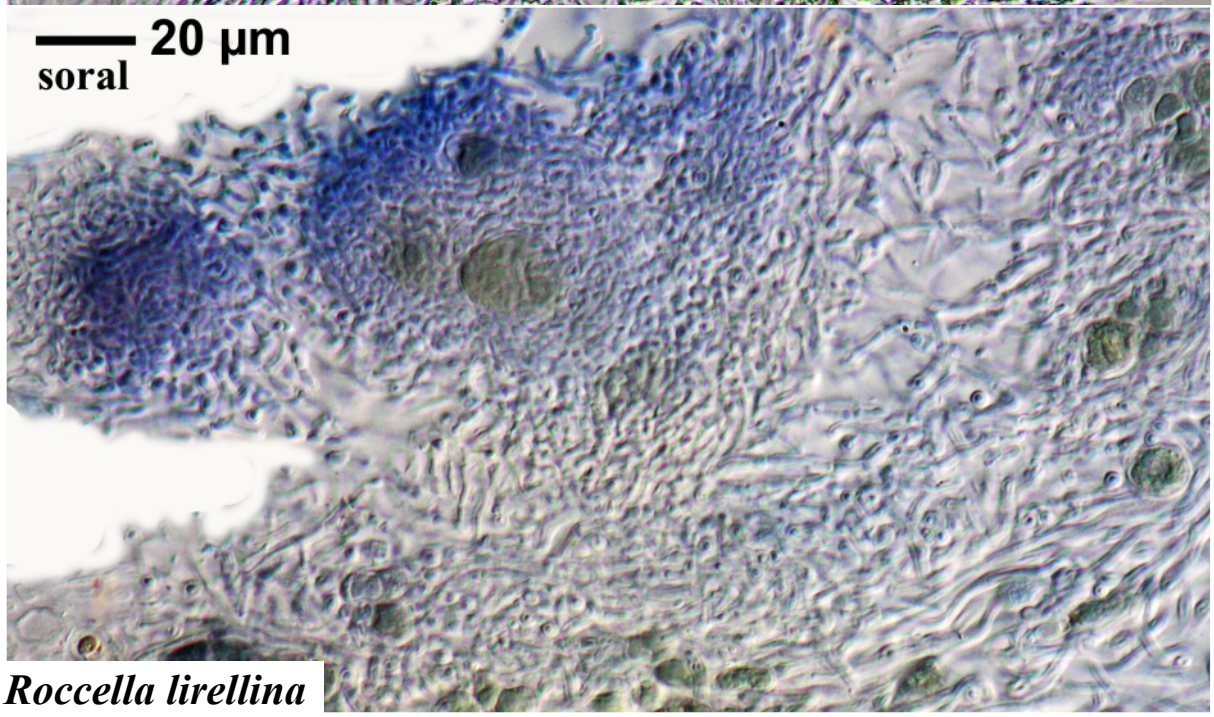




Roccella lirellina







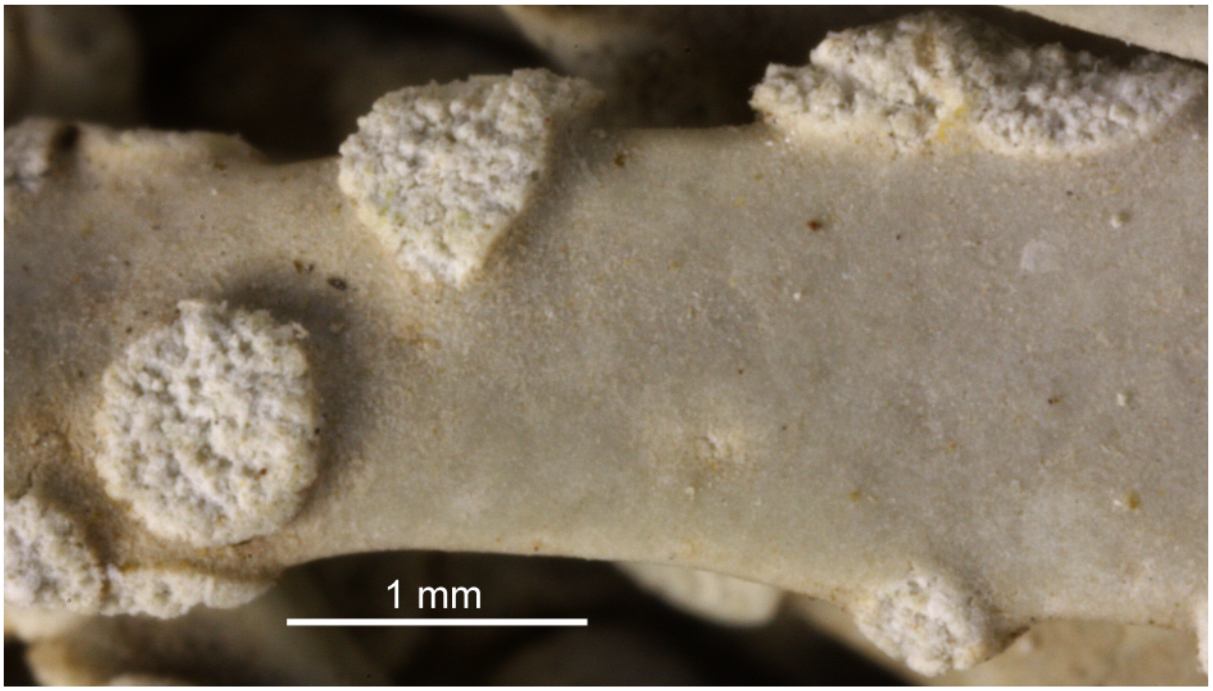
Roccella lirellina

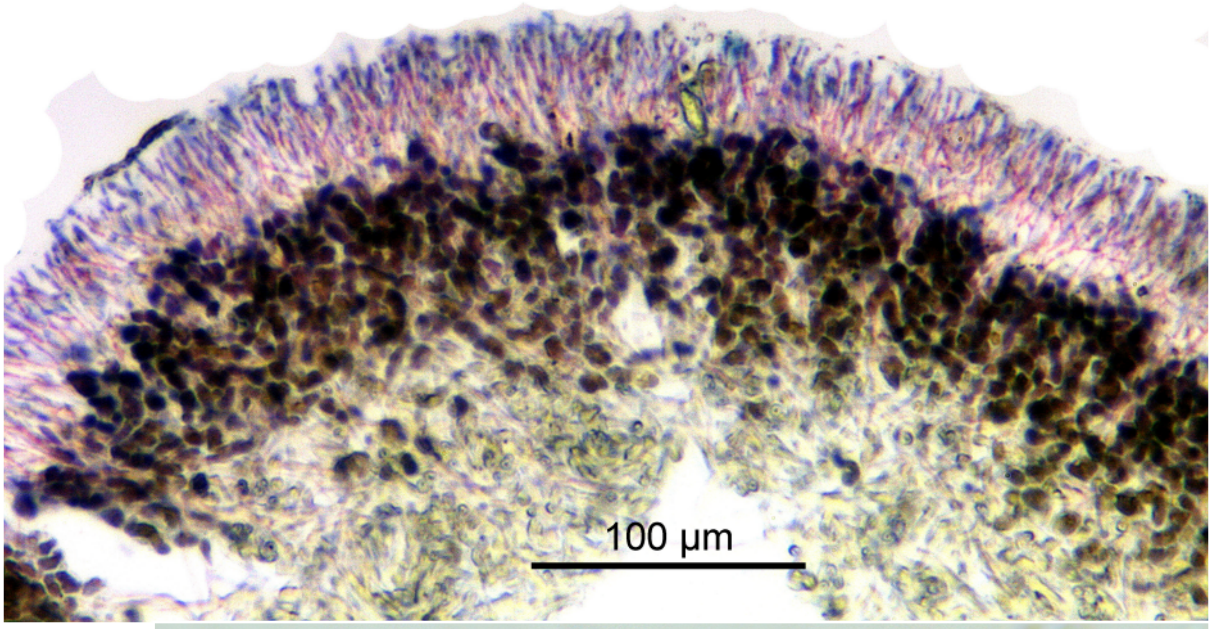
Roccella maderensis (J. Steiner) Follmann (1993)
Roccella fuciformis var. *maderensis* J. Steiner (1904)

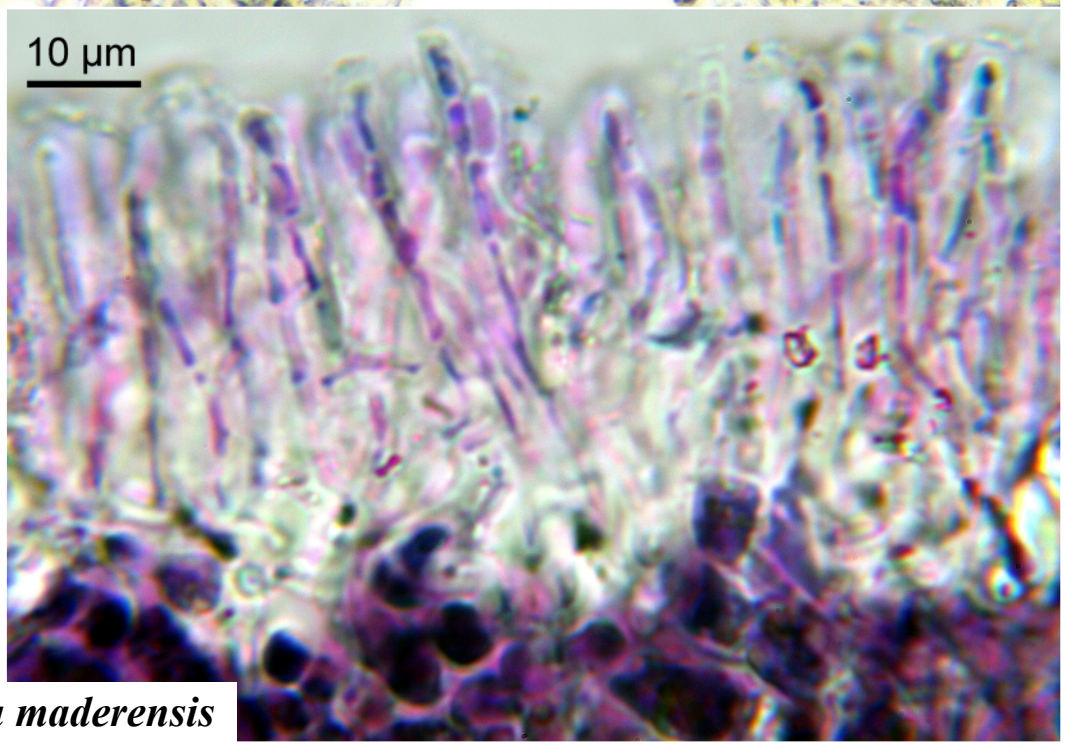
Thallus saxicolous, grey, usually sorediate, rarely not, texture firm, applanate, surface smooth, holdfast internally white to brown. Cortex palisade plectenchymateous. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–27 × 5–6 µm. Cortex C + red, K + red, Pd – or + red, subcortex C –, medulla C –, IKI + violet, soralia if present C + red, major substances erythrin, lecanoric. – Portugal, Spain, Azores, Madeira, Canary Isles.

Portugal, Madeira, Ponta de Sao Lourenço, am Ende der Fahrstraße, sonniger, küstennaher Felshang; 32°44.596' N, 16°42.056' W, 93 m, an Felsen, leg. Schumm 28.12.2003, det. Schumm 01.2004, (zusammen mit *R. phycopsis* wachsend). [11441]

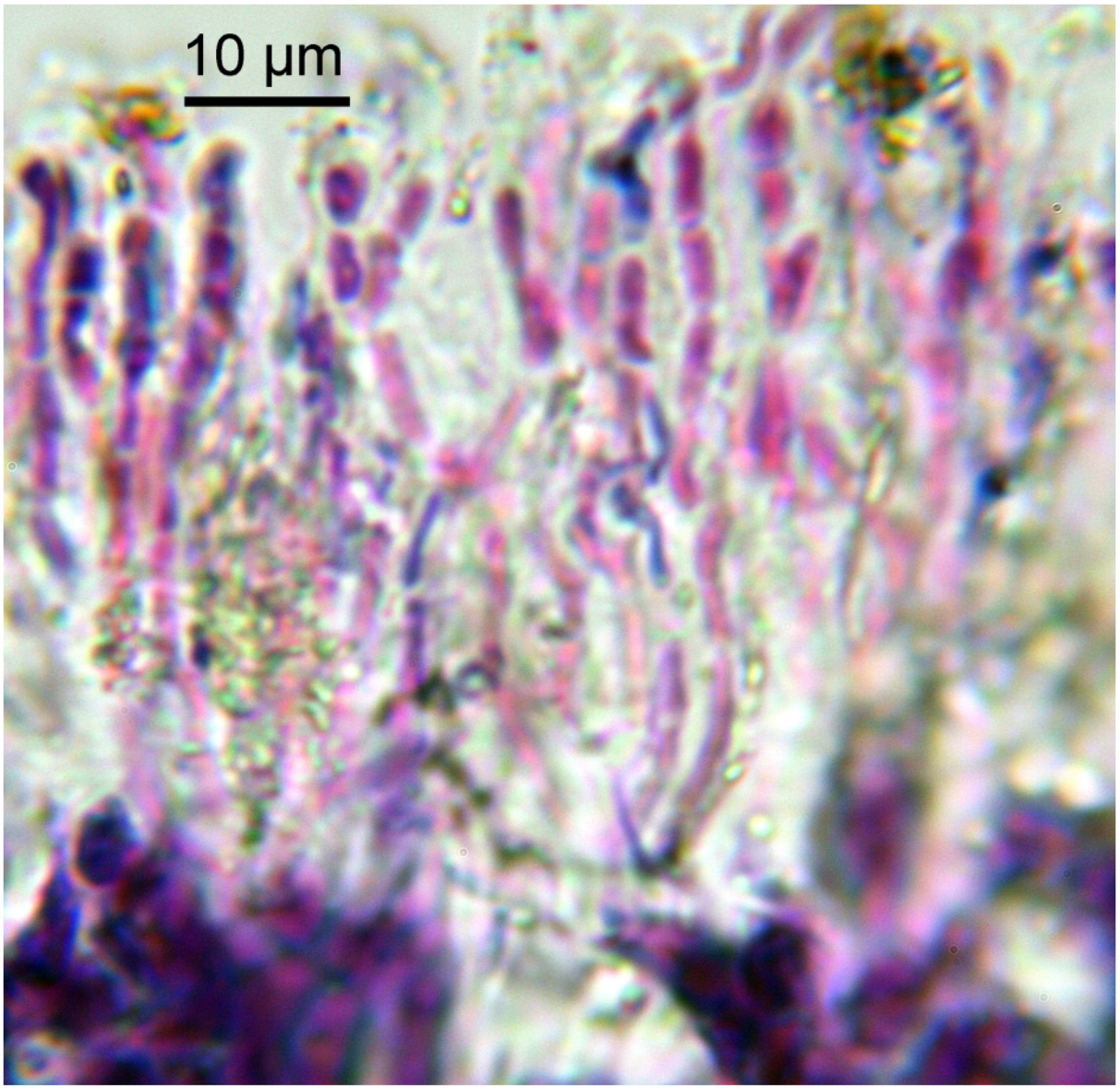








Roccella maderensis



Roccella maderensis

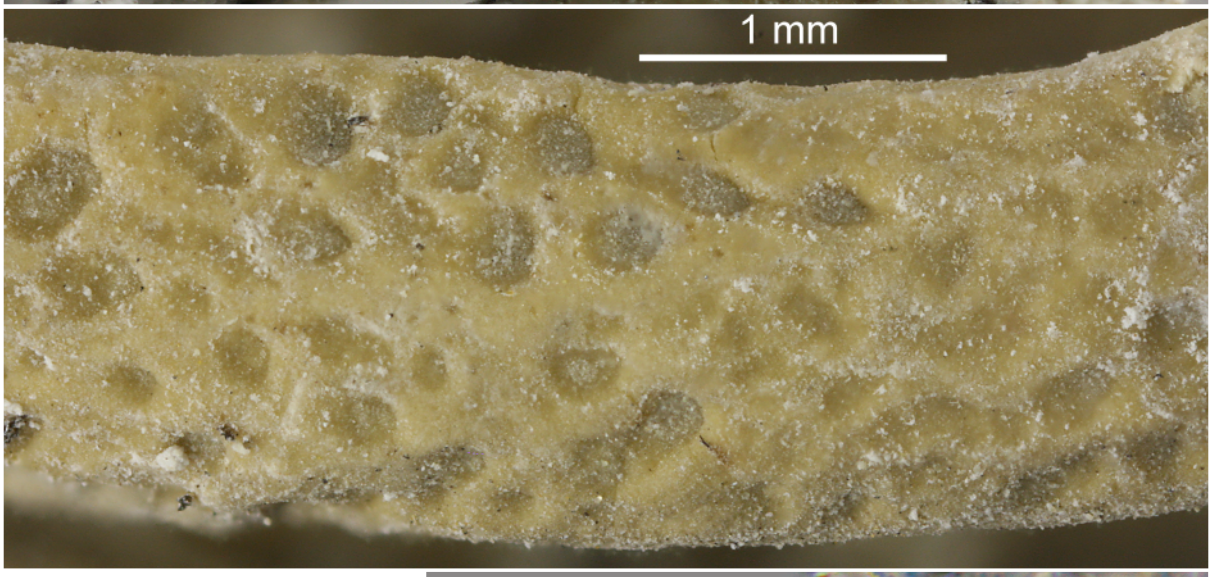
Roccella margaritifera B. Werner & Follmann (1998)
Roccella margaritifera f. *octopodioides* B. Werner (2000)
Roccella octopodioides Follmann (1994)

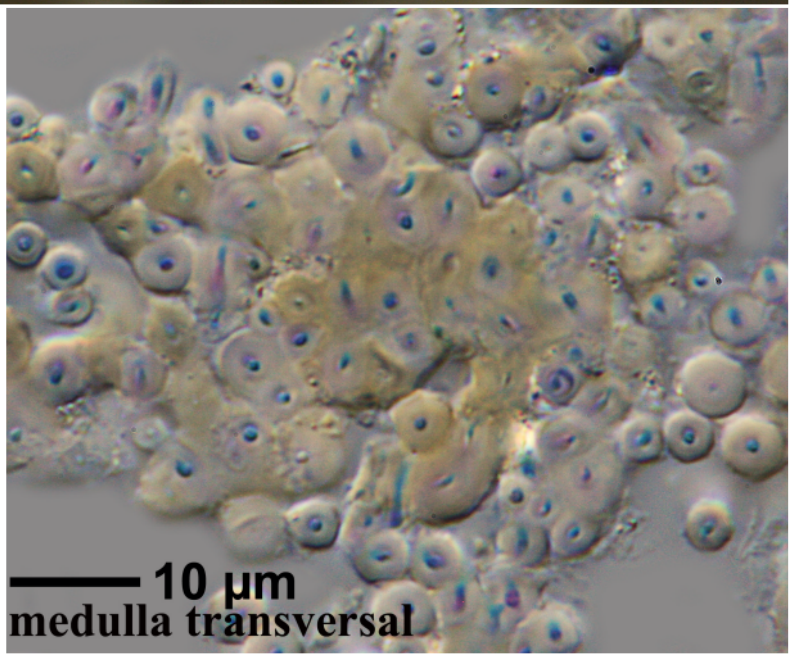
Thallus saxicolous, grey to brown, usually sorediate, rarely not, texture firm, cylindrical, surface smooth or pitted, holdfast internally white to brown, medulla often yellow-brown. Cortex palisade to intermediate plectenchymateous. Apothecia rare, round. Hypothecium black. Ascospores hyaline, 3-septate, 21–30 × 5–7 µm. Cortex C + red , K –, Pd – or + orange, subcortex C –, Pd – or + orange, medulla C –, Pd–, IKI+ violet, soralia if present C – or + red, major substances erythrin, protocetraric. – Galapagos.

Ecuador, Galapagos Islands, James Island, Sullivan Bay. Leg. Yale Dawson 1964, det. A. Aptroot. [ABLGal41137]

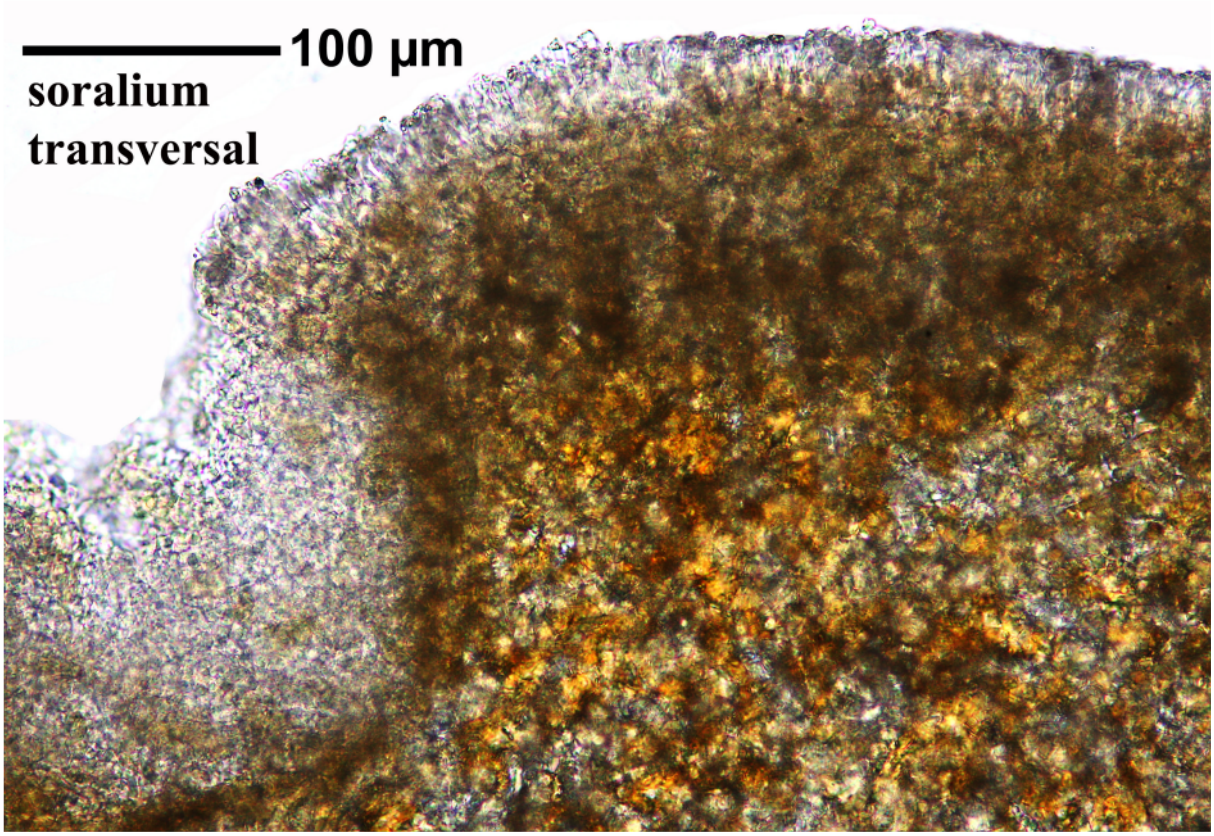


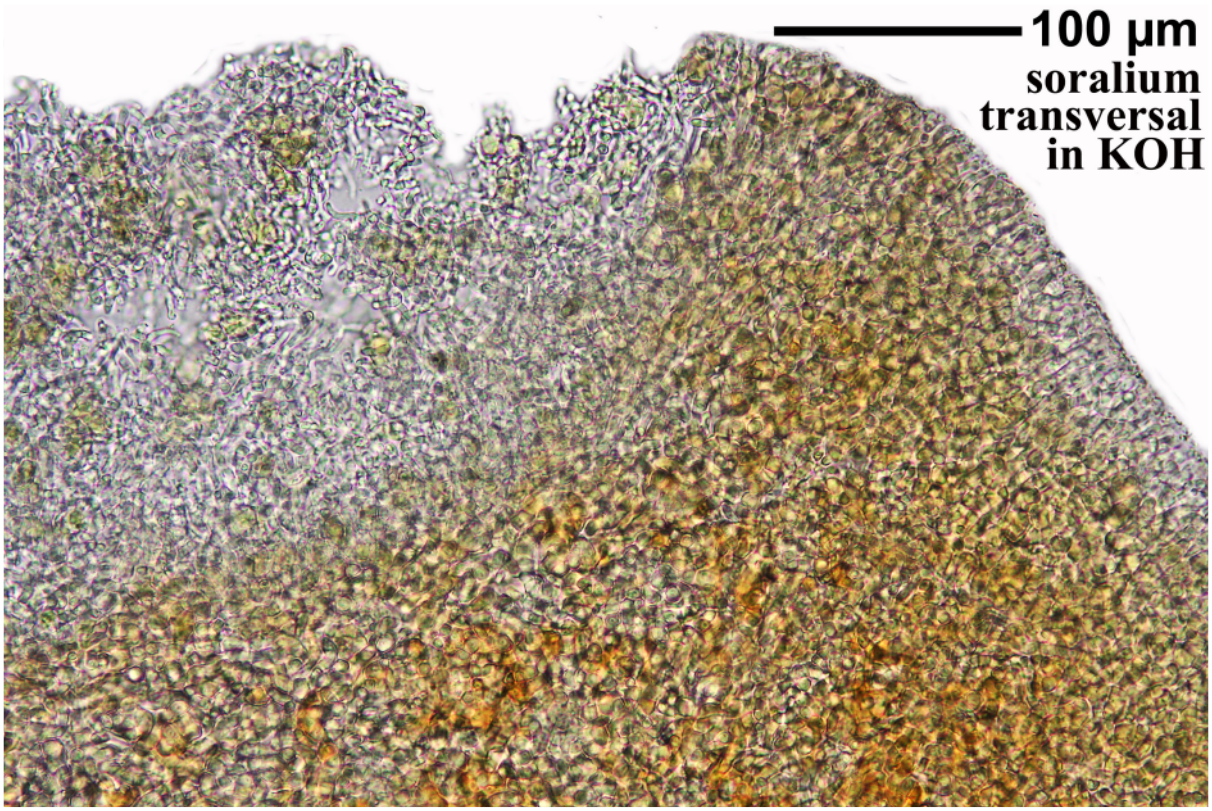




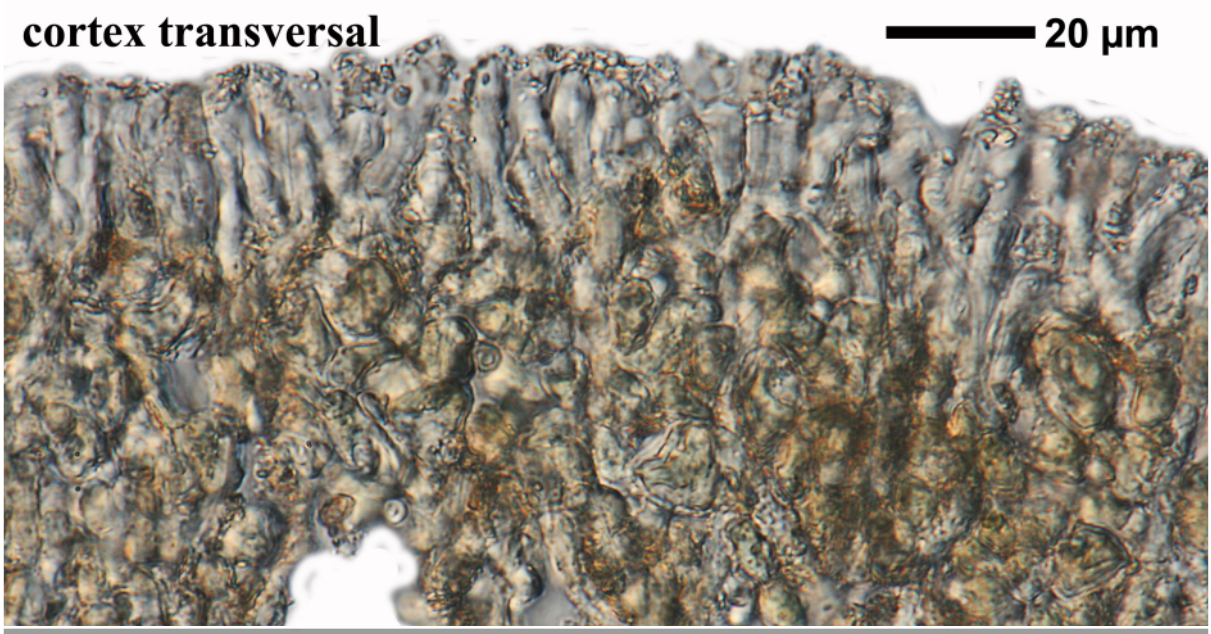


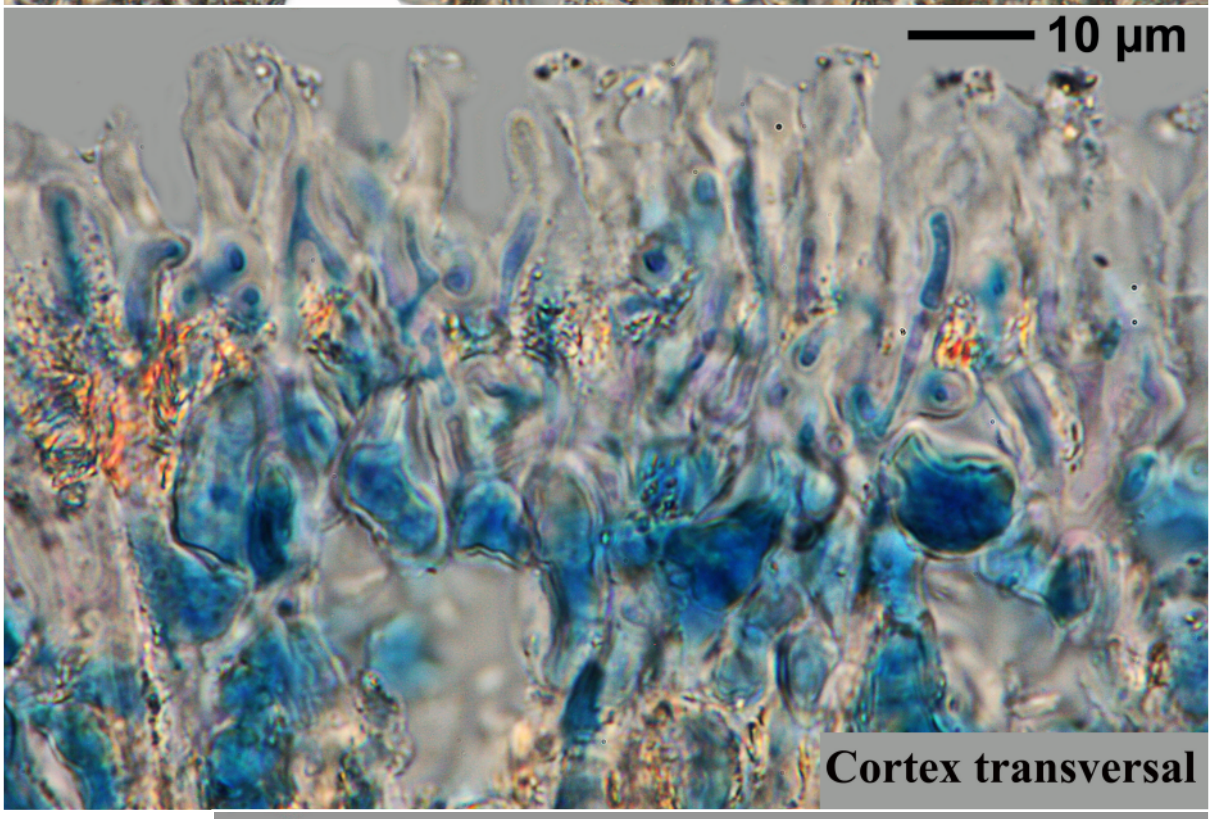
Roccella margaritifera

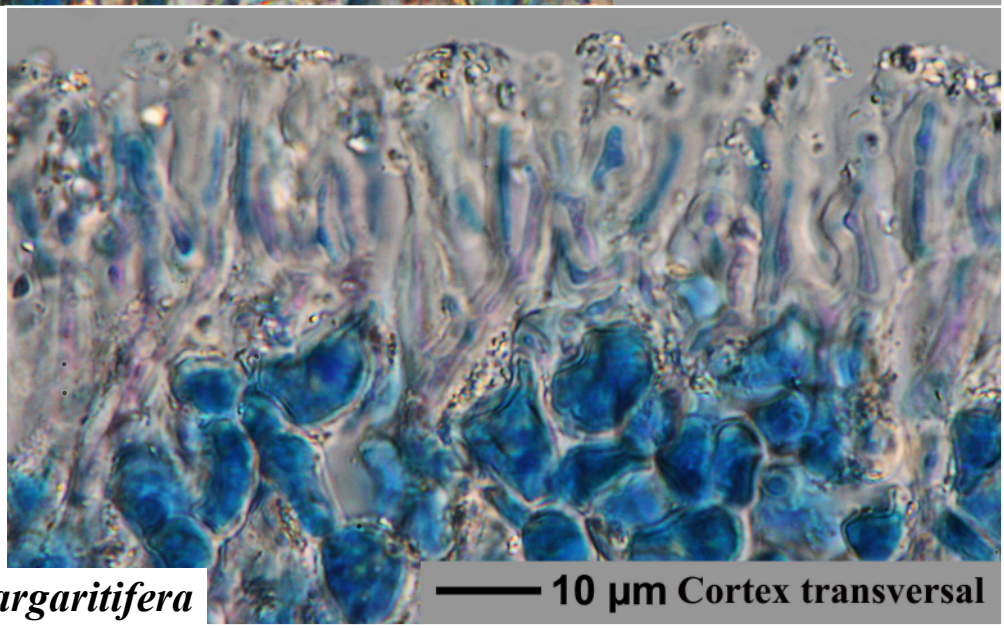




Roccella margaritifera

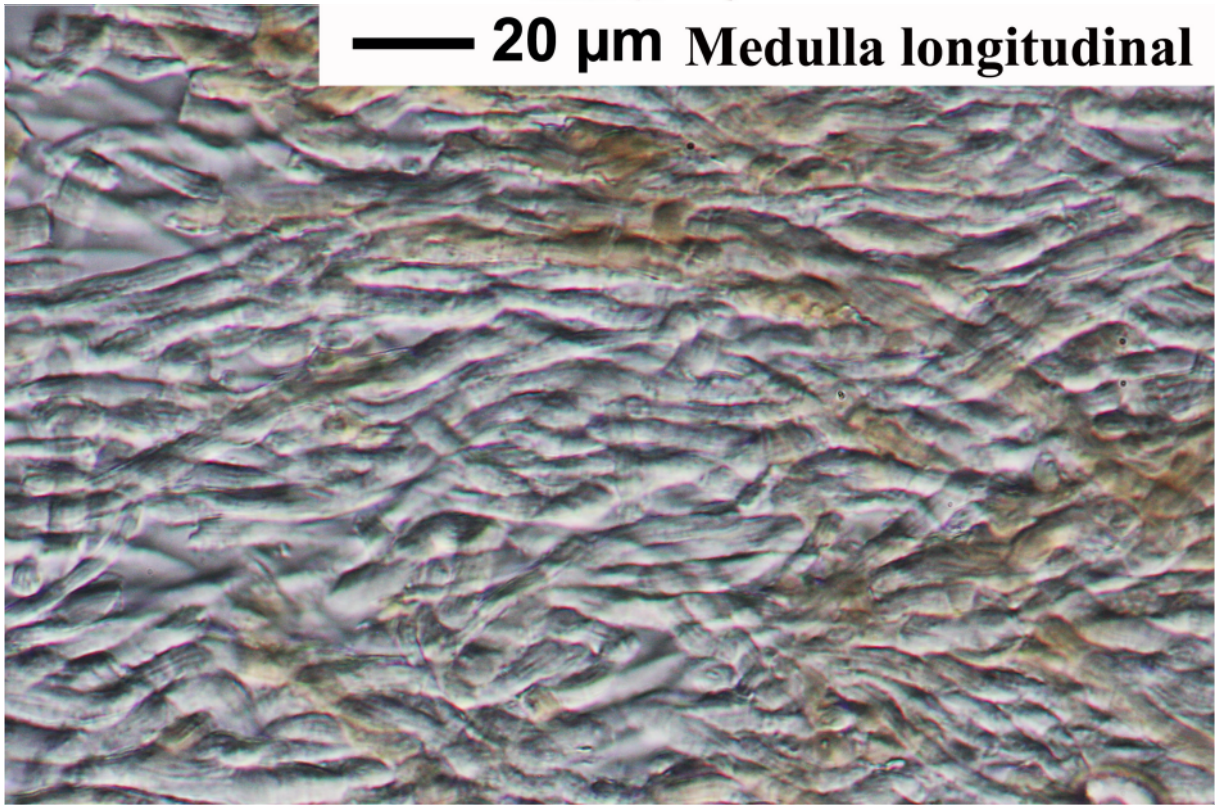




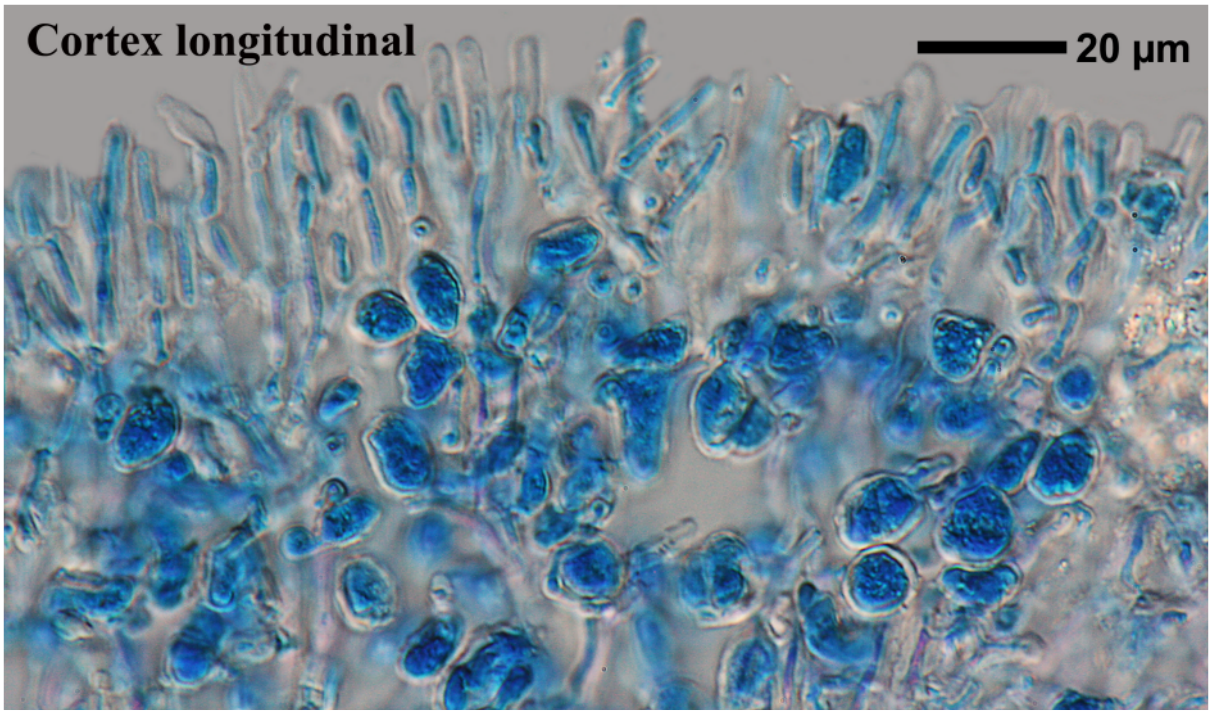


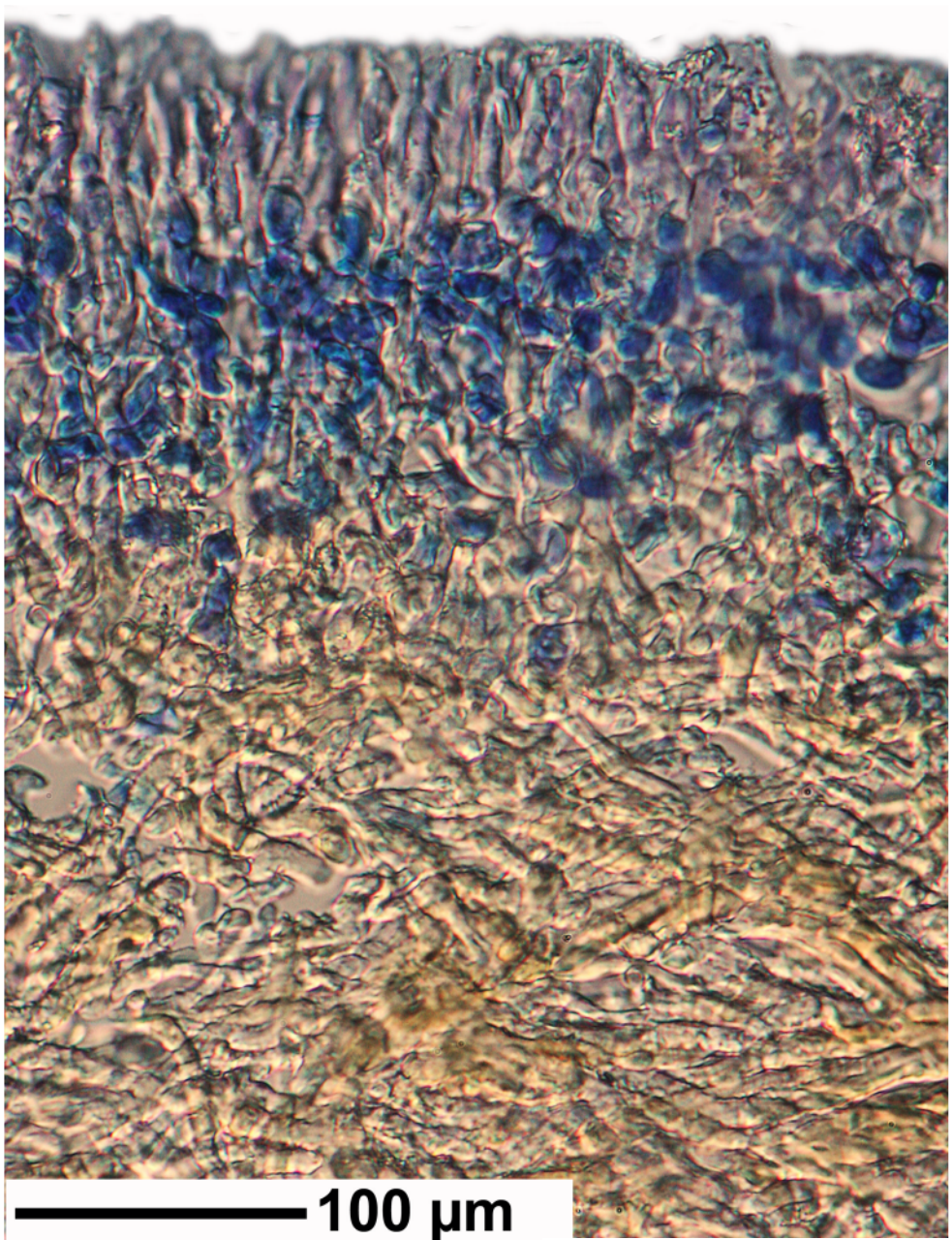
Roccella margaritifera





Roccella margaritifera



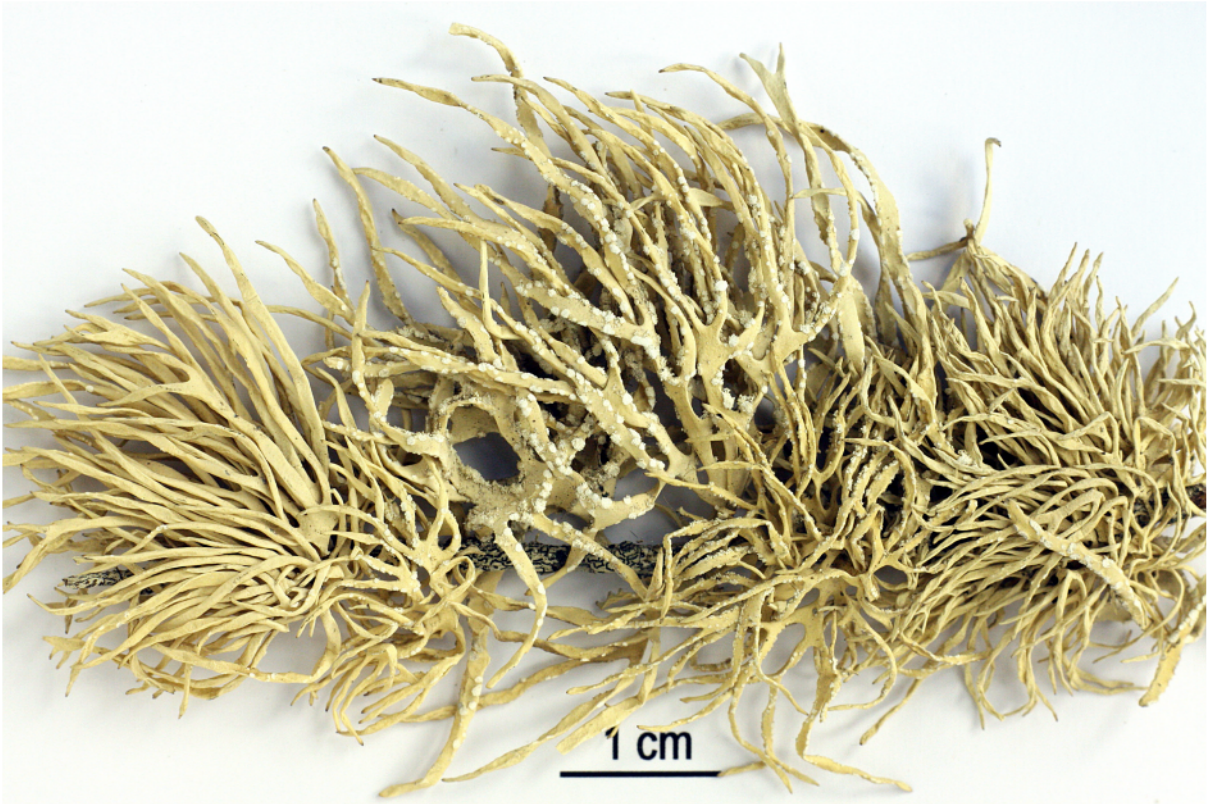


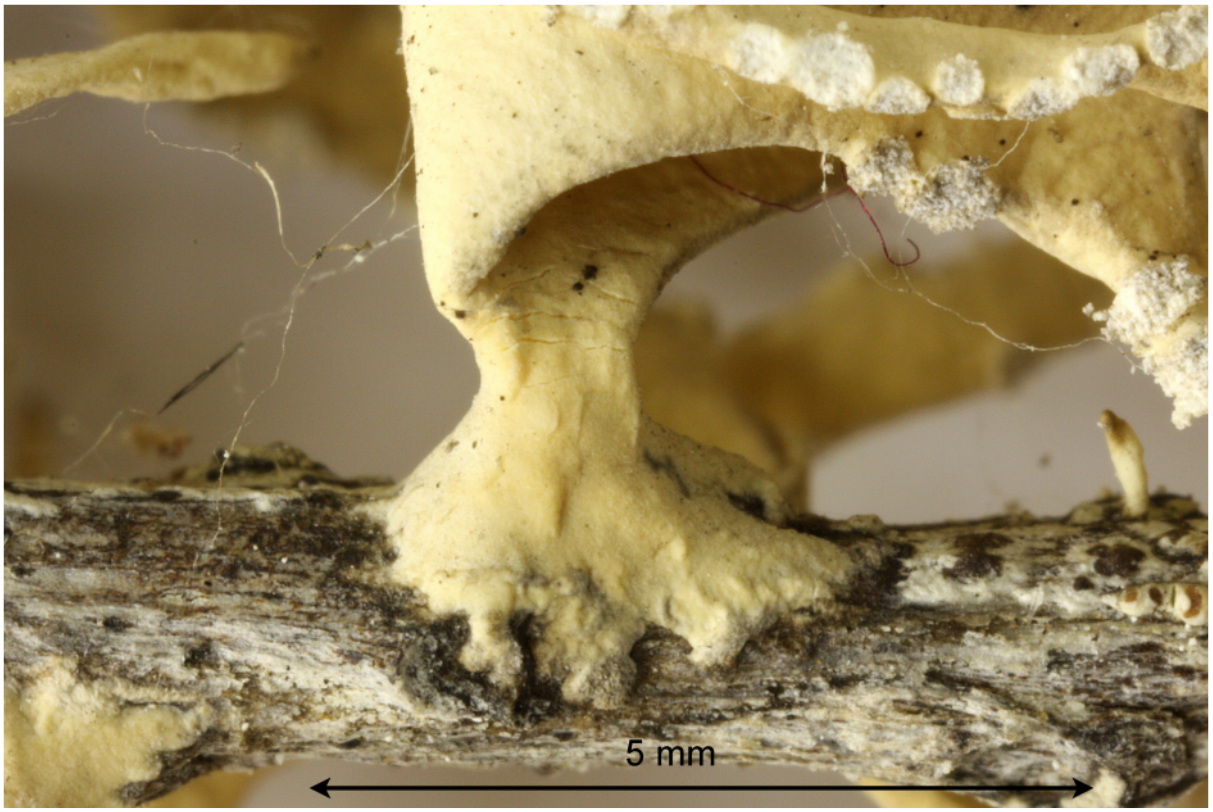
Roccella margaritifera

Roccella montagnei Bél. (1834)
Roccella belangerii Fée ex Darb. (1898)
Roccella falcata Del. ex Darb. (1898)
Roccella fucoidea Ach. ex Darb. (1898)
Roccella montagnei f. *angusta* Nyl. ex Darb. (1898)
Roccella montagnei f. *angustata* Nyl. in Müll. Arg. (1879)
Roccella montagnei f. *angustior* Nyl. (1860)
Roccella tinctoria f. *minor* Nyl. (1868)

Thallus corticolous, grey, sorediate, texture soft, applanate, surface ridged, holdfast internally white to brown. Cortex palisade plectenchymatous. Apothecia rare, sterile and immature when present. Cortex C + red, K – or + yellow, Pd –, subcortex C + red, medulla C –, IKI+ violet, soralia C –, major substances erythrin, lecanoric, roccellic. – Palaeotropic coasts from Australia over India to E. and W. Africa, Ascension, St Helena.

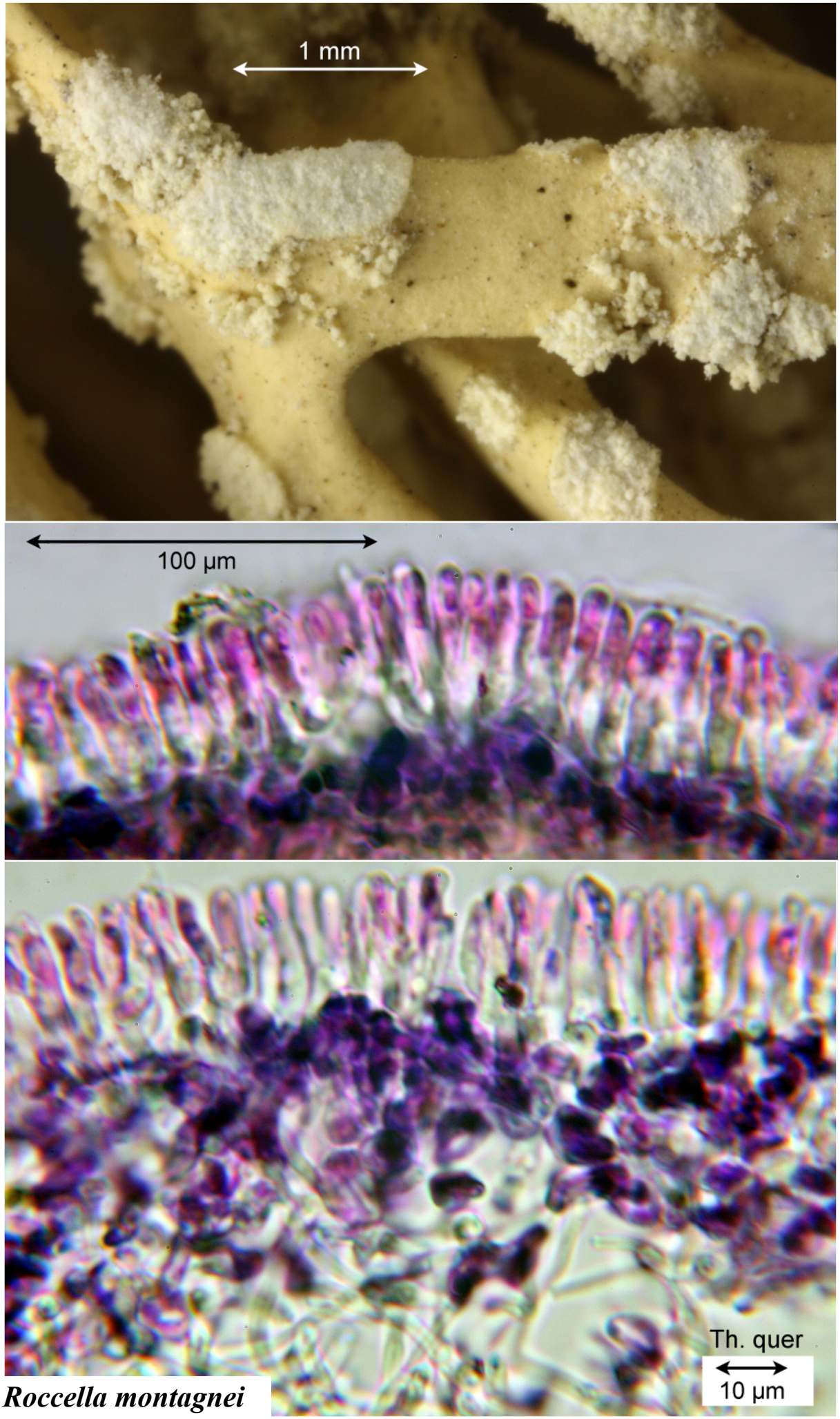
Tanzania: Tanga, flat coastal formation northeast of Pangani, on weather-beaten branches of dead shrubs, about 10 m elevation, NE-SE exposition, gregarious. Leg. Moberg 01.1971. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 451 (as *Roccella linearis*). [11977]







Roccella montagnei

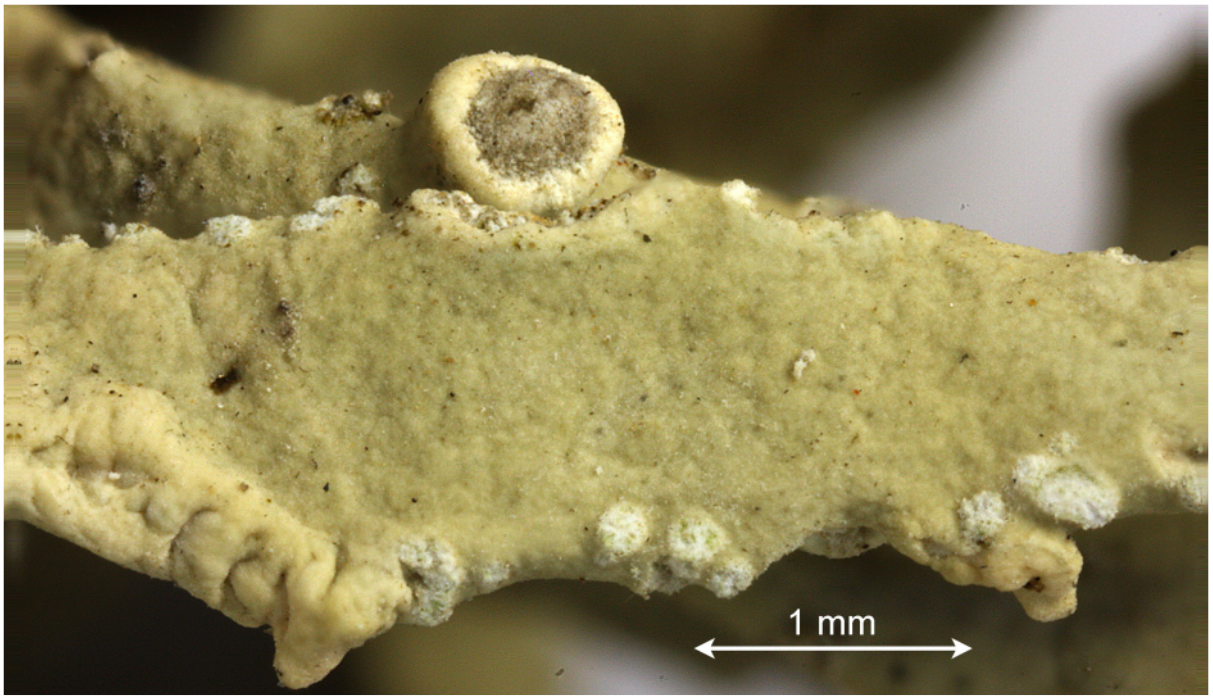


Roccella montagnei

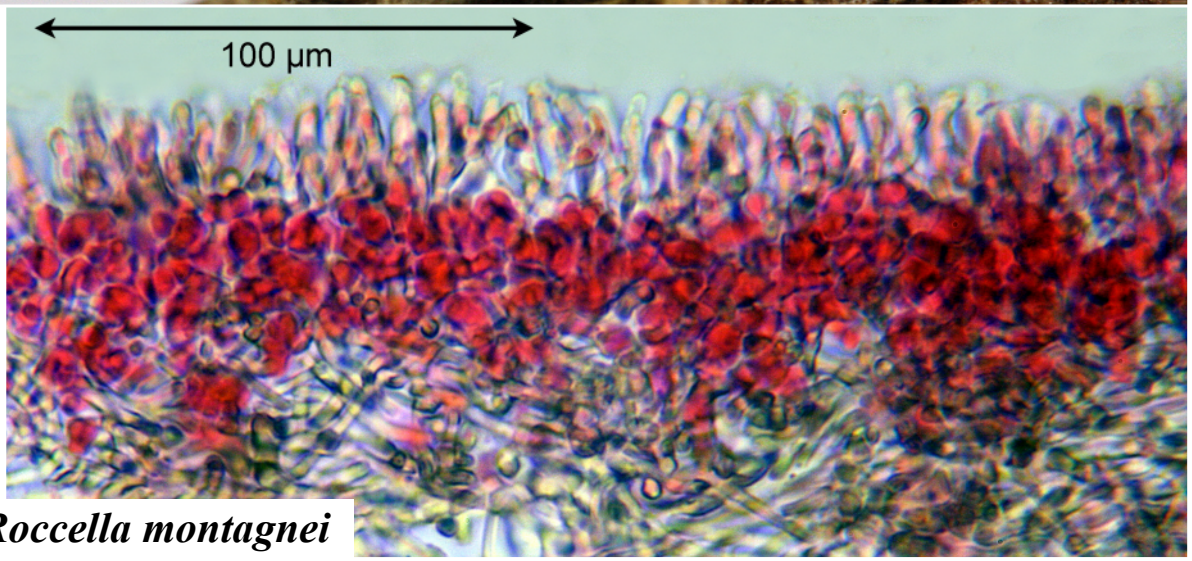
Roccella montagnei Bél. (1834)

Madagaskar, Süd-Madagaskar, Berenti Park, an Bäumen; Schumm 28.12.1992, det. Schumm 01.1993, test. Follmann 04.1999. [4082]

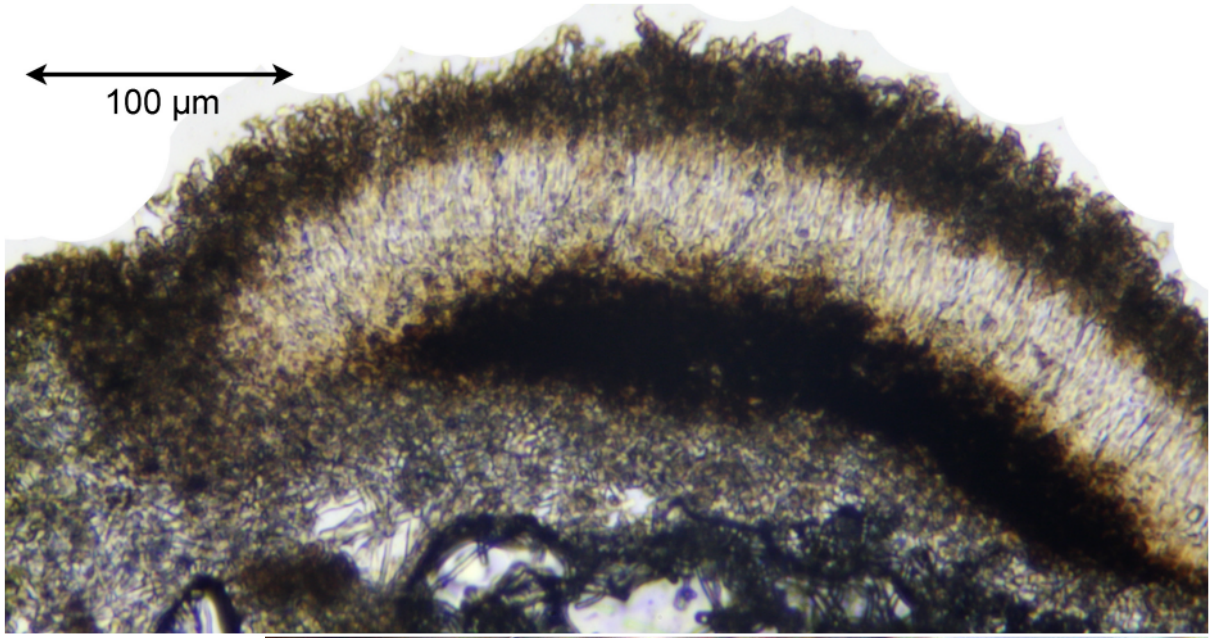


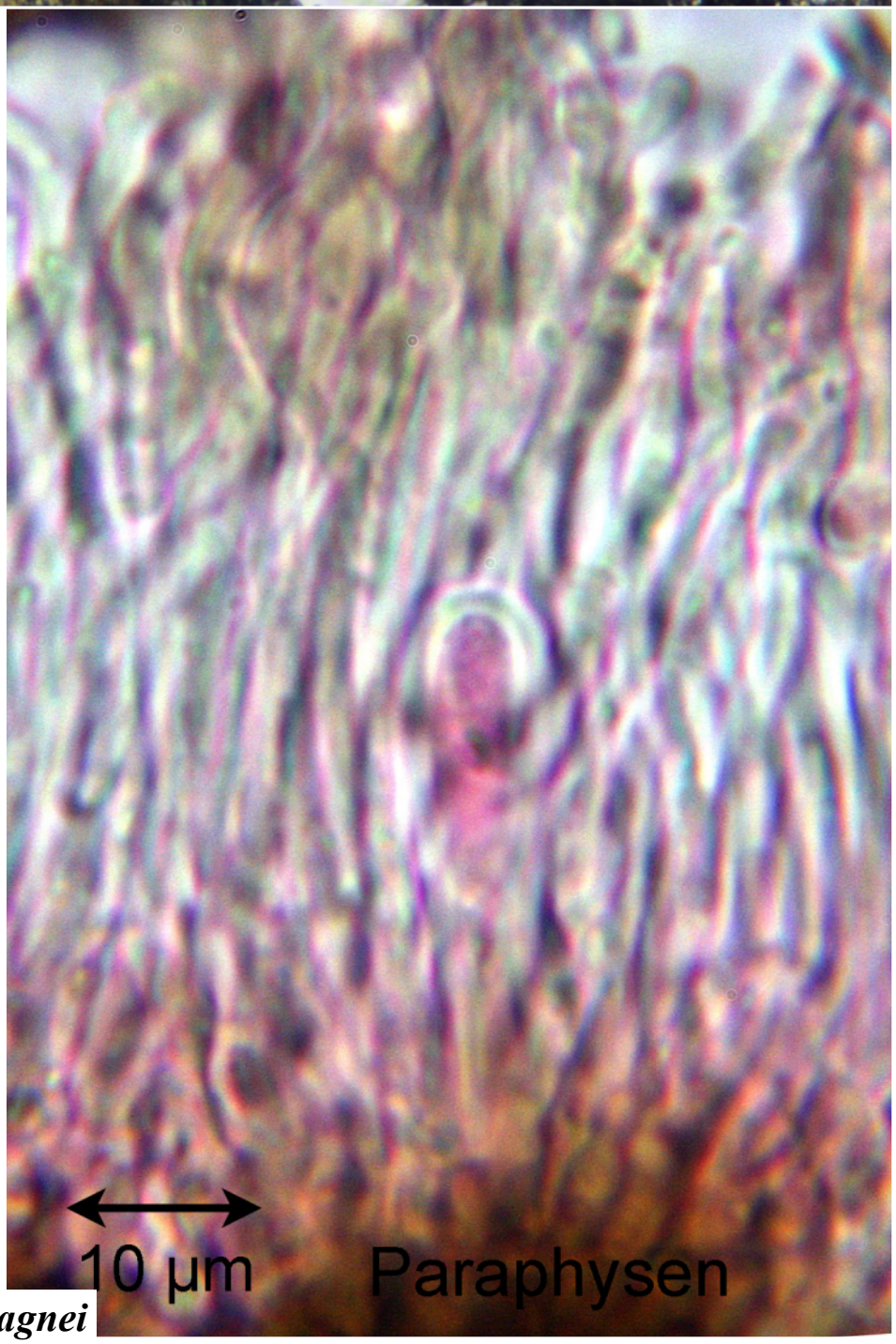






Roccella montagnei





Roccella montagnei

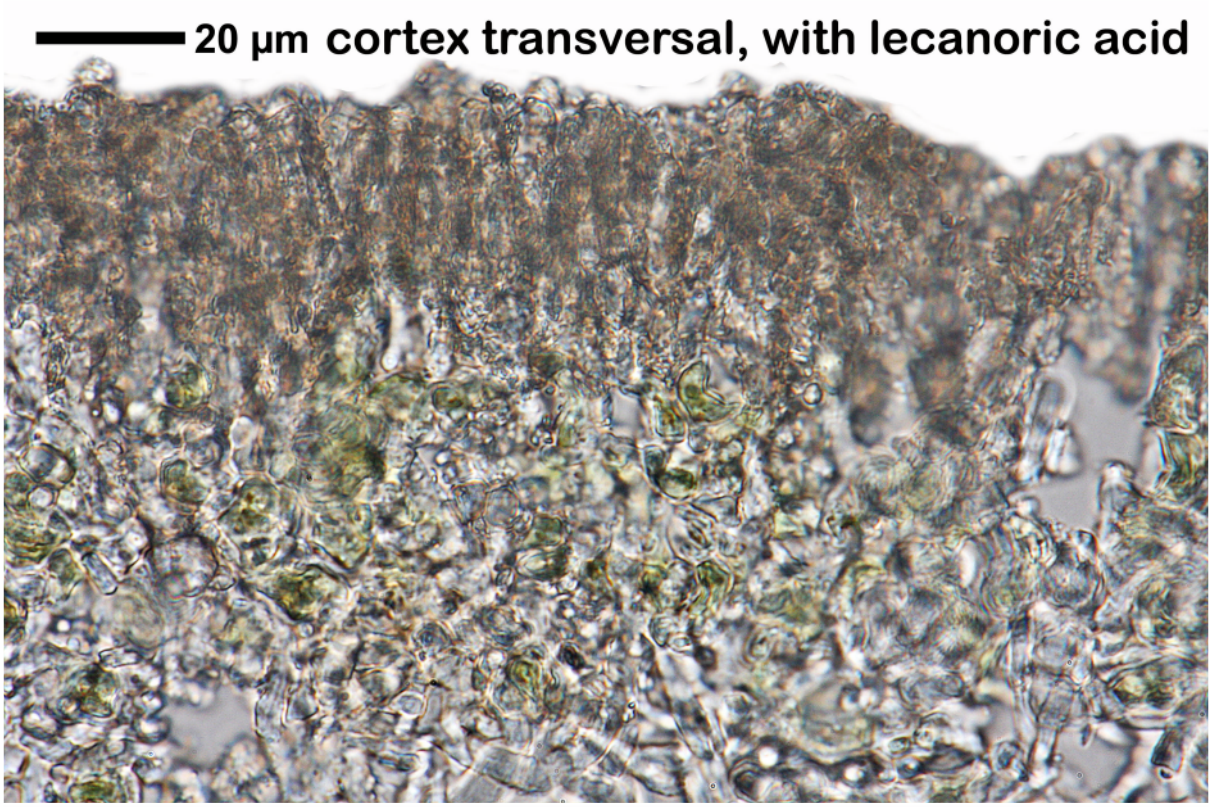
Roccella montagnei Bél. (1834)

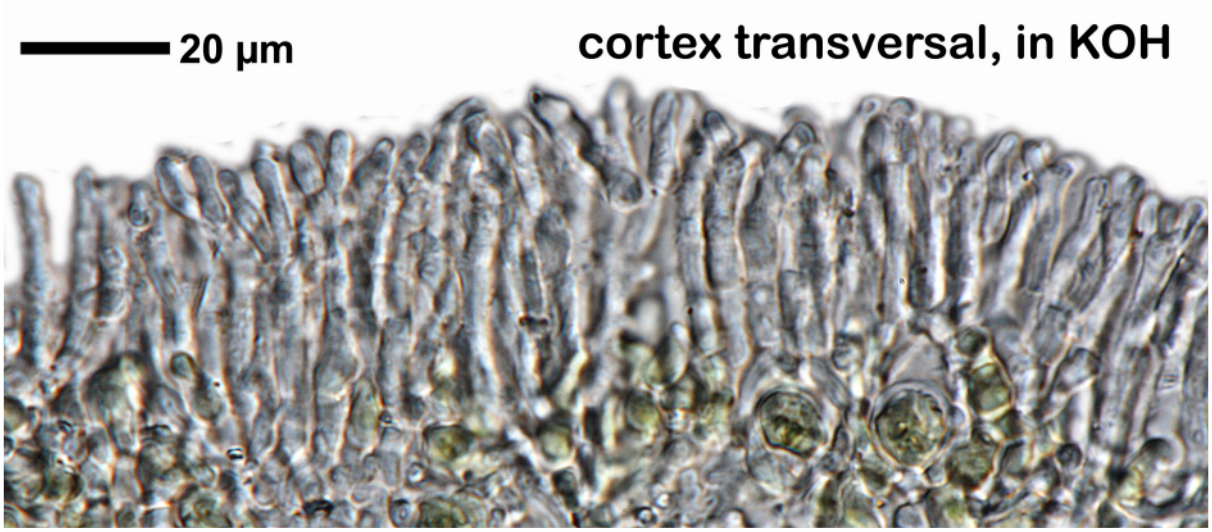
South Africa, Cape Good Hope, 34°21'S, 18°28' E, on trees in fijnbos. Leg. C.M. van Herk 29. Sept. 1997, Det. A. Aptroot 1997. [ABLsnSAfrica]

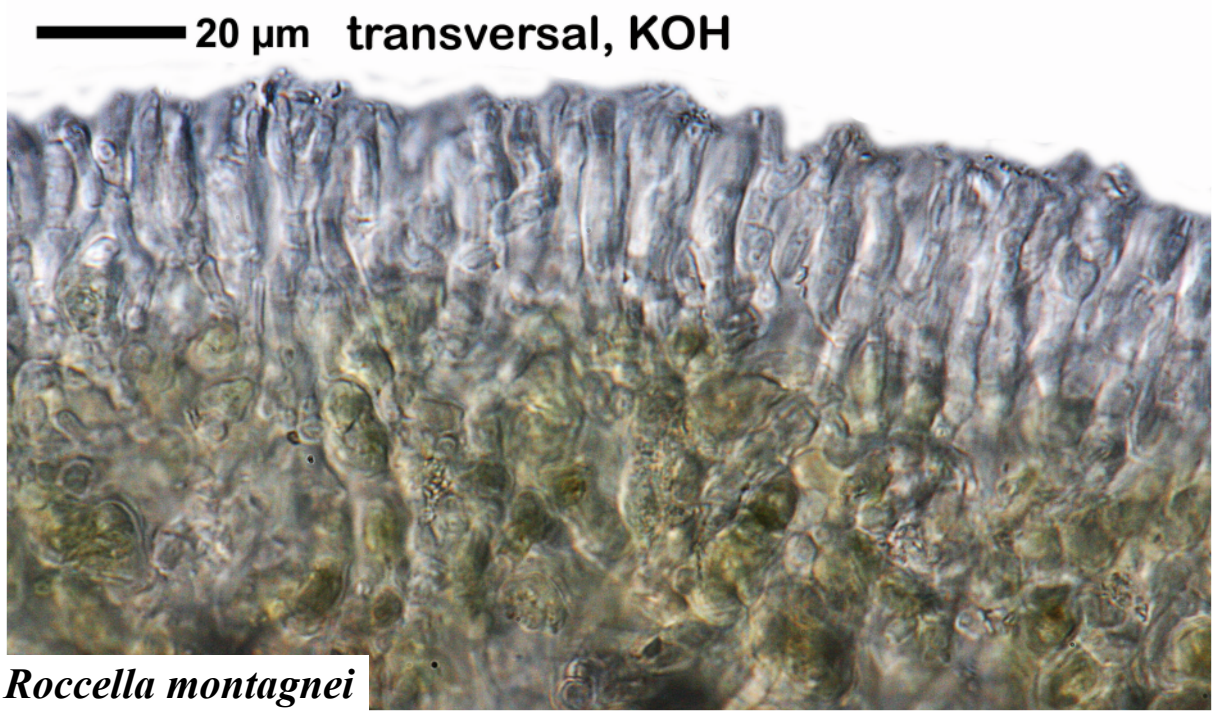




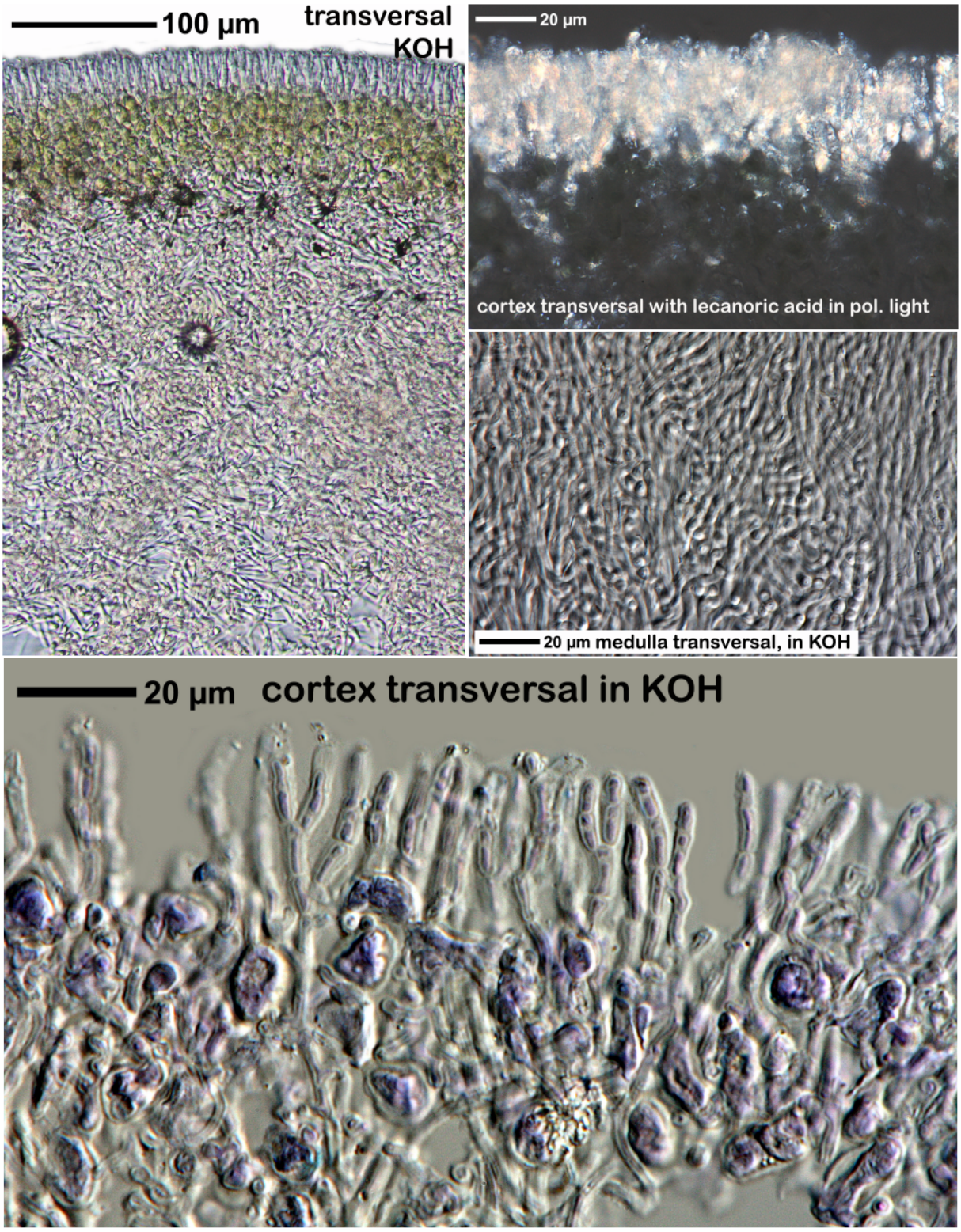
Roccella montagnei



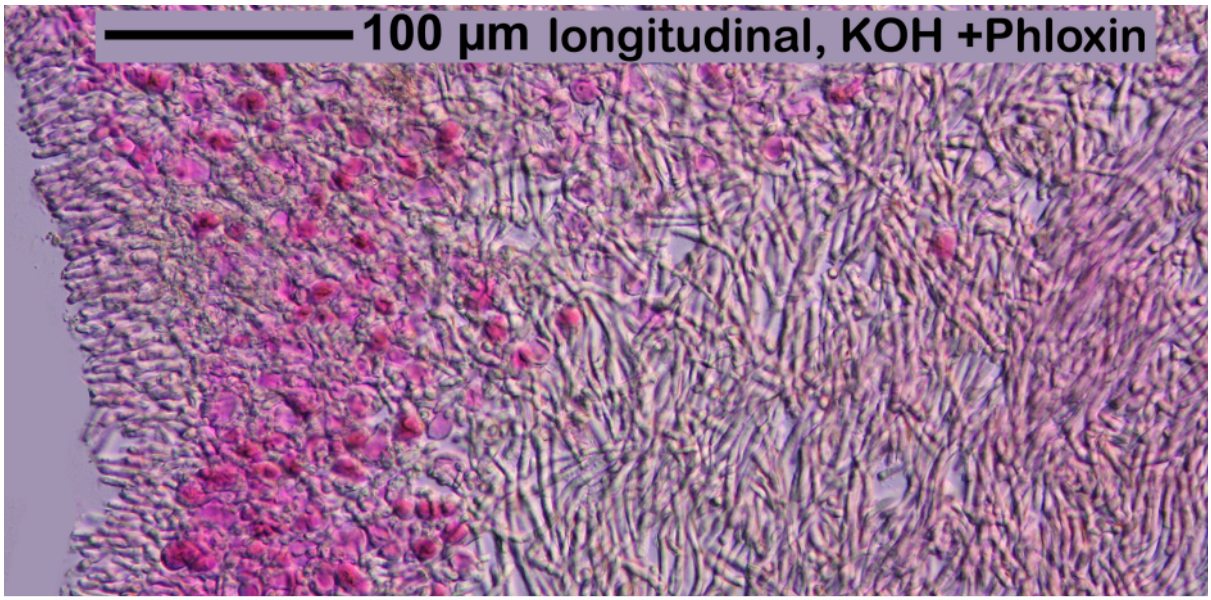


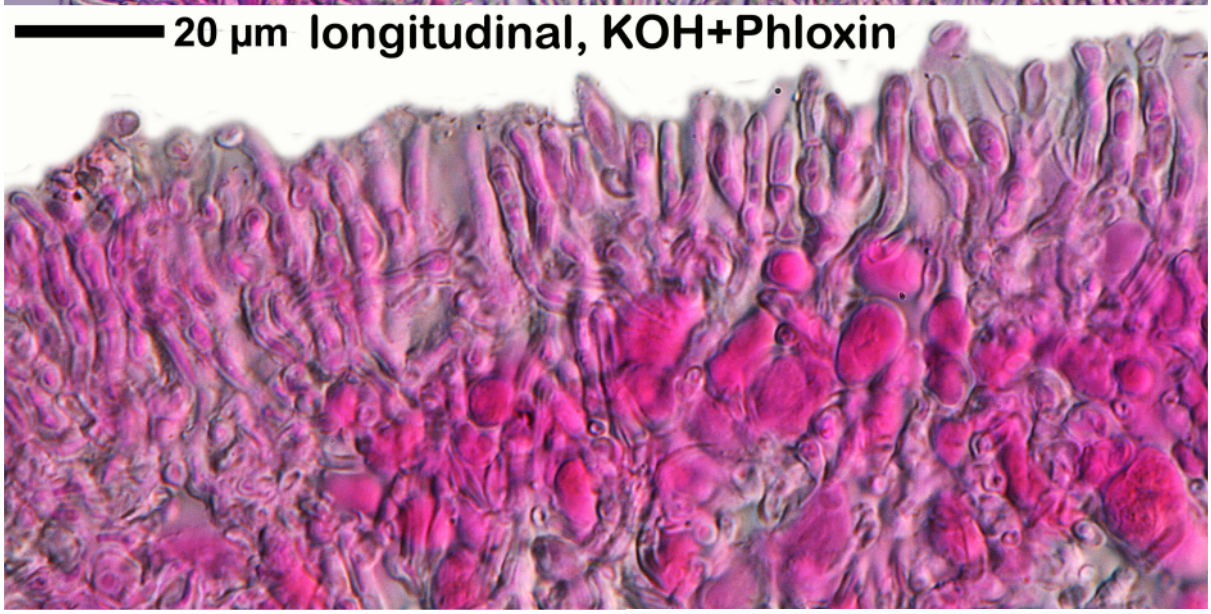


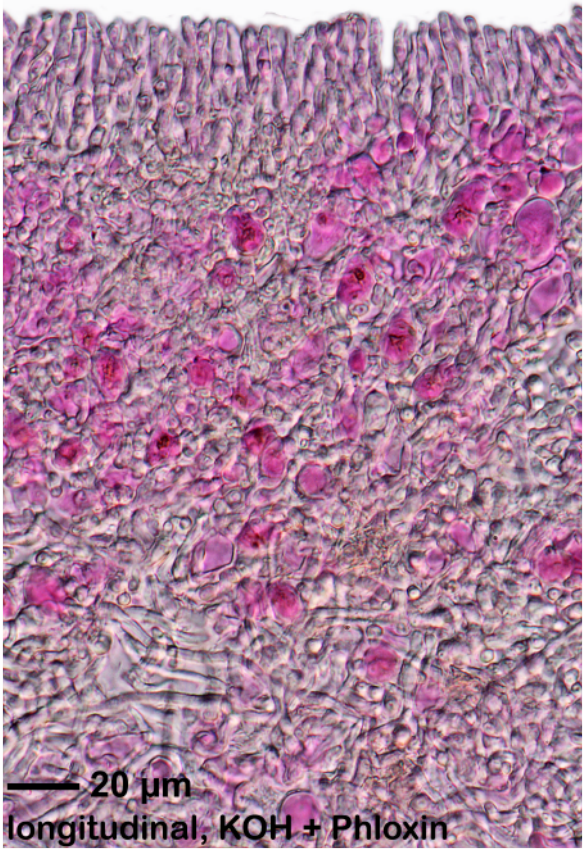
Roccella montagnei



Roccella montagnei







Roccella montagnei

Roccella nigerrima (Darb.) Follmann (1998)
Roccella botrytis B. Werner (2000)
Roccella floreana B. Werner (2000)
Roccella floribrassica B. Werner (2000)
Roccella floteana Follmann (1994)
Roccella incurvata B. Werner (2000)
Roccella kappeniana Follmann & B. Werner (2000)
Roccella stipitata B. Werner & Follmann (2000)
Roccella translucida Follmann & B. Werner (2001)

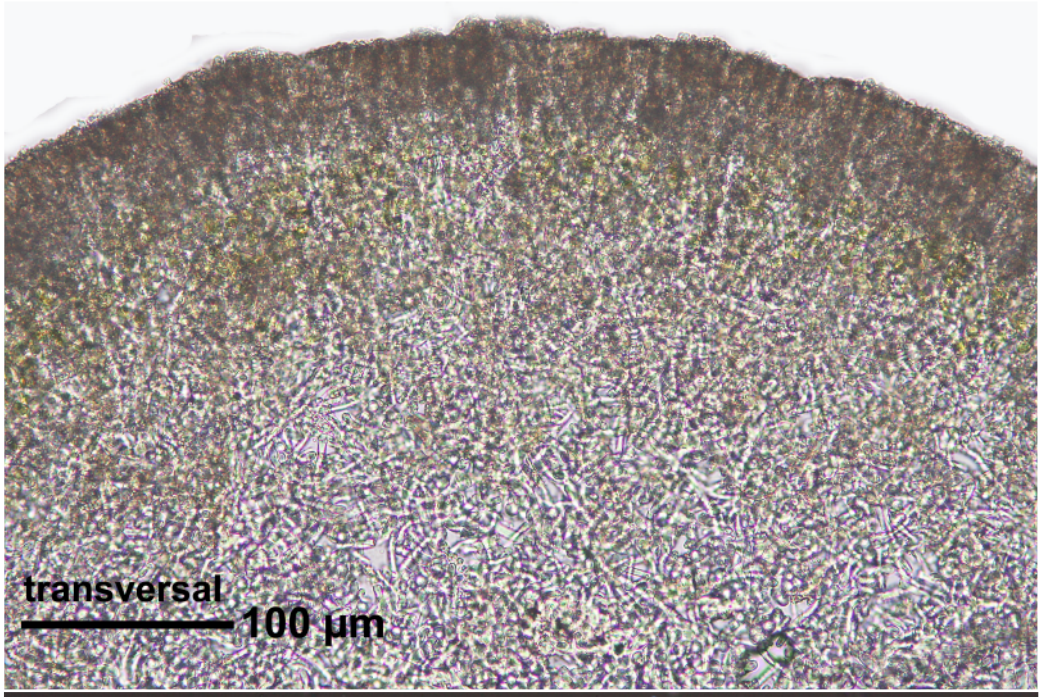
Thallus saxicolous, grey, sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex anticlinal intermediate type. Apothecia unknown. Cortex C –, K –, Pd – or + orange, subcortex C –, medulla C –, Pd ± red, IKI+ violet, soralia C –, major substances galapagin, roccellin, ± protocetraric. – Galapagos.

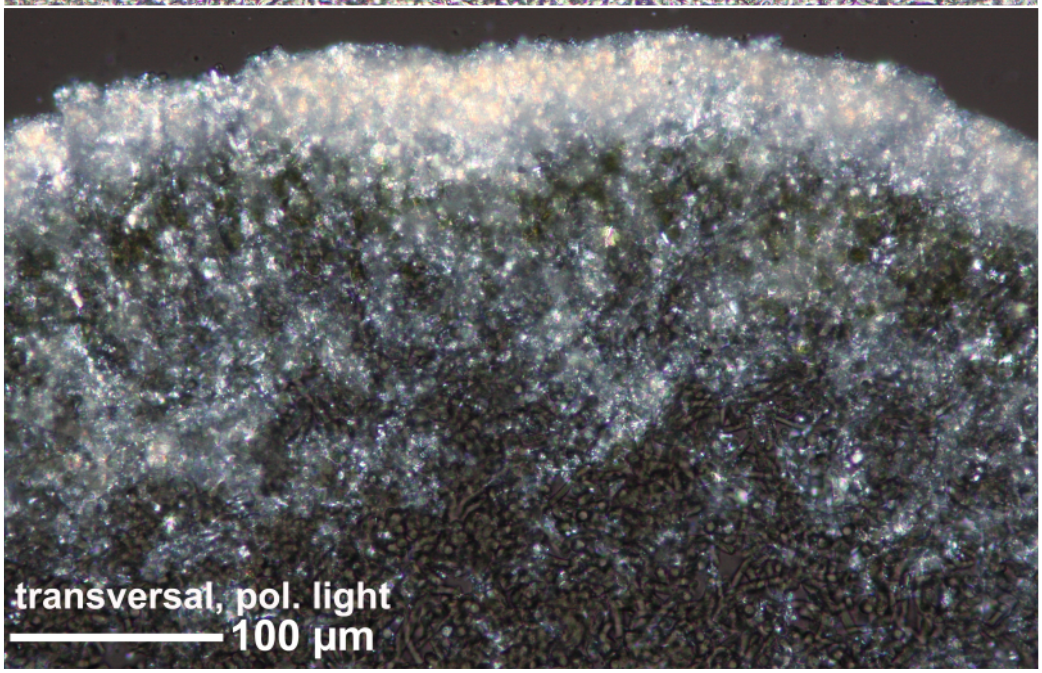
Galapagos Islands, San Cristobal, Las Tigueretas, on lava, 00°53’33” S, 89°36’40” W, 5-25 m. Leg. A.Aptroot 2. June 2005. [ABL63444]

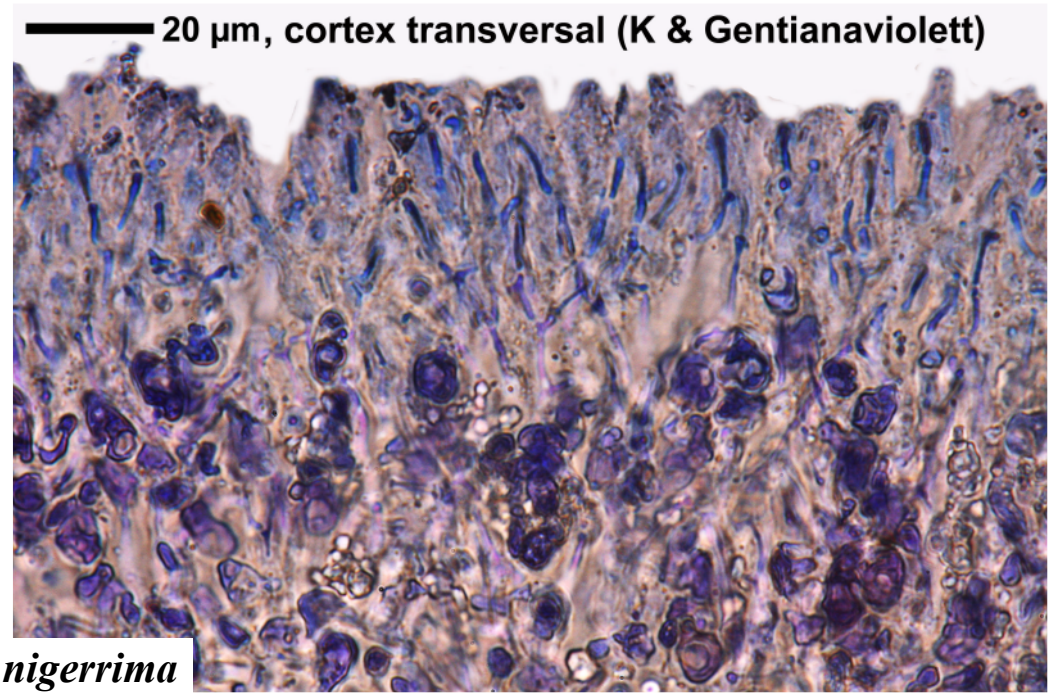




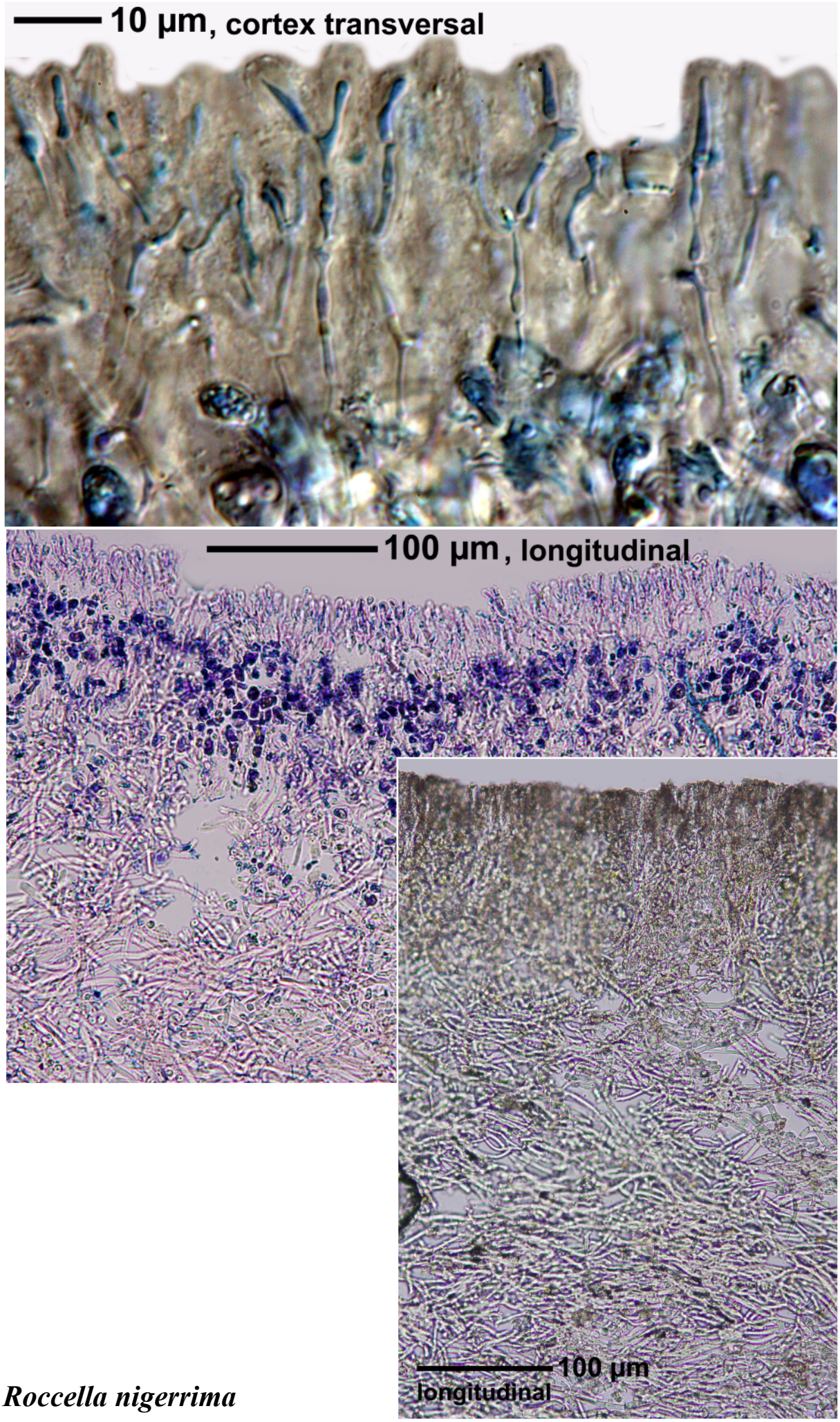
Roccella nigerrima



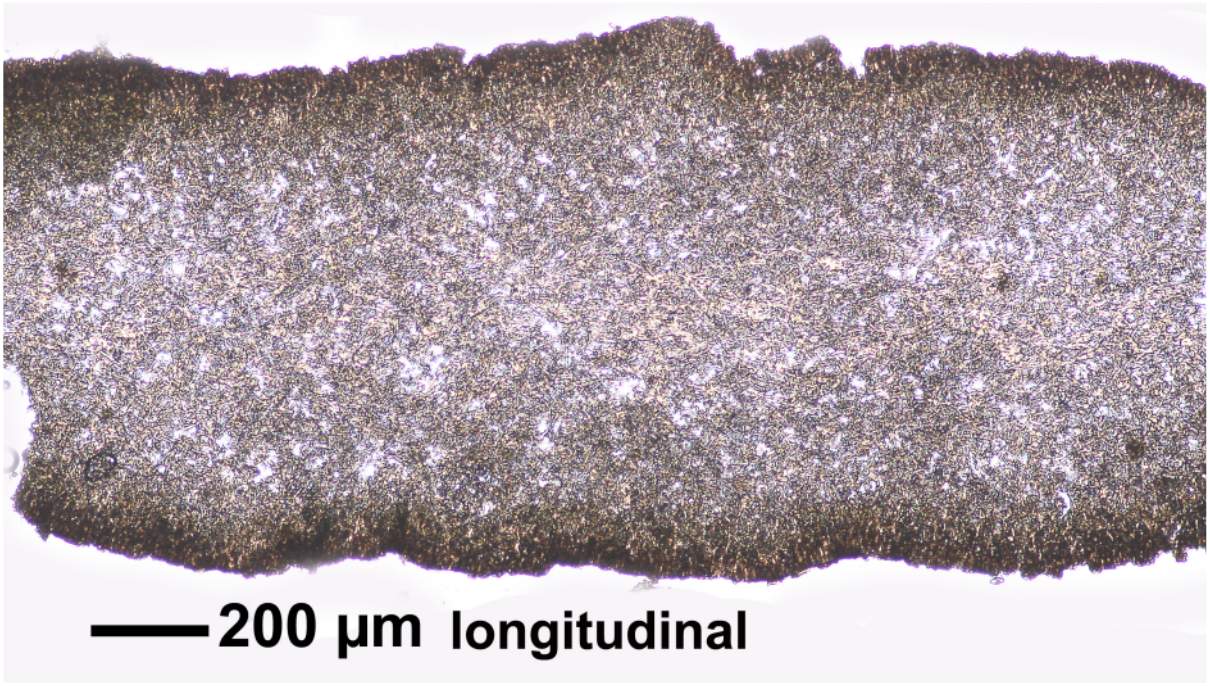


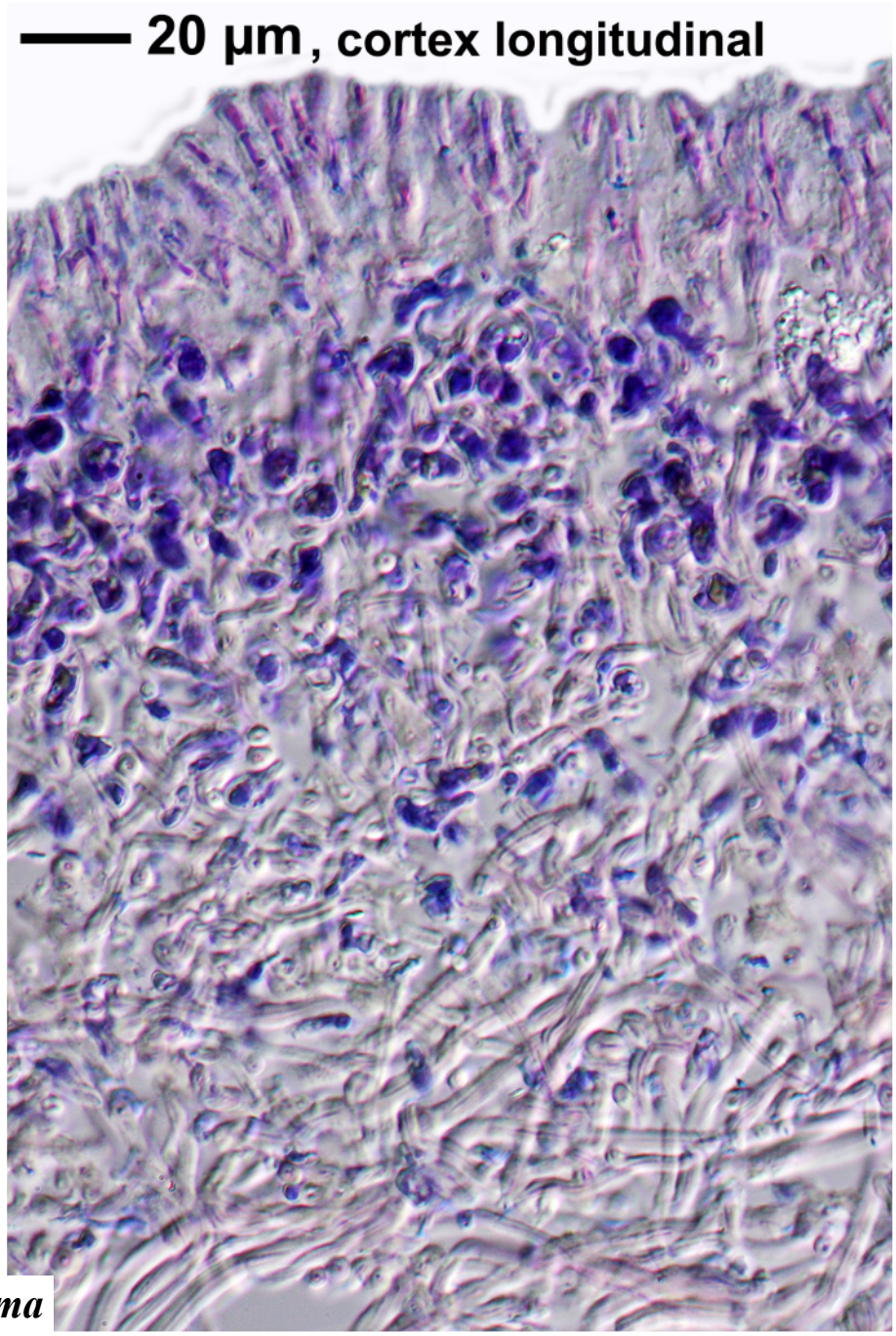


Roccella nigerrima



Roccella nigerrima



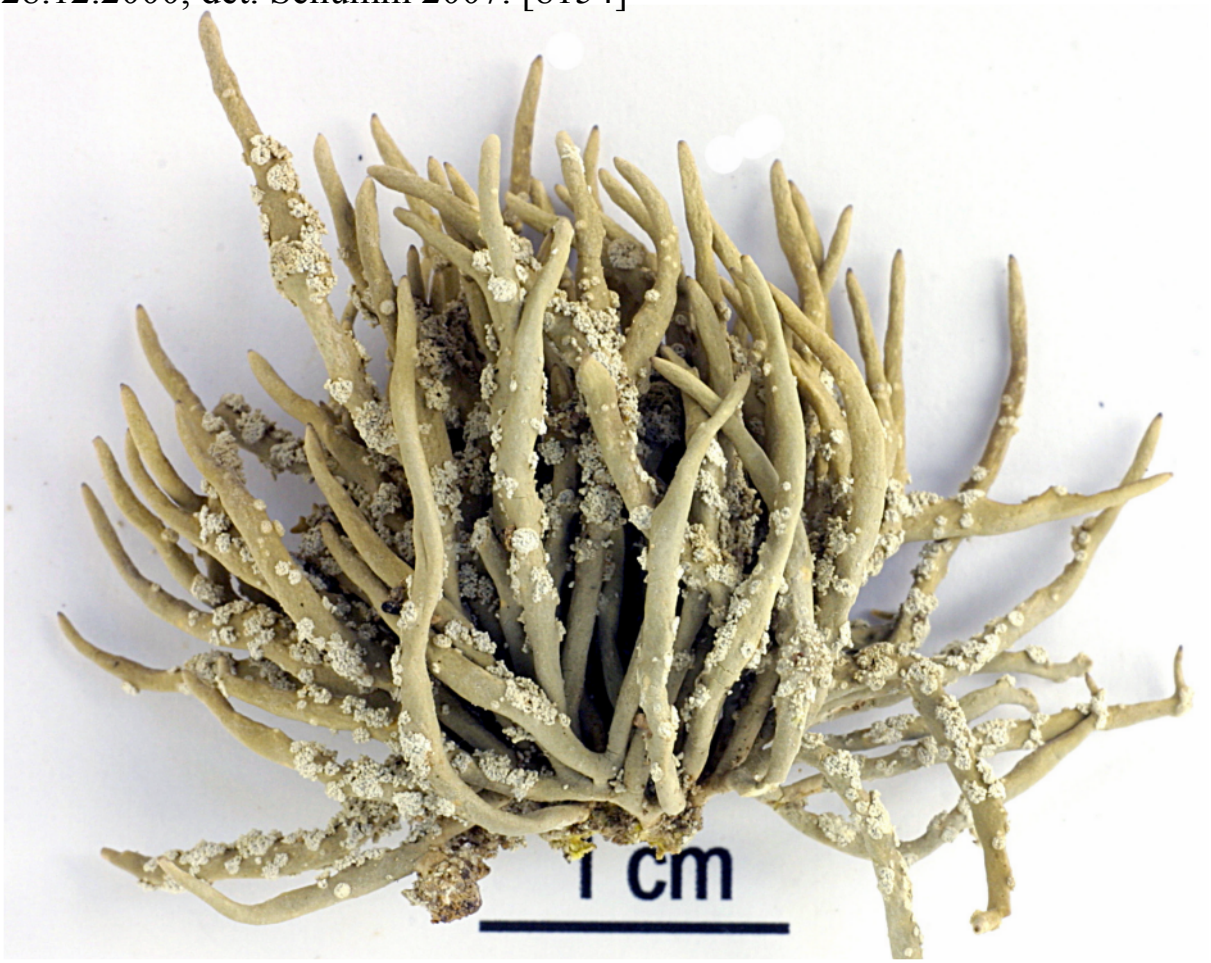


Roccella nigerrima

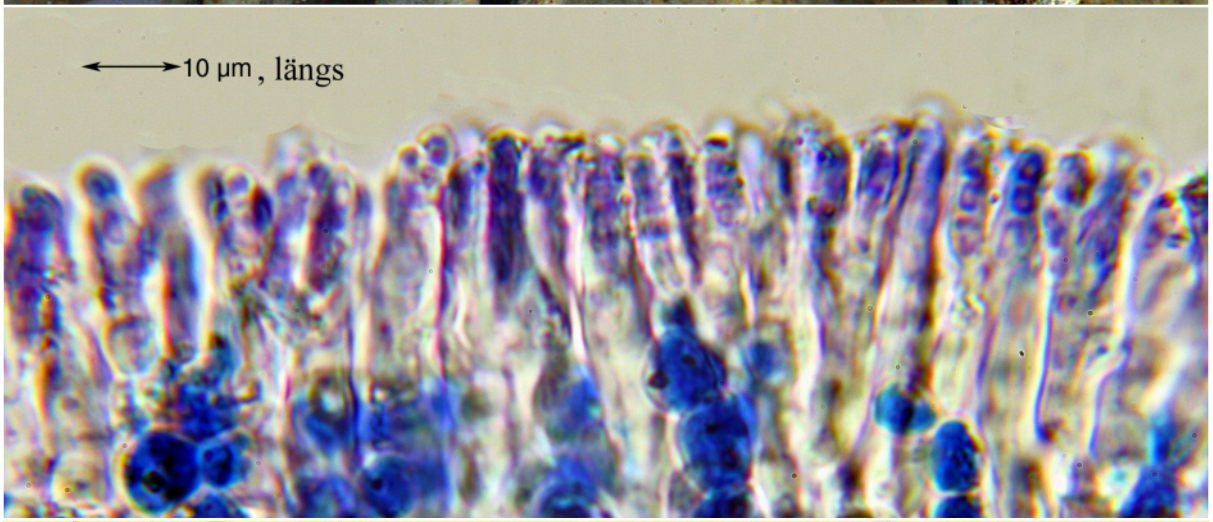
Roccella phycopsis Ach. (1804)
Roccella dillenii Bory (1828)
Roccella fuciformis var. *phycopsis* Sol. ex Darb. (1898)
Roccella fucoides (Neck.) Vain. (1901)
Roccella fucoides f. *cecilia-metella* (Beltr.) Zahlbr. (1924)
Roccella fucoides f. *pygmaea* (Durieu & Mont.) Zahlbr. (1924)
Roccella fucoides f. *tenuior* (Cromb.) Zahlbr. (1924)
Roccella fucoides var. *corticola* Cengia-Sambo (1927)
Roccella fucoides var. *farinosa* Del. ex Cengia-Sambo (1927)
Roccella phycopsis f. *pygmaea* (Durieu & Mont.) Nyl.
Roccella phycopsis f. *tenuior* Cromb. (1904)
Roccella phycopsis var. *cecilia-metella* Beltr. (1879)
Roccella phycopsis var. *farinosa* DC. ex Darb. (1898)
Roccella pusilla Mont. & Durieu (1846)
Roccella pygmaea Durieu & Mont. (1849)
Roccella tinctoria var. *phycopsis* (Ach.) Mudd (1861)

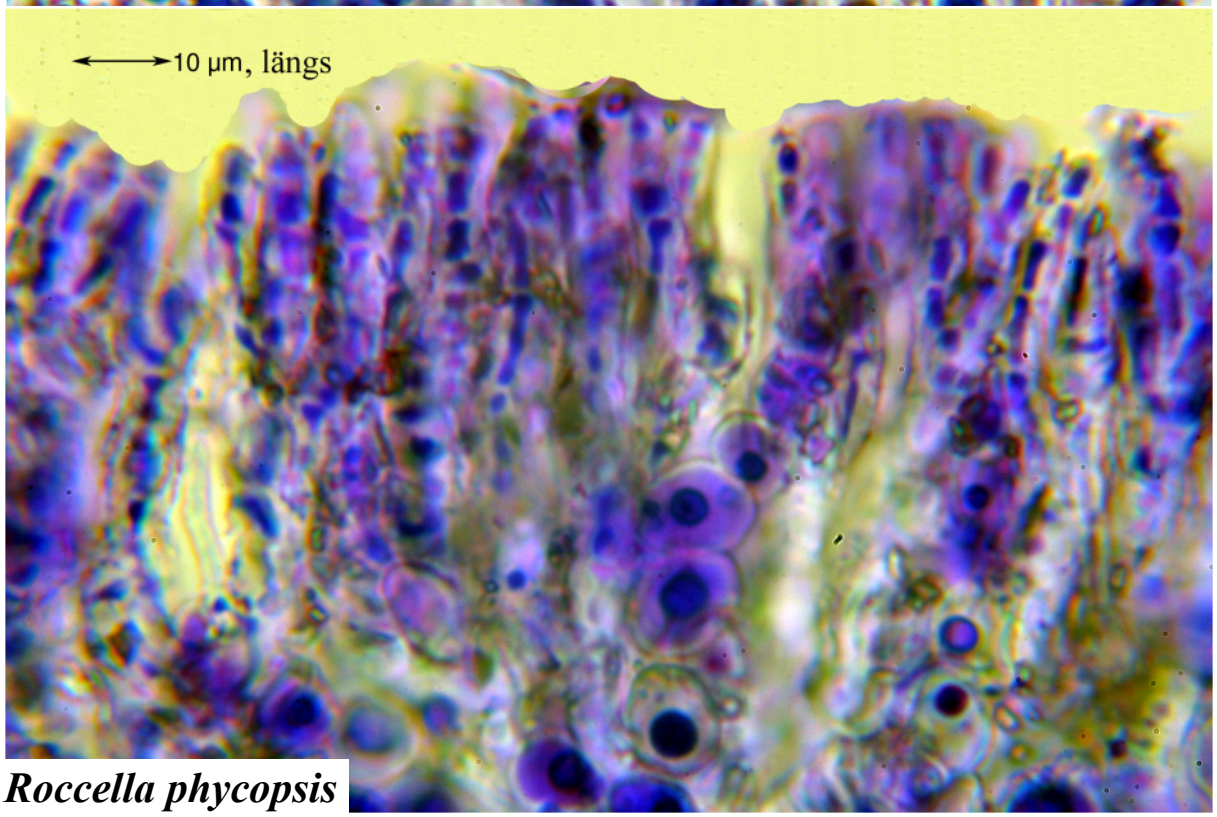
Thallus saxicolous, grey, sorediate, texture firm, cylindrical, surface smooth, holdfast internally yellow. Cortex palisade plectenchymatous. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 24–31 × 5–7 µm. Cortex C + red, K –, Pd –, subcortex C + red, Pd –, medulla C –, IKI + blue, soralia C –, major substances erythrin, lecanoric, ± roccellic. – Macaronesia, Mediterranean Europe, Turkey, N. Africa.

Spanien, Kanarische Inseln, Gran Canaria, zwischen Agaete und San Nicolás de Tolentino, nebelreicher west-exponierter Felsen mit viel Roccella und Ramalina; N 28°01.684', W 15°46.159', 526 m. Leg. Schumm 28.12.2000, det. Schumm 2007. [8154]









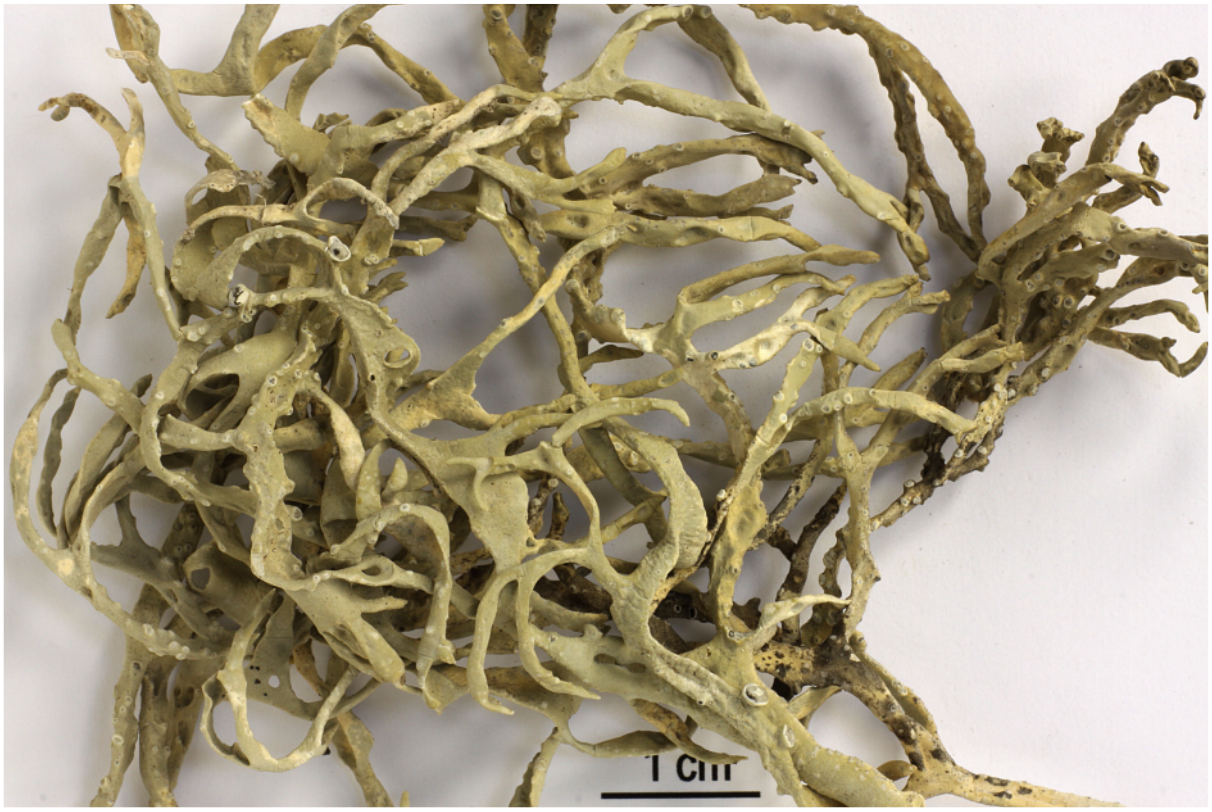
Roccella phycopsis

Roccella sanctae-helenae Aptroot & Schumm sp. nov. (2011)

Thallus fruticosus, erectus, saxicolus, cinereus vel fuscus. Rami tereti vel applanati, perforati. Cortex palisadoplectenchymaticus. Soredia nulla. Apothecia numerosa. Ascosporis hyalinis, 3-septatis, 24–26 × 4–5 µm. Cortex C+ rubra. Acidis erythrinis, lecanoricis et roccellicis continens.

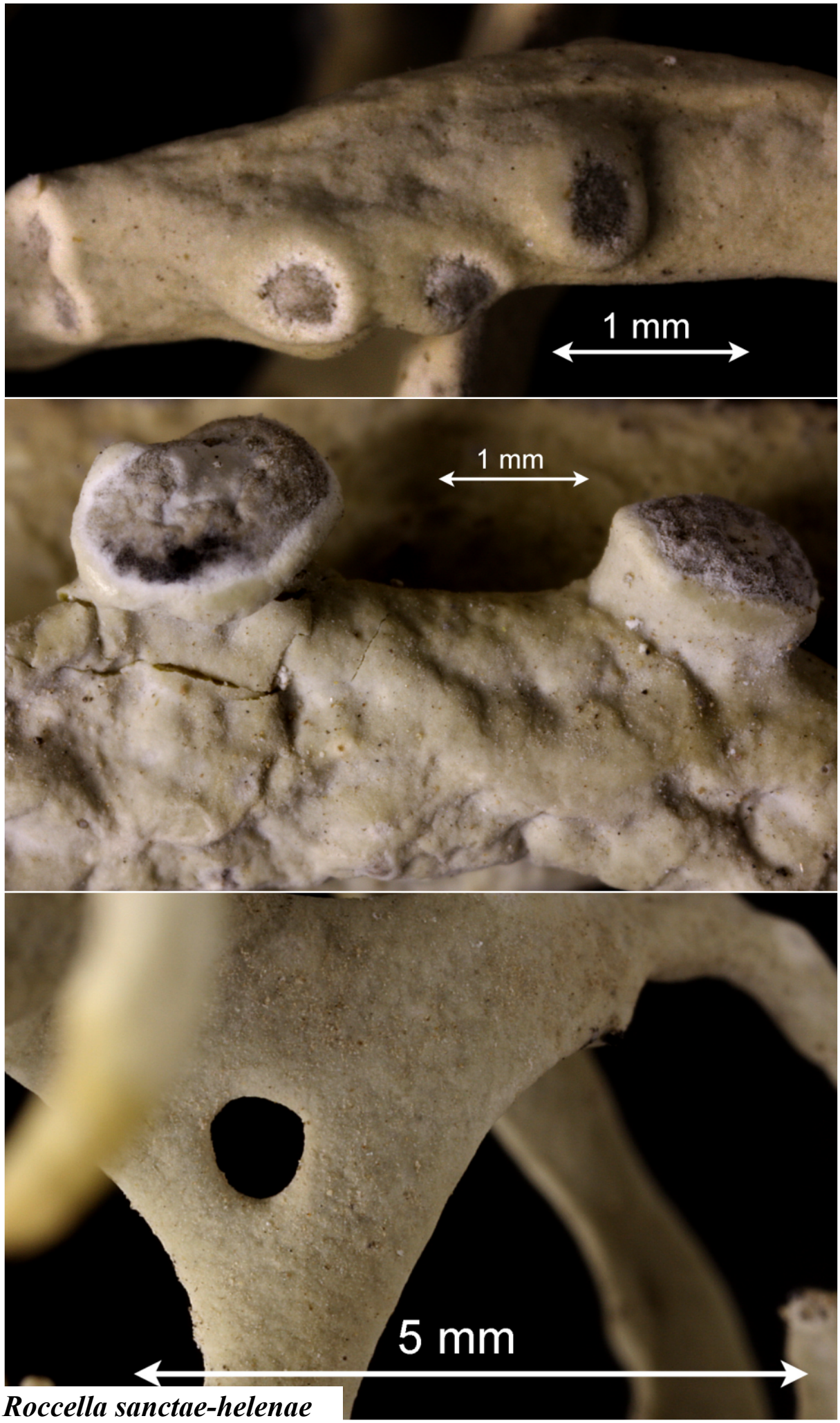
Holotype: St Helena (South Atlantic Is.), Prosperous Bay Plain, N. slope of Dry Gut on track of runway at proposed fill, vertical basalt cliff, 15º57.641'S, 5º39.080'W, alt. 280 m., leg. A. Aptroot 17 Oct. 2006 (ABL-holotype; in B there is an additional specimen from South of St Gregory's battery, Aptroot 66363). Pictures here are from the holotype [ABL66251]

Thallus saxicolous, grey to brown, not sorediate, texture firm, cylindrical, at branching points often flattened and perforated surface smooth, holdfast internally white to brown. Cortex palisade plectenchymatous. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 24–26 × 4–5 µm. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, IKI + violet, major substances erythrin, lecanoric, roccellic. – St Helena. Note: The fertile *Roccella* species on St Helena is morphologically and phylogenetically well characterized within the *R. montagnei*-complex. As this strictly fertile species is unlikely to spread into other areas, it is evolutionally isolated. The species is not abundant on the island. Most specimens are long, thick and/or gnarled and seem quite old.

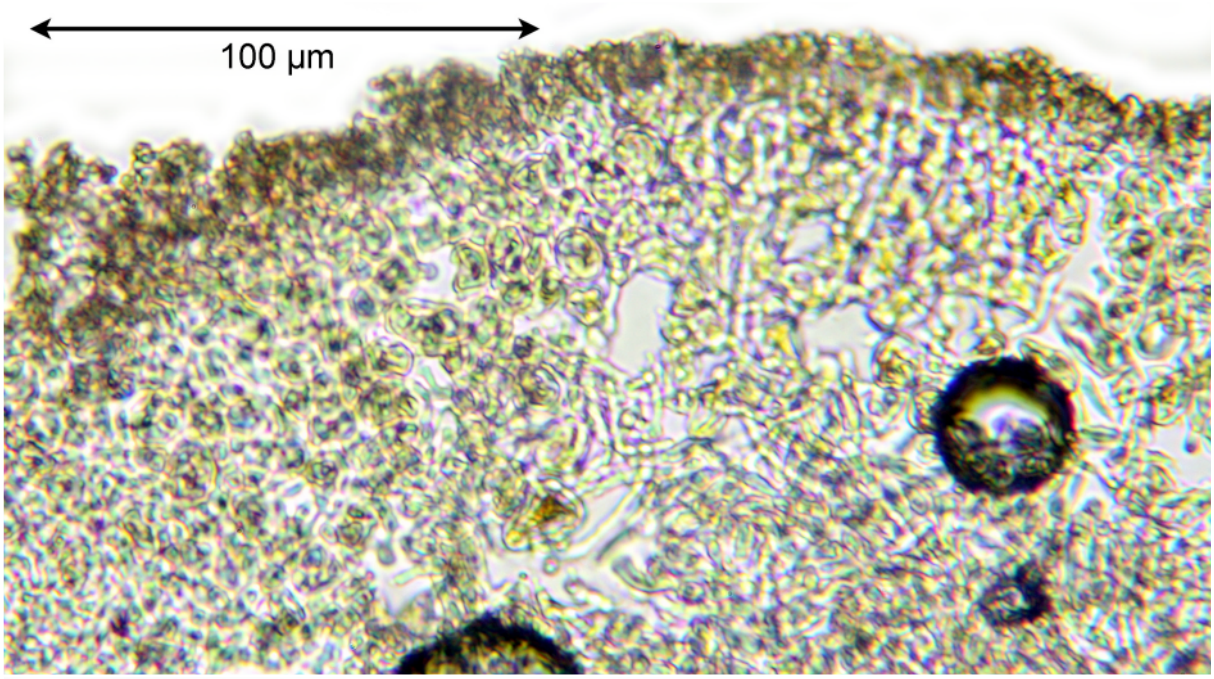




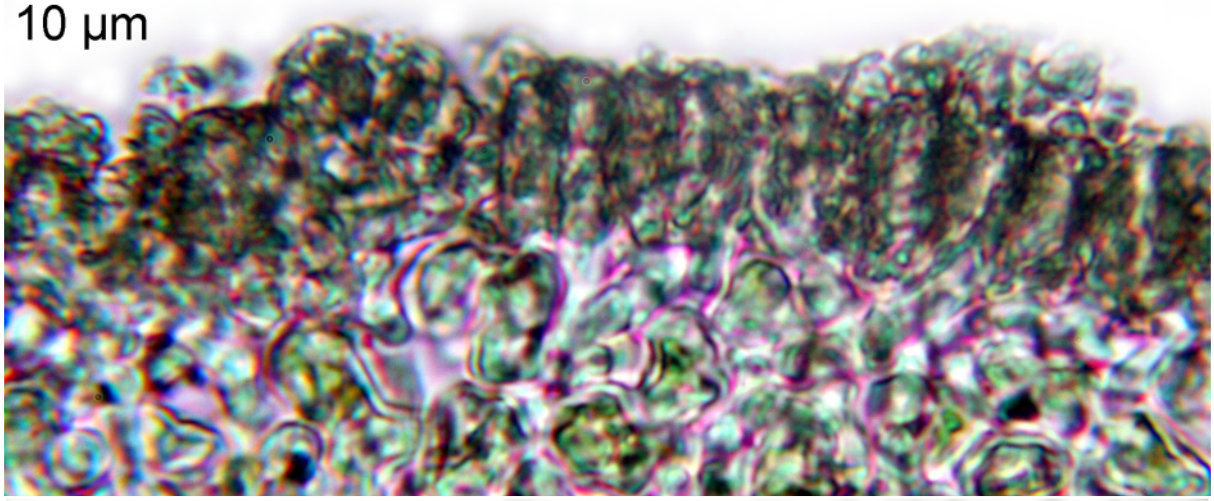
Roccella sanctae-helenae

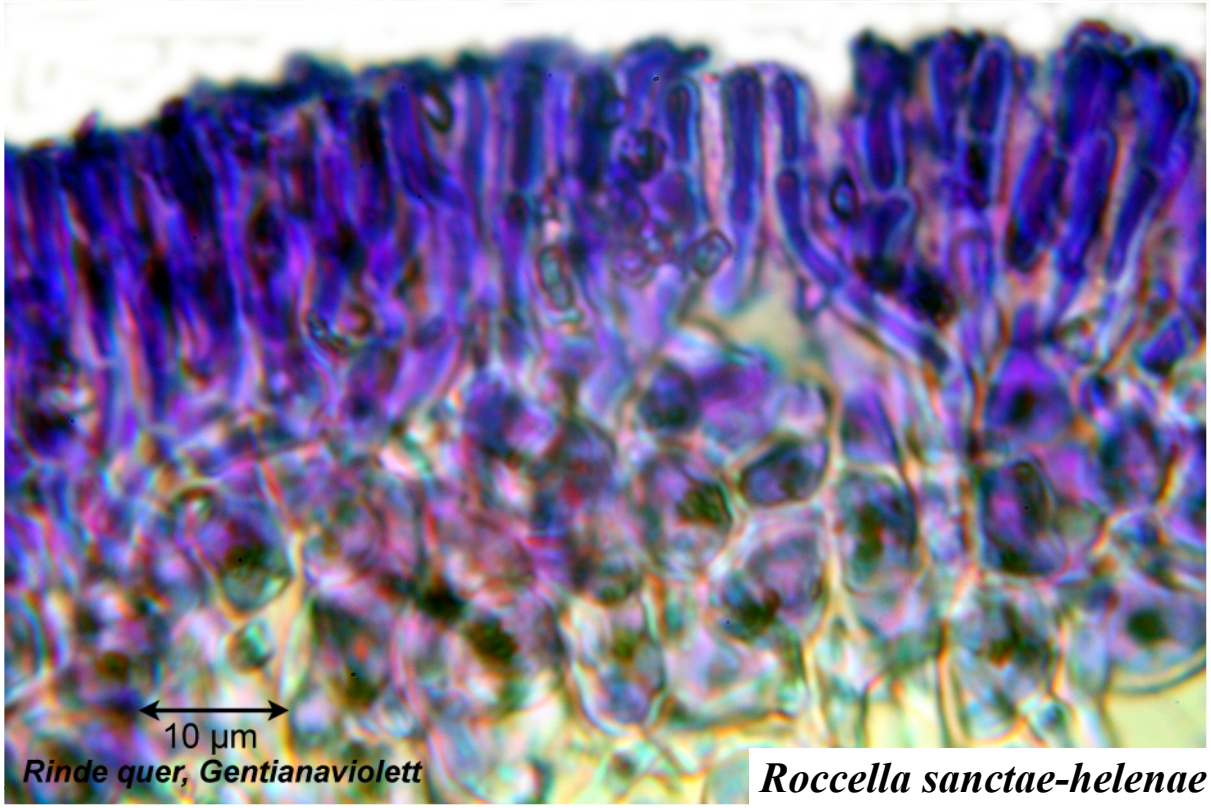


Roccella sanctae-helenae

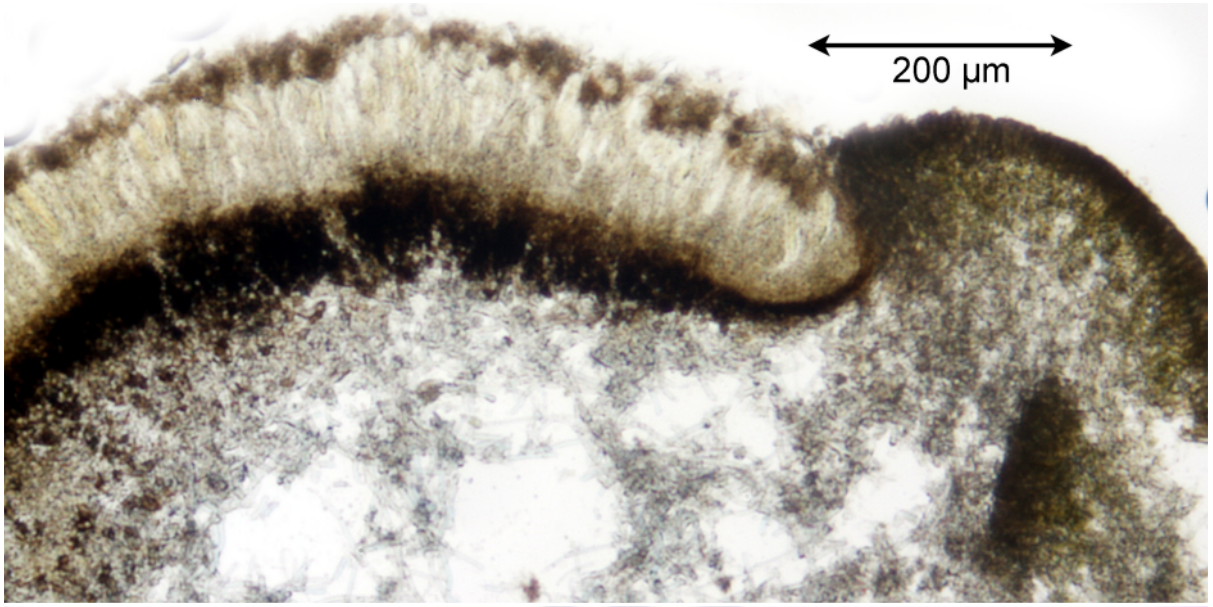


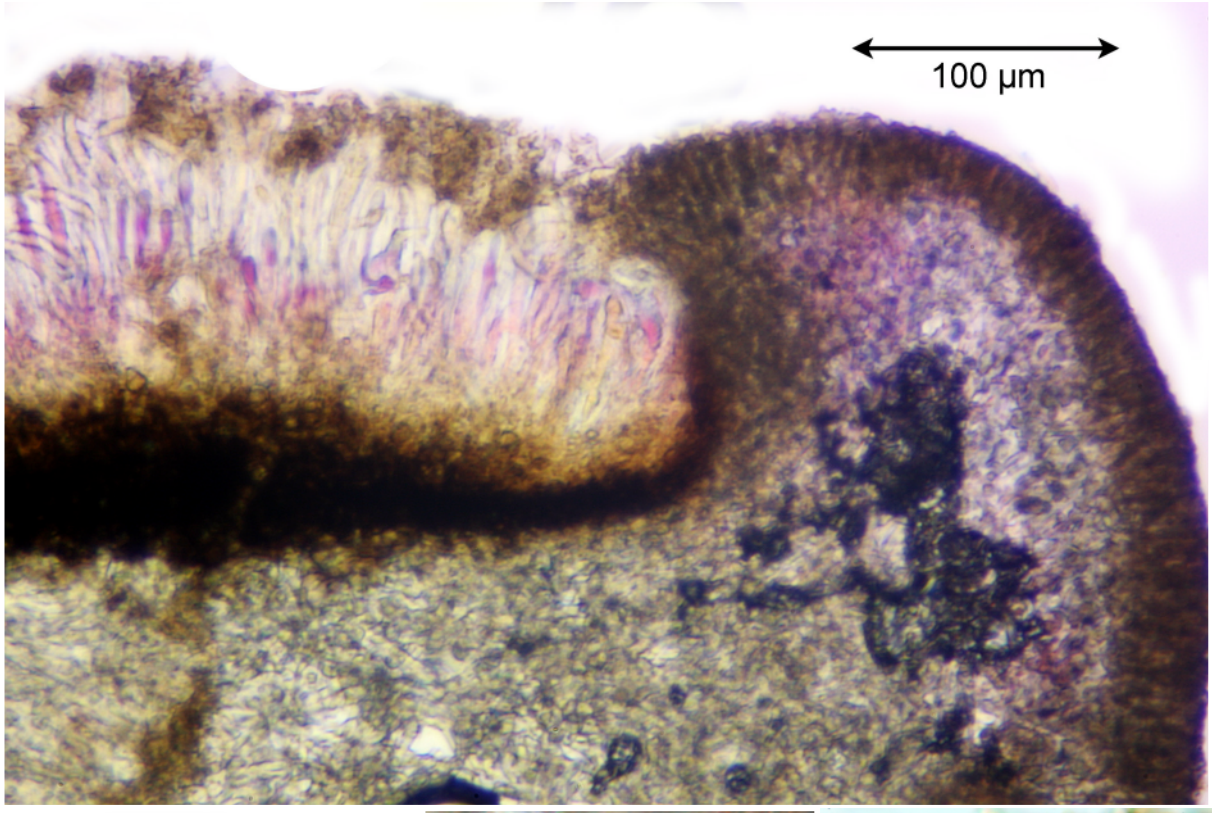
Rinde quer, Lecanorsäurekristalle

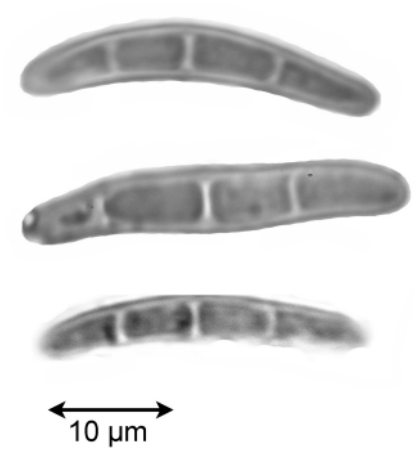


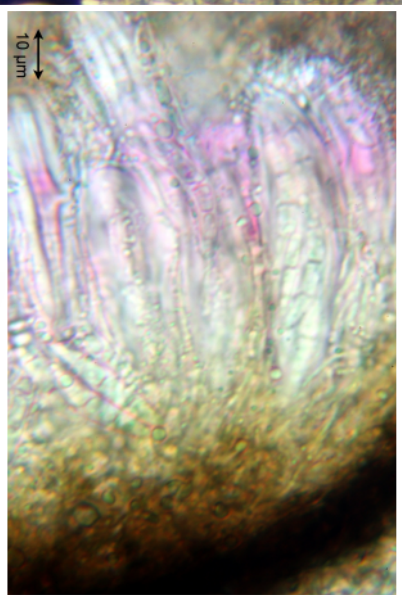


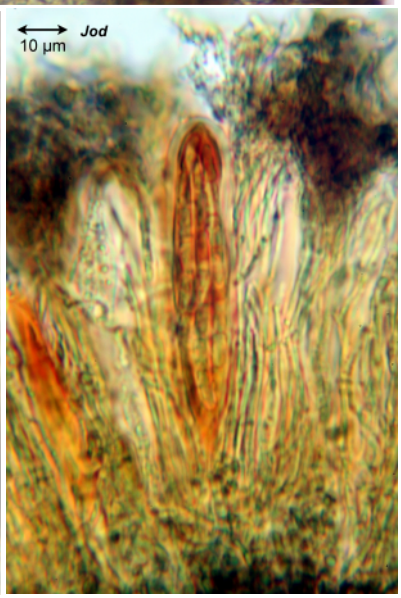
Roccella sanctae-helenae











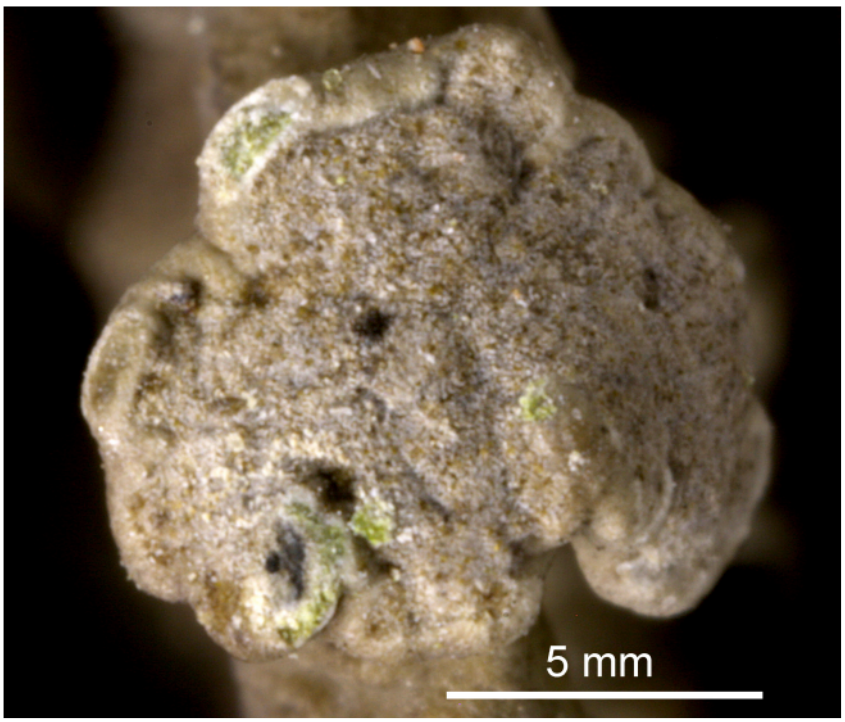
Roccella sanctae-helenae

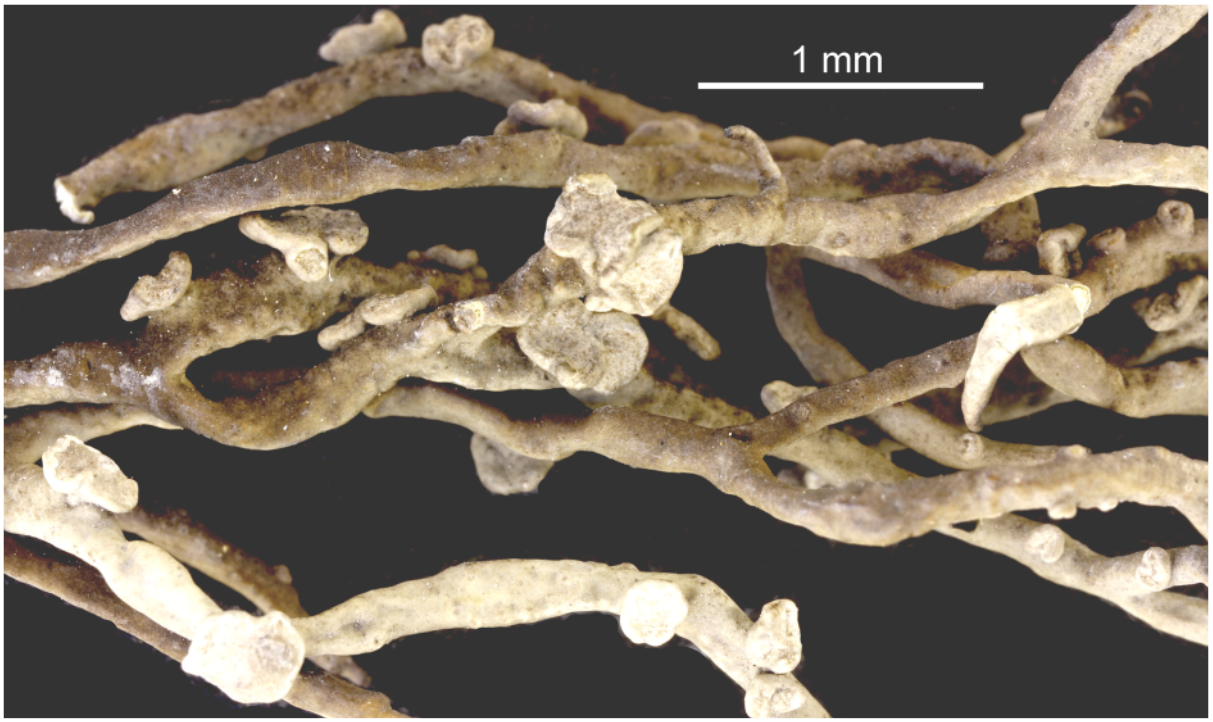
Roccella sinensis Nyl. (1860)

Thallus saxicolous, brown, not sorediate, texture firm, angular, surface pitted, holdfast internally white to brown. Cortex intermediate type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 20–24 × 5–6 µm. Cortex C + red, K + yellow, Pd –, subcortex C –, medulla C –, IKI+ violet, major substance erythrin. – China.

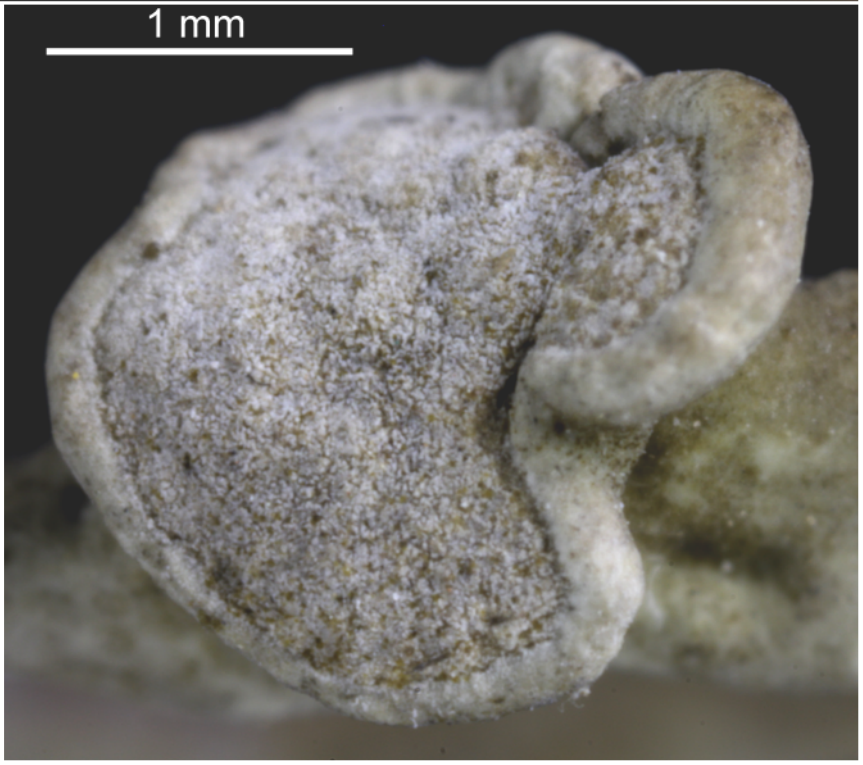
Hong Kong, New Territories, Shek Mai Tau, in coastal area on exposed granite, 1-20 m. Leg. A. Aptroot 06.1998, det. A. Aptroot. [ABL43475]



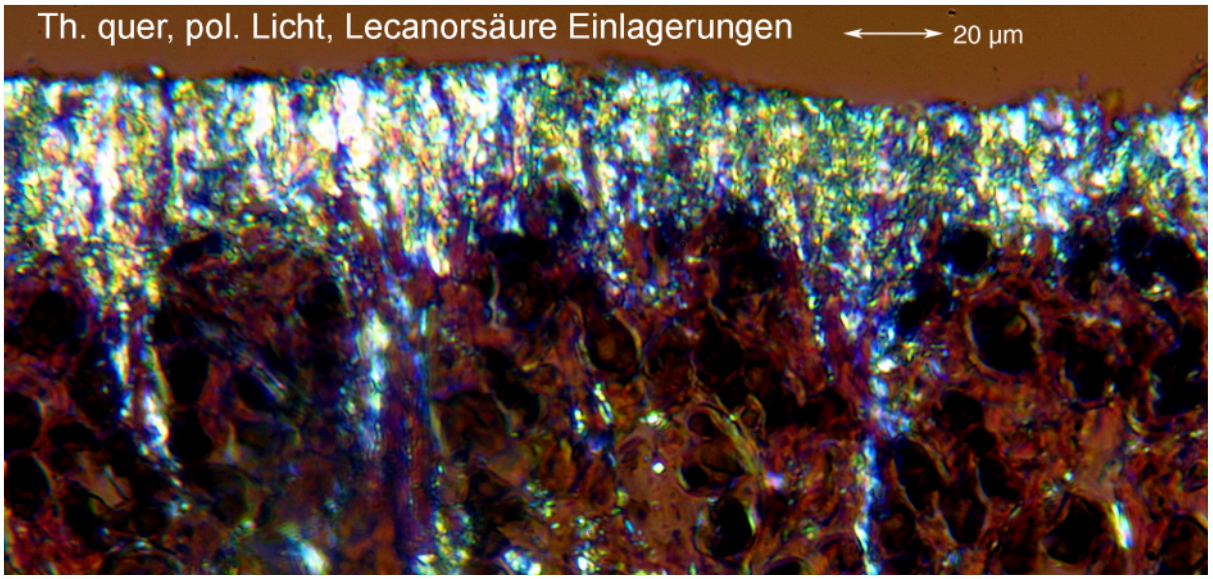


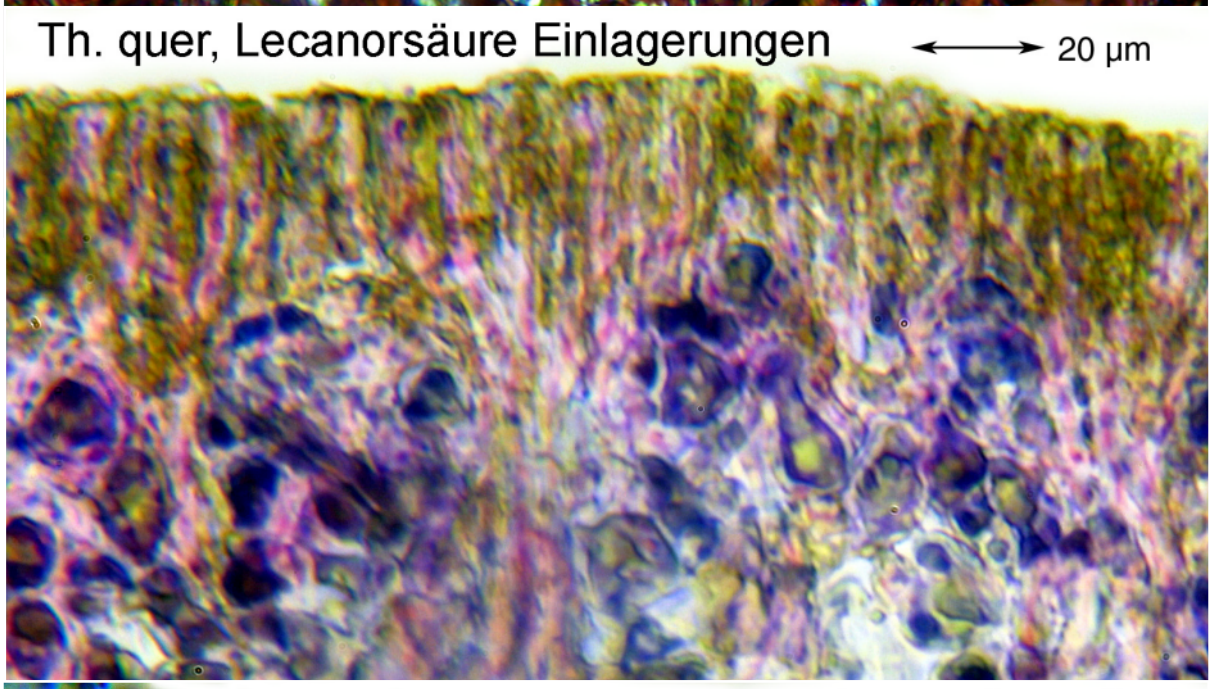


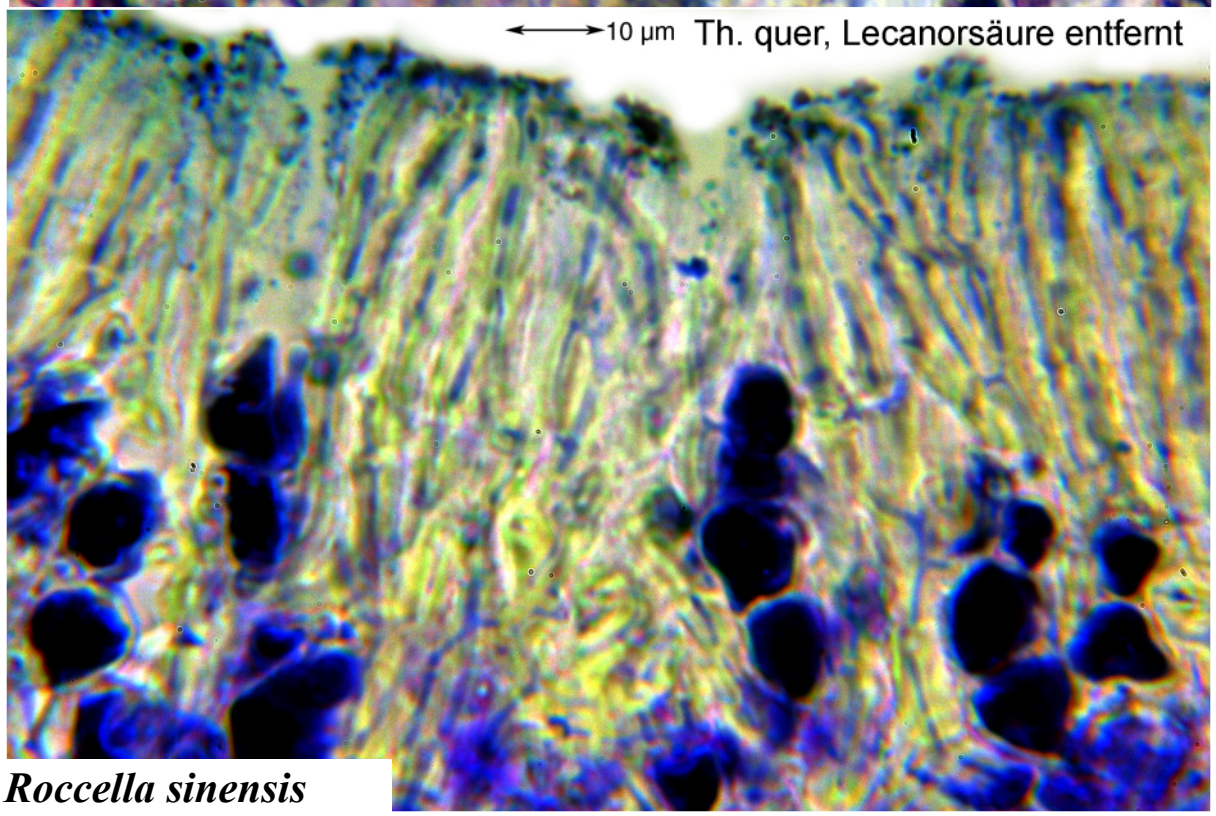




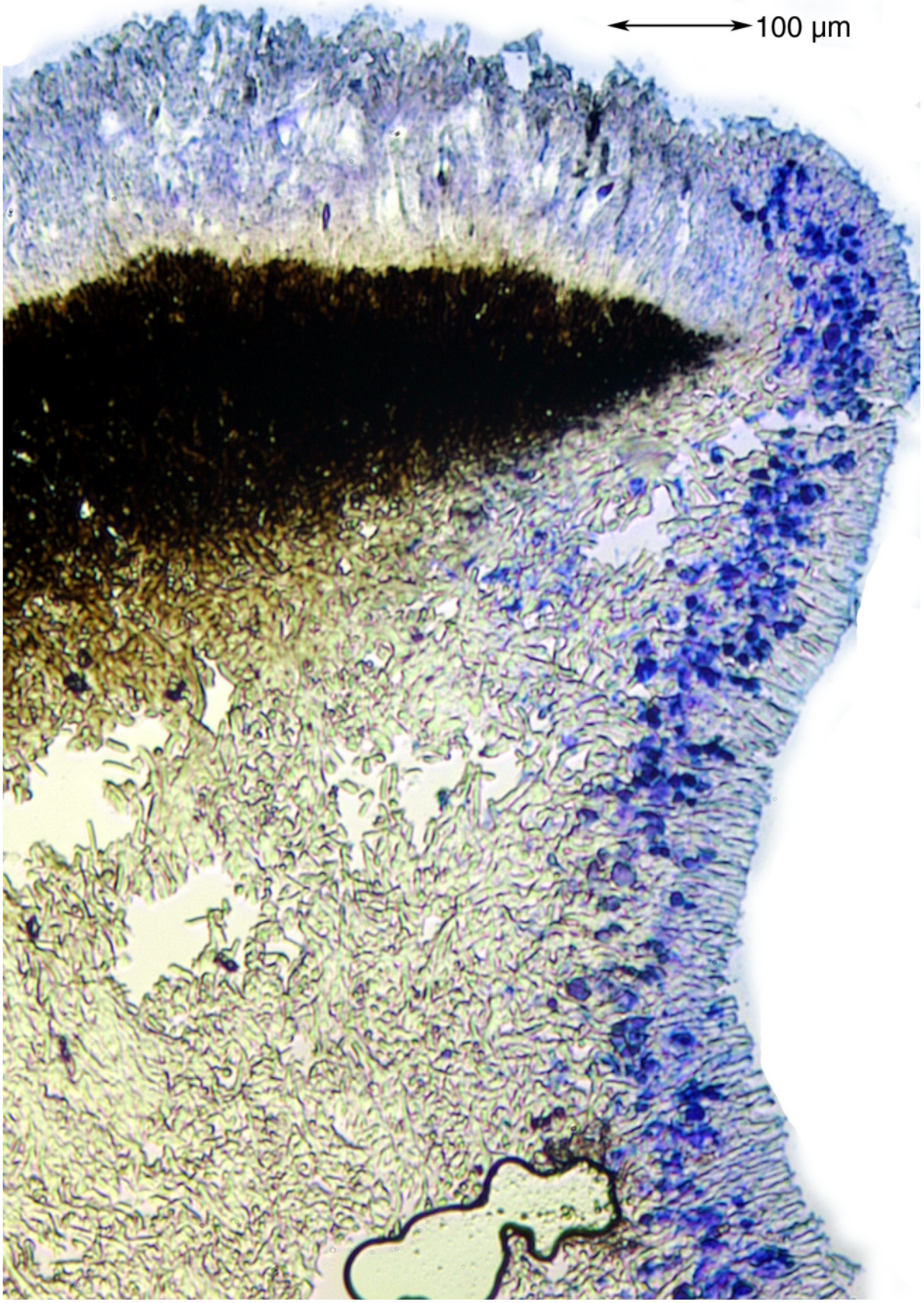
Roccella sinensis



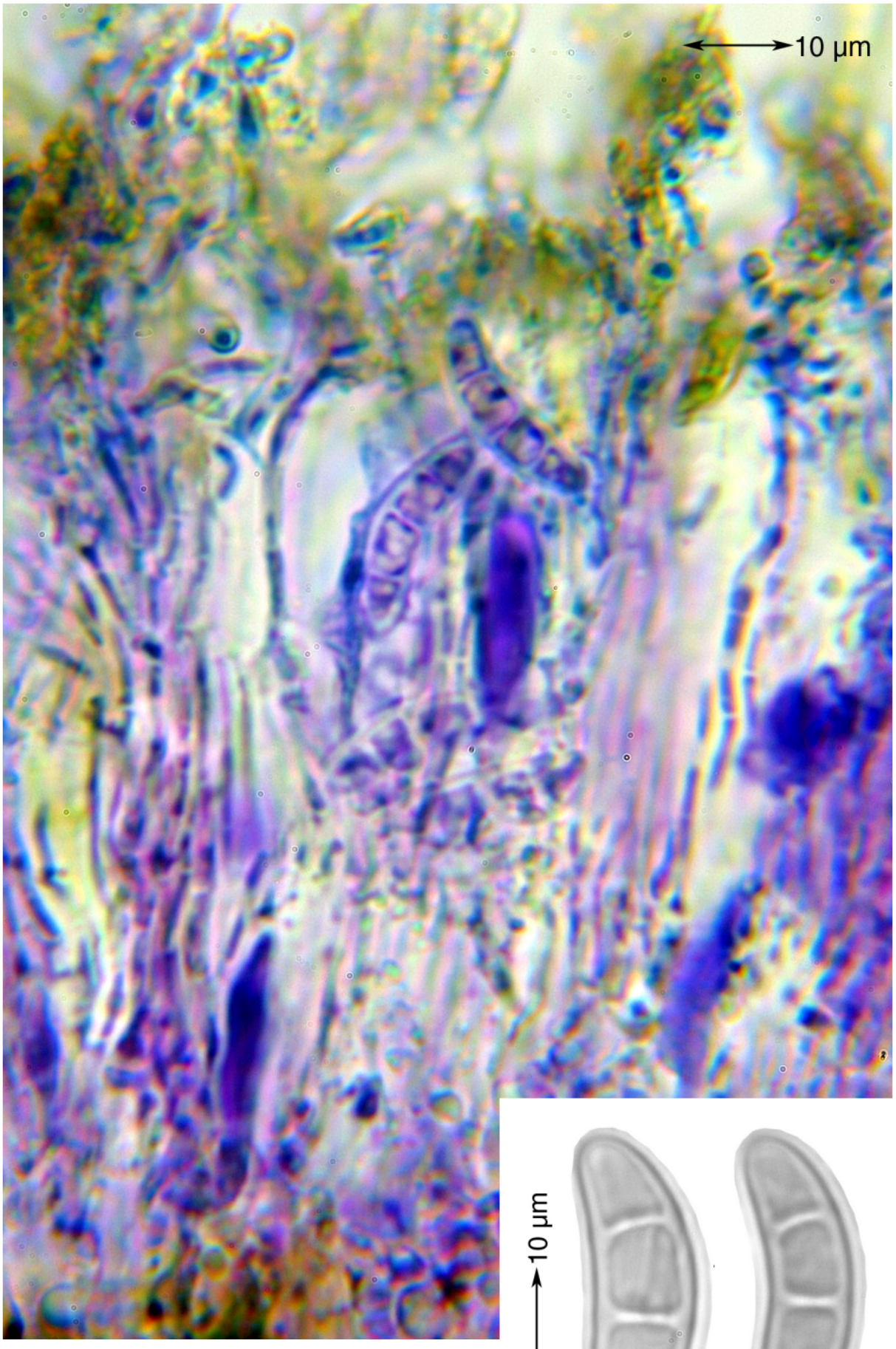




Roccella sinensis



Roccella sinensis



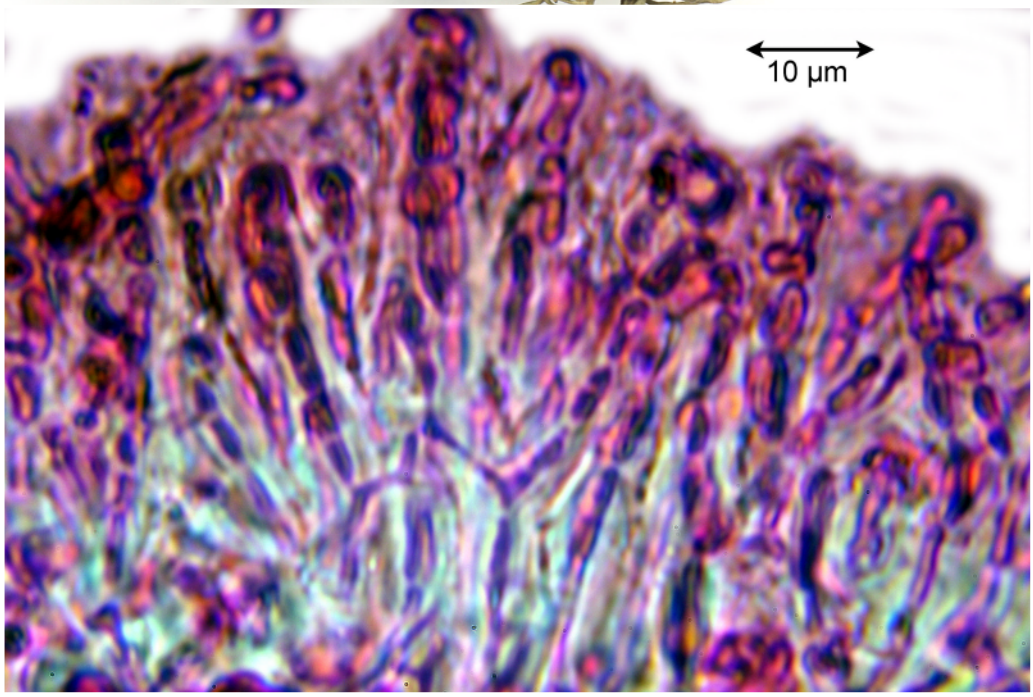
Roccella sinensis

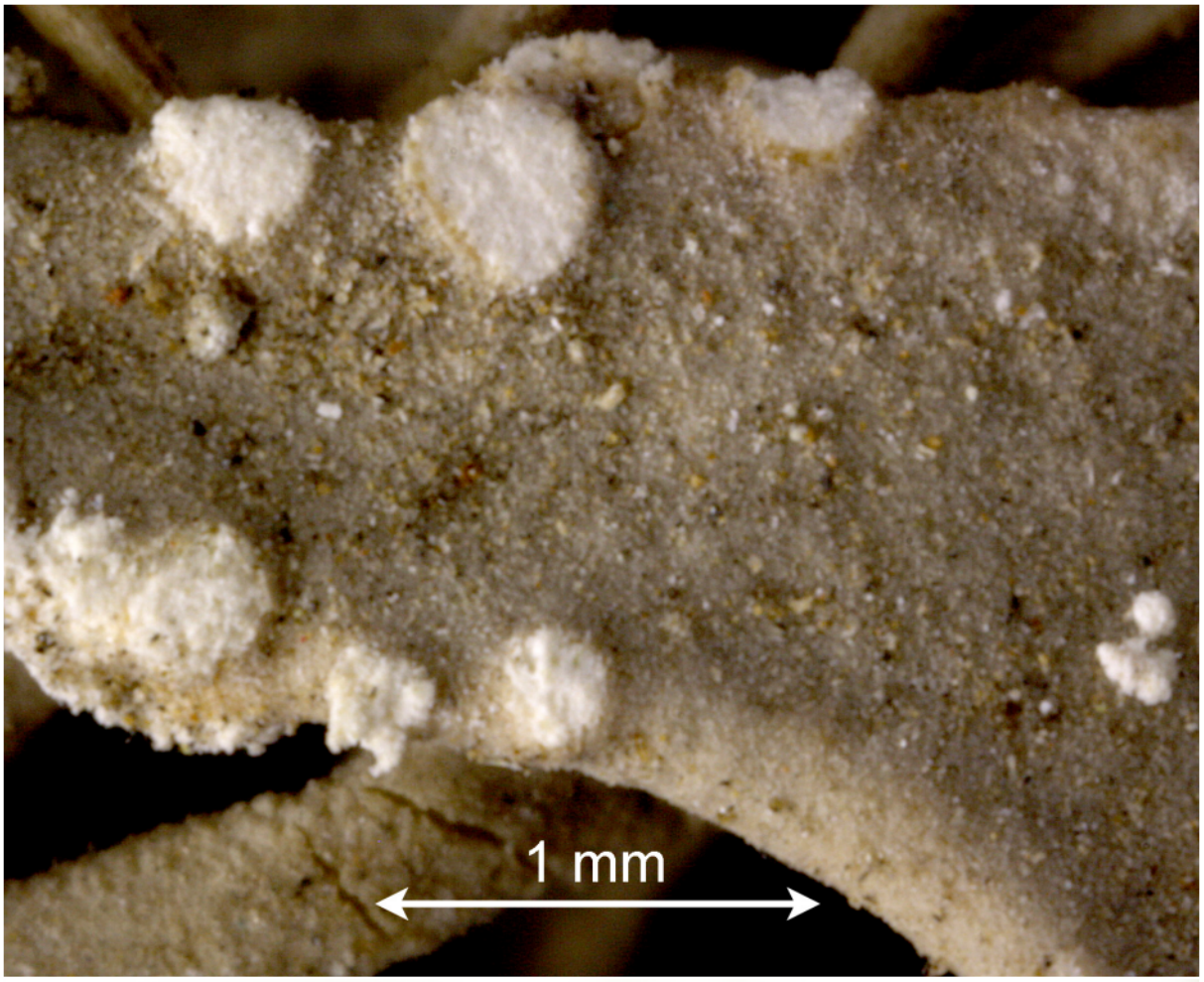
Roccella teneriffensis Vain. (1924)

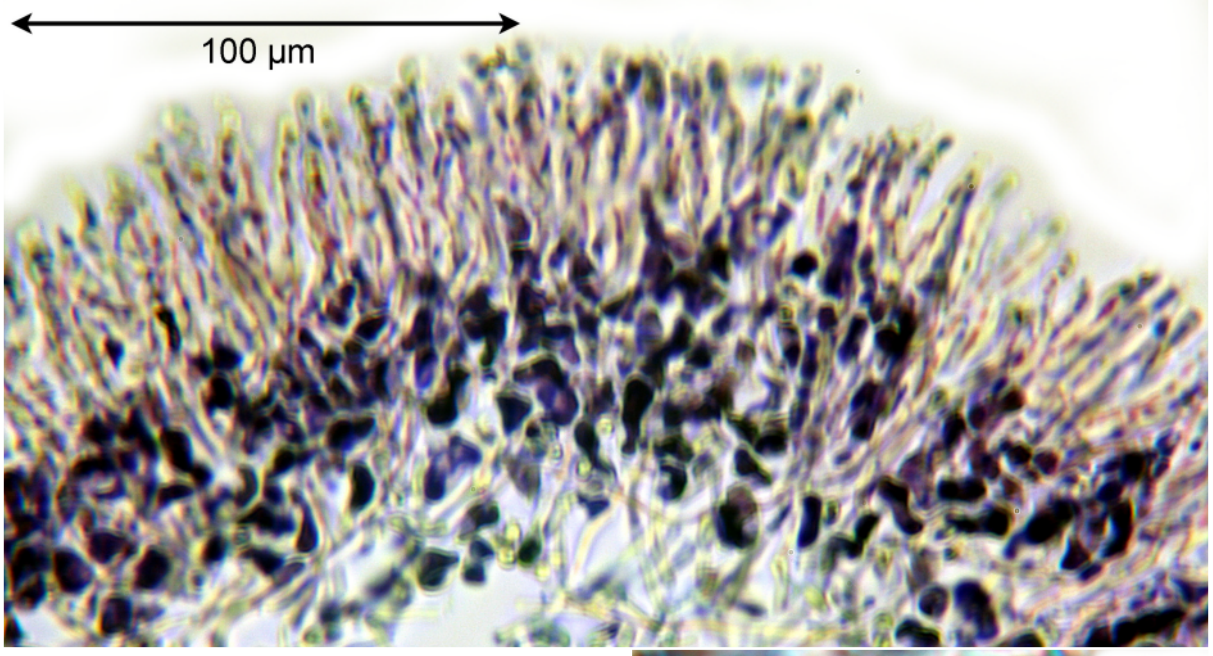
Thallus saxicolous, grey, sorediate, texture firm, applanate, surface smooth, holdfast internally white to brown. Cortex palisade plectenchymatous.Apothecia unknown. Cortex C –, K – or + yellow, Pd –, subcortex C –, medulla C –, IKI –, soralia C + red, major substances erythrin, lepraric. – Canary Isles.

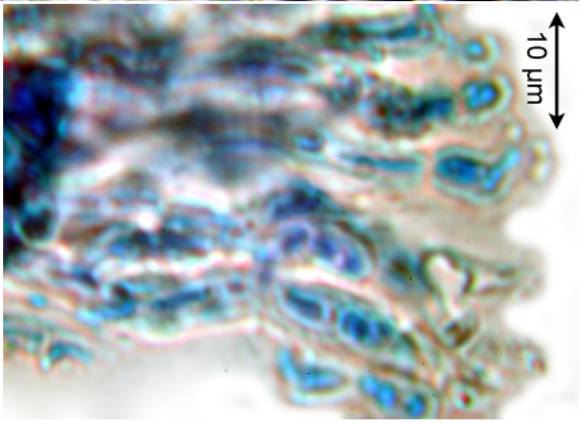
Azores, Sâo Miguel, Ponta Delgada, parks and gardens, on wall built of lava rocks, 20 m. Leg. A. Aptroot 07.1986, det. A. Aptroot. [ABL16096]











Roccella teneriffensis

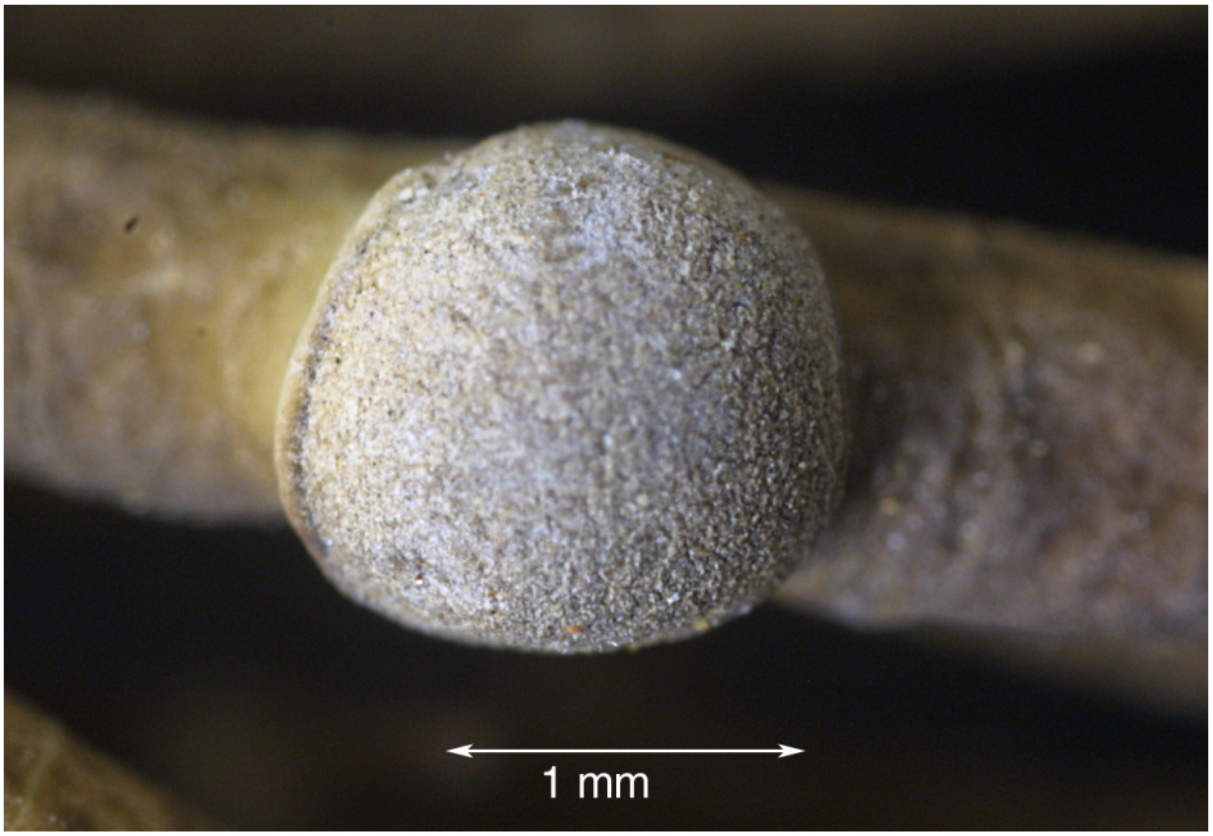
Roccella tinctoria DC. (1805)
Roccella caribaea Darb. (1898)
Roccella dichotoma (Pers.) Ach. (1814)
Roccella dubia Darb. (1898)
Roccella patellata Stirt. (1874)
Roccella tinctoria f. *complanata* Vain. (1901)
Roccella tinctoria f. *gracilis* Czerwiak. (1849)
Roccella tinctoria var. *dichotoma* (Pers.) Ach. (1814)
Roccella tinctoria var. *fastigiata* (Bory) Delise ex Darb. (1898)
Roccella arnoldii Vain. (1901)
Roccella boergesenii Vain. (1924)
Roccella canariensis Darb. (1897)
Roccella canariensis var. *vincentina* (Vain.) Zahlbr. (1906)
Roccella complanata Bory ex Darb. (1897)
Roccella complanata var. *intricata* Bory ex Darb. (1897)
Roccella crassa Darb. (1898)
Roccella fastigiata Bory (1828)
Roccella fuciformis var. *ventricosa* Mont. (1857)
Roccella fucoides var. *arnoldii* (Vain.) Zahlbr. (1914)
Roccella guanchica Feige & Viethen (1987)
Roccella hypomecha var. *isabellina* Vain. (1901)
Roccella hypomecha var. *soredifera* Bory ex Darb. (1898)
Roccella medusina Bory ex Darb. (1898)
Roccella medusina var. *irregularis* Bory ex Darb. (1898)
Roccella medusina var. *soredifera* Bory ex Darb. (1898)
Roccella purpura-antiquorum Bory (1828)
Roccella rangiformis Bory ex Darb. (1898)
Roccella tinctoria f. *filiformis* Bab. (1839)
Roccella tinctoria f. *valida* Hampe (1897)
Roccella tinctoria var. *deformis* Bory ex Darb. (1898)
Roccella tinctoria var. *soredifera* Bory ex Darb. (1898)
Roccella tuberculata var. *vincentina* Vain.
Roccella vincentina (Vain.) Follmann (1987)
Roccella vincentina var. *boergesenii* (Vain.) Follmann (1987)
Note: *Roccella tinctoria sensu* most authors is *Roccella africana.* The sorediate plants have been mostly named as *Roccella boergesenii* and the plants with apothecia *Roccella canariensis,* but new molekular investigations had showed their indentity.

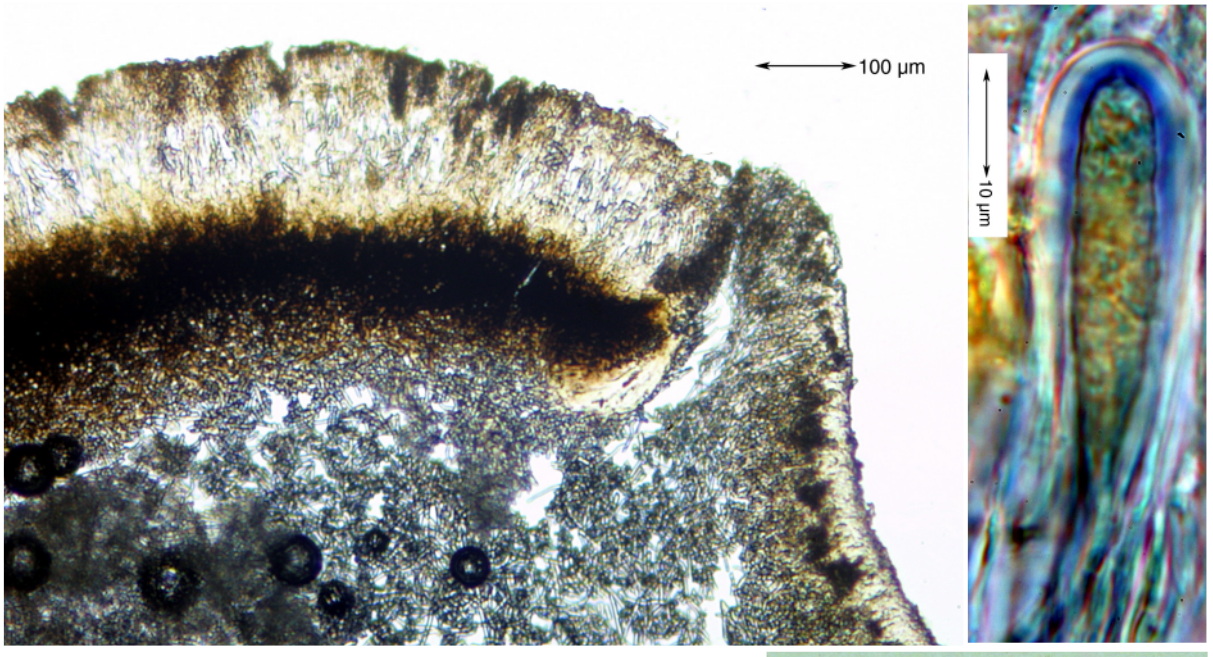
Thallus saxicolous, brown, sorediate or not, texture firm, cylindrical, surface dull, holdfast internally white to brown. Cortex typically

branched type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 21–27 × 5–8 µm. Cortex C –, K –, KC –, Pd –, subcortex C + red, KC + red, K –, Pd –, medulla C –, KC –, K –, Pd –, IKI+ violet, soralia if present C + red, IKI –, major substances erythrin, lecanoric. – Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe, Senegal, Angola

Spanien, Kanarische Inseln, Teneriffa, 1 km südöstlich von Los Cristianos an einem Ausläufer des Mont Guaze, ca. 220 m, auf Erde zwischen vulkanischem Gestein in Sukkulenten-Steppe. Leg. Schumm 27.12.1975, det. Schumm. [2438] – the fertile lichen „*Roccella canariensis*“

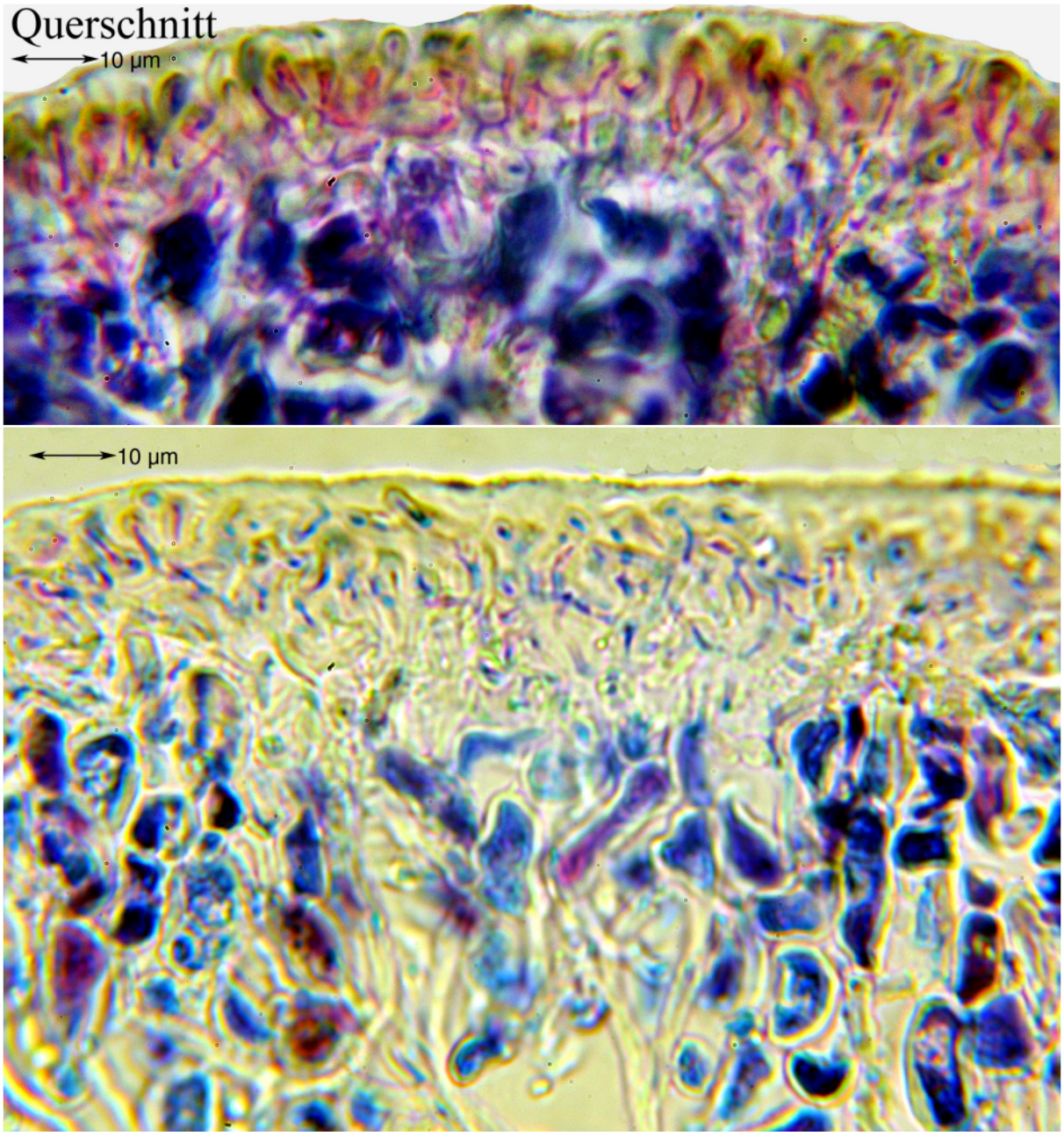








Roccella tinctoria

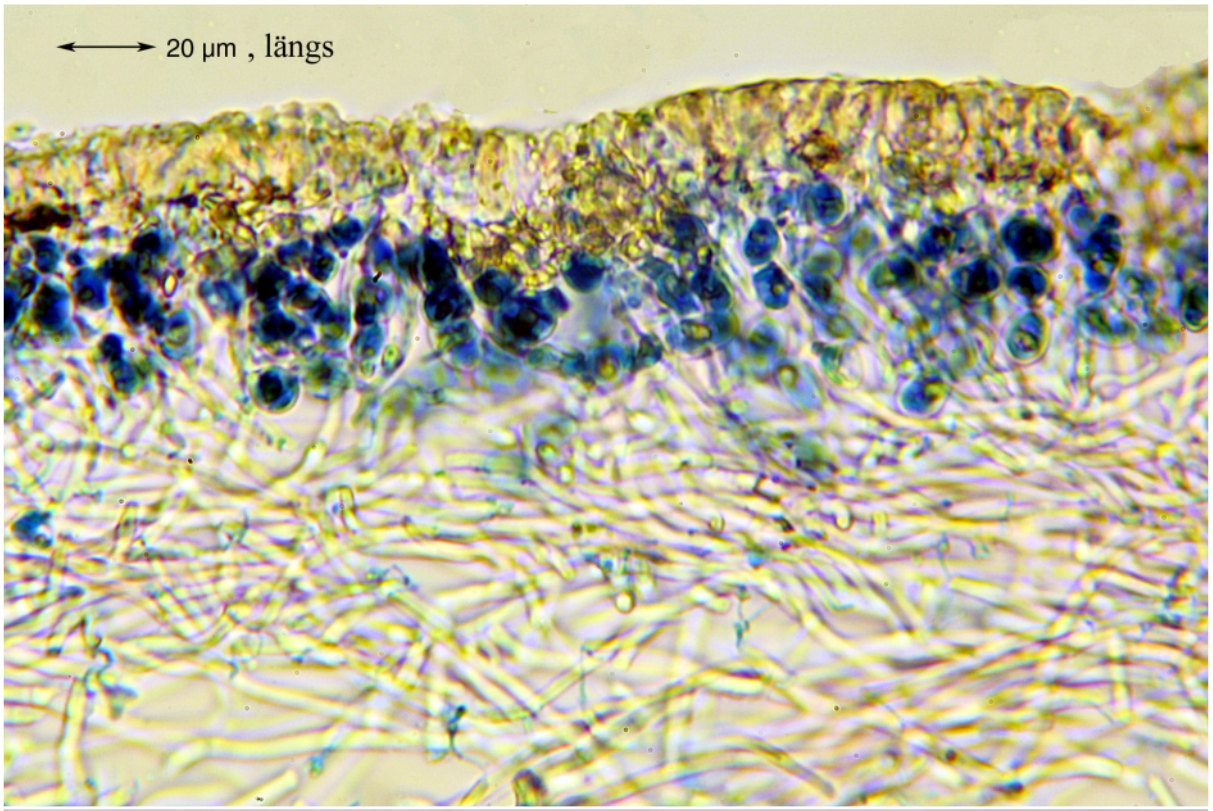


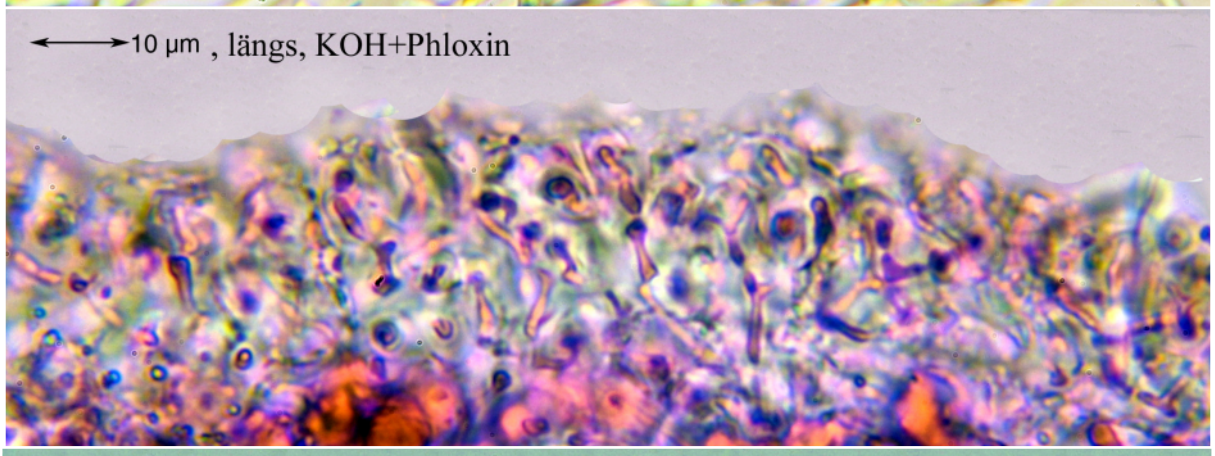
Roccella tinctoria

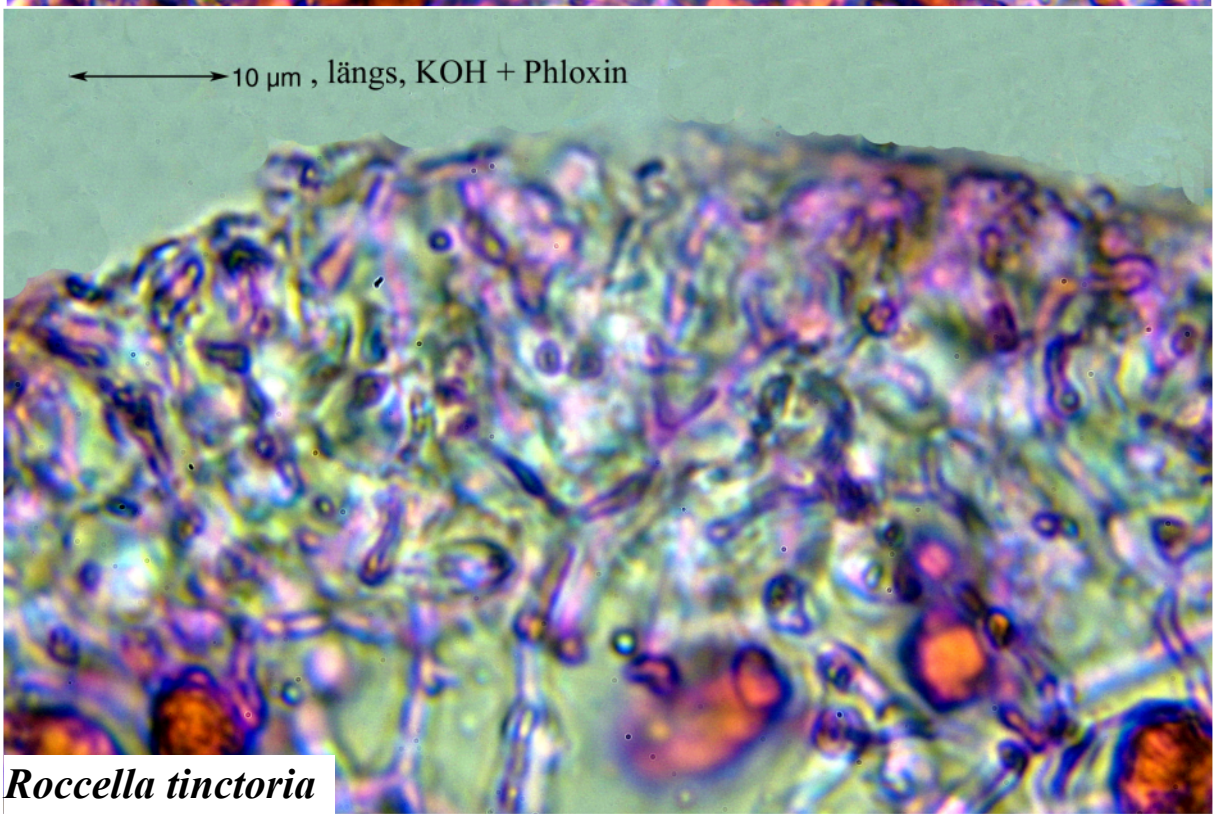
Roccella tinctoria DC.

Spanien, Kanarische Inseln, Gran Canaria; an der Straße von San Nicolas nach Agaete im Barranco los Berreos an nord-exponierten Stellen; N 28°02.100, W 15°45.464, Höhe 570 m; an Felsen. Leg. Schumm 02.01.2000, det. Schumm 11.2000. [6825] – this sorediate lichen was often named as *Roccella boergesenii* Vain.









Roccella tinctoria

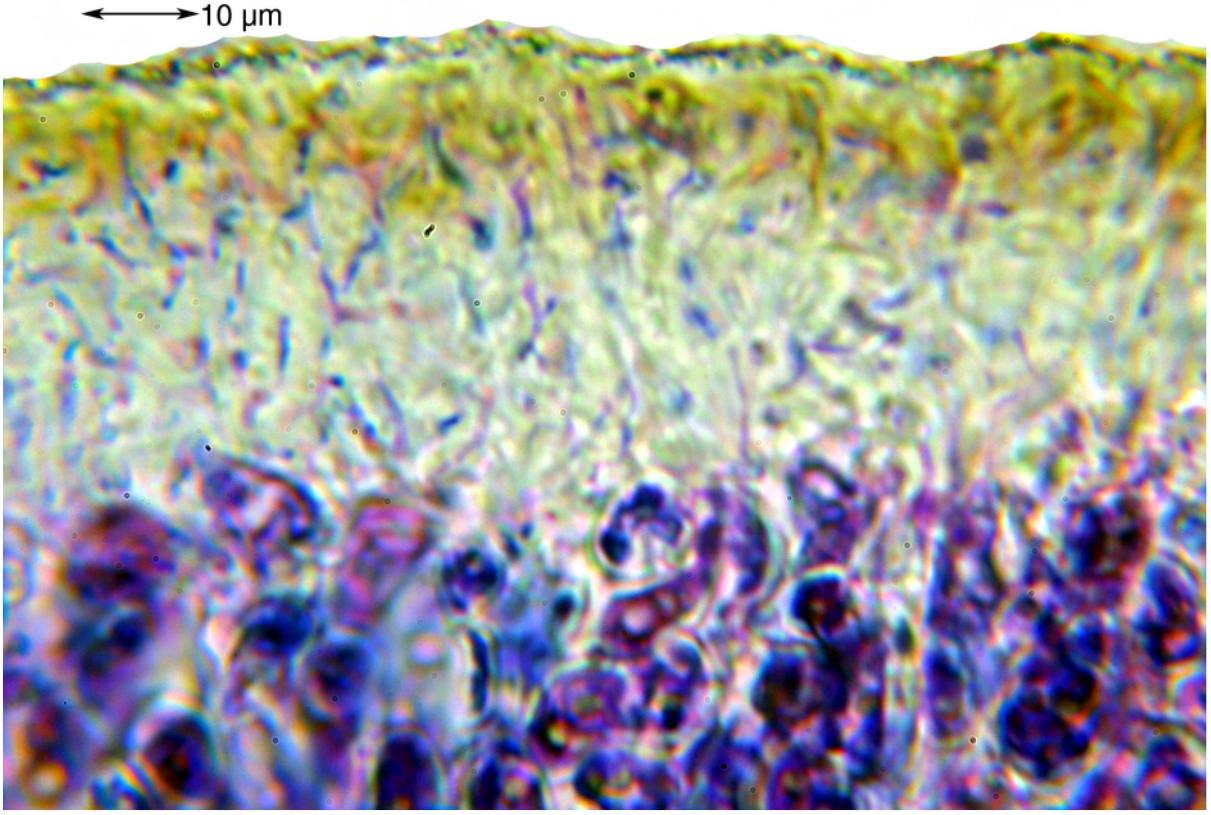
Roccella tuberculata Vain. (1901)
Roccella canariensis var. *subphycopsis* Steiner (1904)
Roccella canariensis var. *tuberculata* (Vain.) Steiner (1904)

Thallus saxicolous, brown, sorediate, texture firm, cylindrical, surface dull, holdfast internally white to brown. Cortex branched type. Apothecia unknown. Cortex C –, K –, Pd –, subcortex C + red, K –, Medulla C –, K –, Pd –, soralia C –, major substance lecanoric. – Azores, Madeira, Selvagem Isles, Canary Isles, Cape Verde Islands, W. Mediterranean Europe.

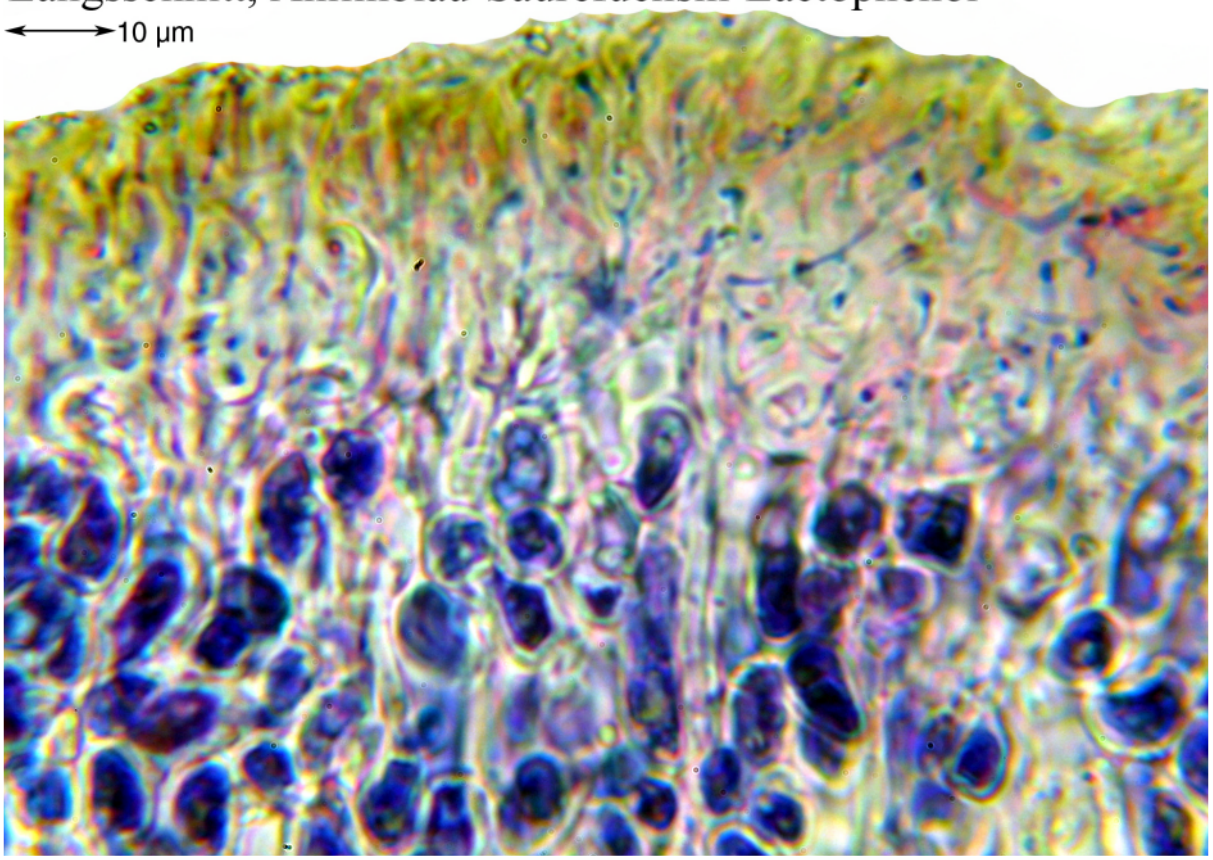
Spanien, Kanaren, La Palma, Lavafeld an der Südküste bei Playa del Faro, 28°28.352' N, 17°51.813' W, ca. 30-40 m. Leg. Schumm 13.01.2007, det. Schumm. [12865]



Querschnitt, Aniliblau-Säurefuchsin-Lactophenol



Längsschnitt, Anilinblau-Säurefuchsin-Lactophenol



Roccella tuberculata

Roccella verruculosa Follmann (1980)
Roccella bellicosa Darb. (1897)
Roccella caribaea sensu most authors

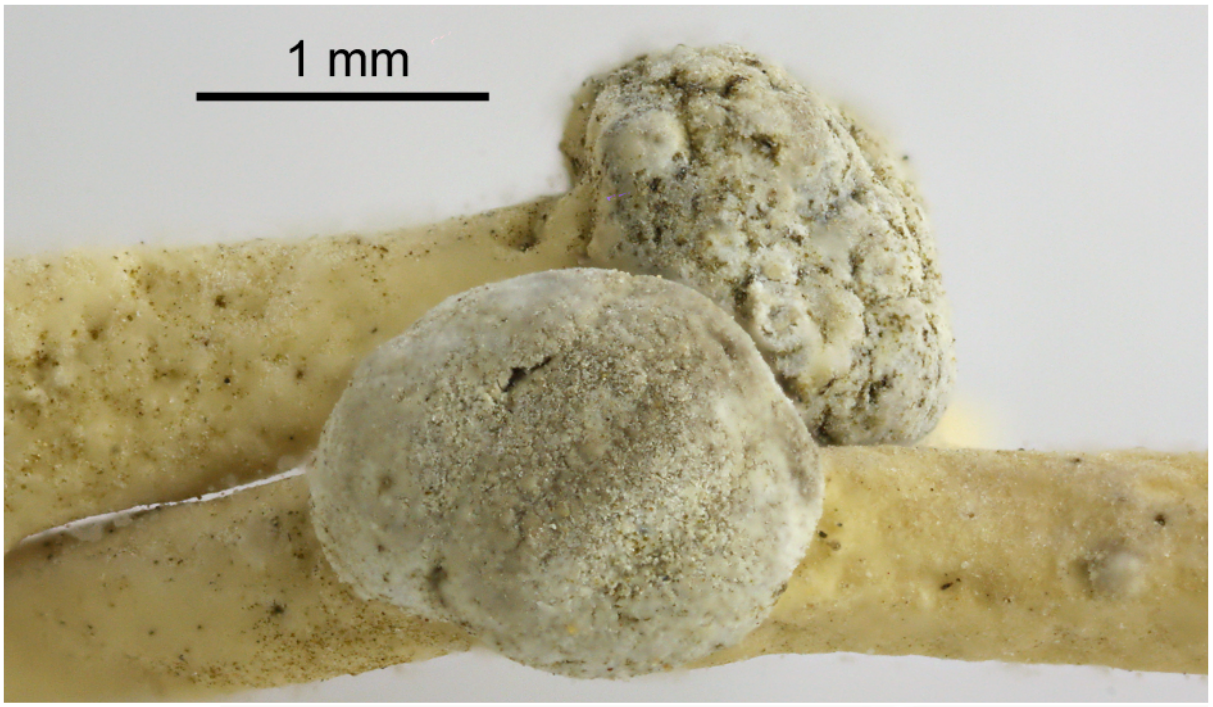
Thallus saxicolous, grey, not sorediate, texture firm, angular, surface smooth, holdfast internally white to brown. Cortex anticlin intermediate type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 17–18 × 4–5 µm. Cortex C + red, K + reddish, Pd –, subcortex C + red, major substances erythrin, gyrophoric. – Colombia, Venezuela, Netherlands Antilles (Aruba, Bonaire, Curacao).

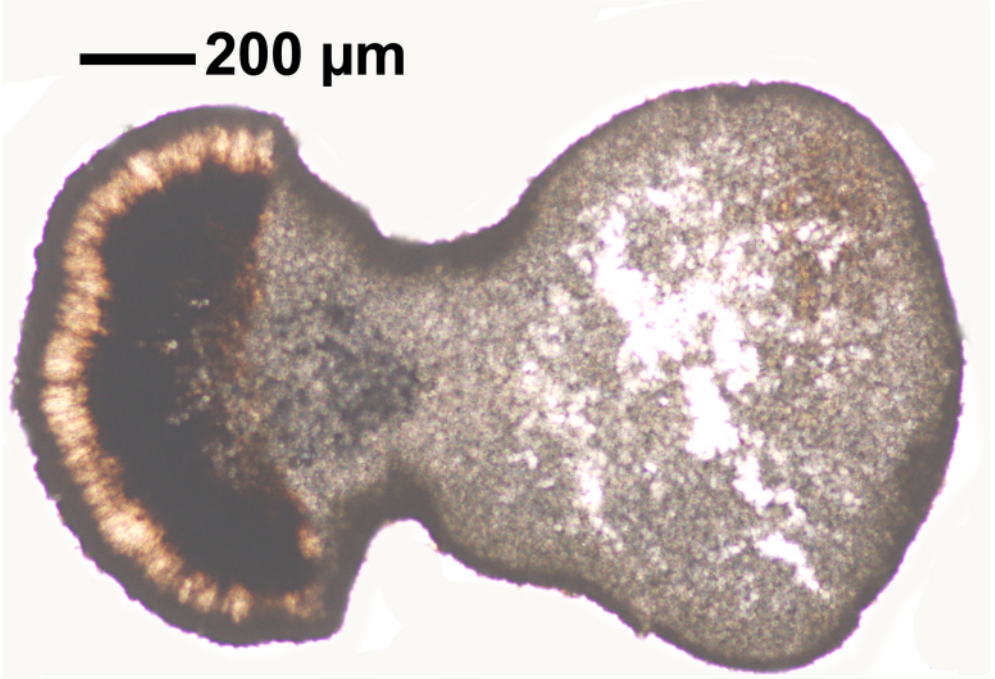
West Indies, Curacao, Knip Hills, 12°25’ N, 69°10’ W, leg. A.L. Stoffers 2. Dec. 1963, det. A.Aptroot 1990. [ABLsnInd]

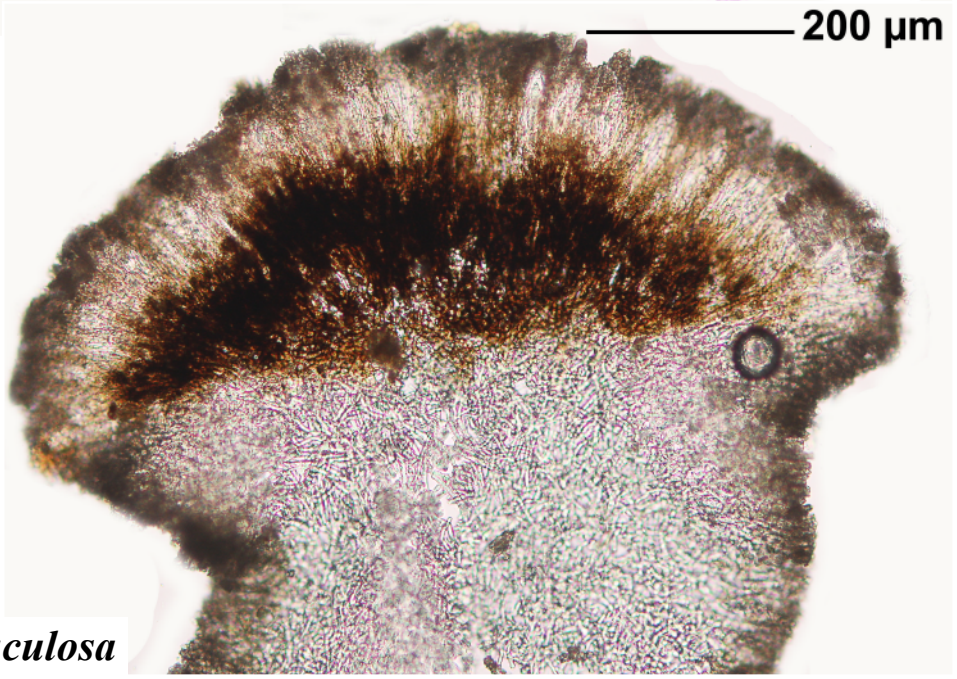




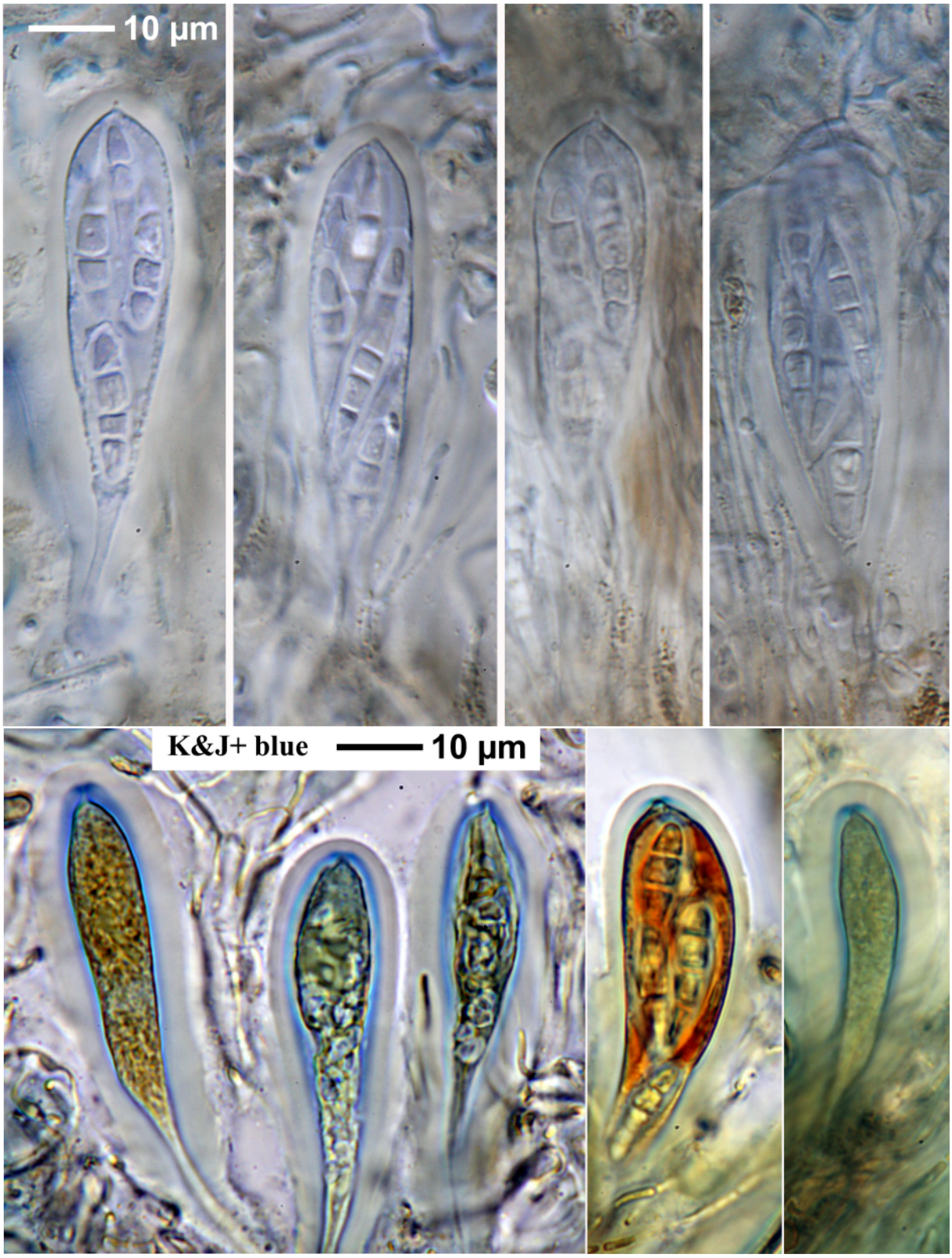
Roccella verruculosa



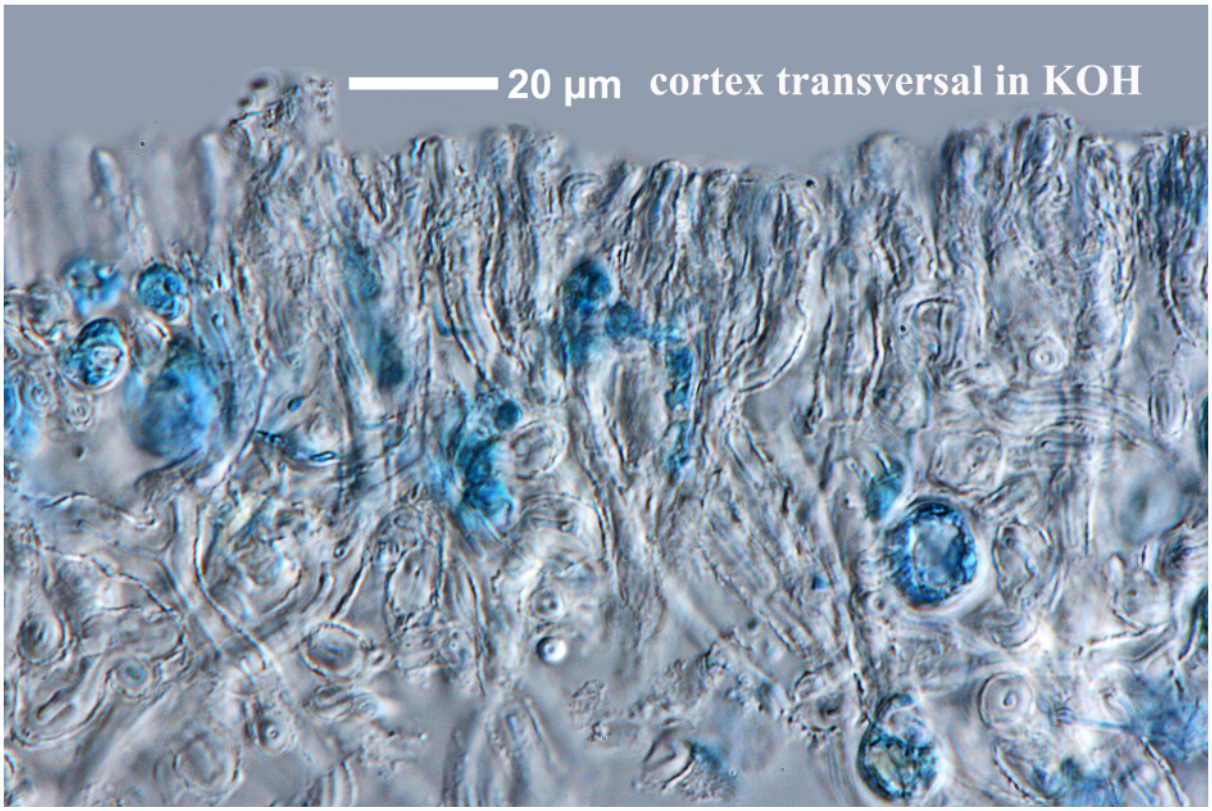


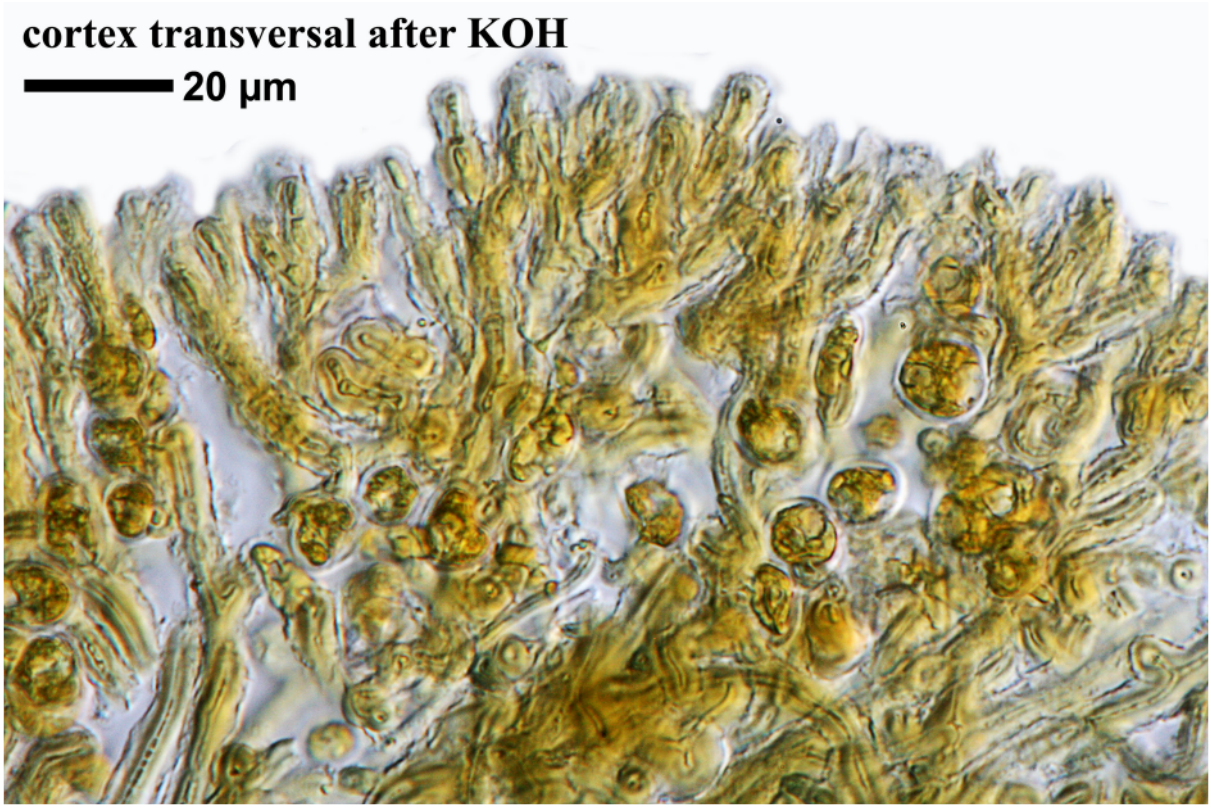


Roccella verruculosa



Roccella verruculosa



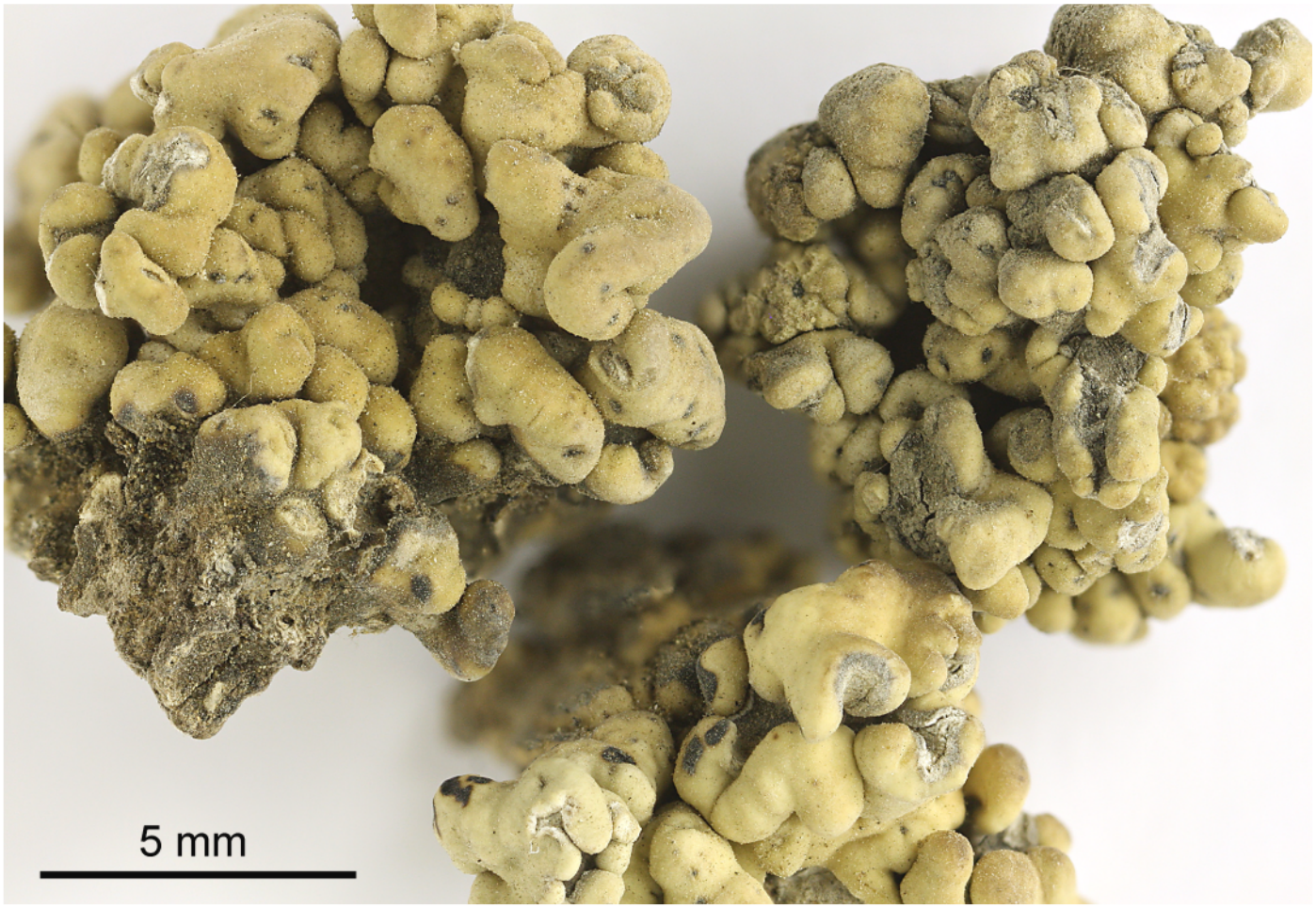


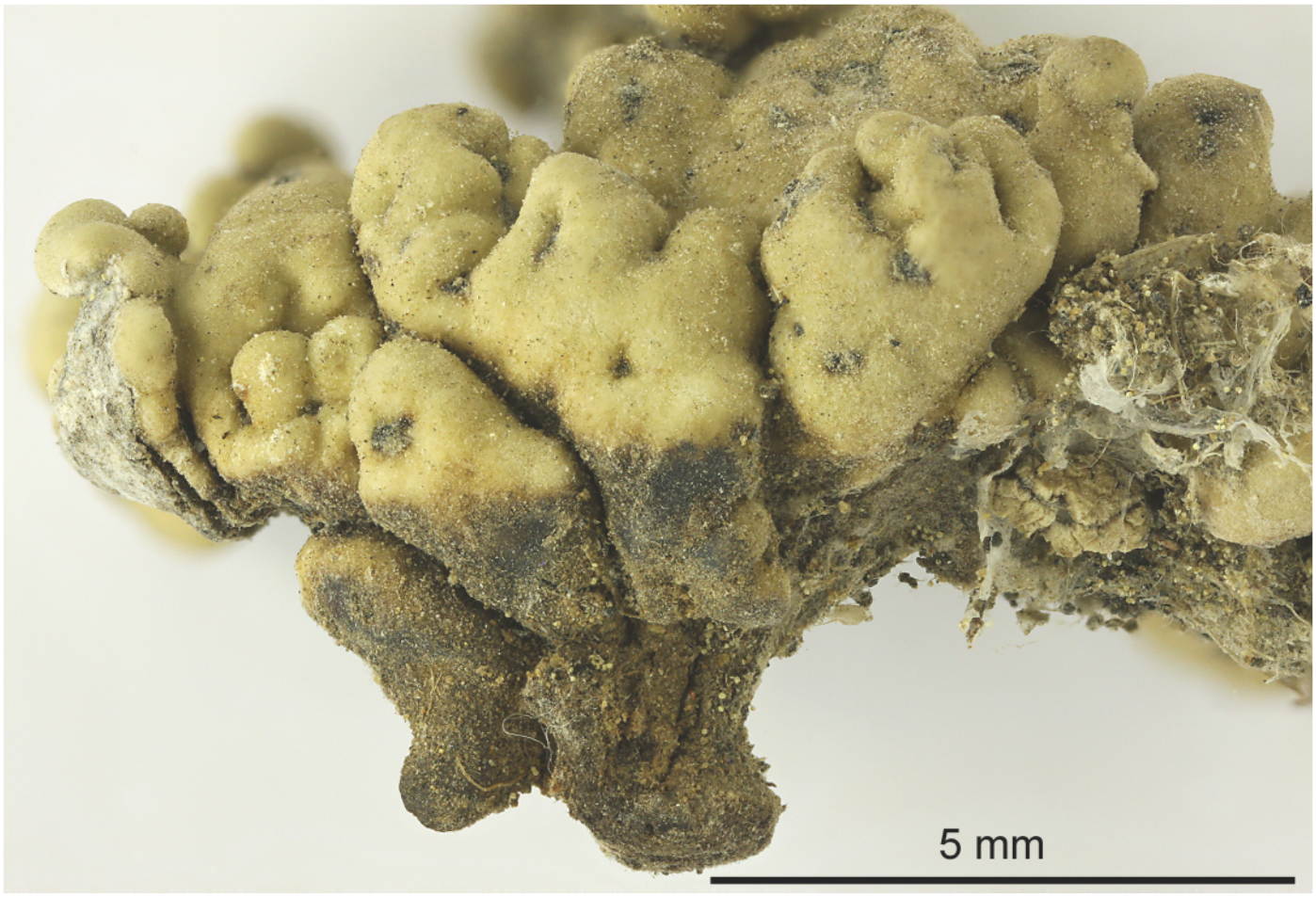
Roccella verruculosa

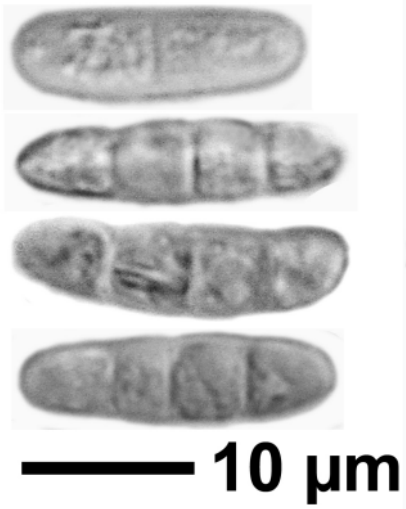
Roccellina accedens (Nyl.) Tehler (1983)
Roccellina olivacea Follmann (1979)
Lecidea accedens Nyl. (1855)

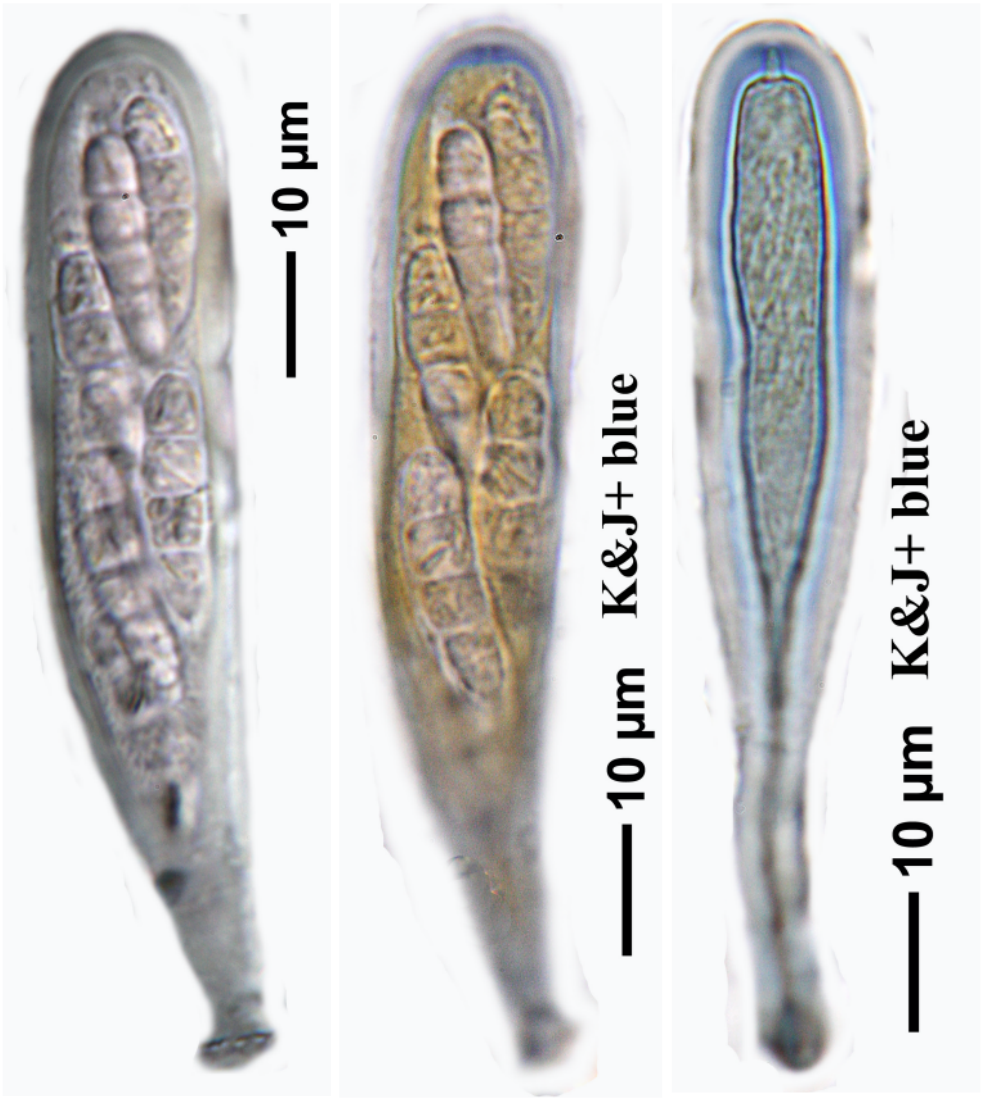
Thallus saxicolous, ochraceous, not sorediate, texture firm, crustose, surface smooth. Cortexhyphae intricate dense branched. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 18–21 × 4–5 µm. Cortex C –, K –, Pd –, medulla C –, major substances terpenoids. – Chile.

Nordchile, Prov. Coquimbo, gesellig an schattseitigen, durch Gischtstaub beeinflußten Stirnflächen und Überhängen von Dioritfelsen im *Roccelletum portentosae* Follm., 30 m, SO-SW, pH 6.6, Küstenformation nördlich der Limarimündung. Leg. et det. G. Follmann 1965/1979. Lichenes Exsiccati Selecti A Museo Historiae Naturalis Casselensi Editi Nr. 296. ISOTYPUS von *Roccellina olivacea* Follm. [2795]

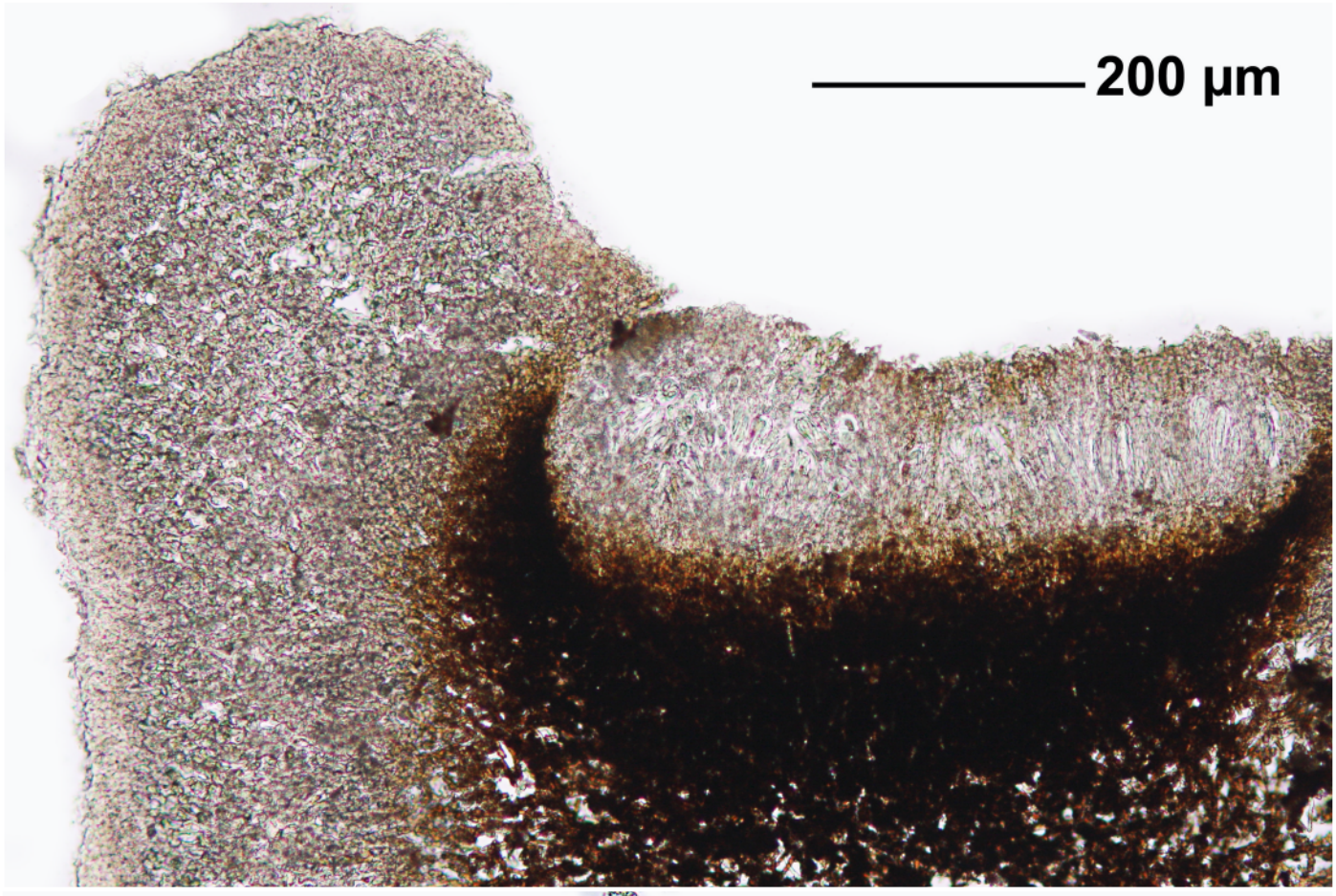


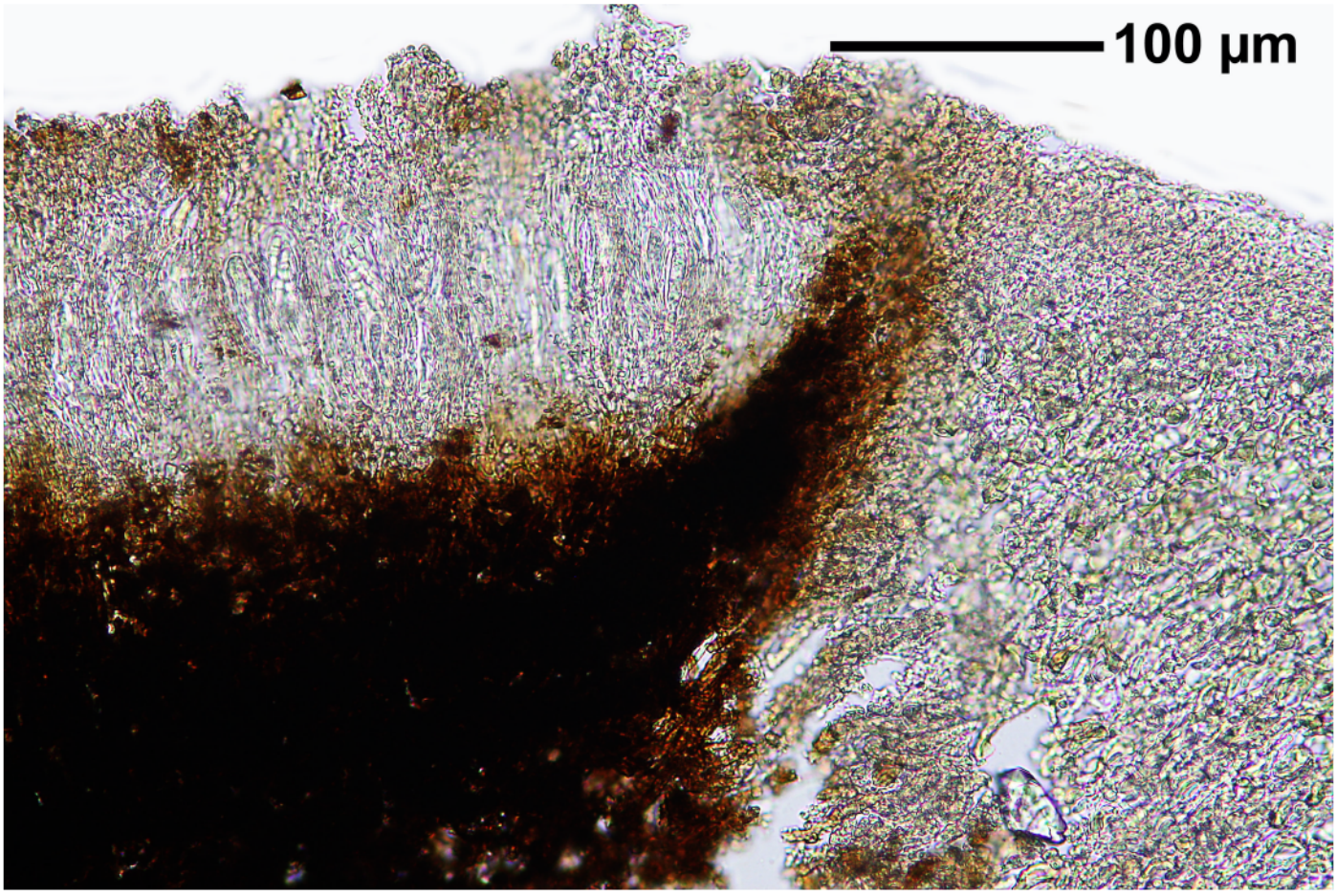




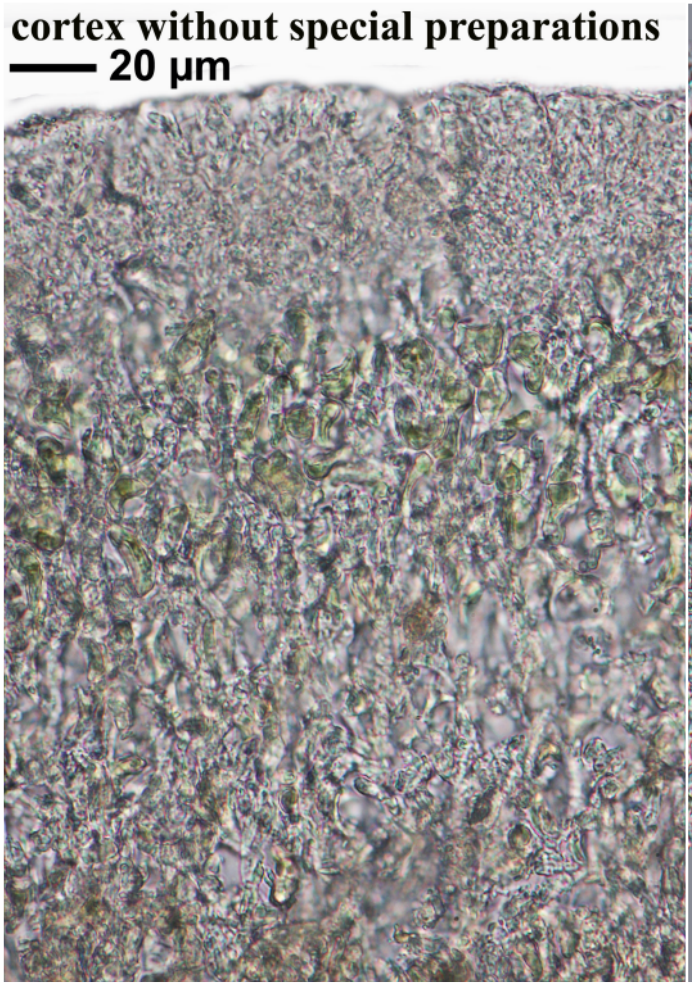


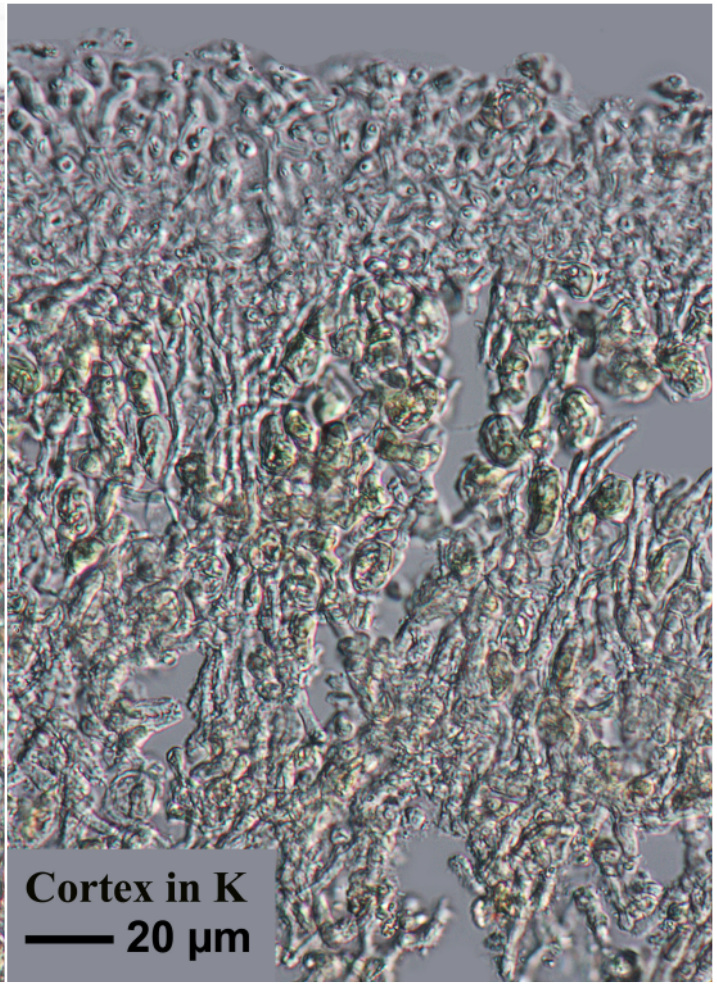
Roccellina accedens

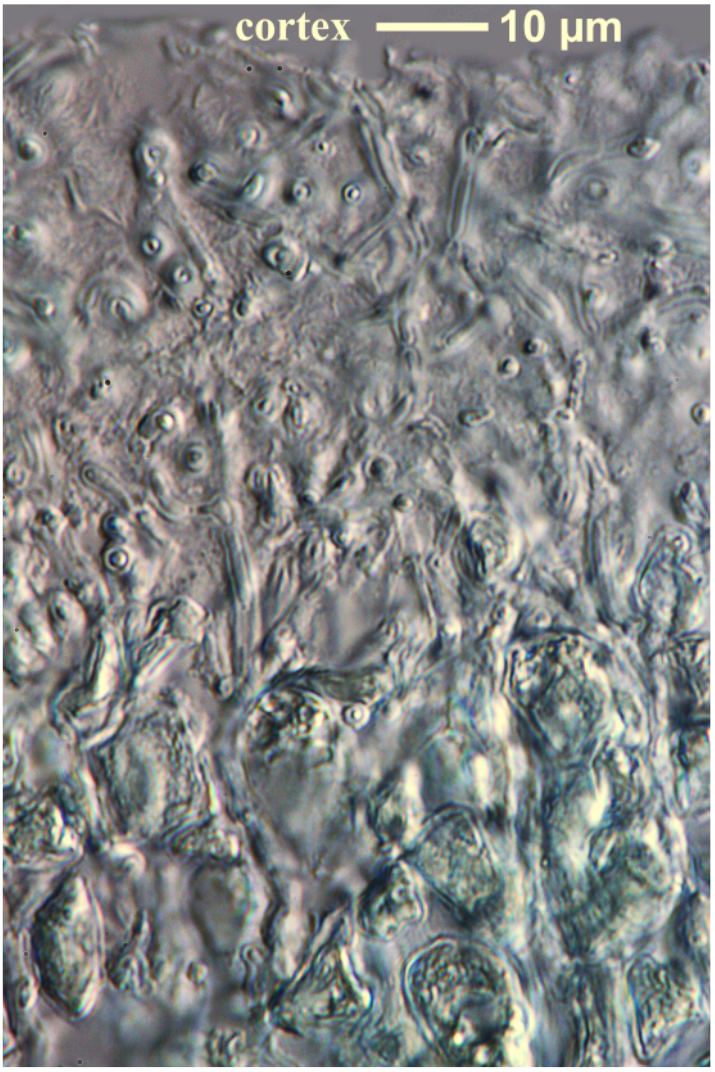




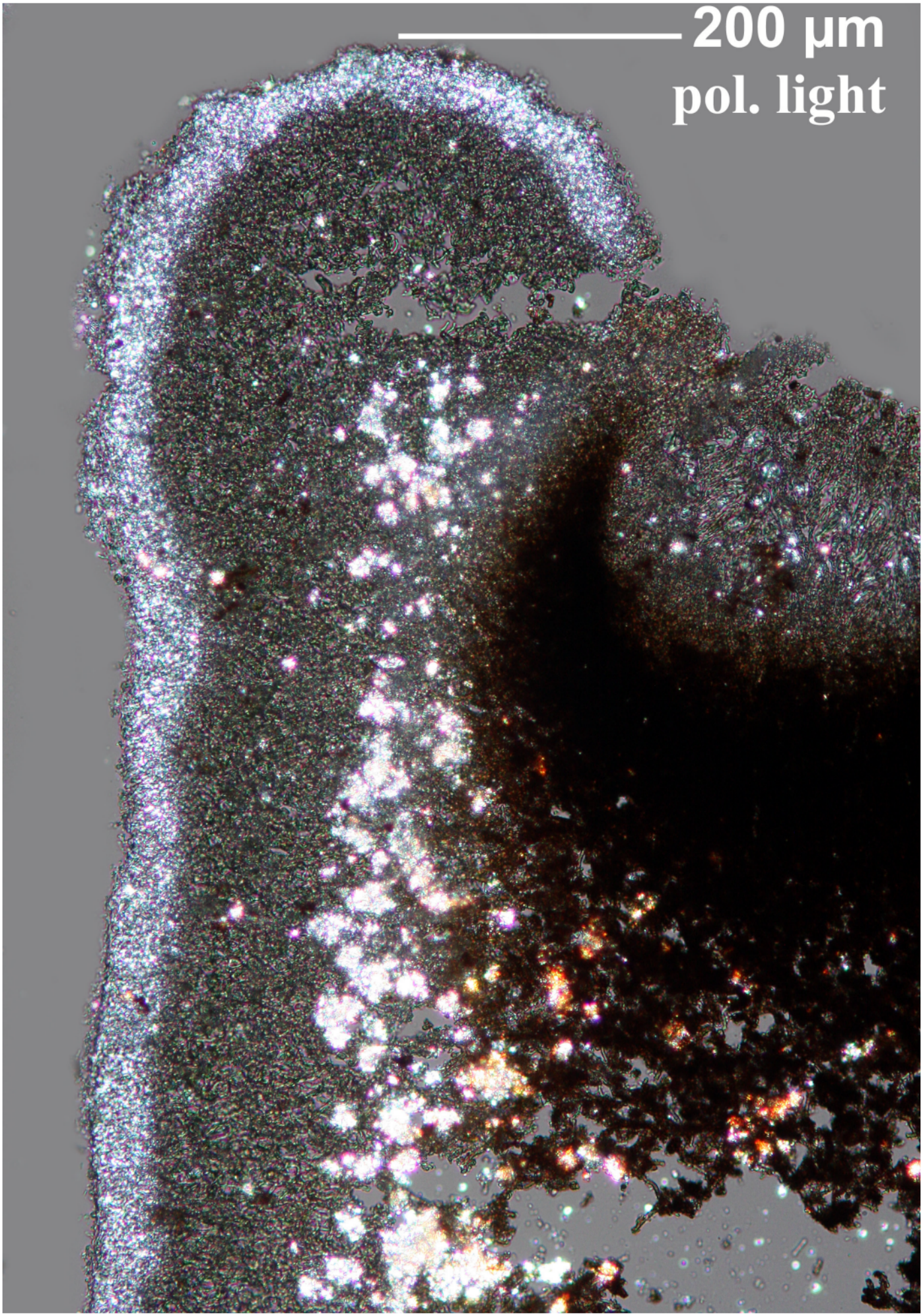
Roccellina accedens







Roccellina accedens



Roccellina accedens

Roccellina arboricola (Follmann) Aptroot & Schumm (2011), comb. nov.
Basionym: *Roccella arboricola* Follmann, Nova Hedwigia 15: 334 (1968).
Note: Included in *Roccellina (Roccellaria, Roccella) mollis* by most authors.

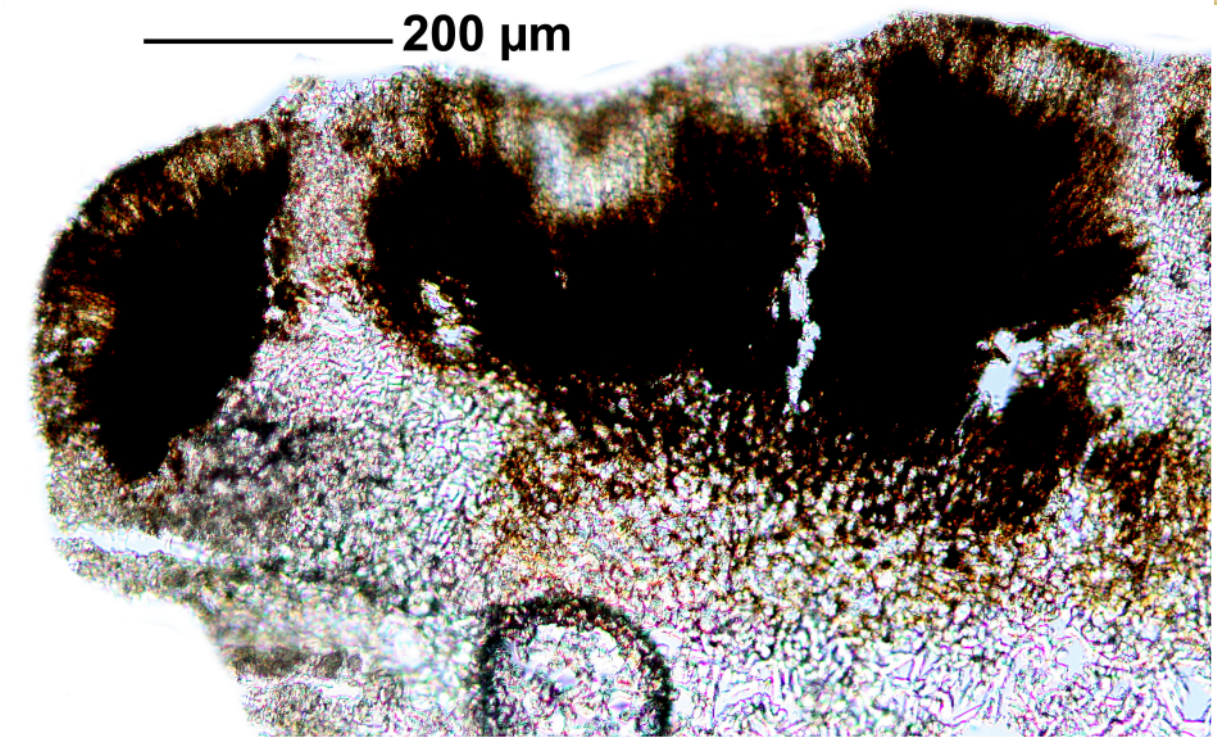
Thallus corticolous, grey, sorediate, texture soft, cylindrical, surface rough, holdfast internally white to brown. Cortexhyphae densely branched in all directions, not differentiated from the medulla. Apothecia round or dissected. Hypothecium black. Ascospores hyaline, 3-septate, 20–23 × 2–2.5 µm. Cortex C –, K –, Pd –, medulla C –, soralia C –, major substances roccellic, lecanoric. – Chile.

Note: Differs from *Roccellina (Roccellaria) mollis* by the presence of soredia, the thinner ascospores and the corticolous growth.

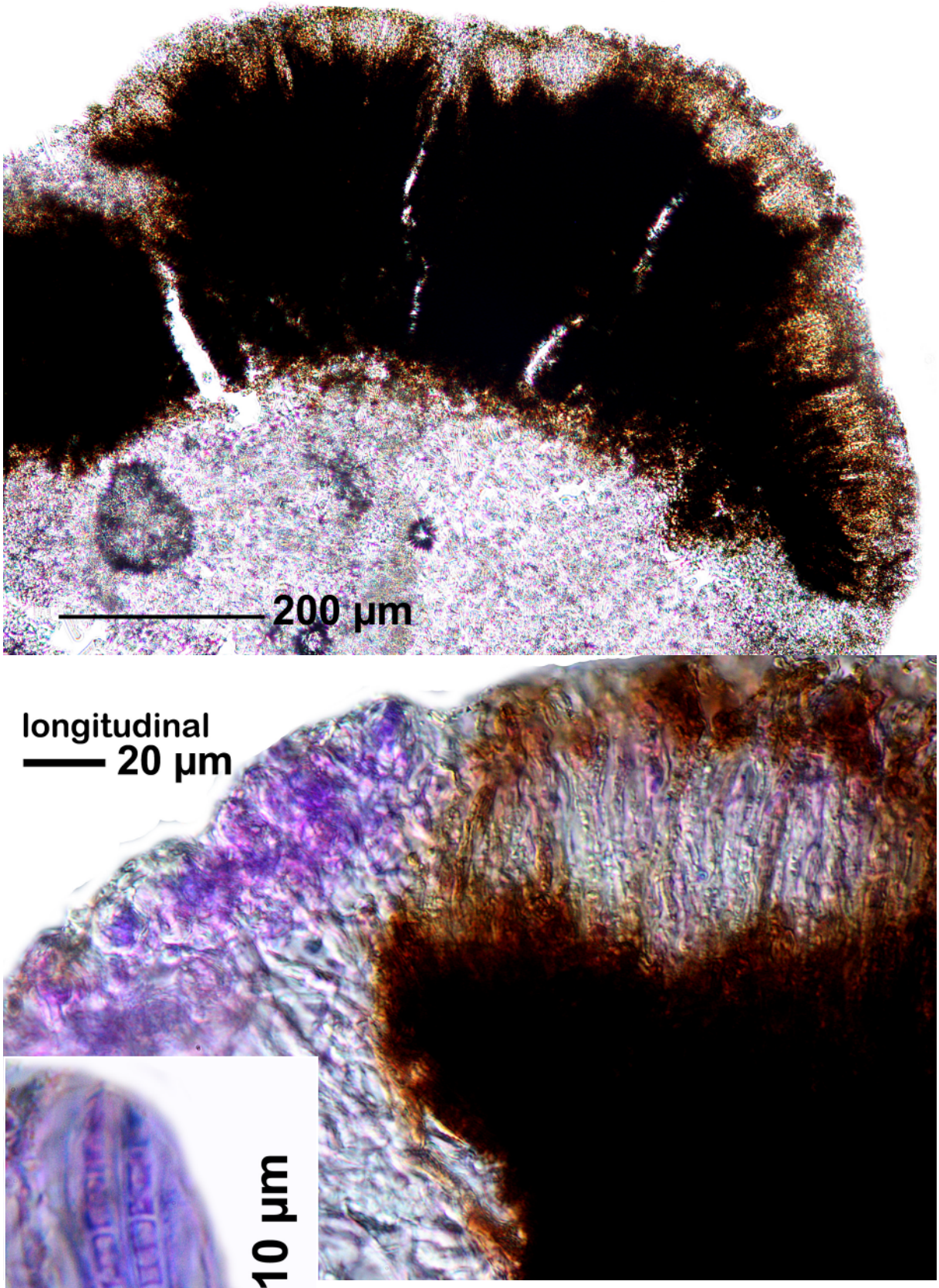
Chile, Prov. Coquimbus, Parque National Fray Jorge, Altos de Talimey, 30°30’ S, corticola. Leg. L.J. Ferraro & S. Redón 17. May 1980, Nr. 2064, det A.Aptroot. [ABLsnChil]



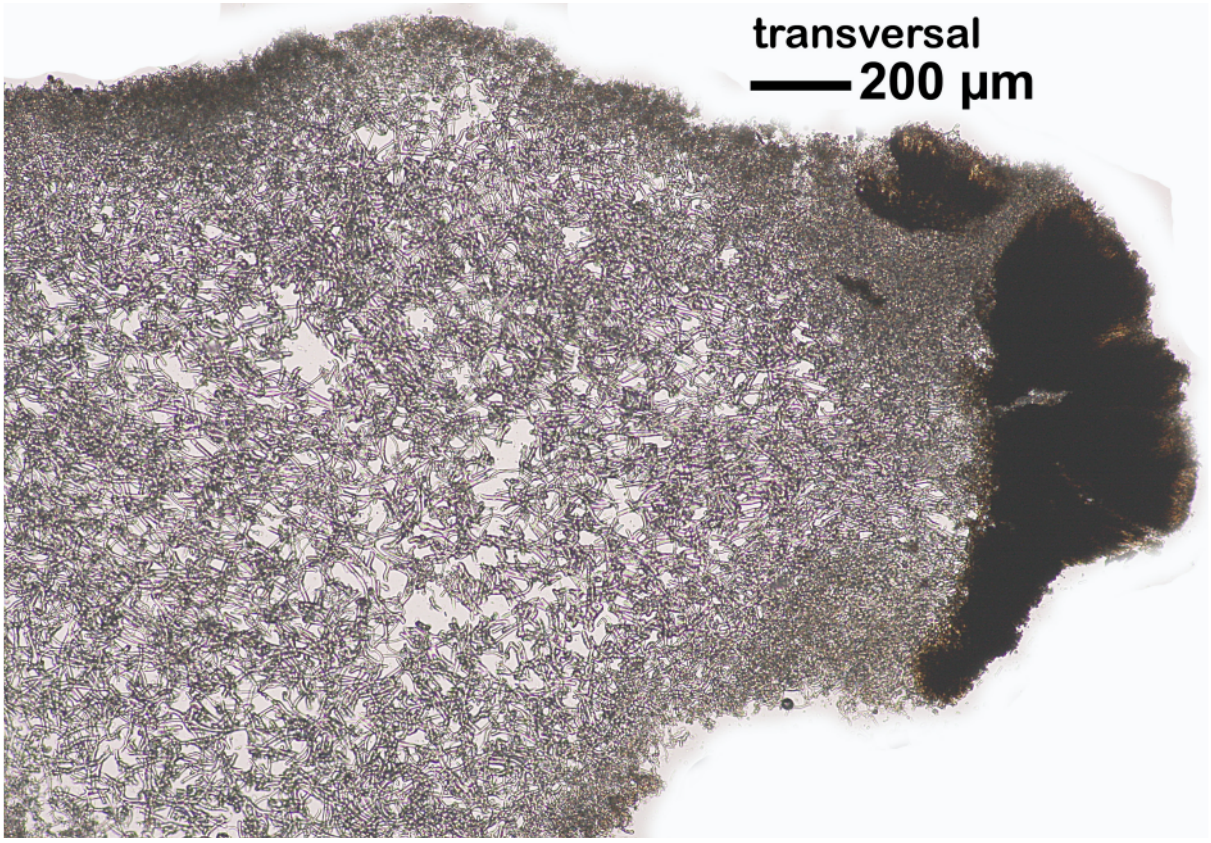


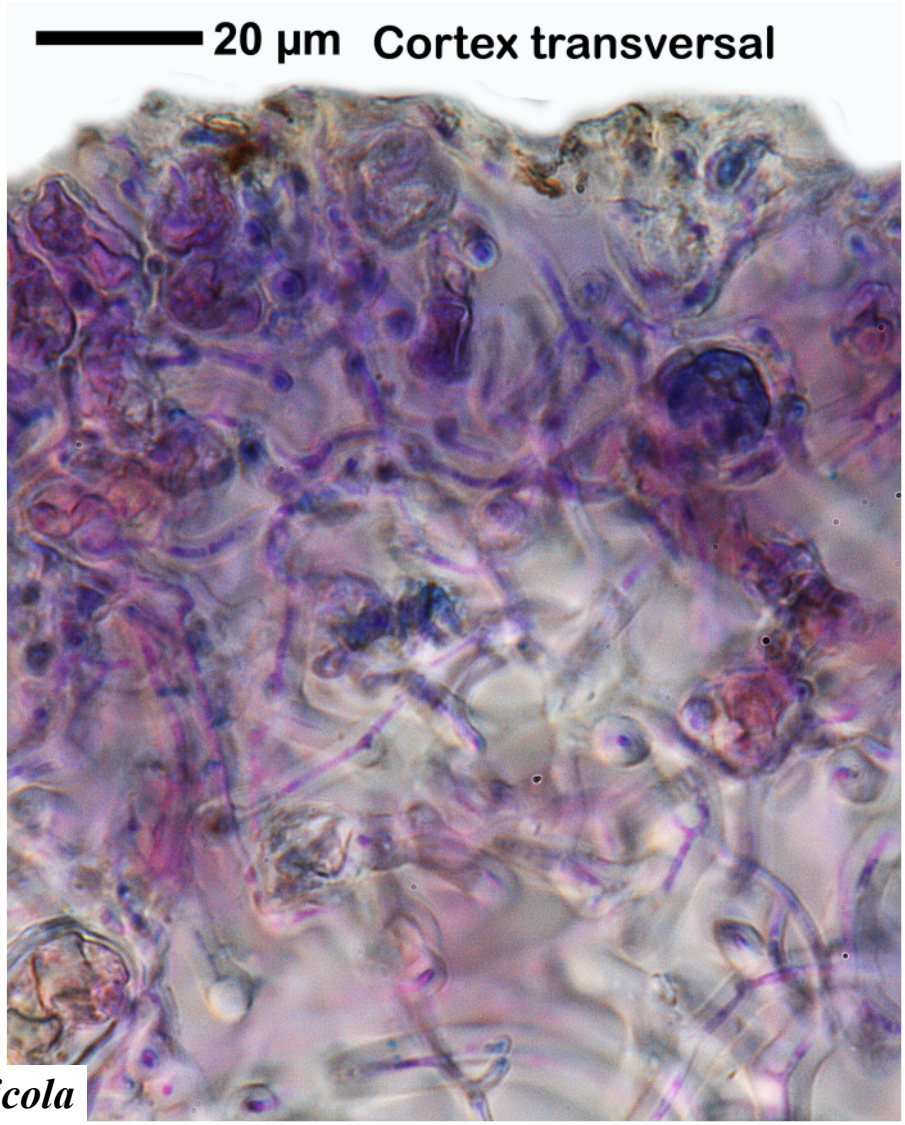


Roccellina arboricola

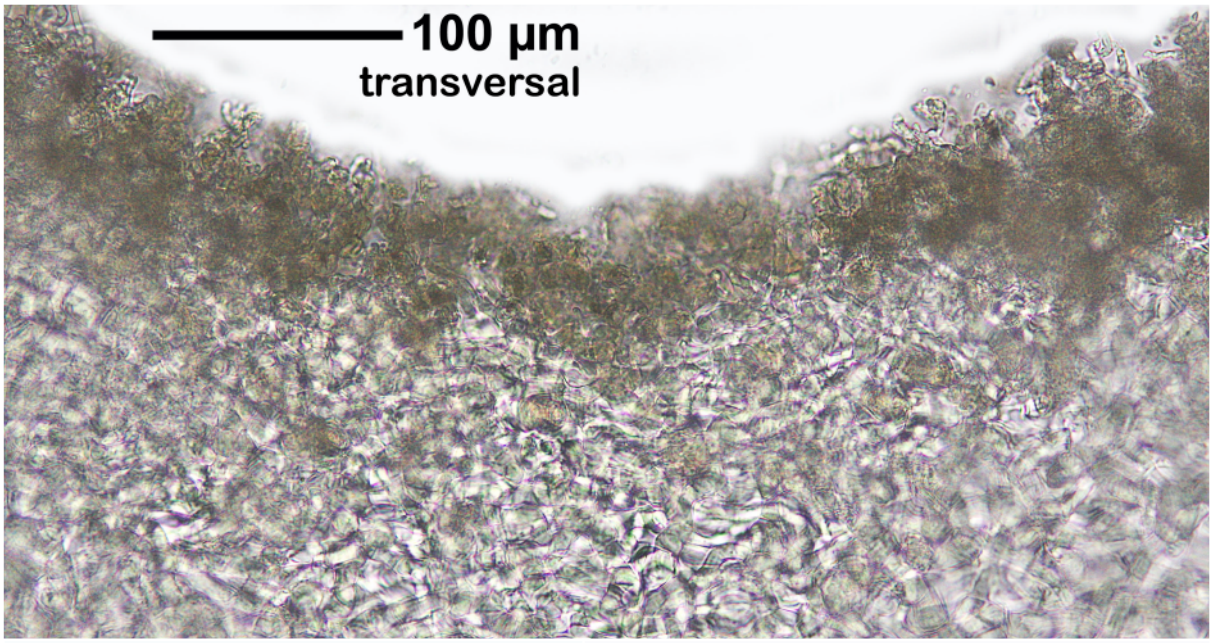


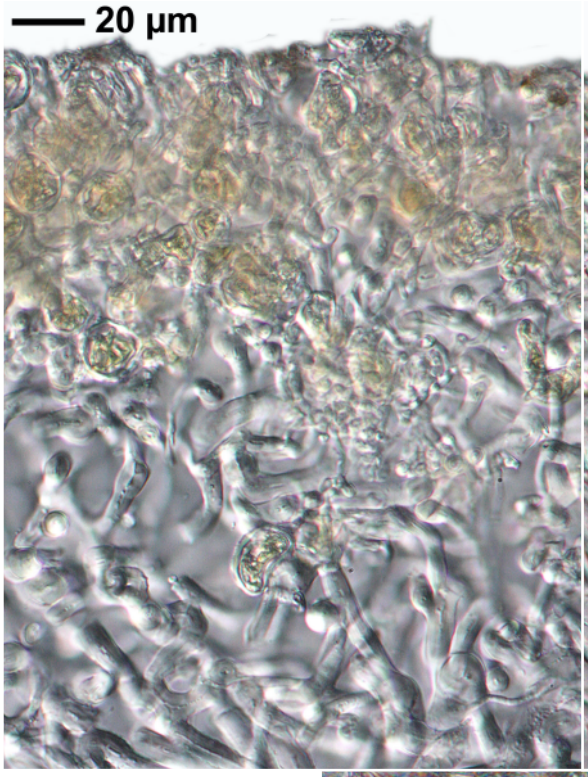
Roccellina arboricola

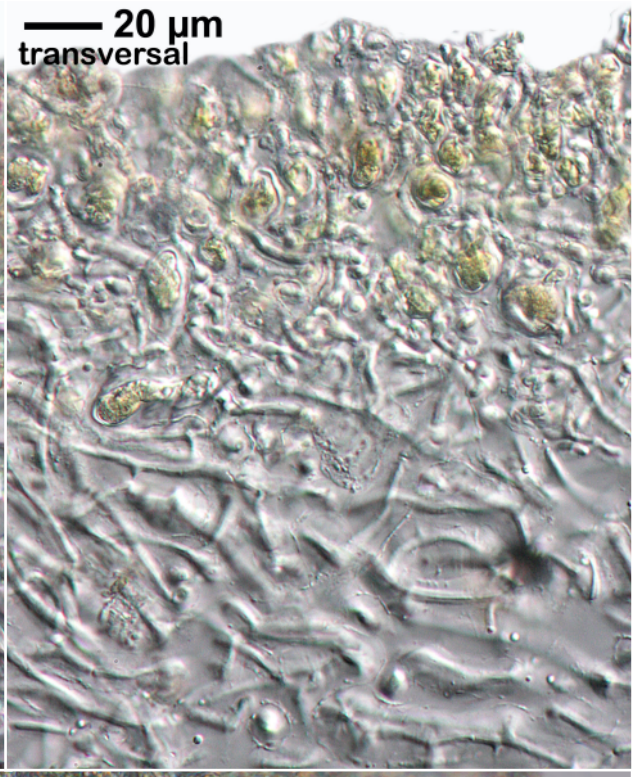


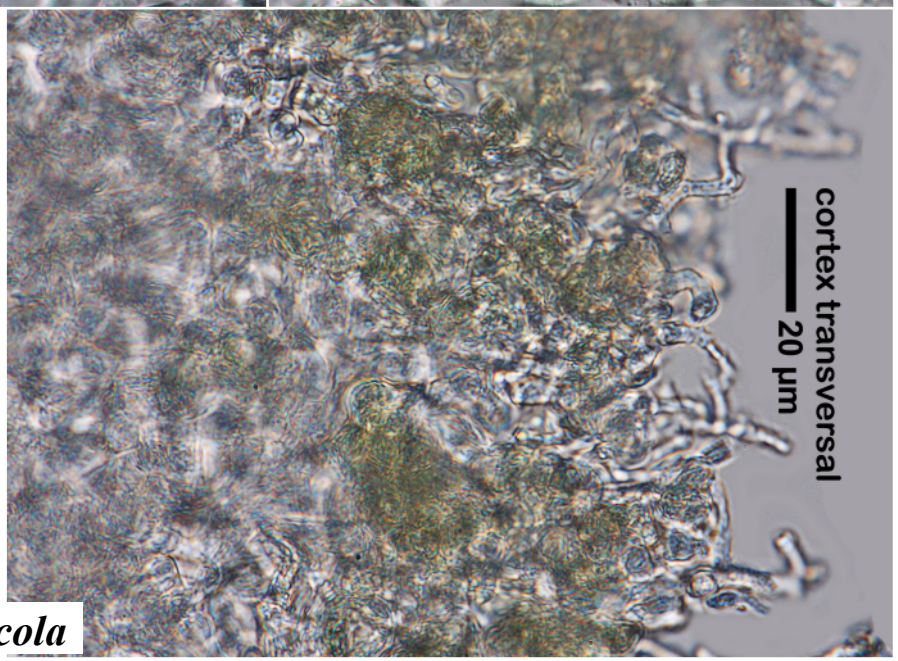


Roccellina arboricola

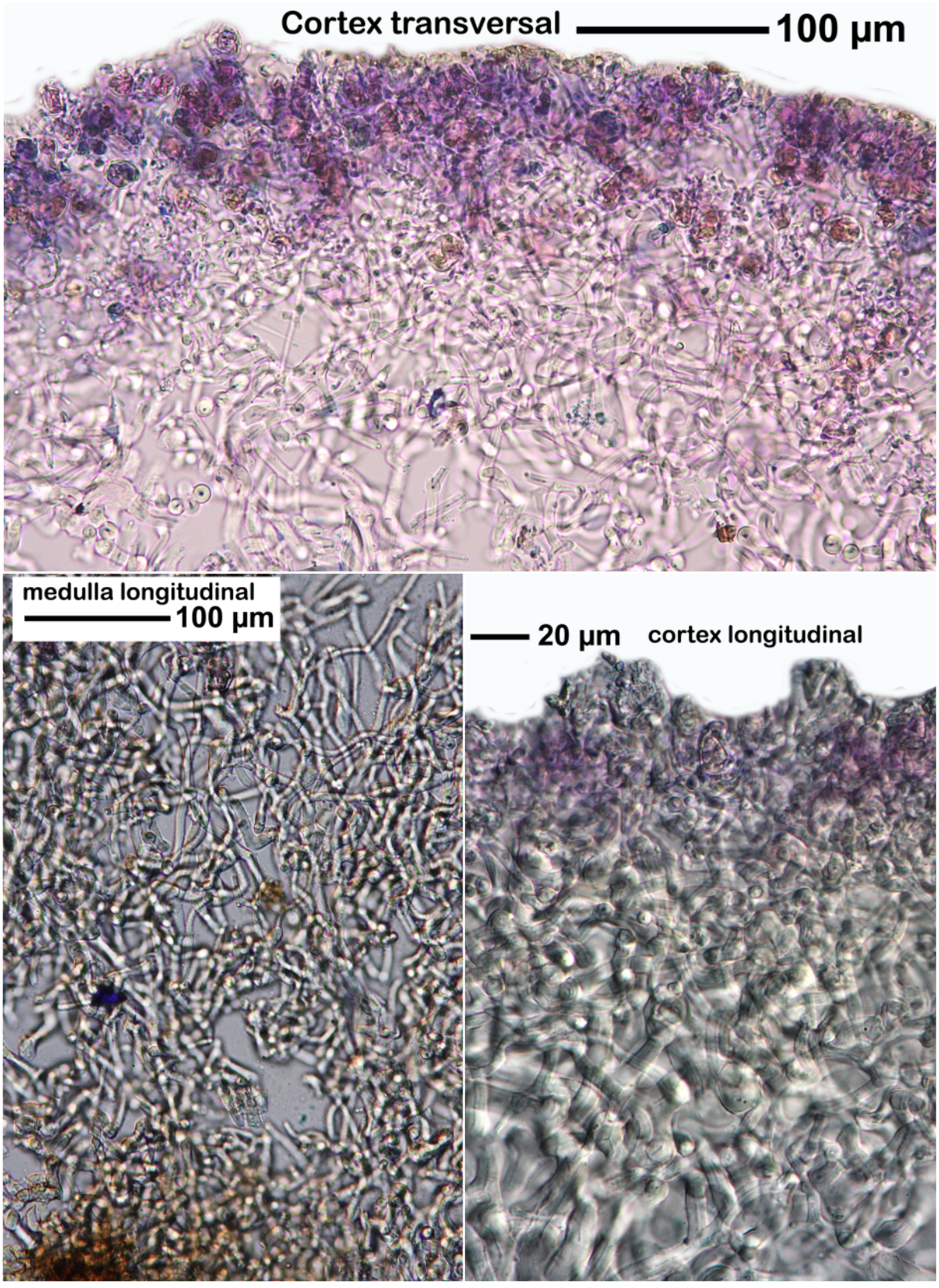








Roccellina arboricola



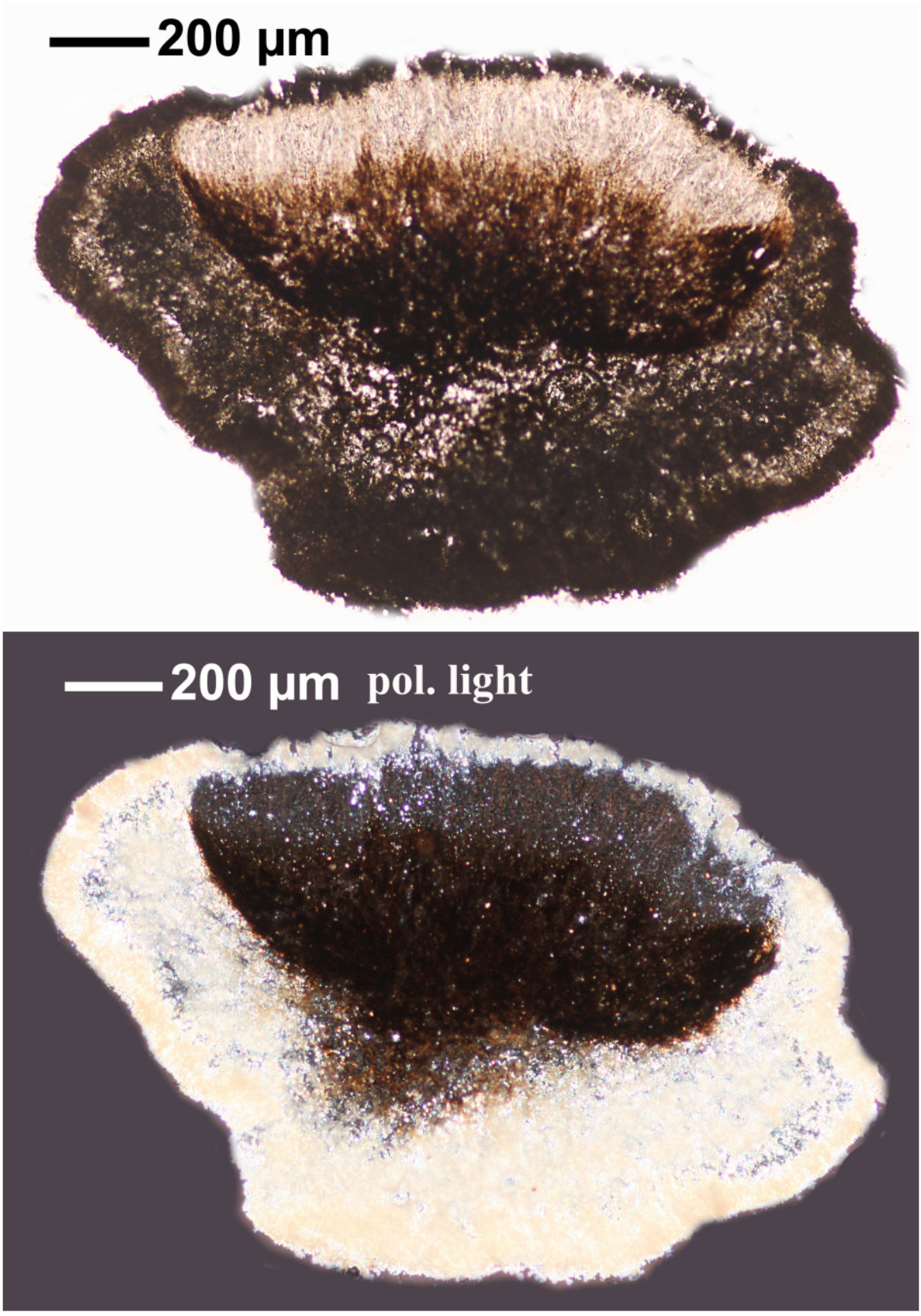
Roccellina arboricola

Roccellina capensis (Nyl.) Tehler (1983)

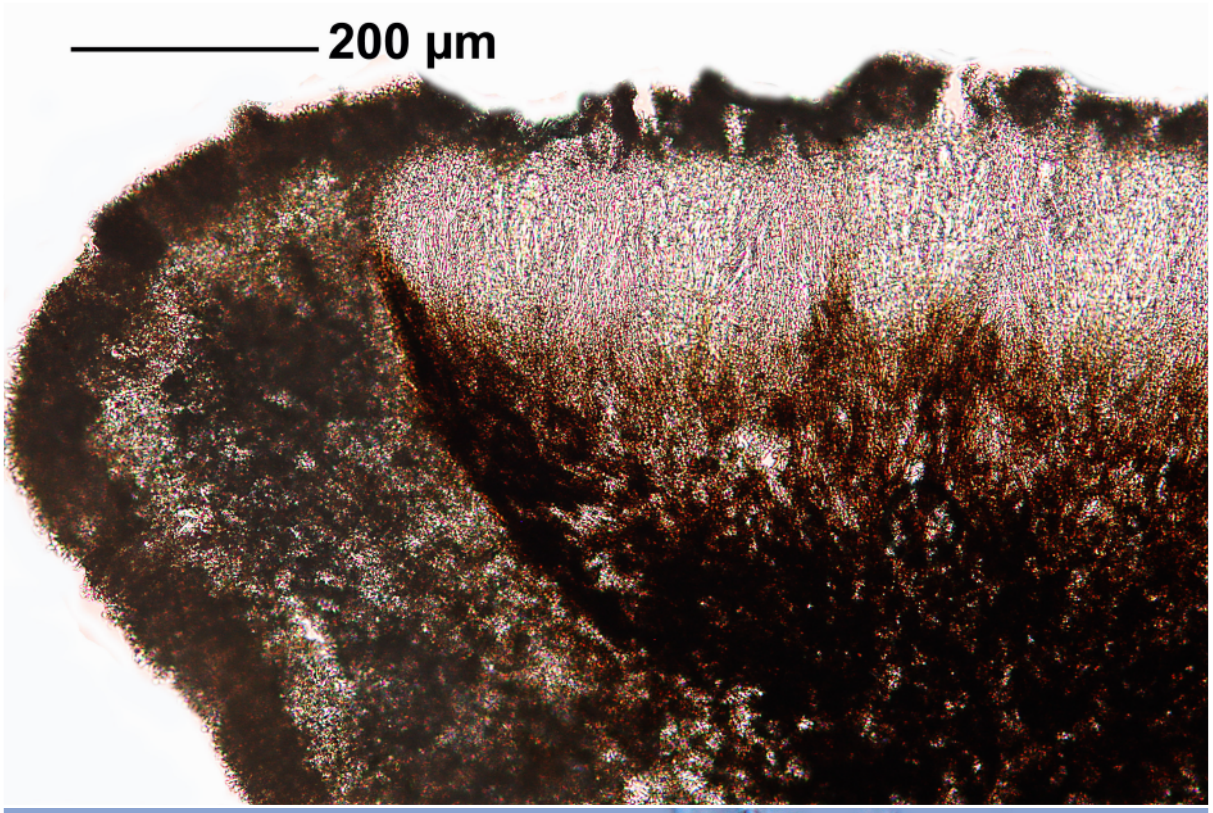
Thallus saxicolous, ochraceous, not sorediate, texture firm, crustose, surface smooth. Cortex branched to intermediate type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 19–24 × 5–6 µm. Cortex C + red, K –, Pd –, subcortex C + red, medulla C –, major substance lecanoric. – S. Africa.

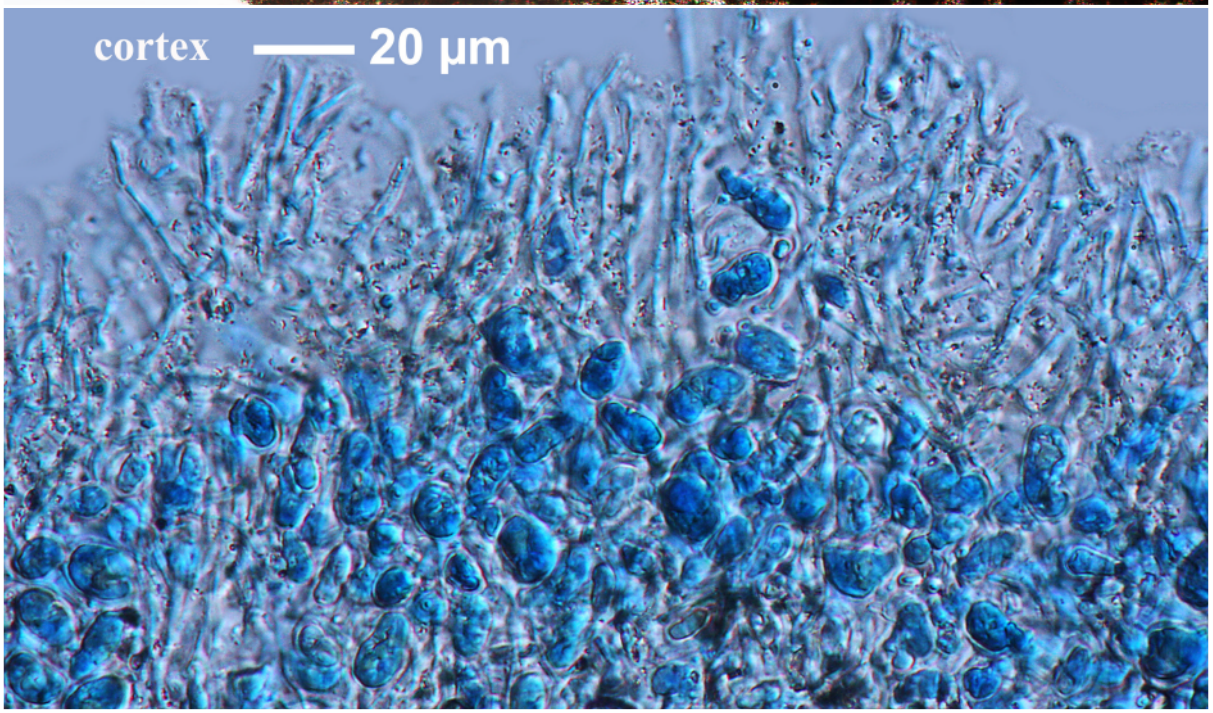
South Africa, Cape Province, District of Knysna, The Heads, two large cliffs flanking the inlet to Knysna Bay, on somewhat protected and shaded, strongly inclined, superficially incrusted and hardened sandstone faces, partly accompanied by smaller individuals of *Roccella* „*arnoldii* Vain.“ and (or) *Roccella linearis* (Ach.) Vain., 10-20 m elev., SW exposition, gregarious. Leg. et det. G. Follmann Feb. 1990. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensibus Editi Nr. 487. [11671]





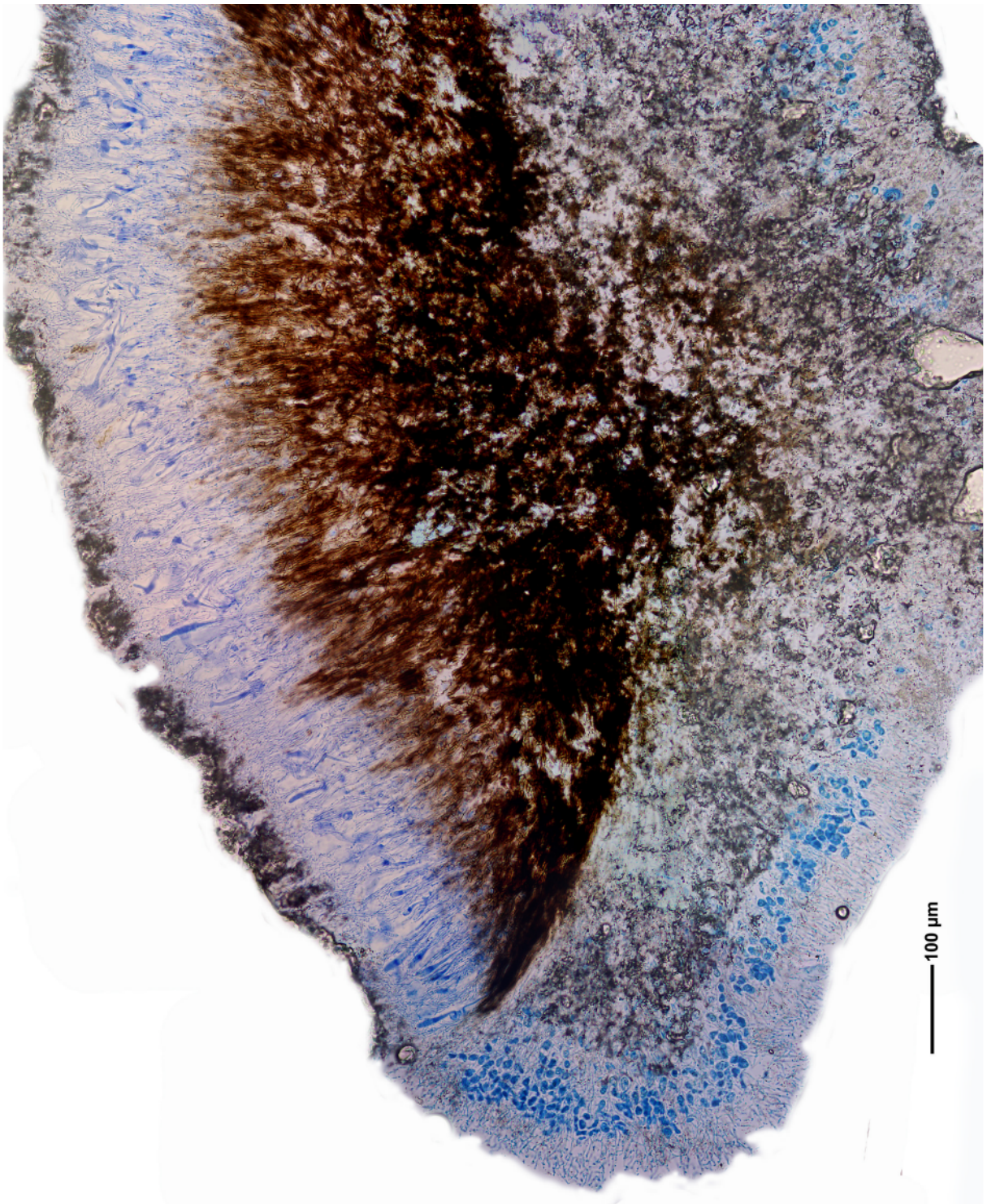
Roccellina capensis



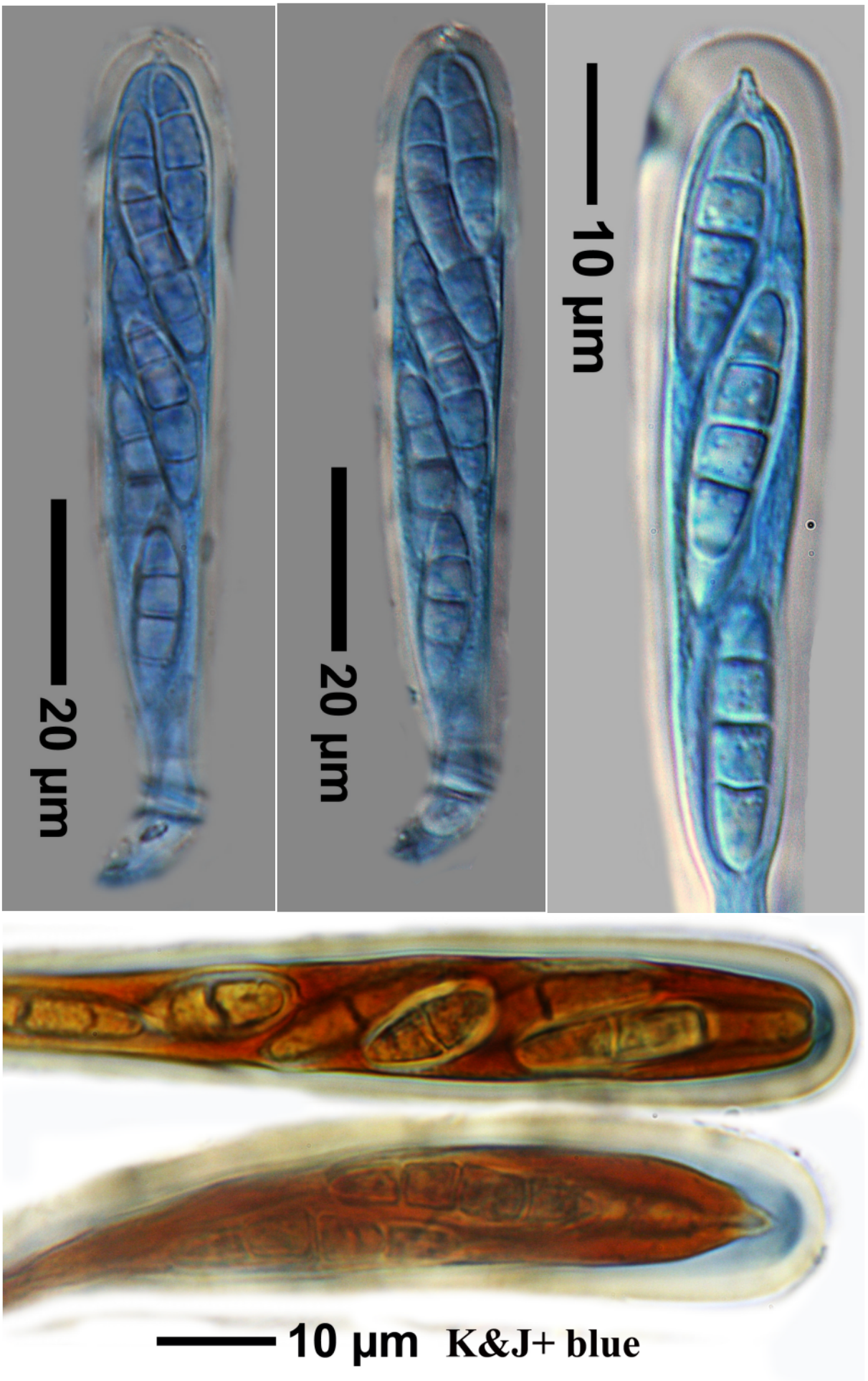




Roccellina capensis



Roccellina capensis

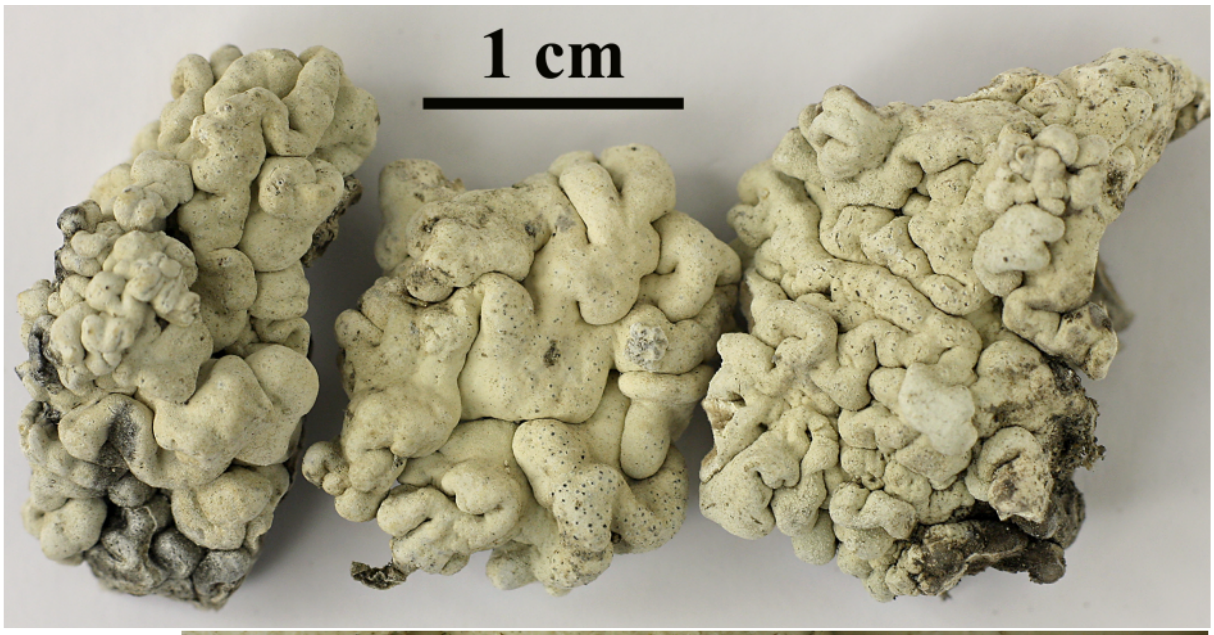


Roccellina capensis

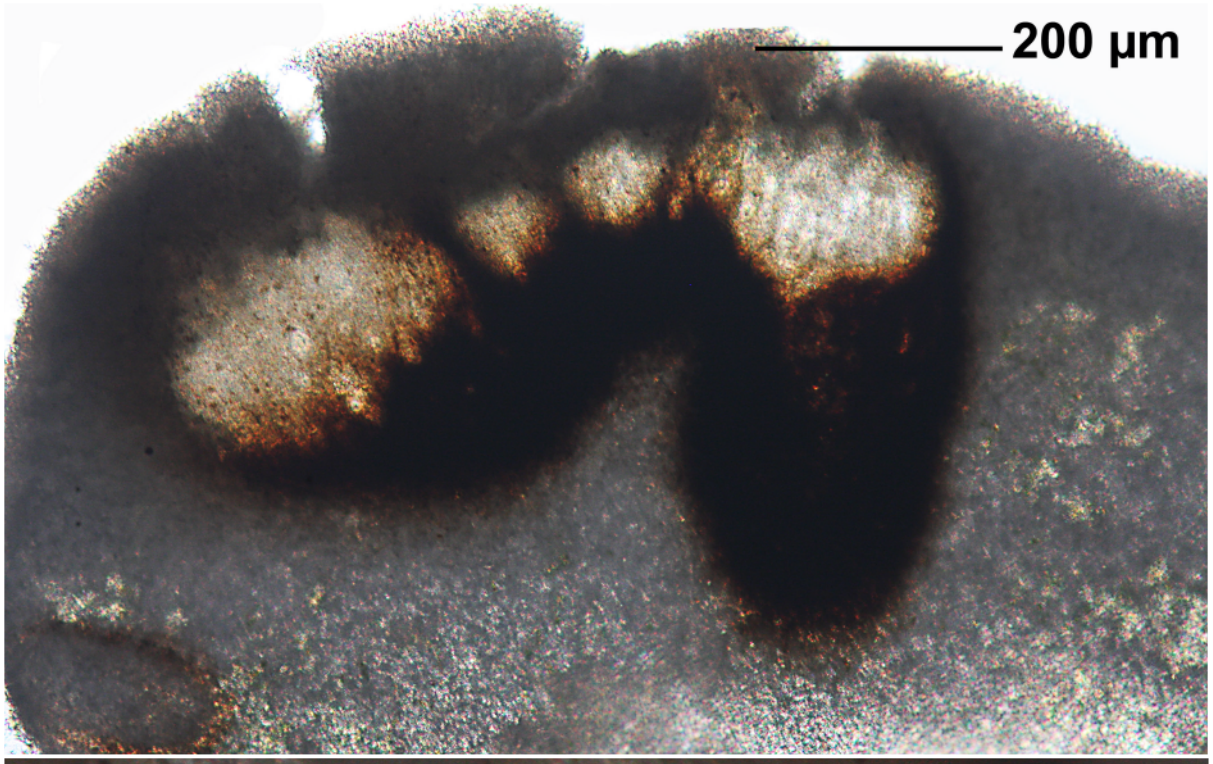
Roccellina cerebriformis (Mont.) Tehler (1983)
Chiodecton cerebriforme Mont. (1852)
Lobodirina cerebriformis (Mont.) Follmann (1968)

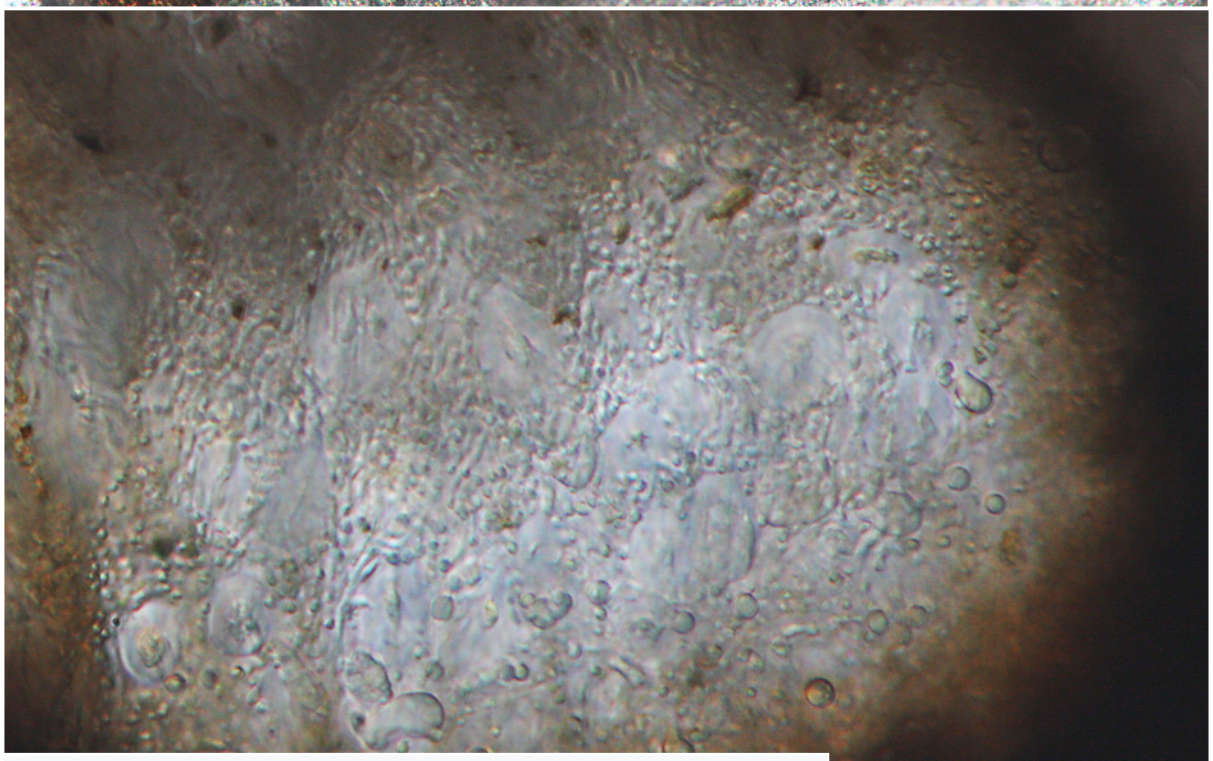
Thallus saxicolous, ochraceous, not sorediate, texture firm, crustose, surface smooth, medulla blackish below. Cortex branched type. Apothecia dissected. Hypothecium black. Ascospores hyaline, 3-septate, 20–23 × 3.5–5.5 µm. Cortex C –, K –, Pd –, subcortex C –, medulla C –, major substance roccellic. – Chile, Peru.

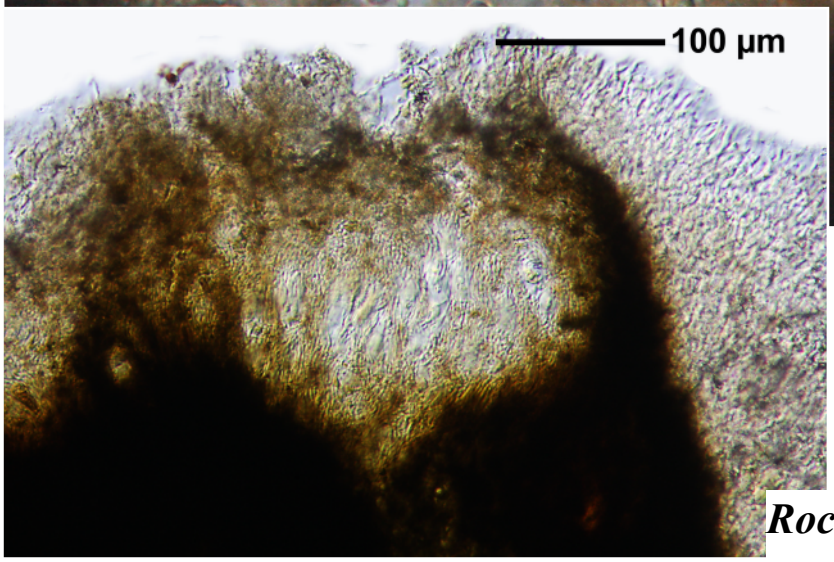
Chile, Antofagasta, Nature Reserve Quebrada de la Chimba northeast of the capital, upper fog-belt, main canyon, on granodioritic rocks of ridges and slopes of the mountainous border, about 400 m, NW-SW expositiuon, gregarious. Leg. et det. G. Follmann Aug. 1993. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 457. [11084]

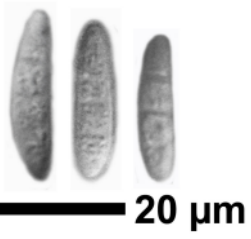




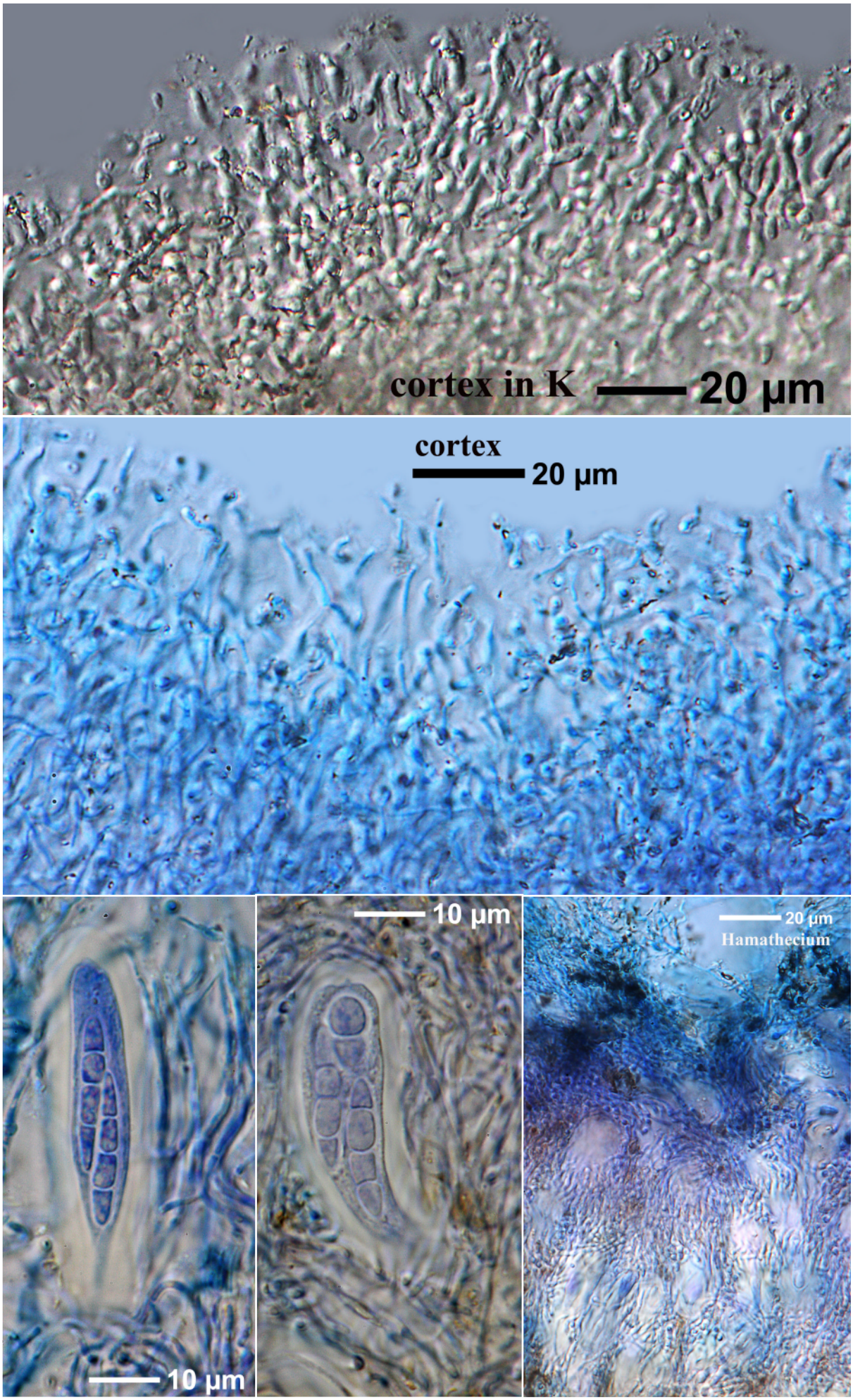








Roccellina cerebriformis

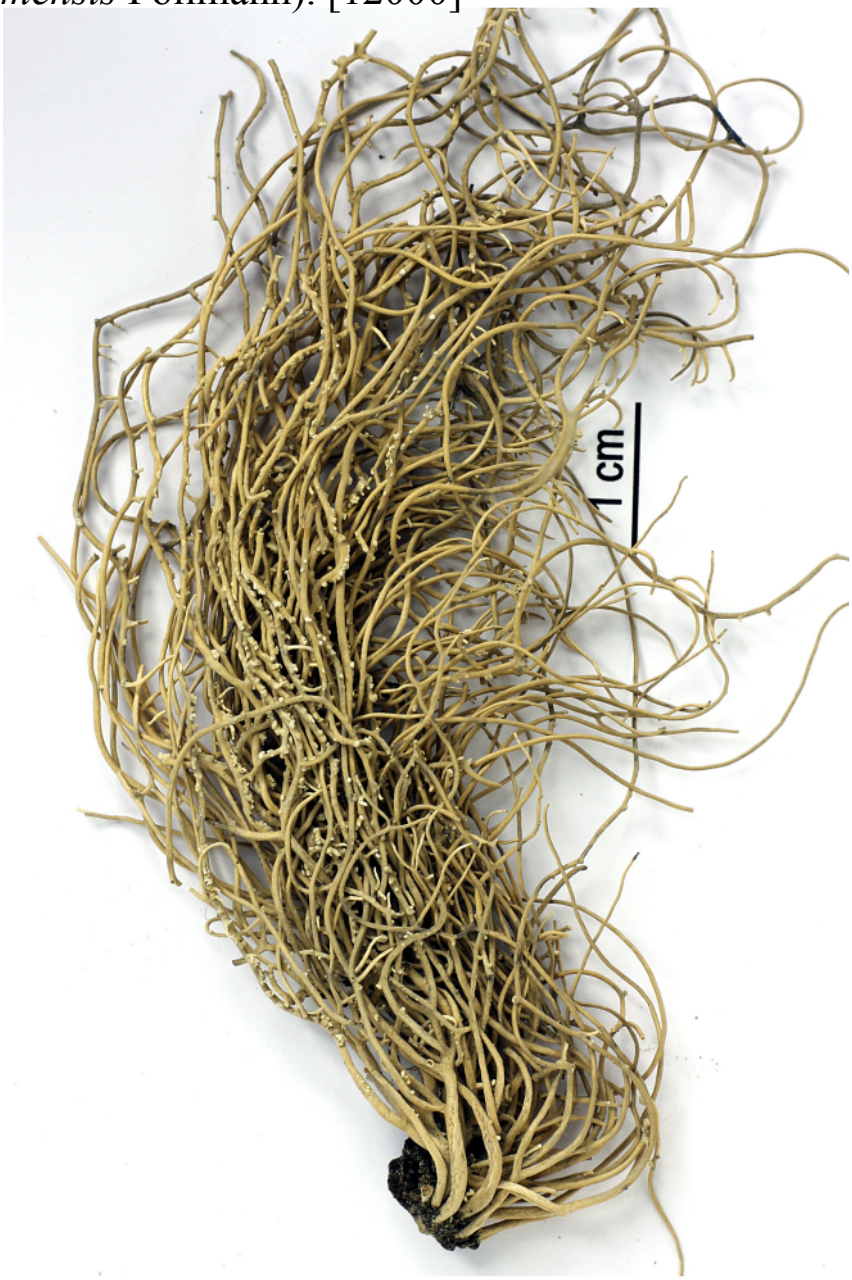


Roccellina cerebriformis

Roccellina cumingiana (Gay) Tehler (2007)
Roccella atacamensis Follmann (1993)
Roccella cumingii Mont. ex Darb. (1898)
Roccella tinctoria var. *cumingiana* Gay in Mont. (1852)

Thallus saxicolous, grey, sorediate, texture firm, cylindrical, surface dull, holdfast internally white to brown. Cortex dense branched type. Apothecia unknown. Cortex C + red, K –, Pd –, subcortex C + red, medulla C –, major substance lecanoric. – Chile.

Nordchile: Antofagasta, Mejillones Peninsula, southwestern slope of Cerro Moreno, central fog-belt, on half-shaded vertical or overhanging faces of granodioritic boulders, ca. 500 m, SW expon., locally abundant. Leg. G. Follmann 08.1991. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 444. (ISOTYPUS of *Roccella atacamensis* Follmann). [12000]



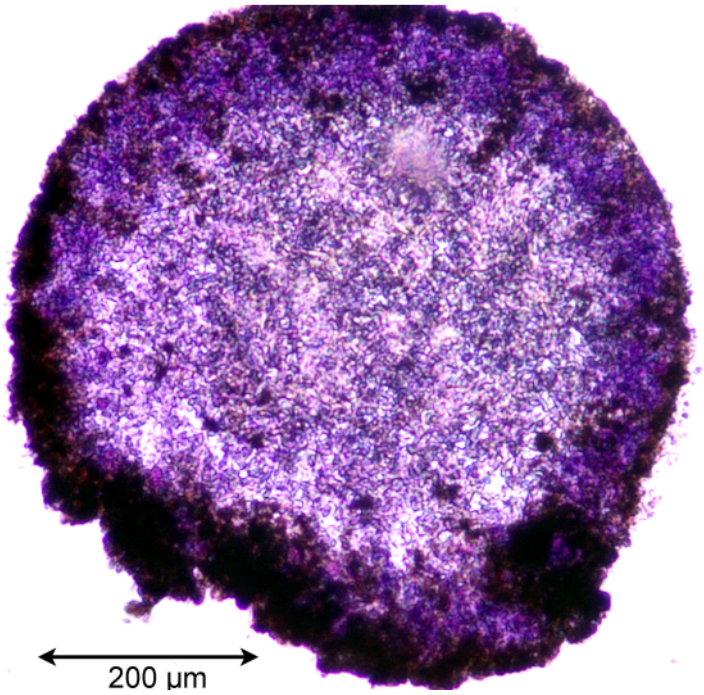


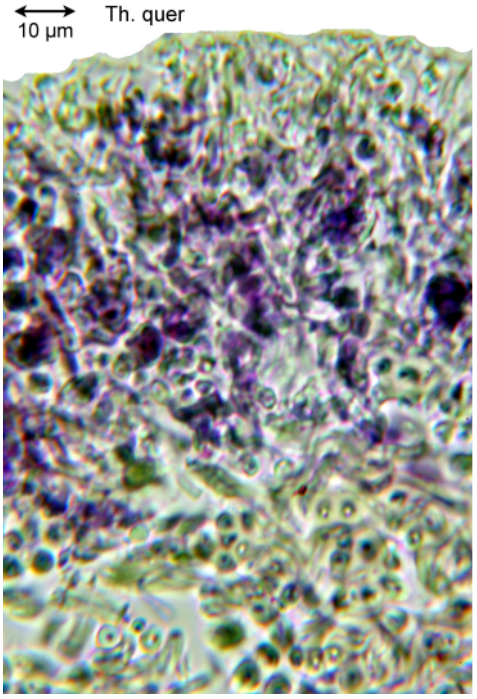
Roccellina cumingiana

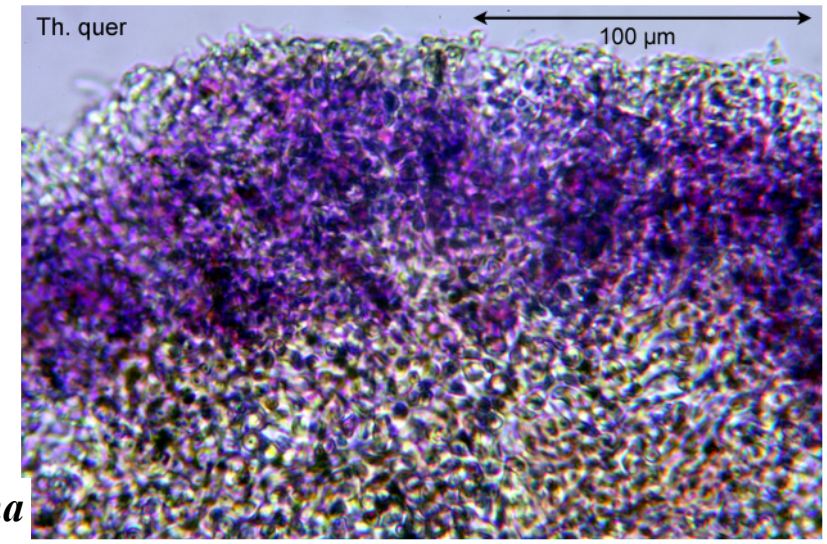


Roccellina cumingiana







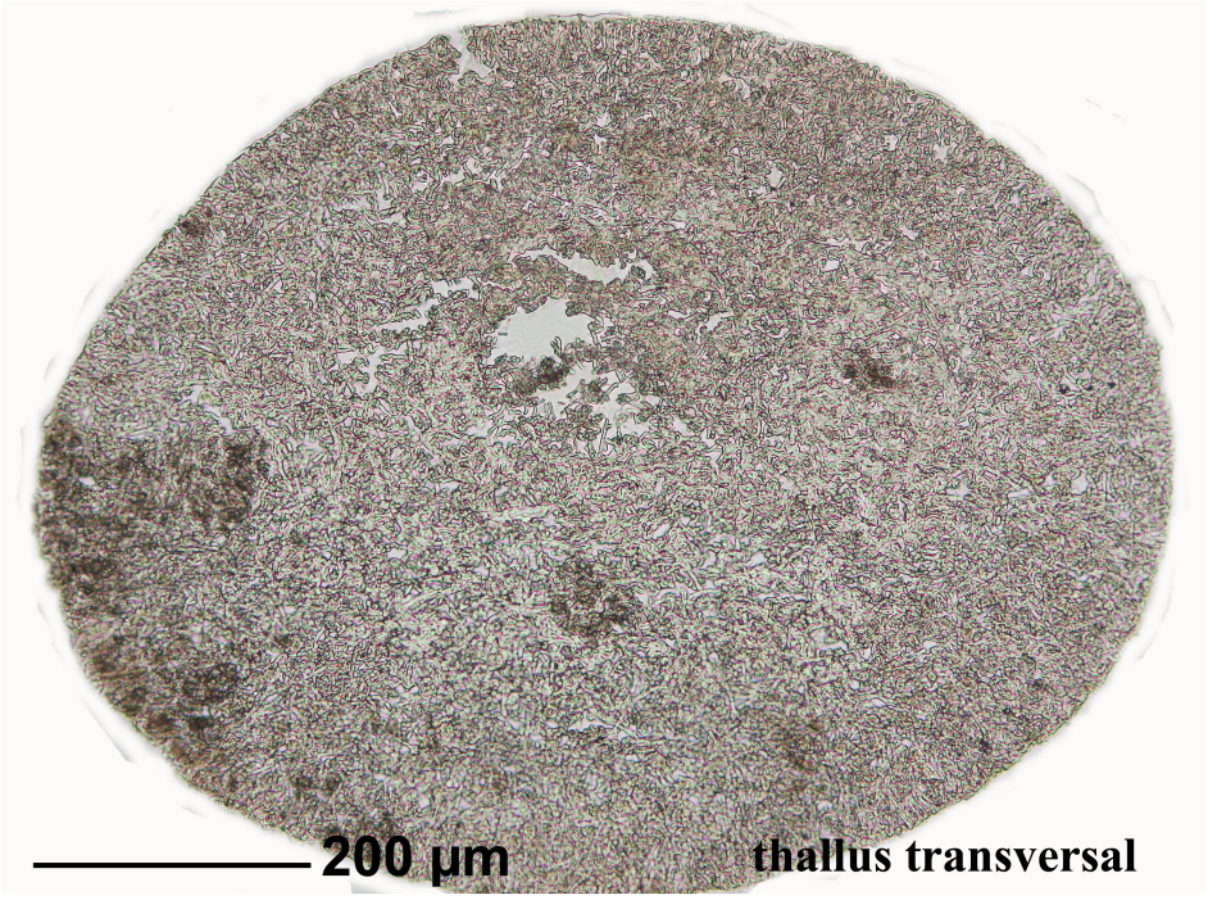


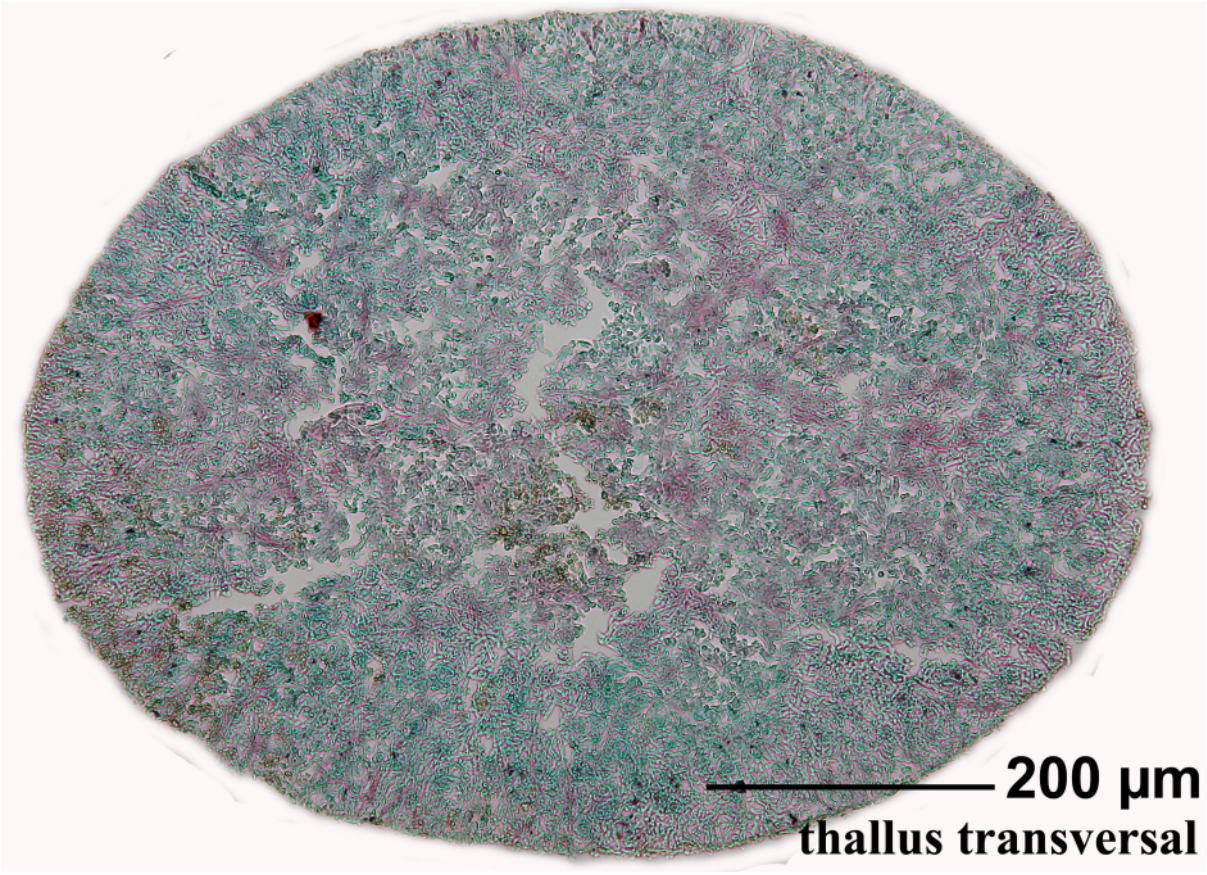
Roccellina cumingiana

Roccellina cumingiana (Gay) Tehler (2007)

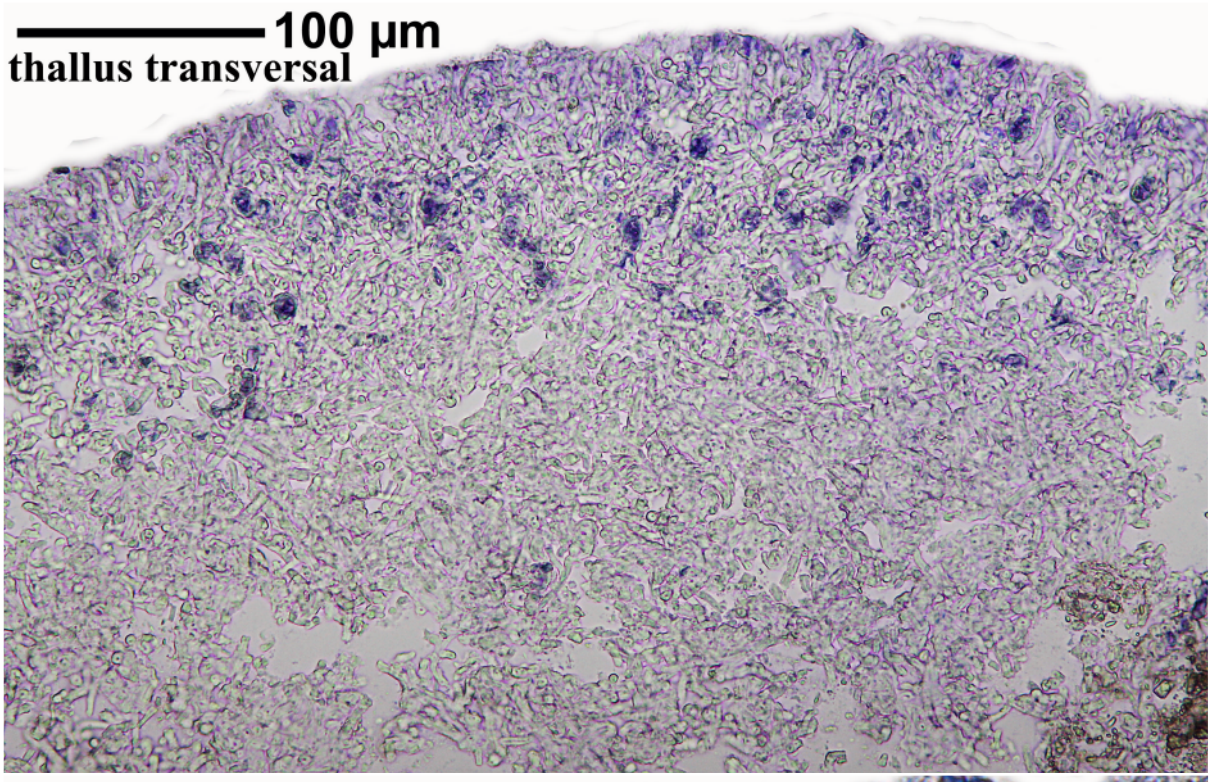
Chile, Prov. Coquimbus, Parque National Fray Jorge, Alto de Telinay, on coastal rock. Leg. L.I. Ferraro & S. Rédon Nr. 2122, 12 May 1980, det. Aptroot. [ABLFerraro2122]

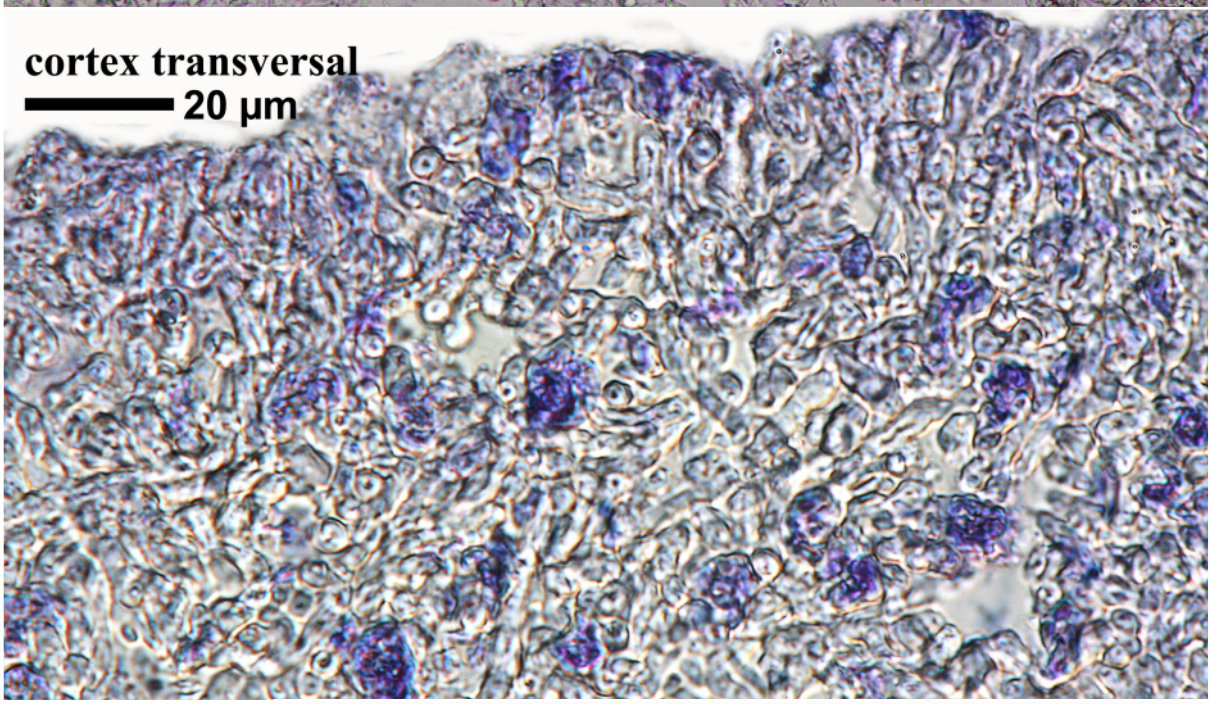


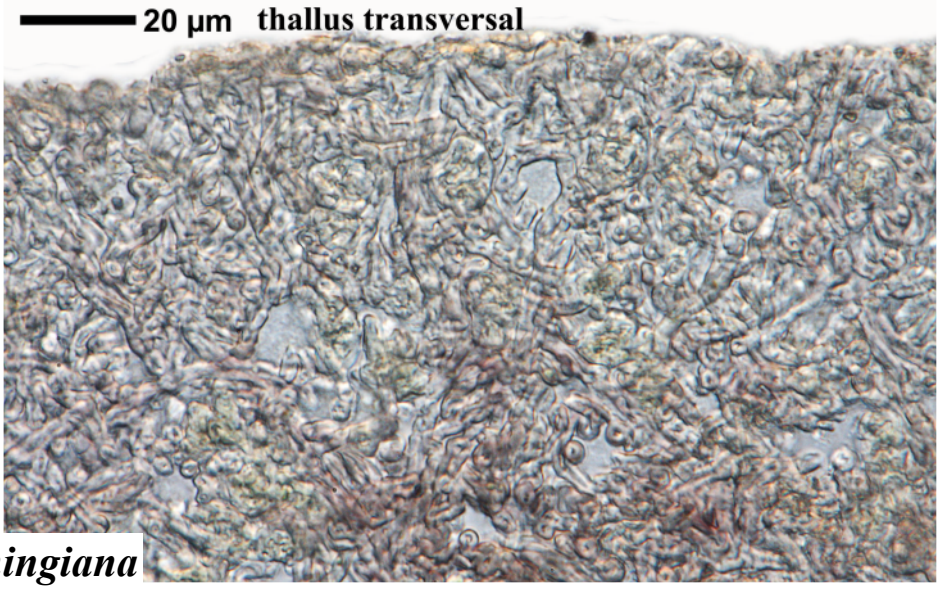




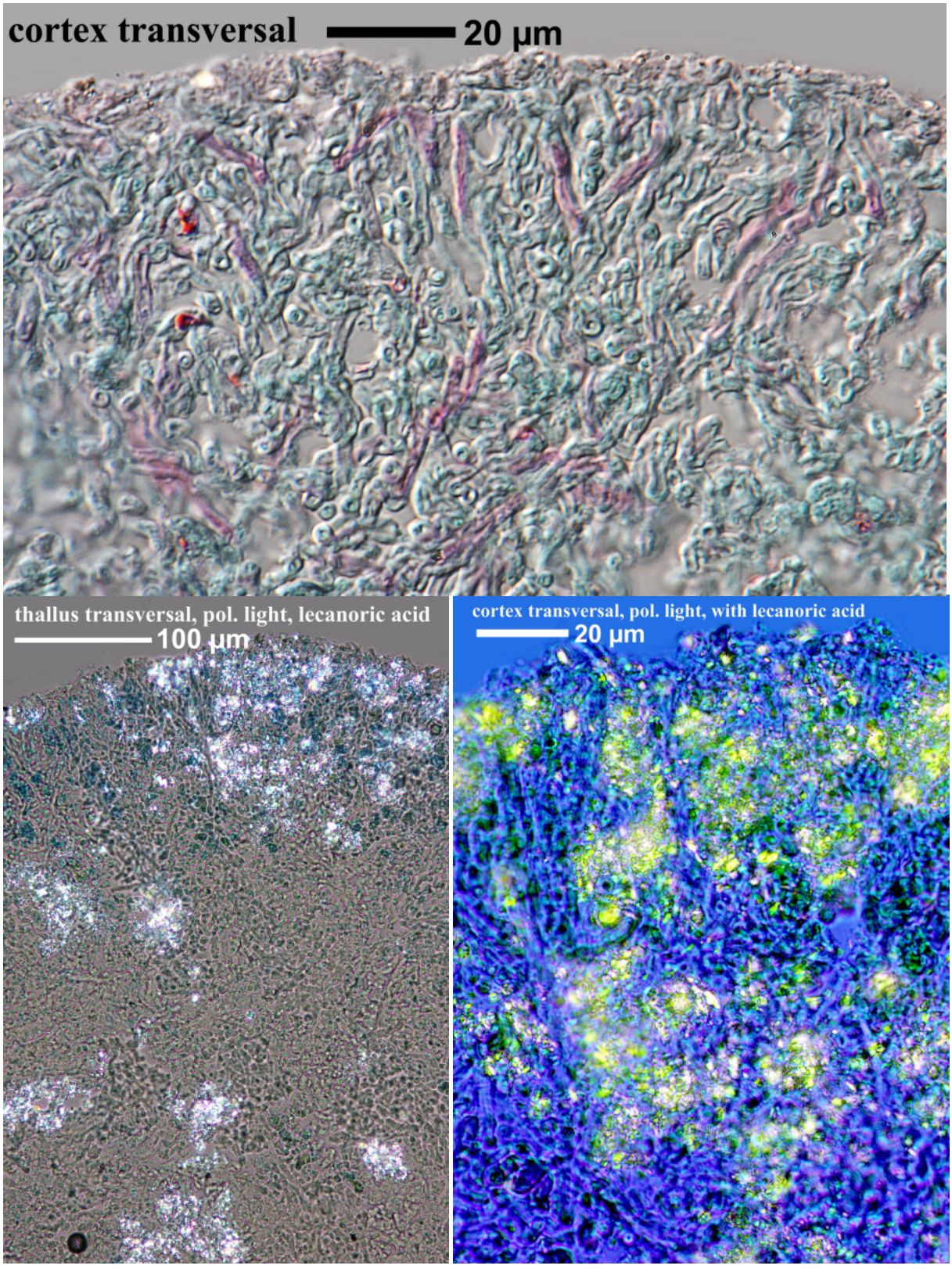
Roccellina cumingiana



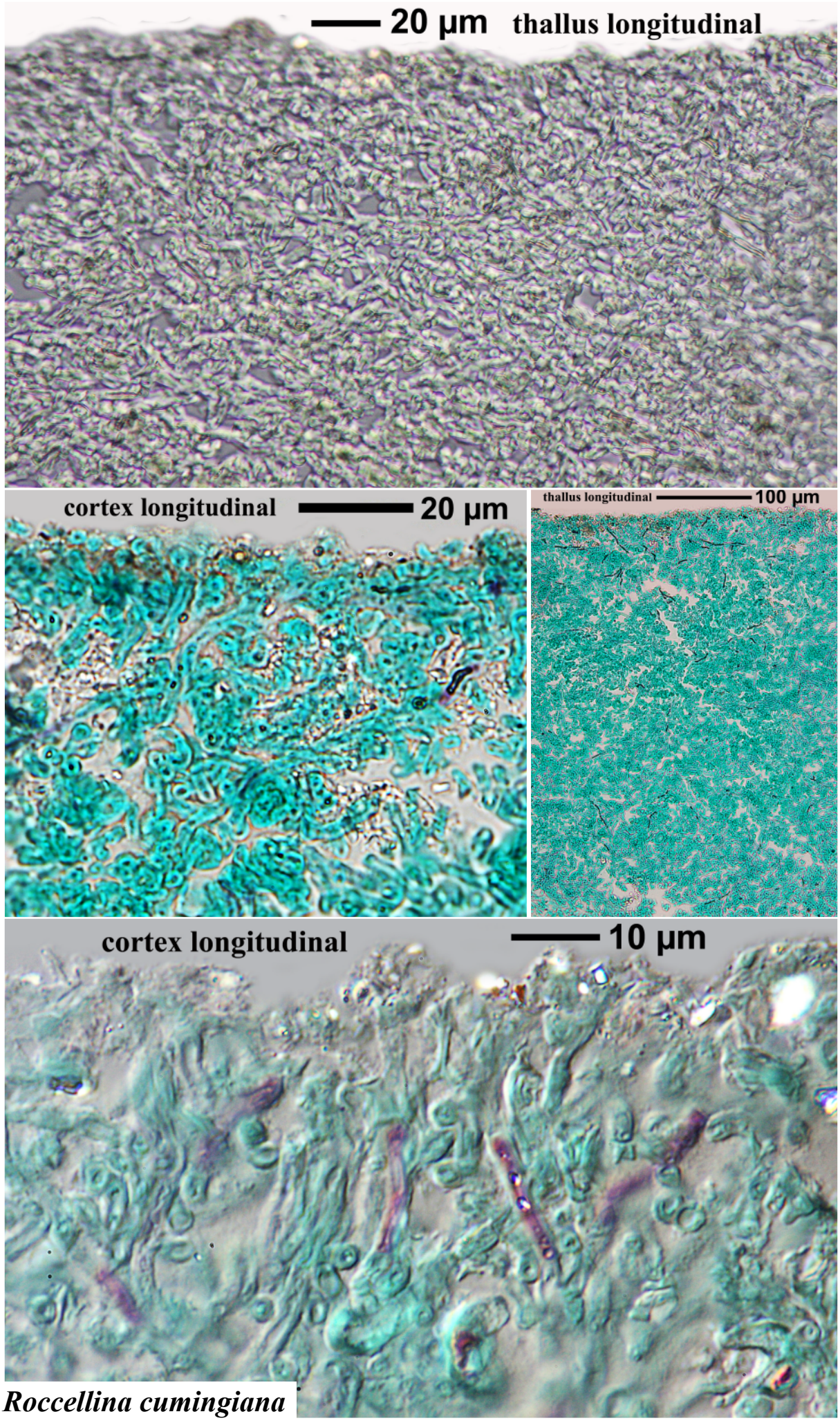




Roccellina cumingiana



Roccellina cumingiana

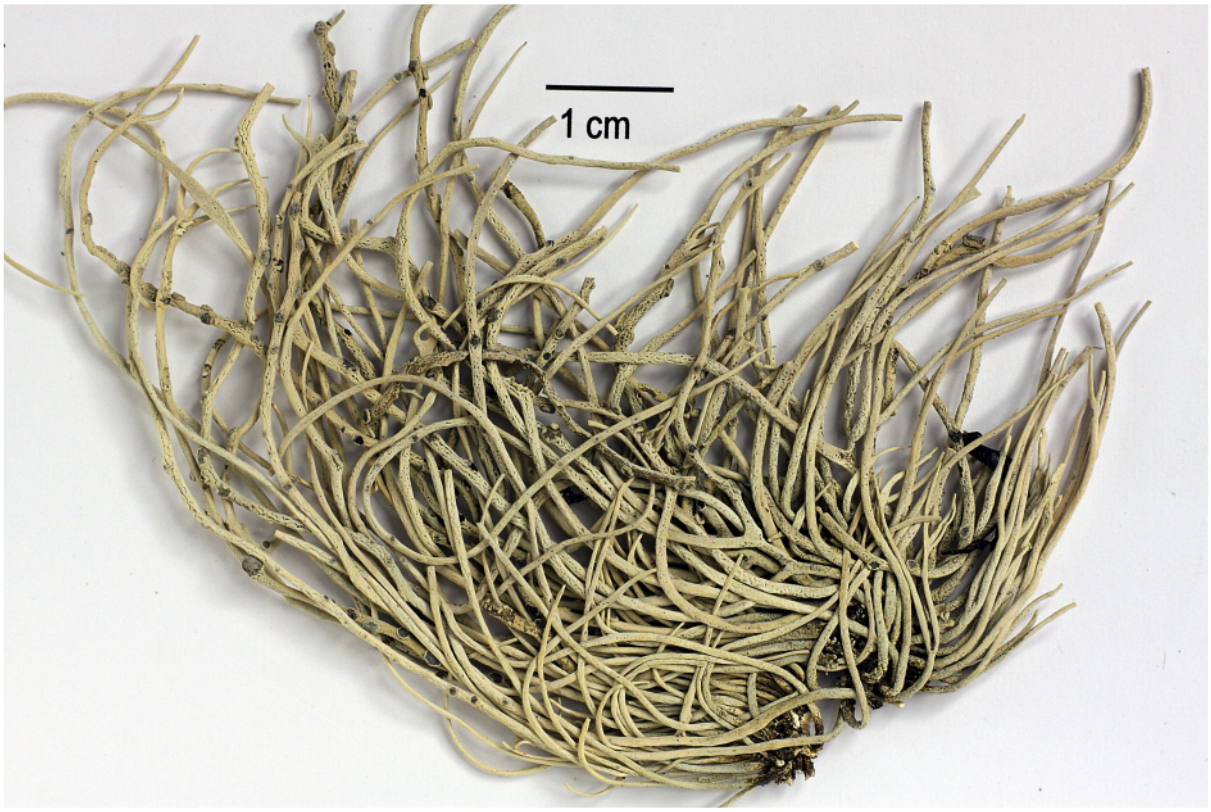


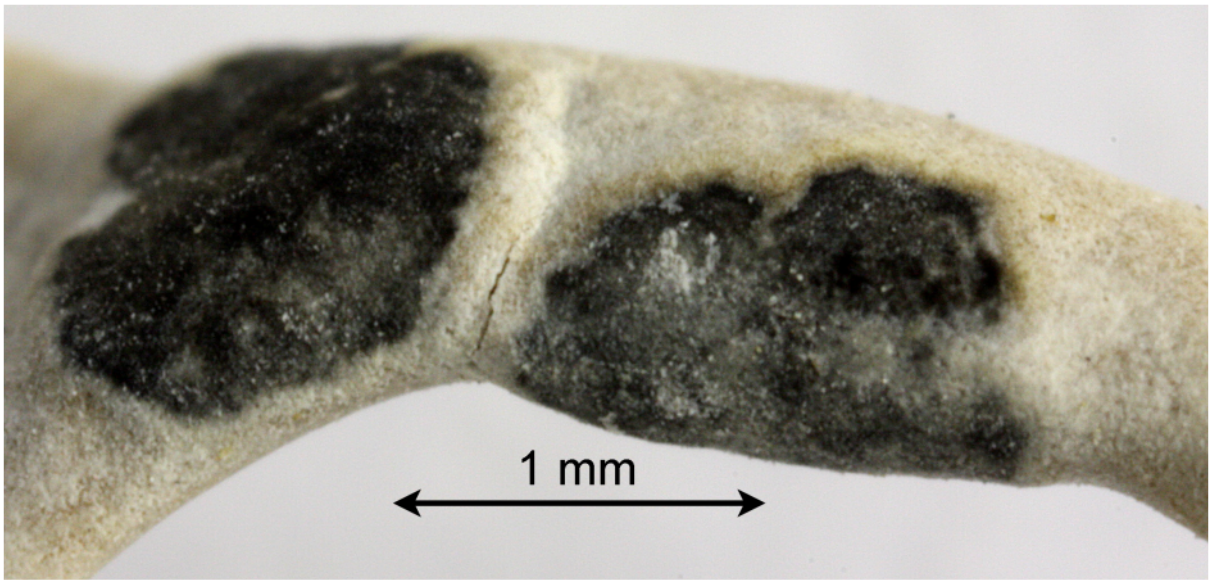
Roccellina cumingiana

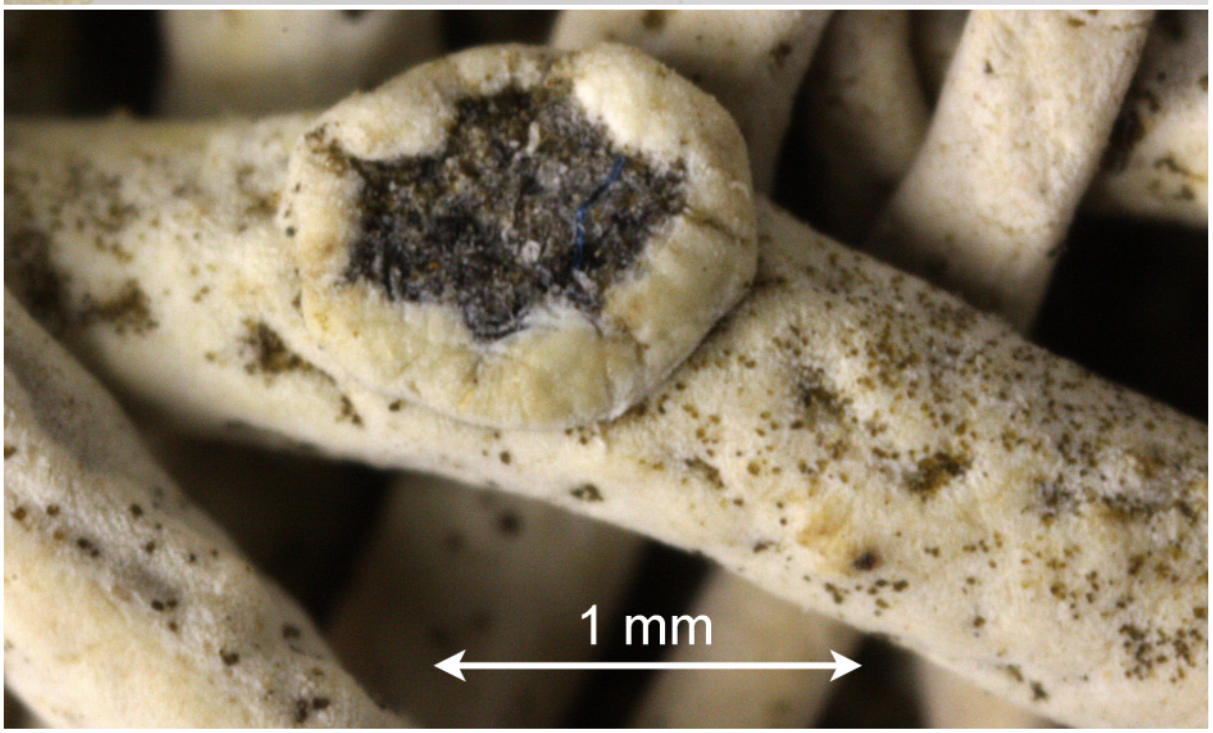
Roccellina hypomecha (Ach.) Tehler (2007)
Roccella capensis Follmann (1994)
Roccella hypomecha (Ach.) Bory (1828)
Roccella hypomecha var. *benguellensis* (Welw.) Vain. (1901)
Roccella tinctoria var. *hypomecha* (Ach.) Ach. (1814)

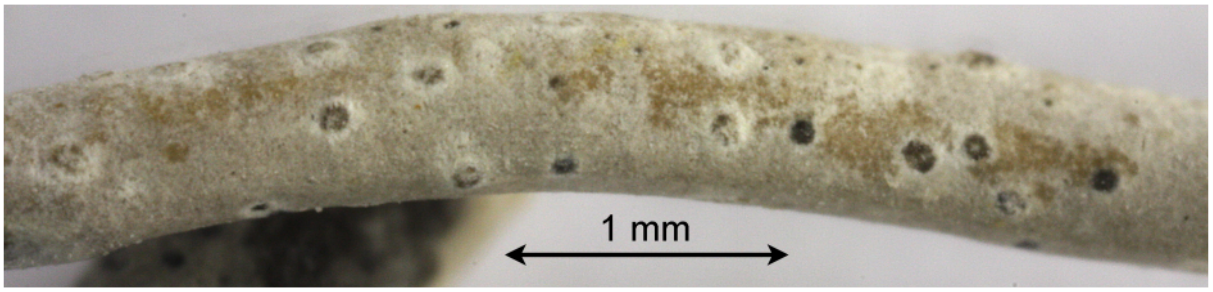
Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface dull, holdfast internally white to brown. Cortex intermediate to branched type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 18–19 × 5–6 µm. Cortex C –, K –, Pd –, subcortex C –, medulla C – or + red, major substances ± roccellic, ± lecanoric. – Madeira, Canary Isles, Cape Verde Islands, W. & S. Africa.

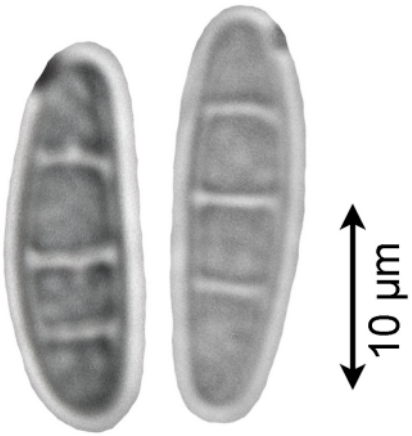
South Africa: Cape Province, District of Simonstown, Cape of Good Hope Nature Reserve, below Pehram´s Point, on exposed vertical walls of rugged siliceous rock within reach of the marine aerosol, avoiding fissures, with Roccellina capensis, 30-50 m. Leg. G. Follmann 02.1990. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 486 (as *Roccella hypomecha*). [11670]



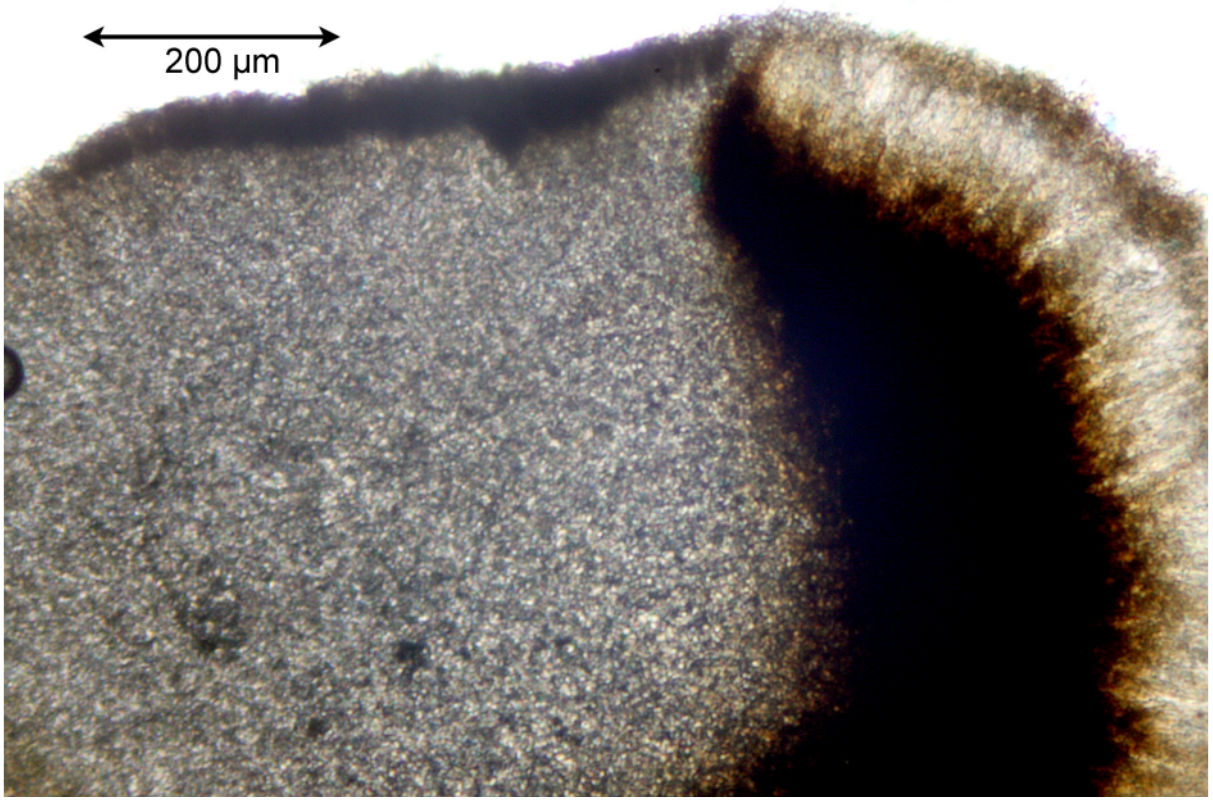


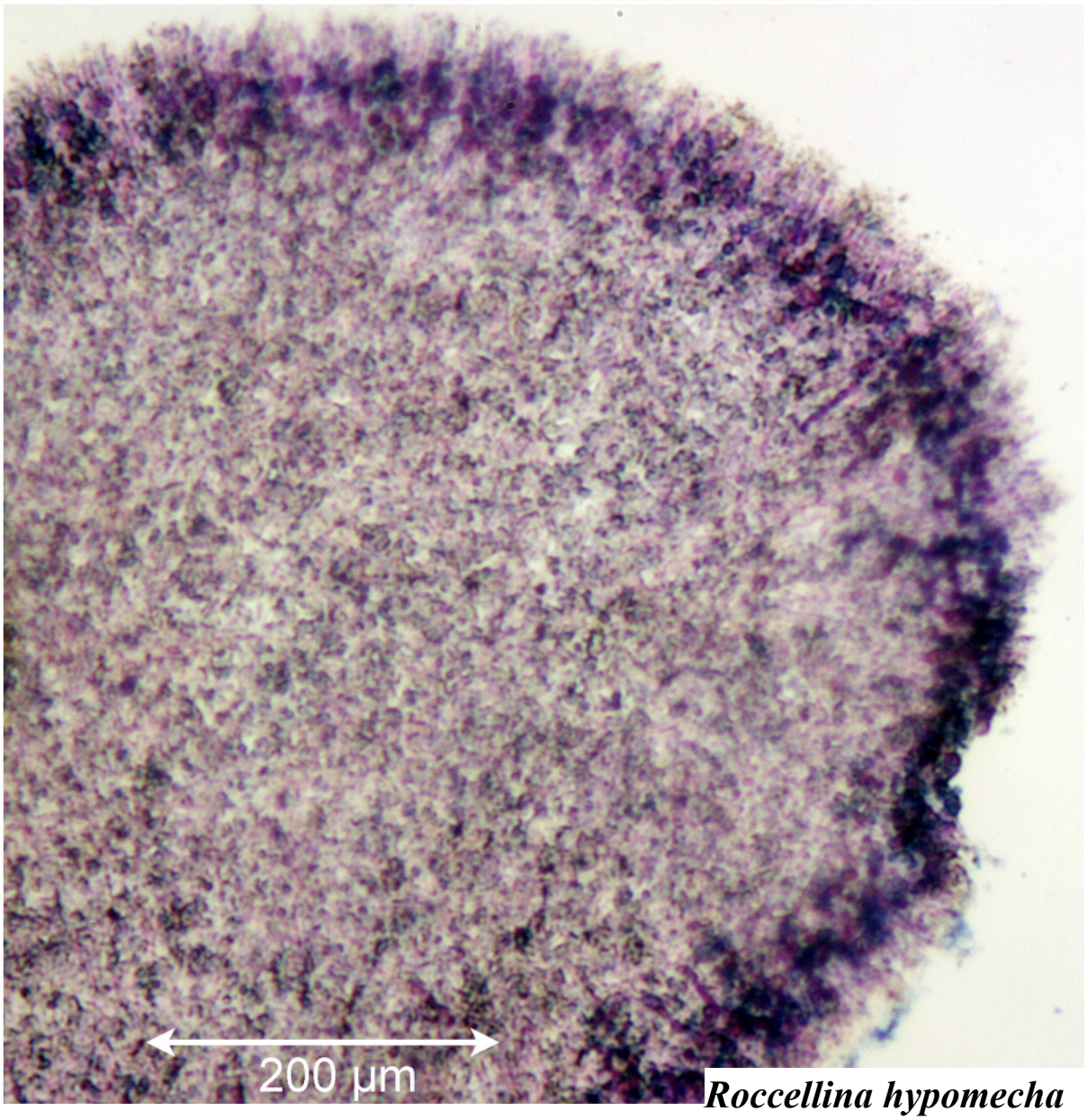




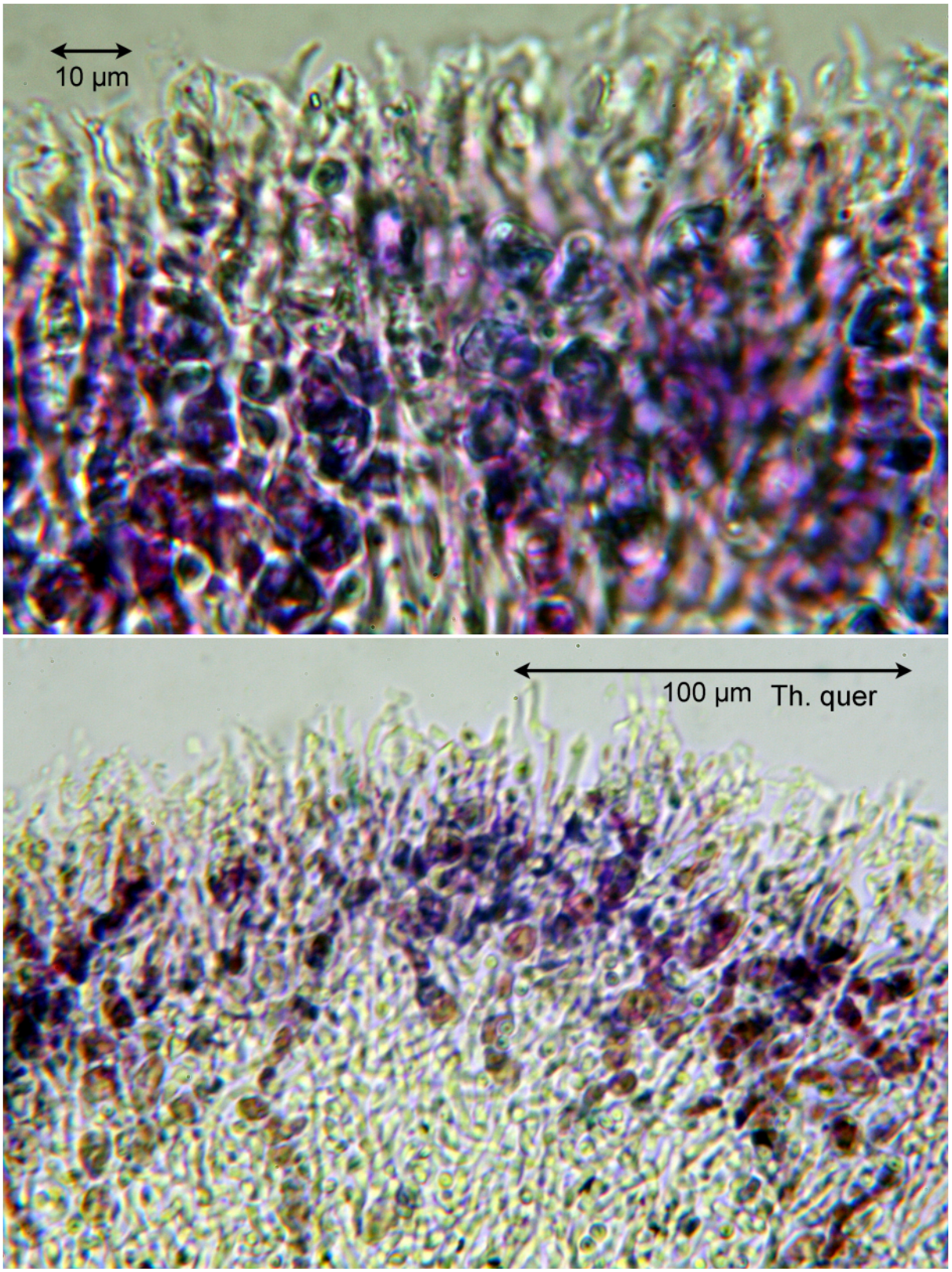


Roccellina hypomecha





Roccellina hypomecha

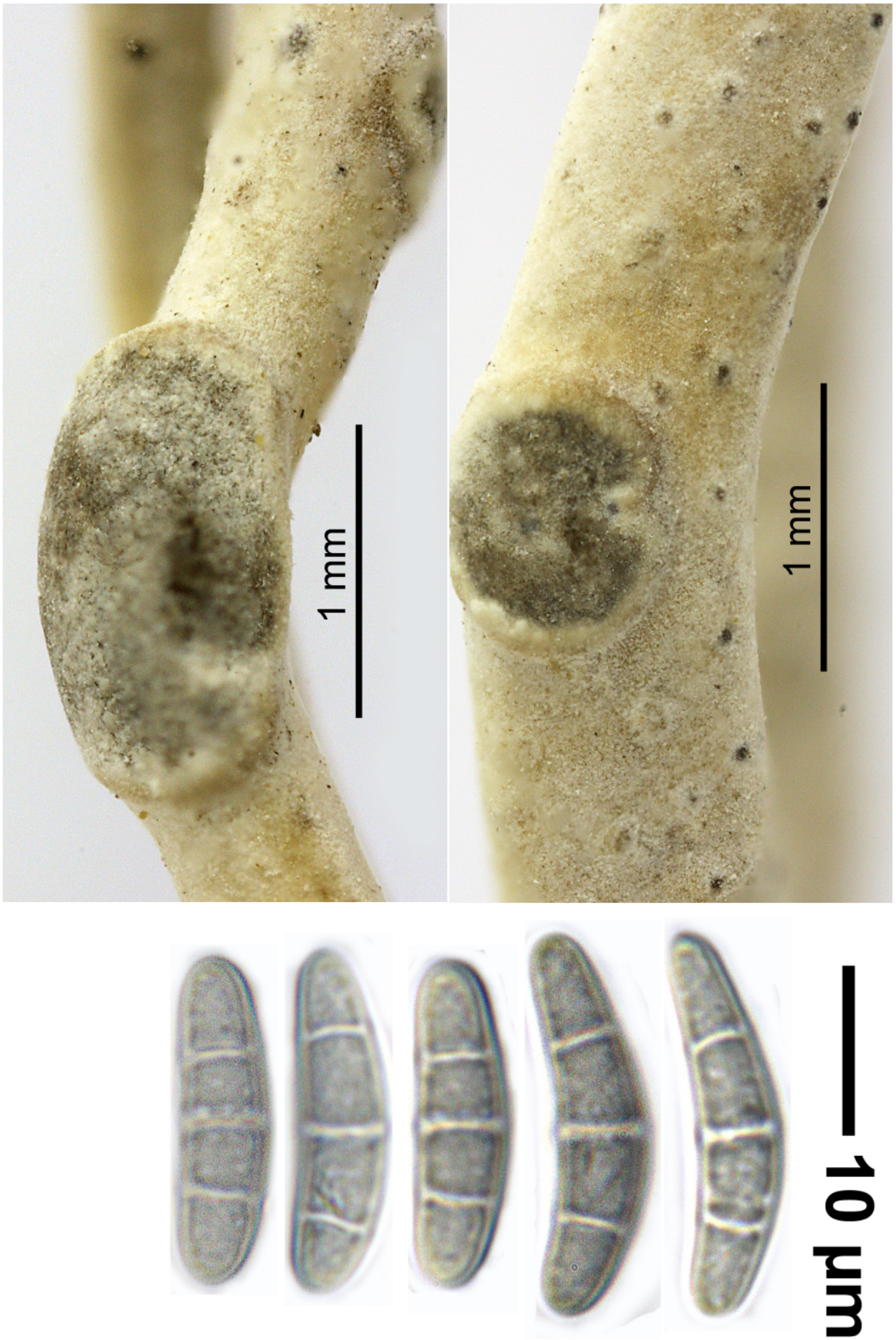


Roccellina hypomecha

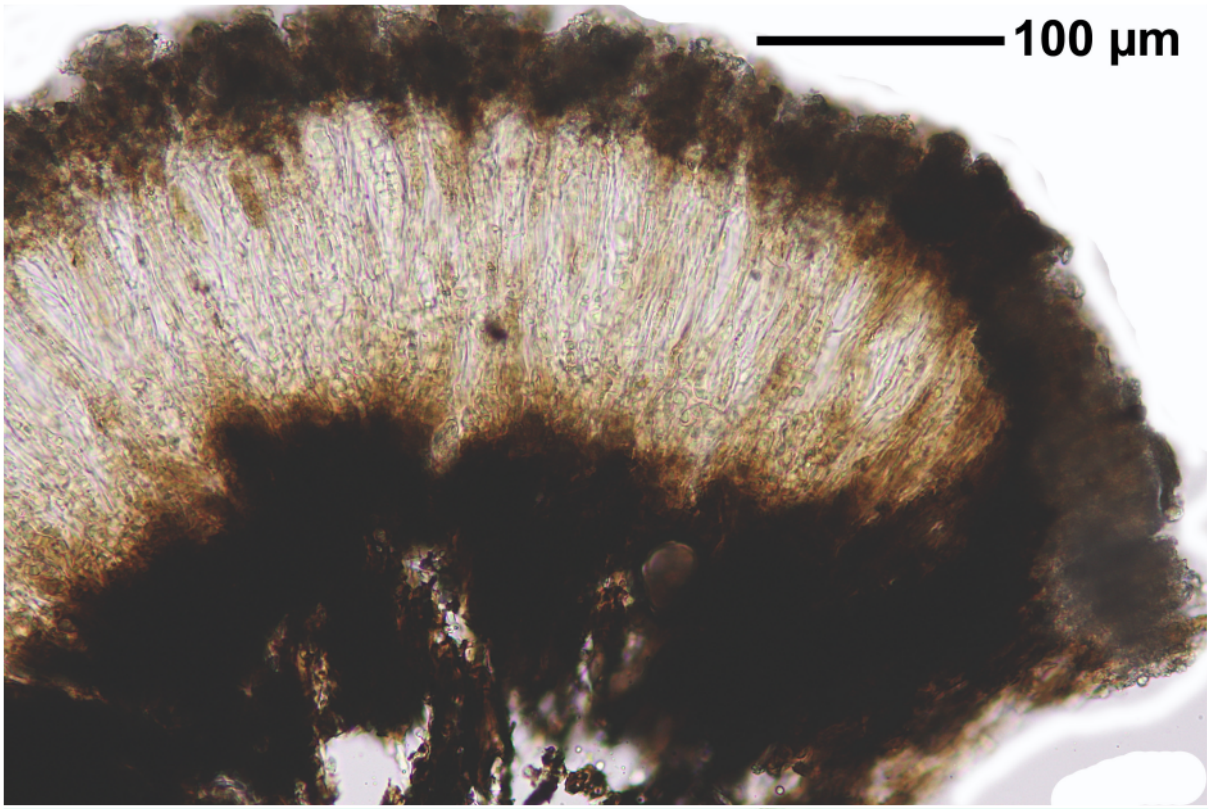
Roccellina hypomecha (Ach.) Tehler (2007)

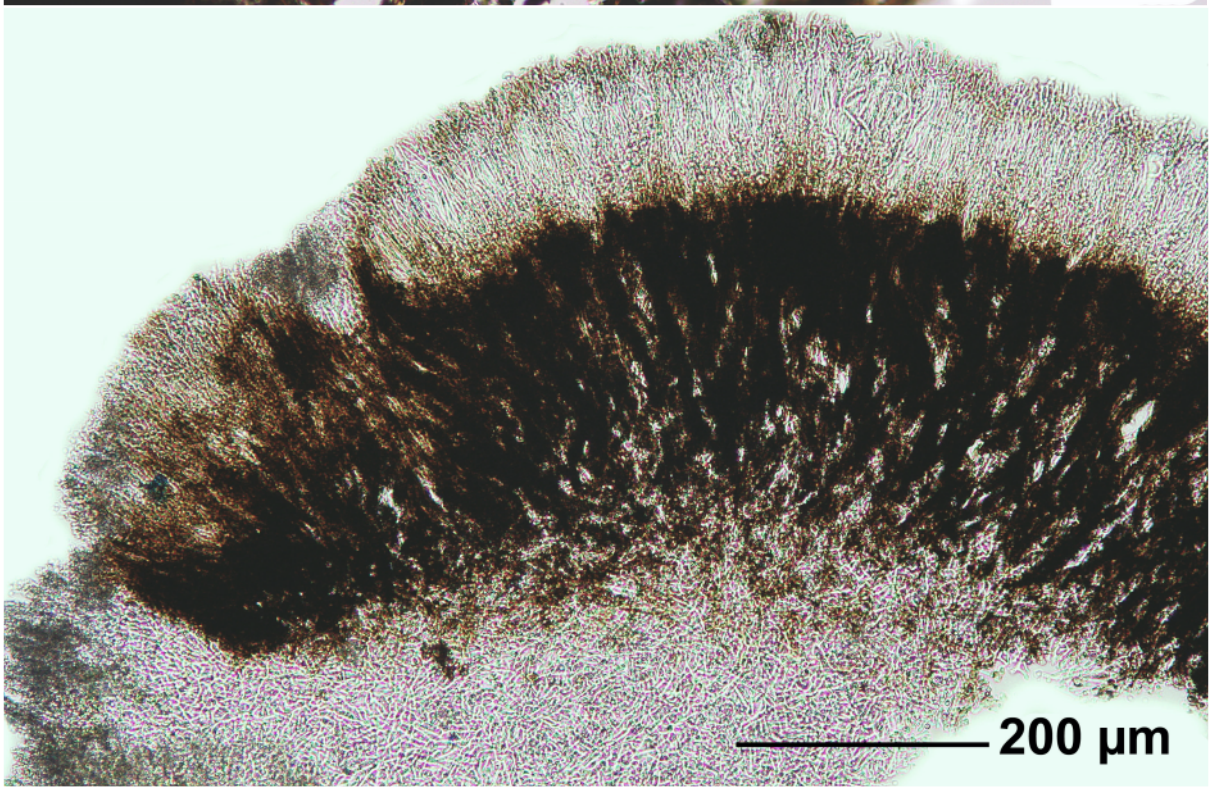
South Africa. Cape province, Simonstown District, Cape of Good Hope Nature Reserve, Pegram's Point (grid 3418 AD), on TMS ledges back from beach. Alt. c. 20 m. Leg. & det. M.E. Hale (no 72759), 21. Jan. 1986. Ex Almborn: Lichenes Africani No. 116. [ALA116]



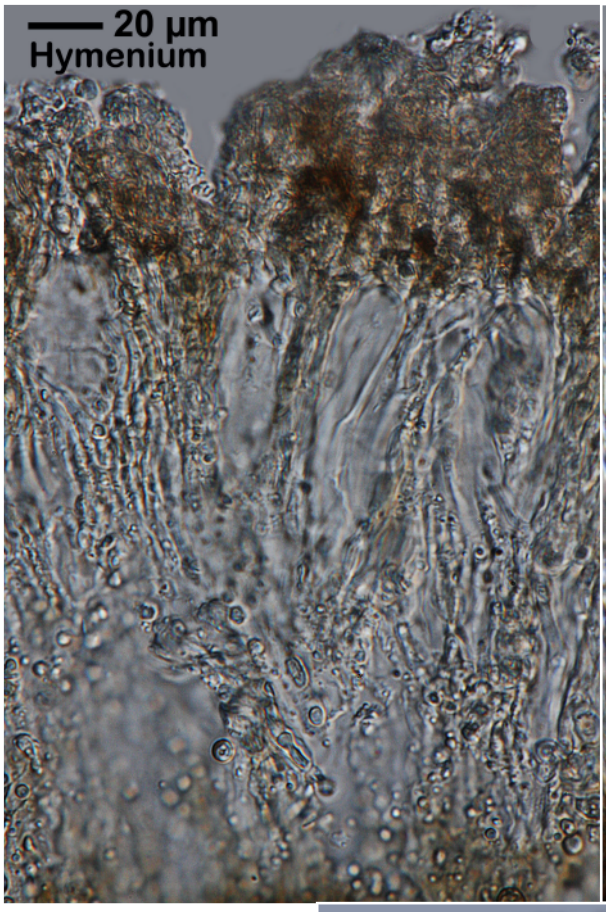


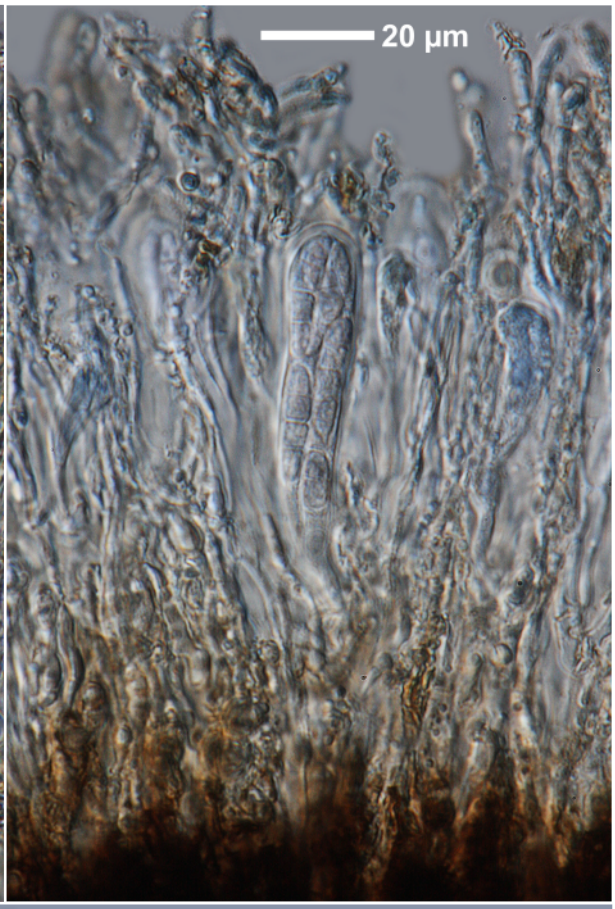
Roccellina hypomecha

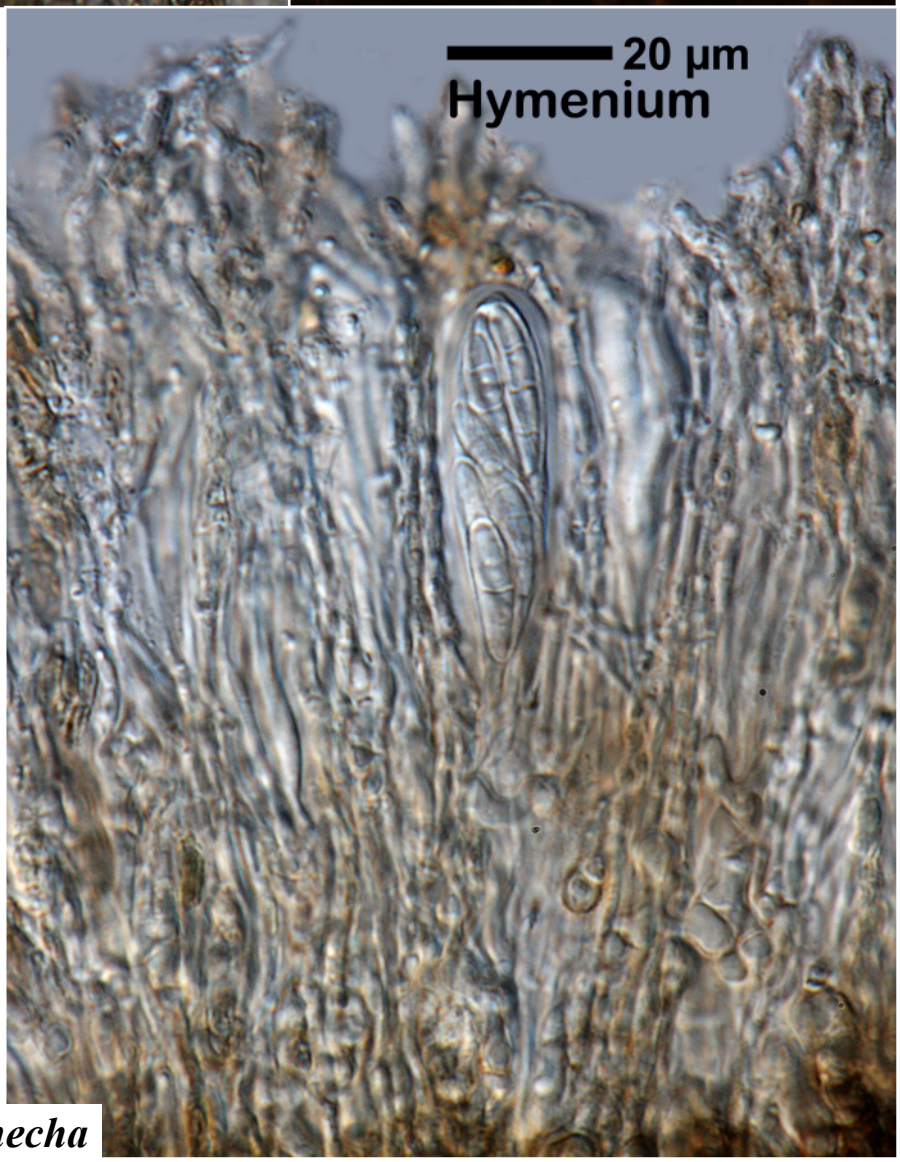




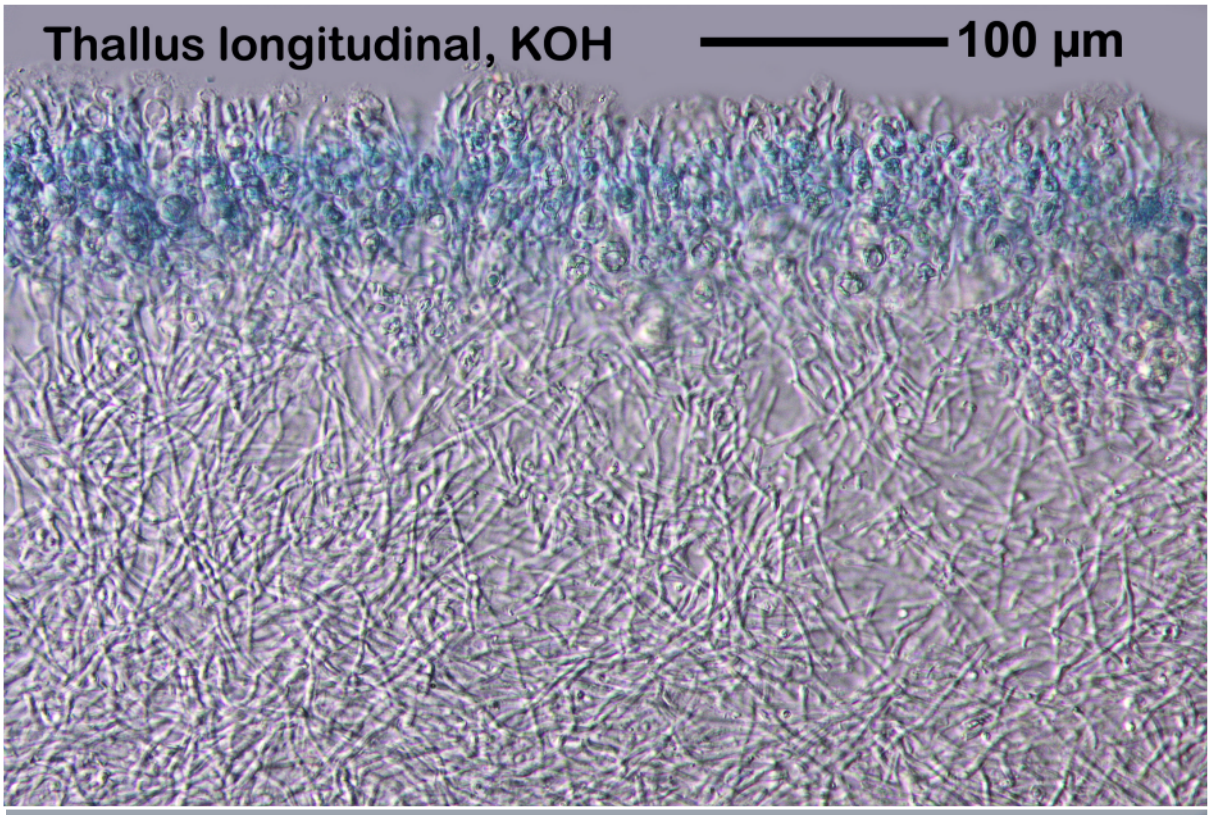
Roccellina hypomecha

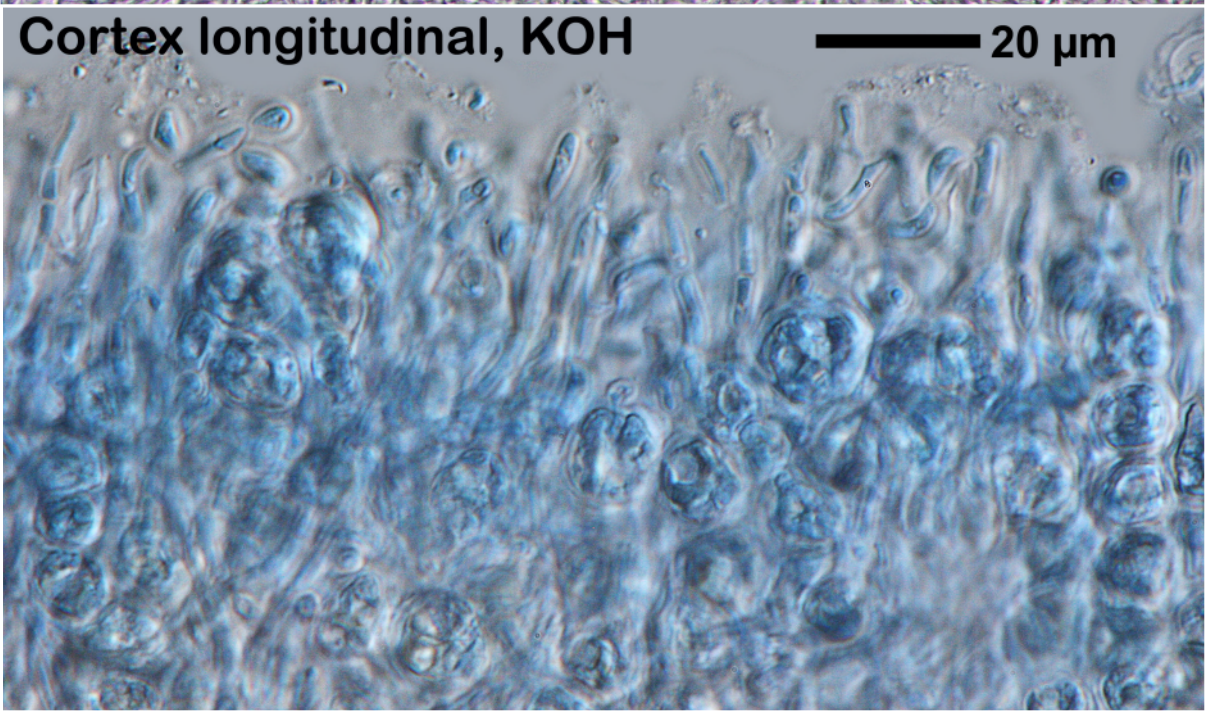




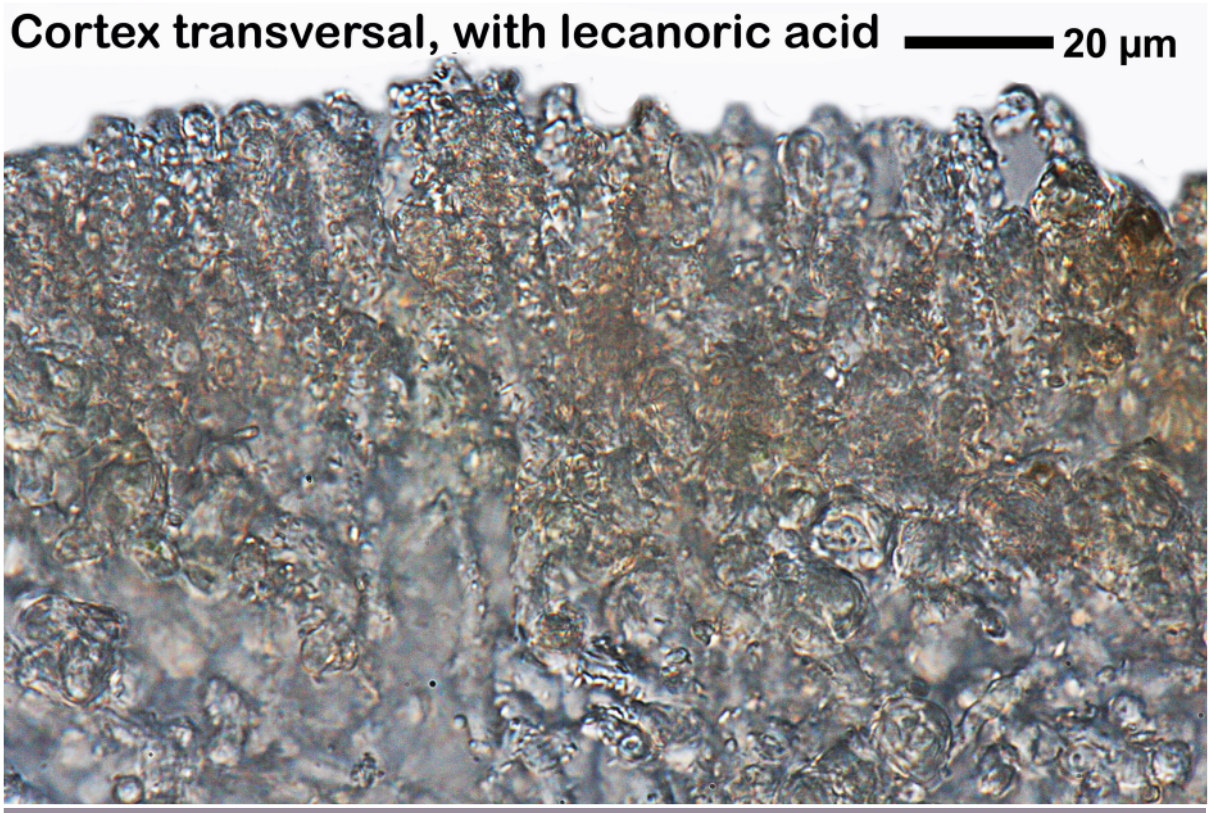


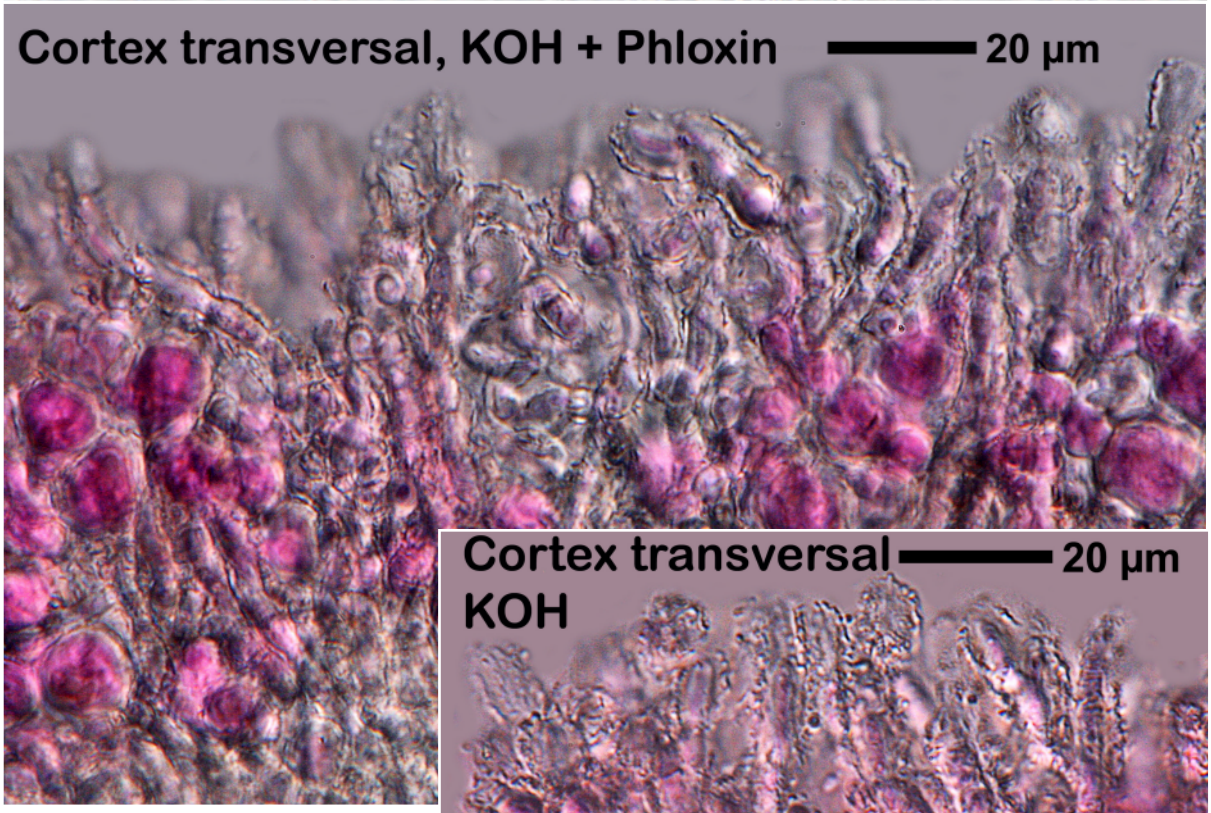
Roccellina hypomecha

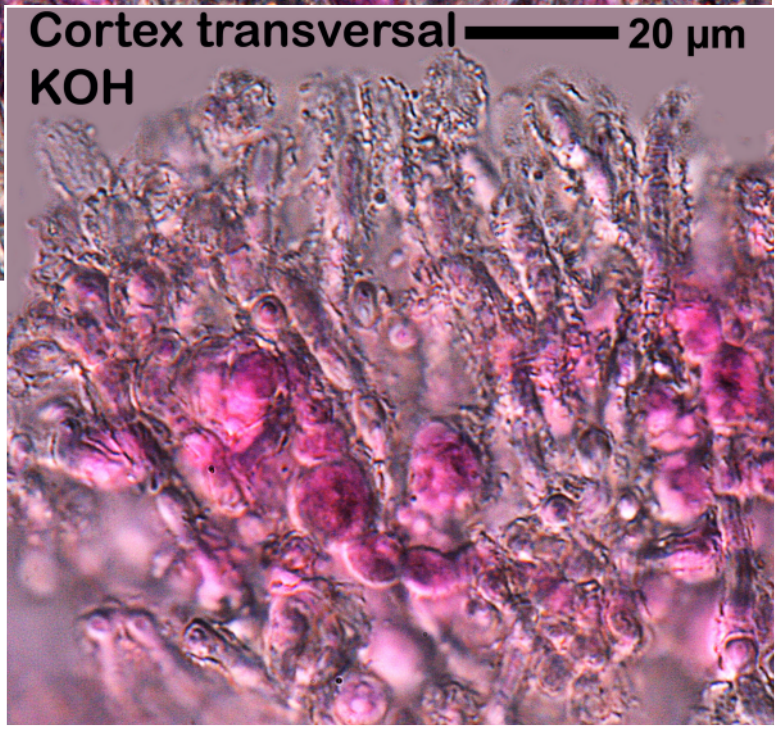




Roccellina hypomecha







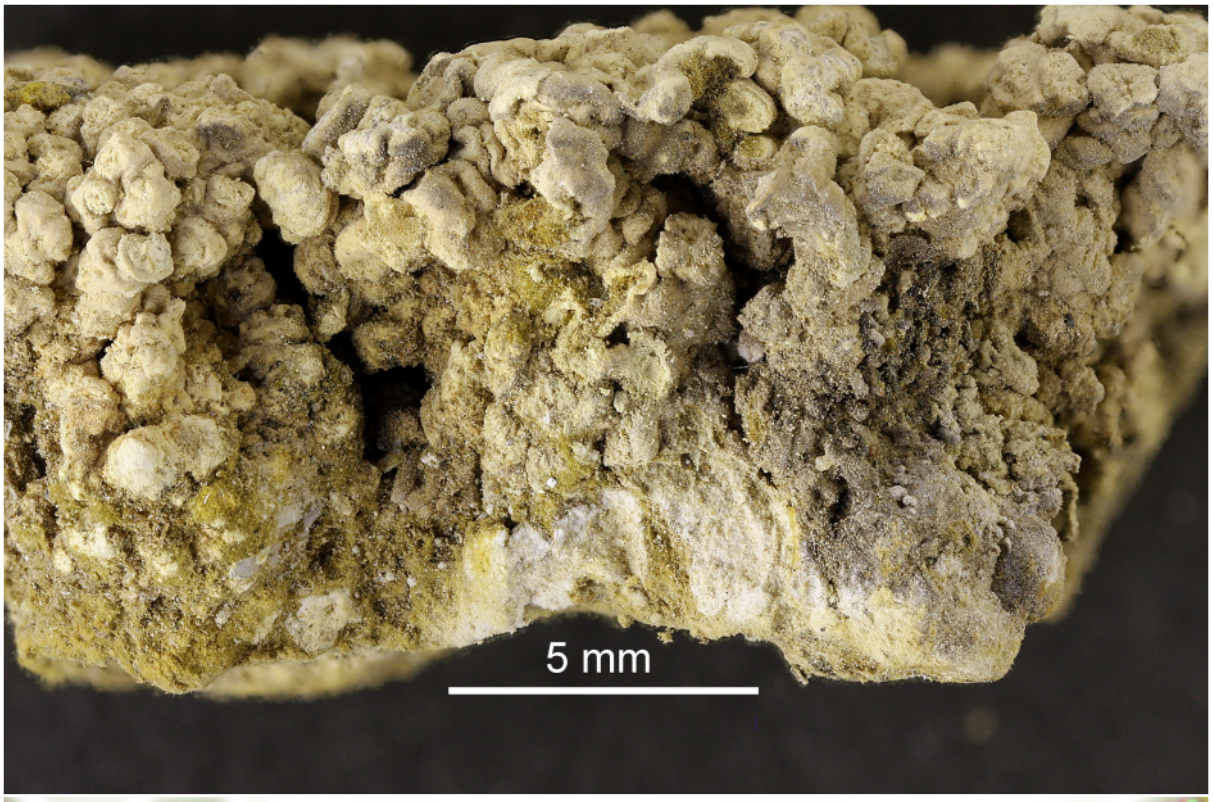
Roccellina hypomecha

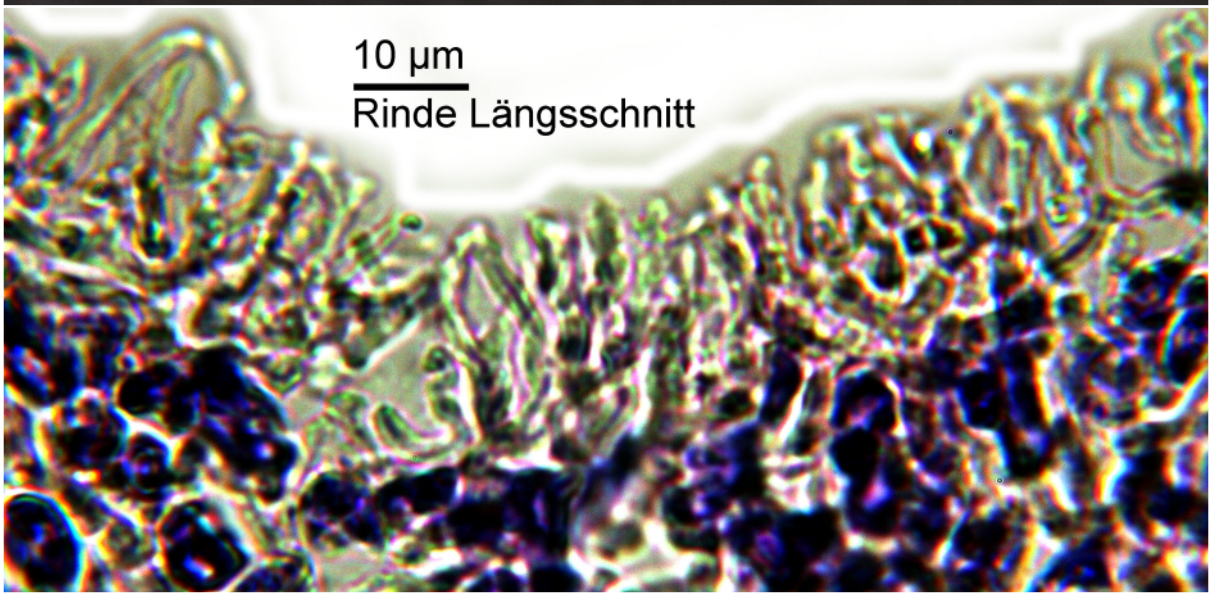
Roccellina luteola Follmann (1967)

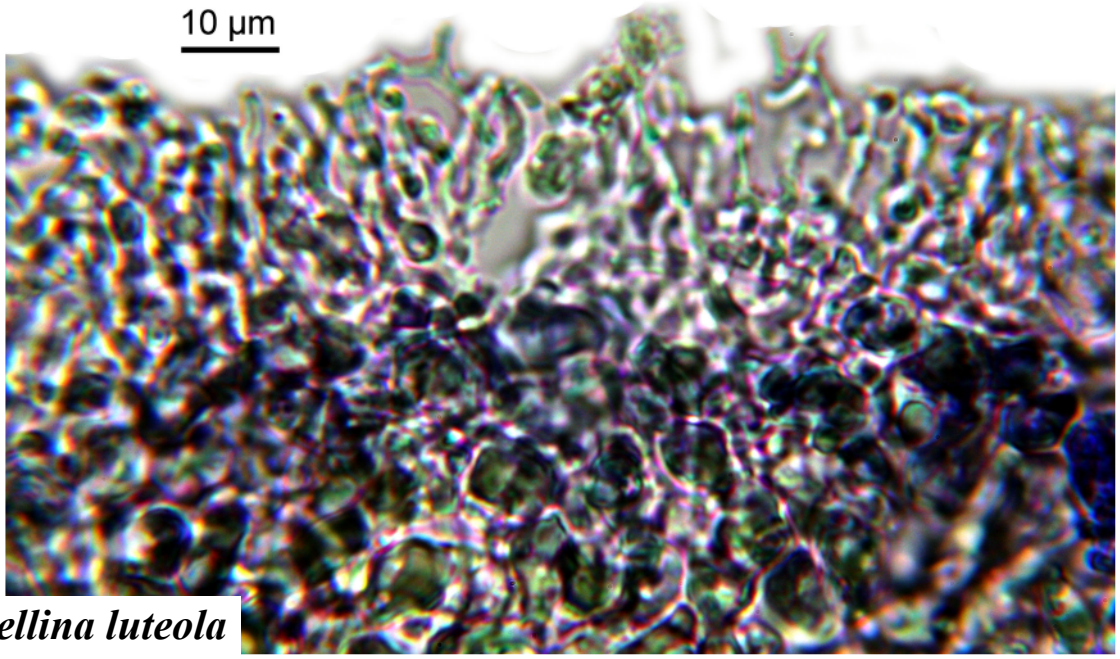
Thallus saxicolous, yellow, not sorediate, texture firm, crustose, surface smooth. Cortex branched type. Apothecia round or dissected. Hypothecium black. Ascospores hyaline, 3-septate, 25–30 × 4–5.µm. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, K + orange, major substances schizopeltic, lecanoric, skyrin. – Chile.

Nordchile, Prov. Antofagasta: koloniebildend an Stirnflächen und Überhängen von Diorithöckern im *Roccelletum portentosae*, 500 m, pH 6,5, Nebelzone am Cerro Moreno, Halbinsal Mejillones unweit Antofagasta. Leg. G. Follmann 09.1965. Lichenes Exsiccati Selecti A Museo Botanica Berolinensi Editi Nr. 54 (ISOTYPUS). [2556]

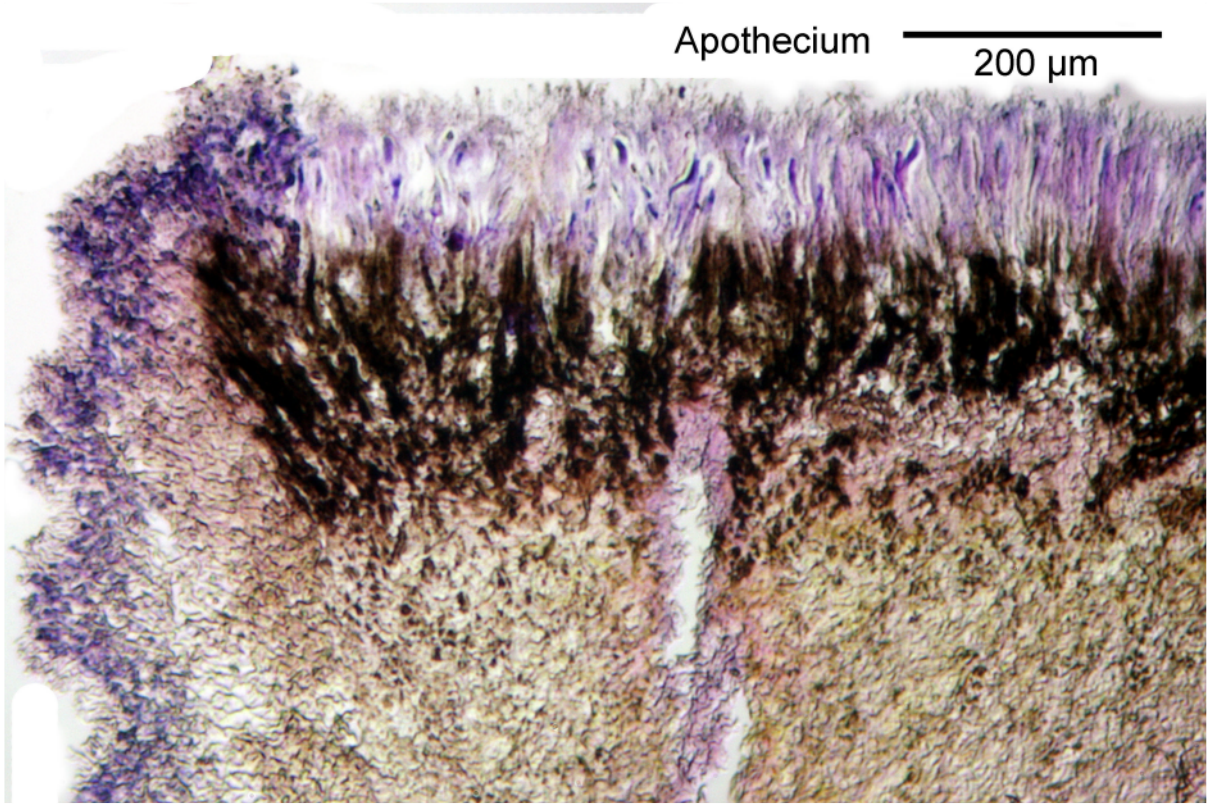


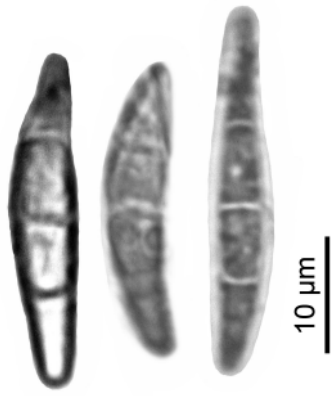


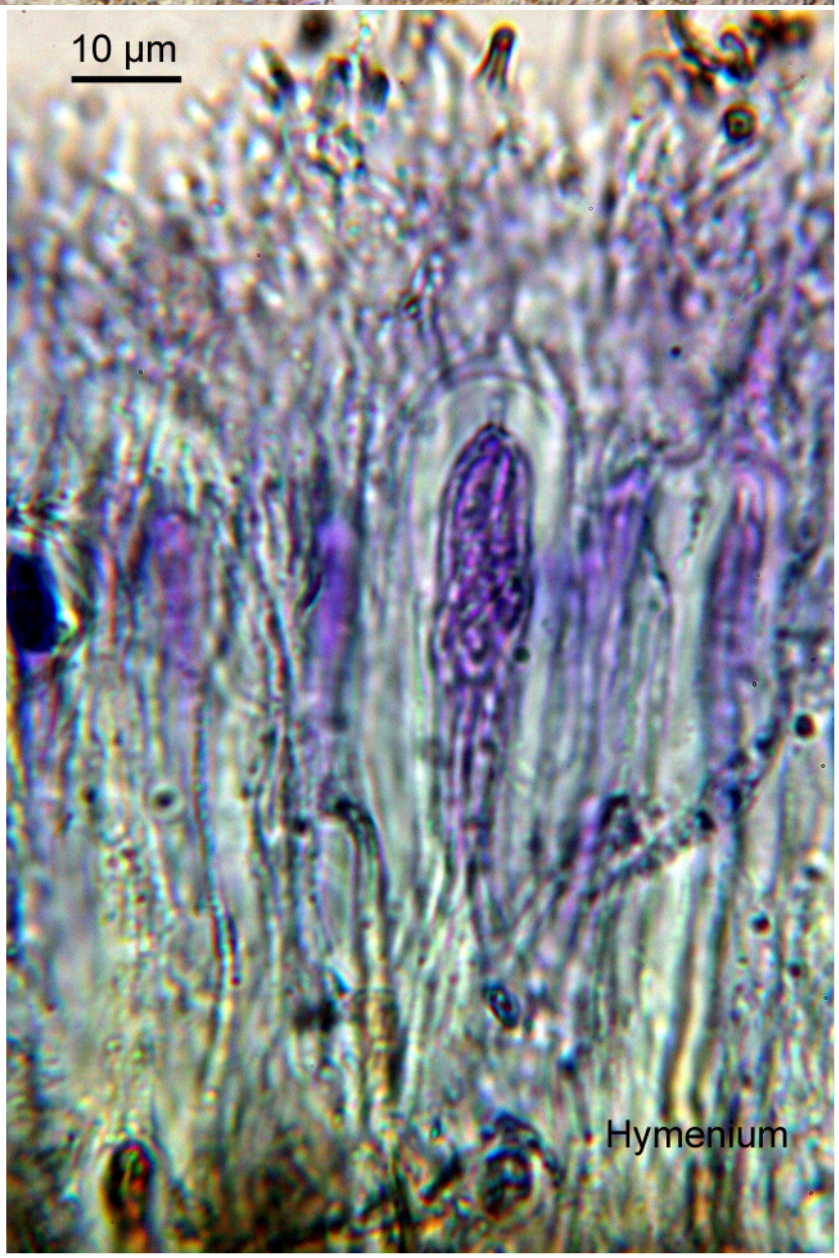




Roccellina luteola







Roccellina luteola

Roccellina mollis (Hampe) Tehler (2007)
Roccella intricata Mont. (1849)
Roccella lanata Hampe (1843)
Roccella mollis Hampe (1843)
Roccella mollis var. *dufoureiformis* Hampe (1843)
Roccellaria mollis (Hampe) Zahlbr. (1923)

Thallus corticolous, grey, rarely sparsely sorediate, texture soft, cylindrical, surface rough, holdfast internally white to brown. Cortex indistinctly periclinal plectenchymatous, not differentiated from the medulla. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 18–24 × 4–6 µm. Cortex C –, K –, Pd –, medulla C –, soralia C –, major substances roccellic, mollin, roccellin. – Chile.

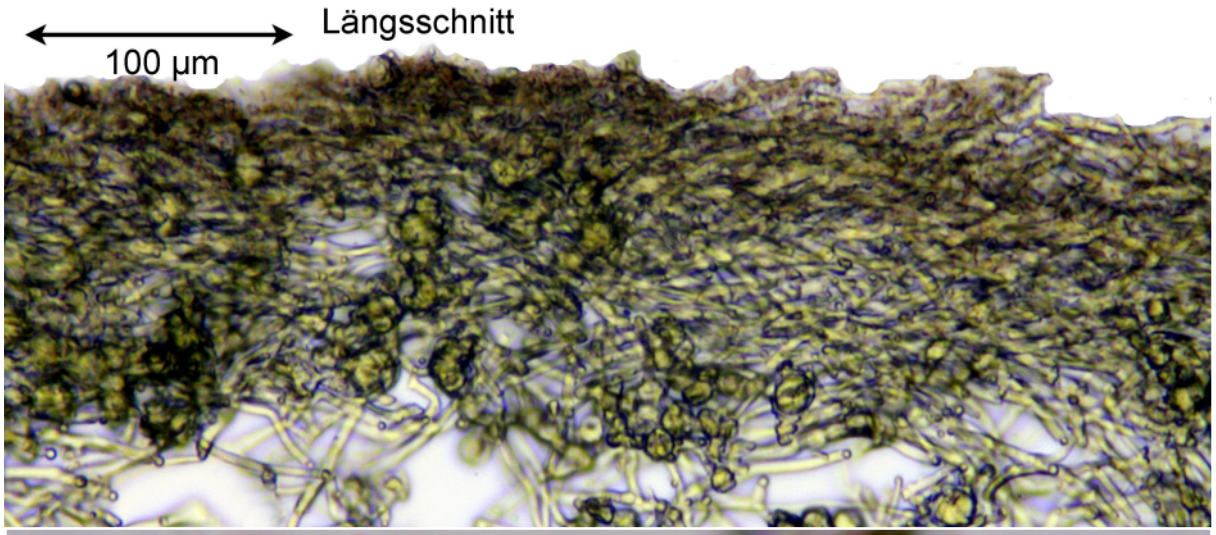
Chile: Atacama, Punta Rancagua close to Caleta Chanaral west of Domeyko, on decumbent cacti and shrubs, especially *Eulychnia acida* and *Skytanthus acutus*, within reach of the oceanic aerosol, 10-20 m, W-SW exposition, gregarious. Leg. G. Follmann 08.1993. Lichenes Exsiccati Selecti Ab Instituto Universitatis Coloniensis Editi Nr. 438. [9428]

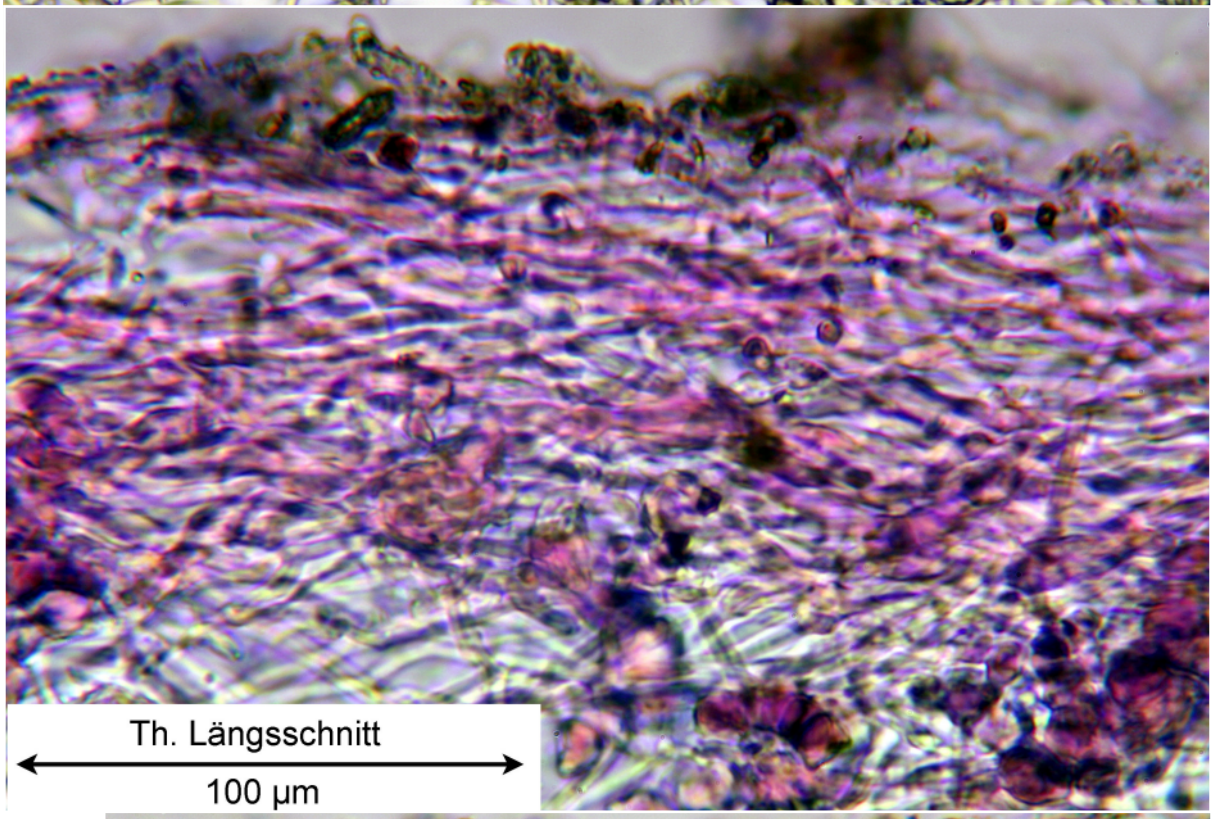


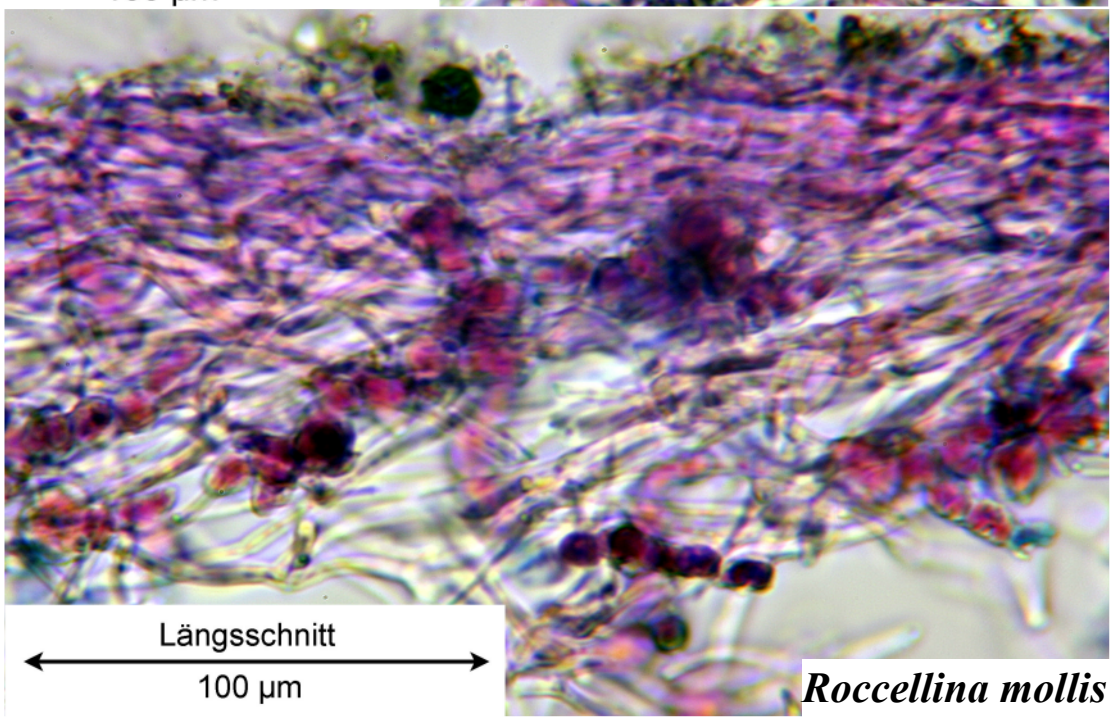




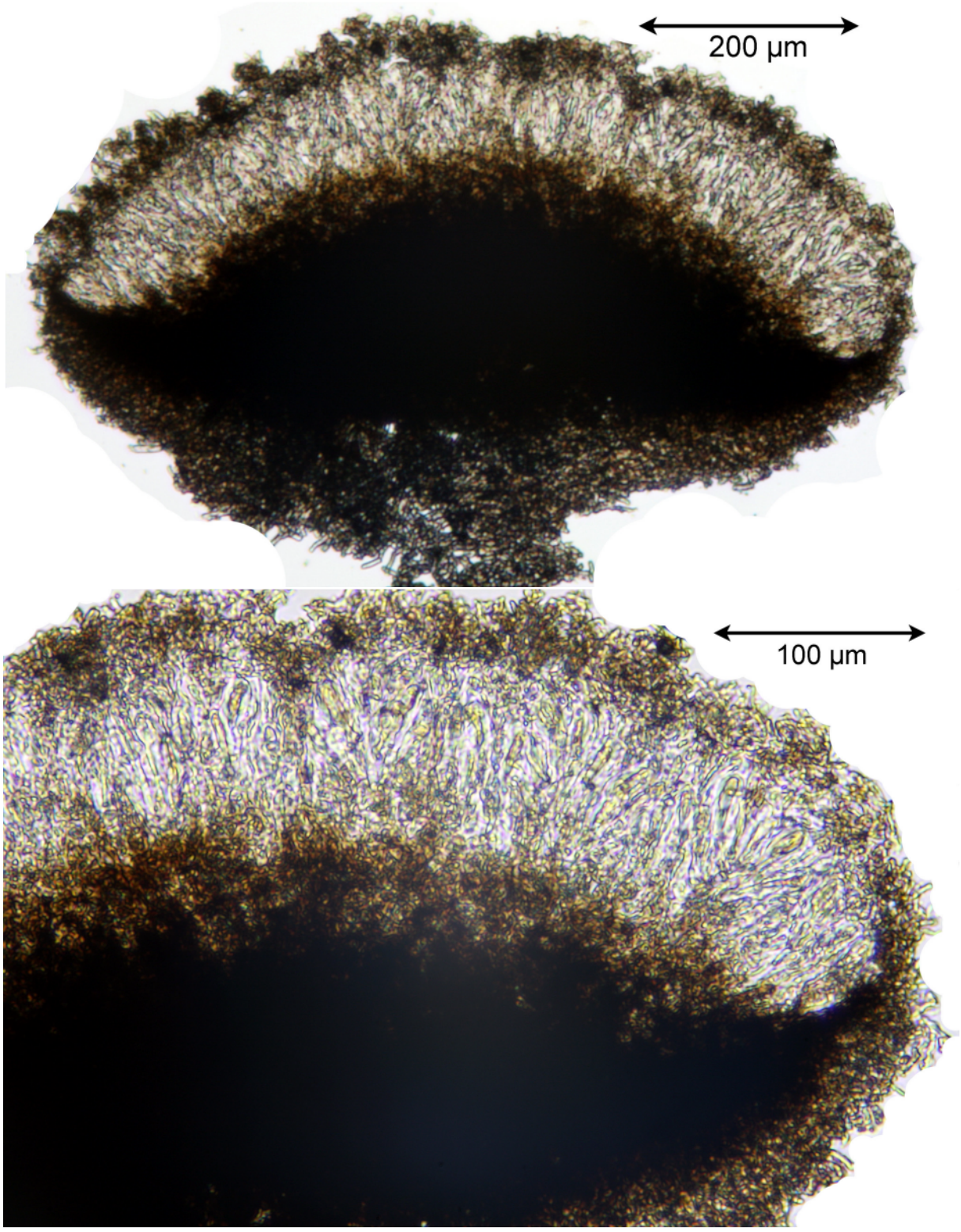
Roccellina mollis



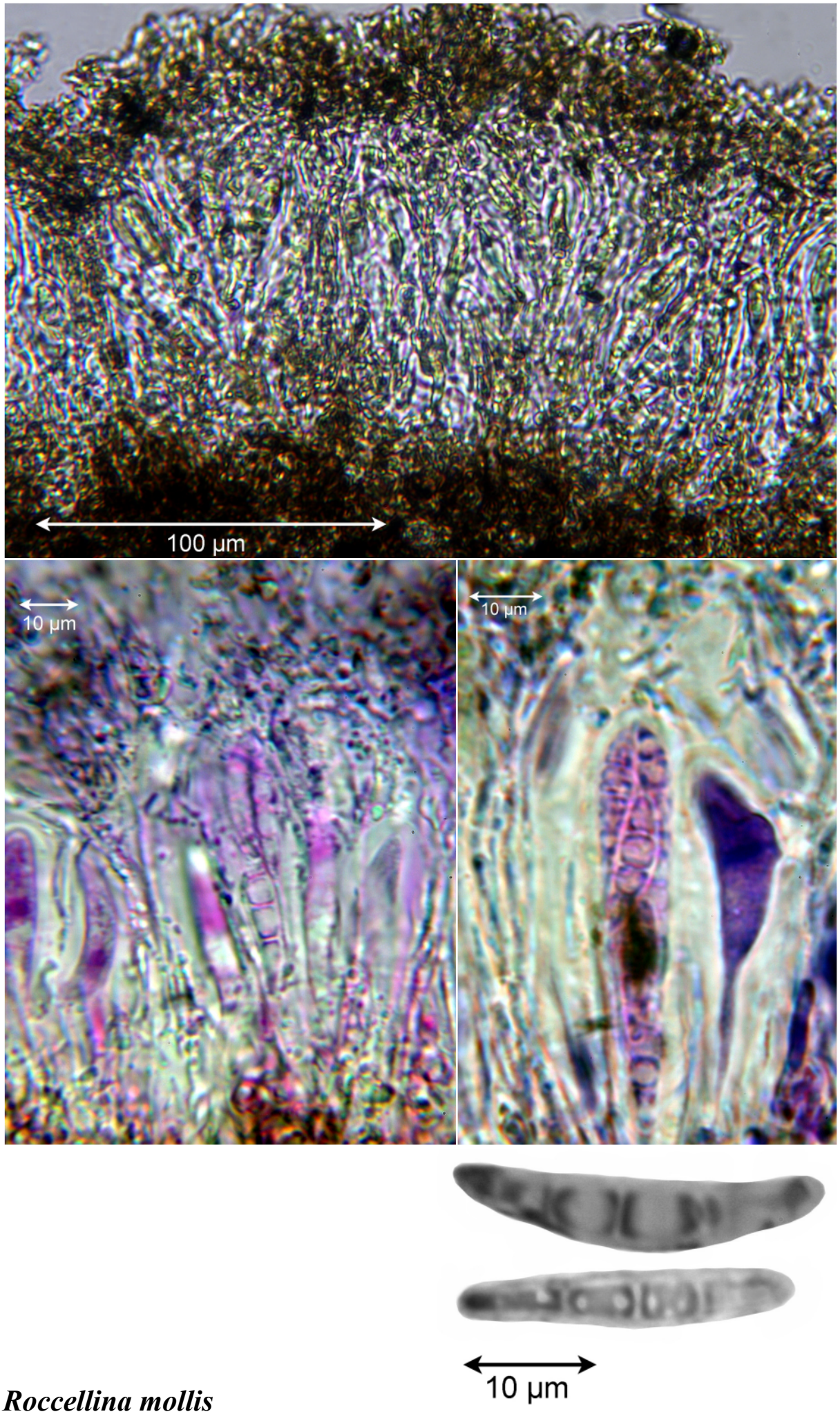




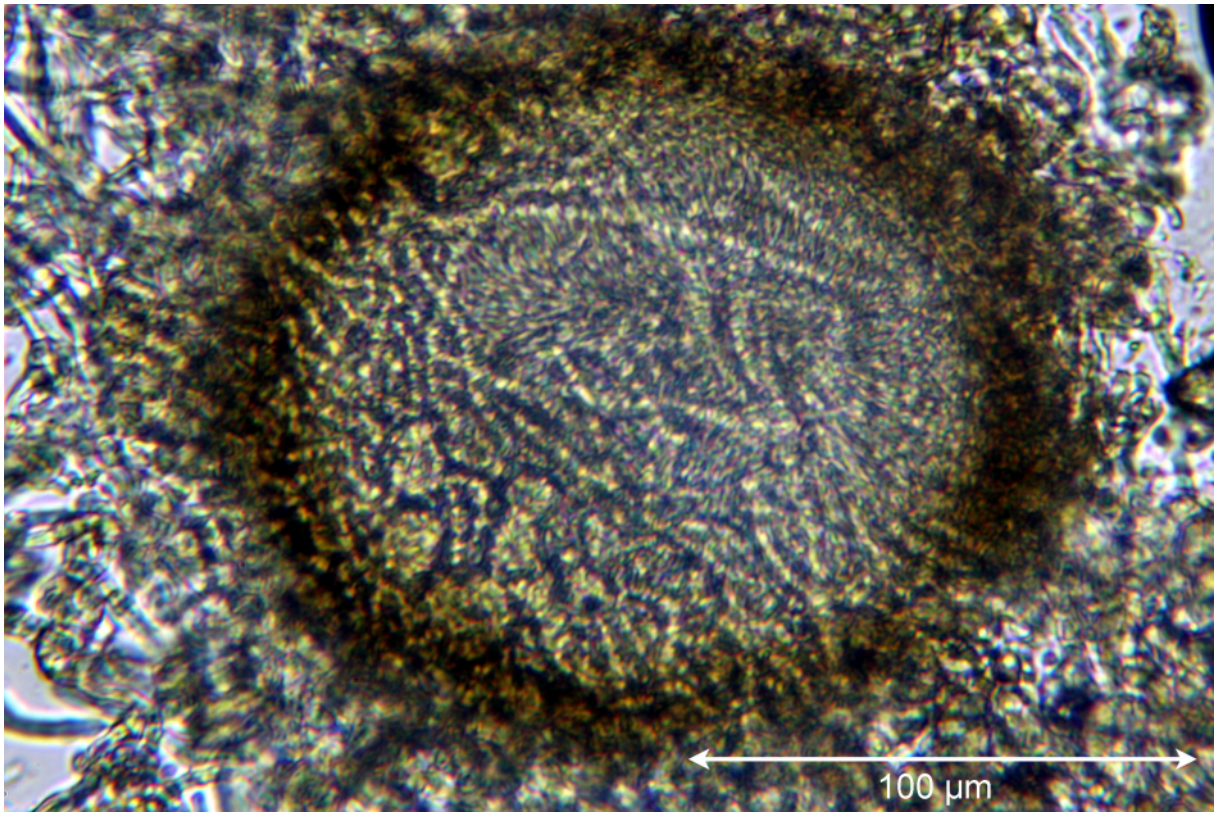
Roccellina mollis

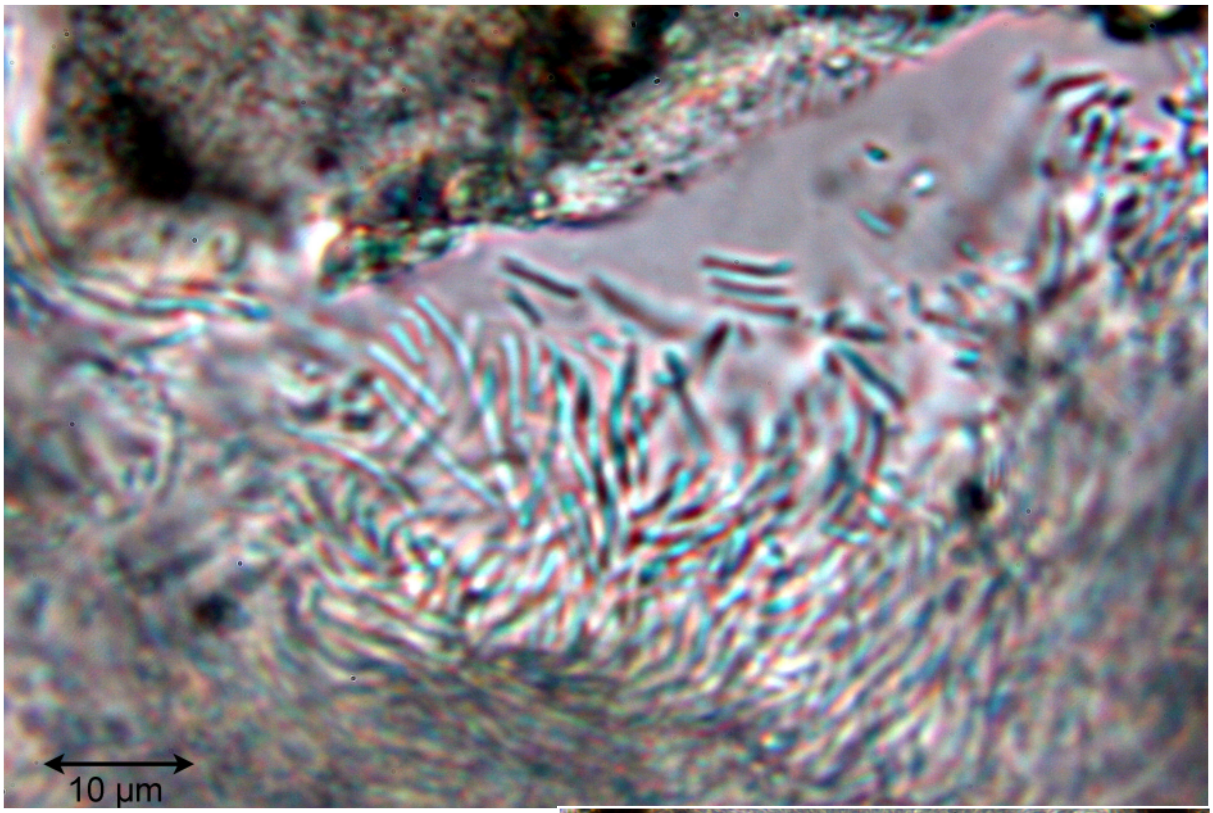


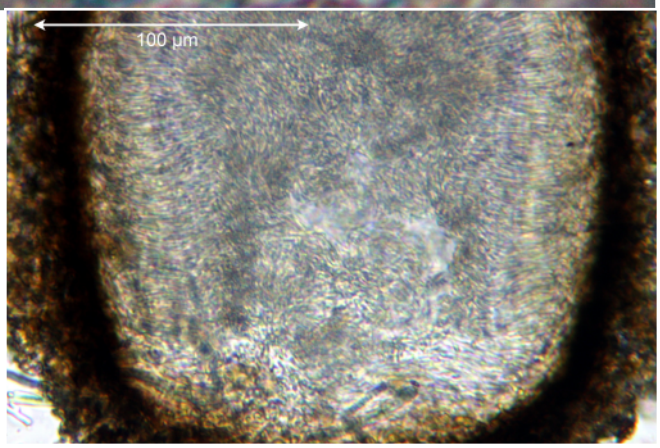
Roccellina mollis



Roccellina mollis





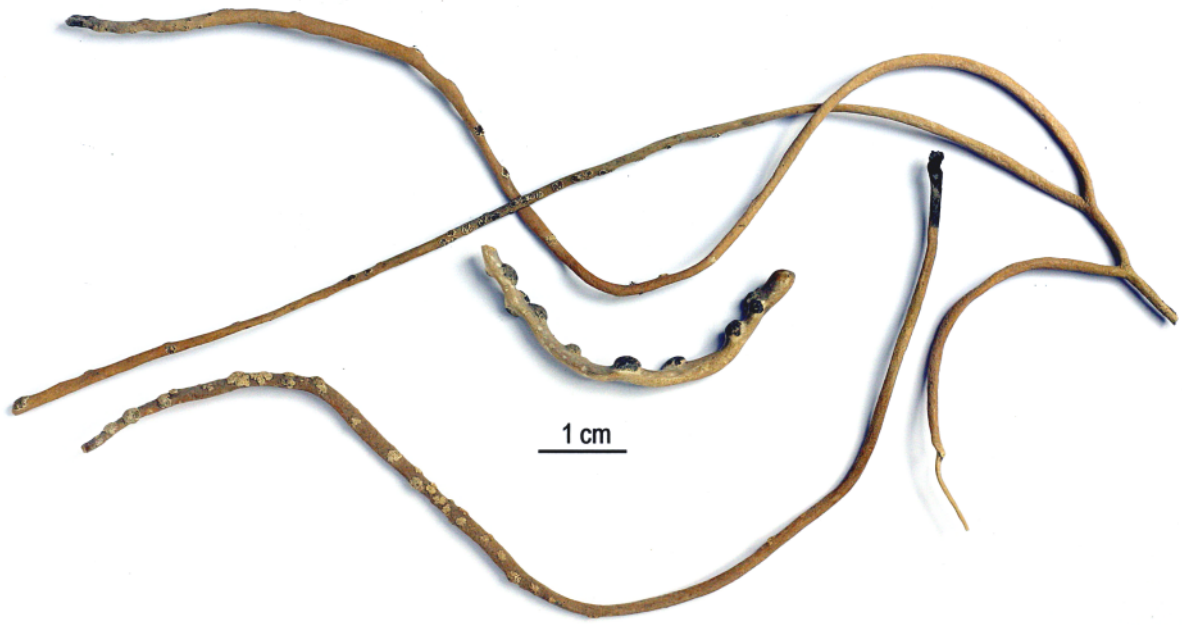


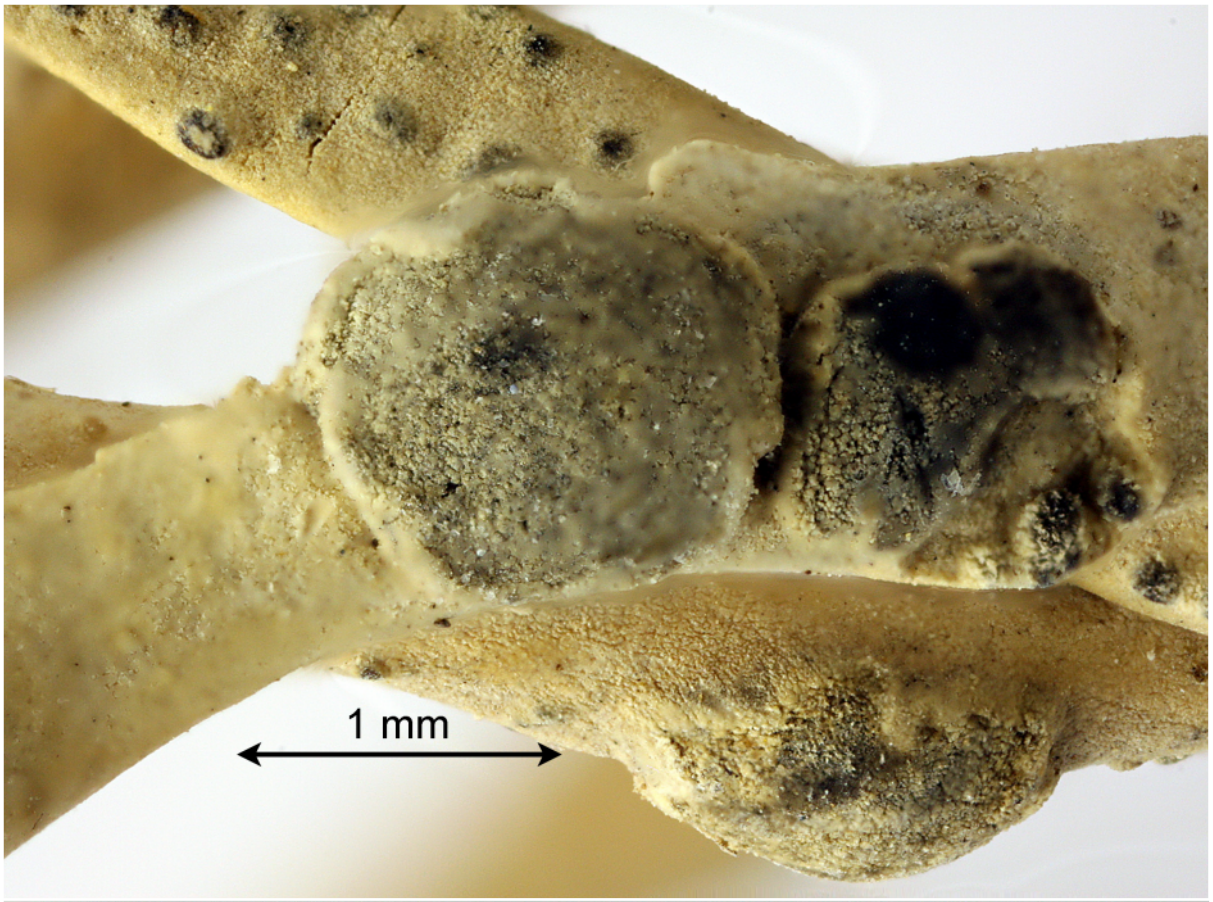
Roccellina mollis

Roccellina portentosa (Gay) Tehler (2007)
Roccella fauiformis Bory ex Darb. (1898)
Roccella gayana Mont. (1852)
Roccella portentosa (Gay) Darb. (1898)
Roccella taeniata Mont. ex Darb. (1898)
Roccella tinctoria var. *portentosa* Mont. (1852)

Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface dull, holdfast internally white to brown. Cortex intermediate type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 22–25 × 7–8 µm. Cortex C + red, K –, Pd –, subcortex C –, medulla C –, K + orange, major substances ± erythrin, lecanoric, skyrin. –Chile, Peru.

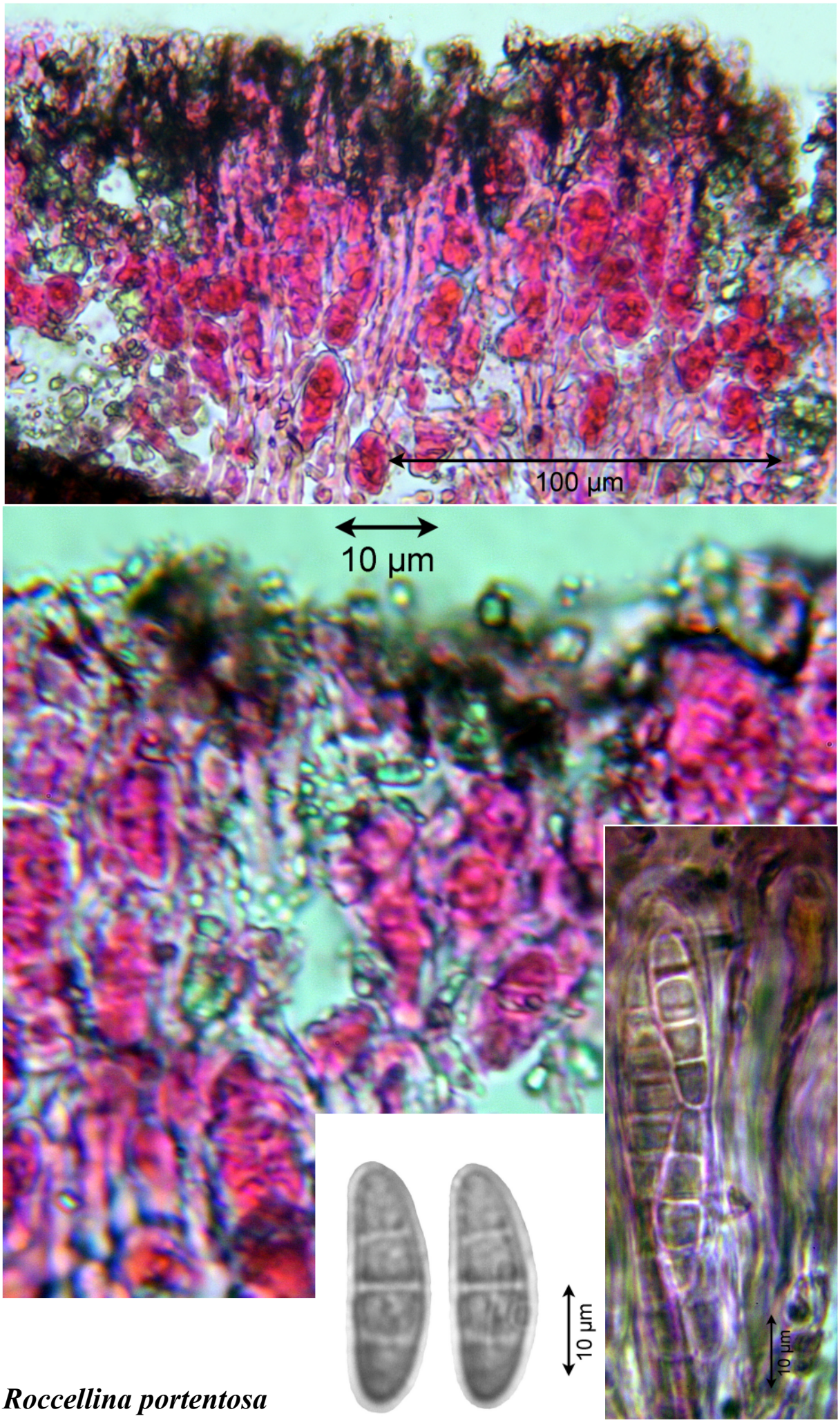
Mittelchile, Prov. Aconcagua: häufig an stark geneigten Küstenfelsen (Granodiorit) im *Roccelletum portentosae* Folln., 20 m, SW, pH 6,5, zwischen Papudo und Zapallar. Leg. G. Follmann X.1964. Lichenes Exsiccati Selecti A Museo Botanico Berolinensi Editi Nr. 12. [2555]







Roccellina portentosa

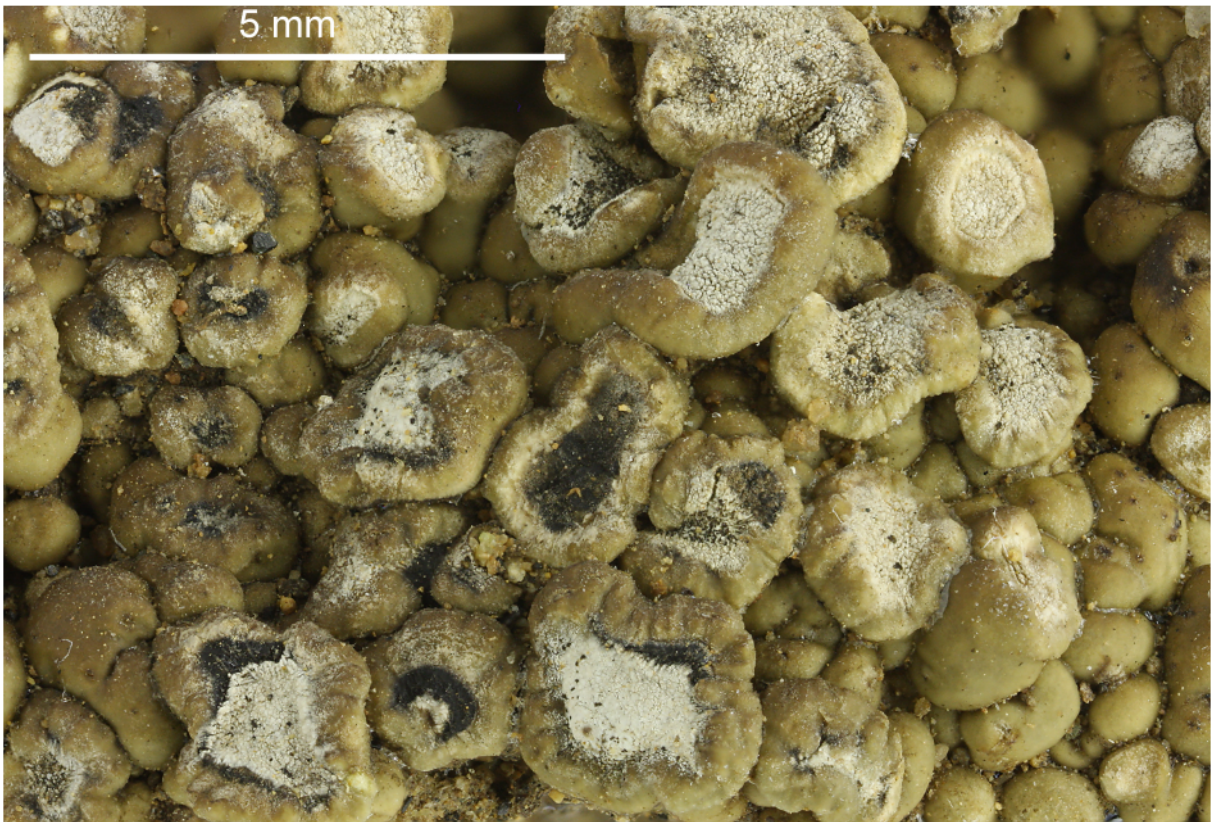


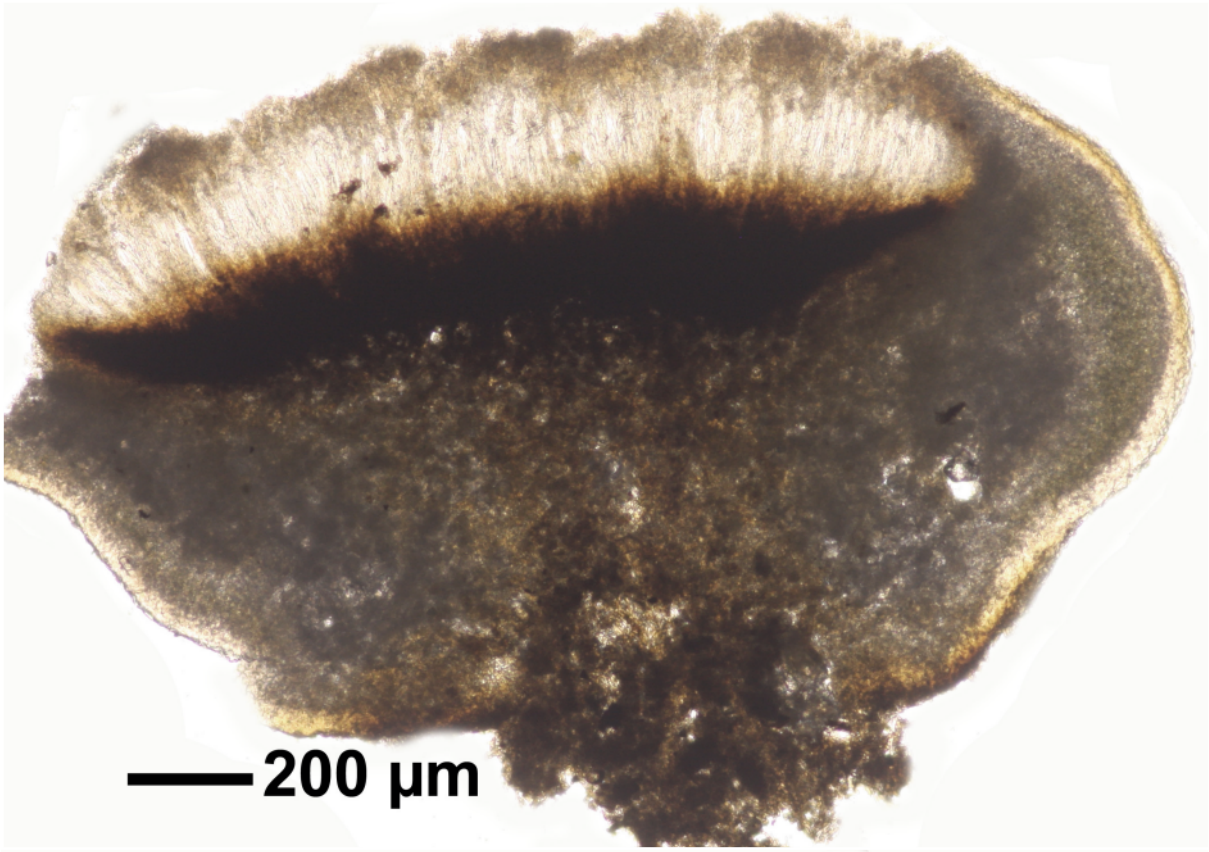
Roccellina portentosa

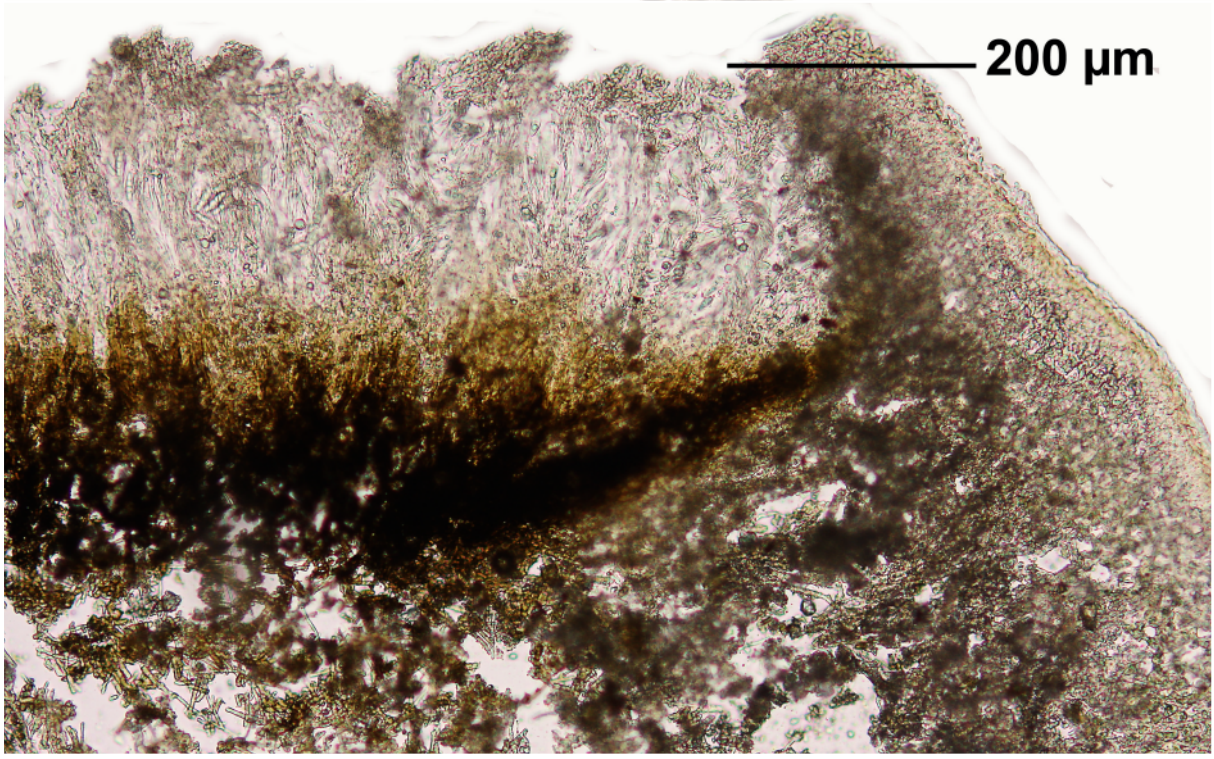
Roccellina terrestris Tehler (1983)

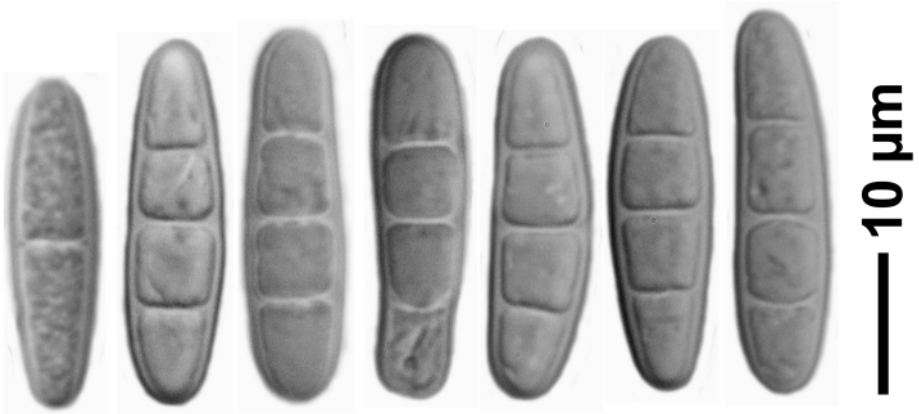
Thallus terricolous, ochraceous, not sorediate, texture firm, crustose, surface smooth. Cortex densely branched type. Apothecia round. Hypothecium black. Ascospores hyaline, 3-septate, 25–27 × 6–7 µm. Cortex C –, K –, Pd –, subcortex C + red, medulla C –, major substances schizopeltic, erythrin, roccellic, terpenoids. – Chile, Peru, Juan Fernandez.

Chile, Coqimbo, Altos de Talinay west of Ovalle, precipitous seaward descent aside of the National Park Fray Jorge, on sandy loam in open niches of low impoverished matorral, 300-350 m, W exposition, in troops. Leg. et det. G. Follmann Nov. 2001. Lichenes Exsiccati Selecti Ab Instituto Universitatis . Coloniensis Editi Nr. 458. [11082]

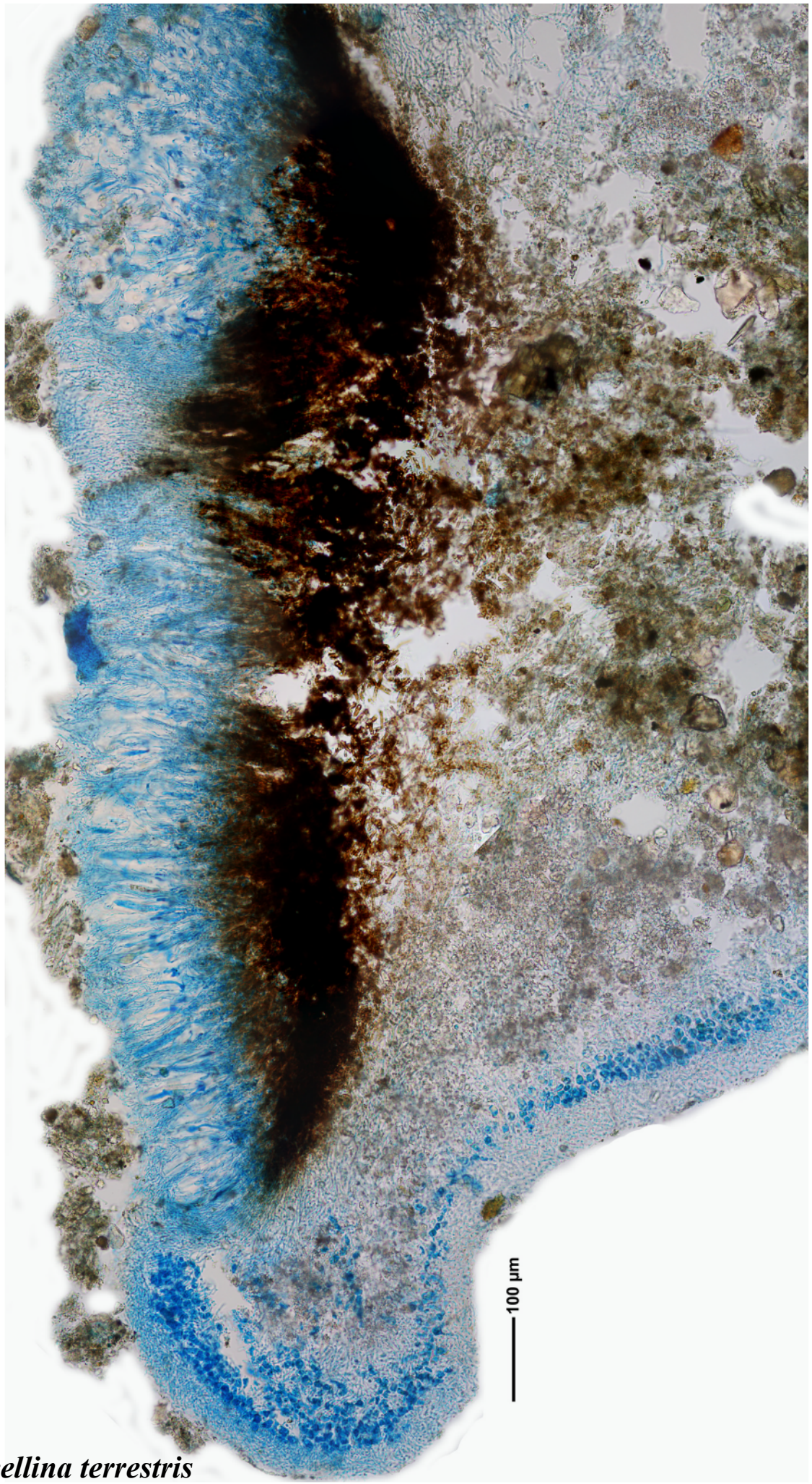








Roccellina terrestris

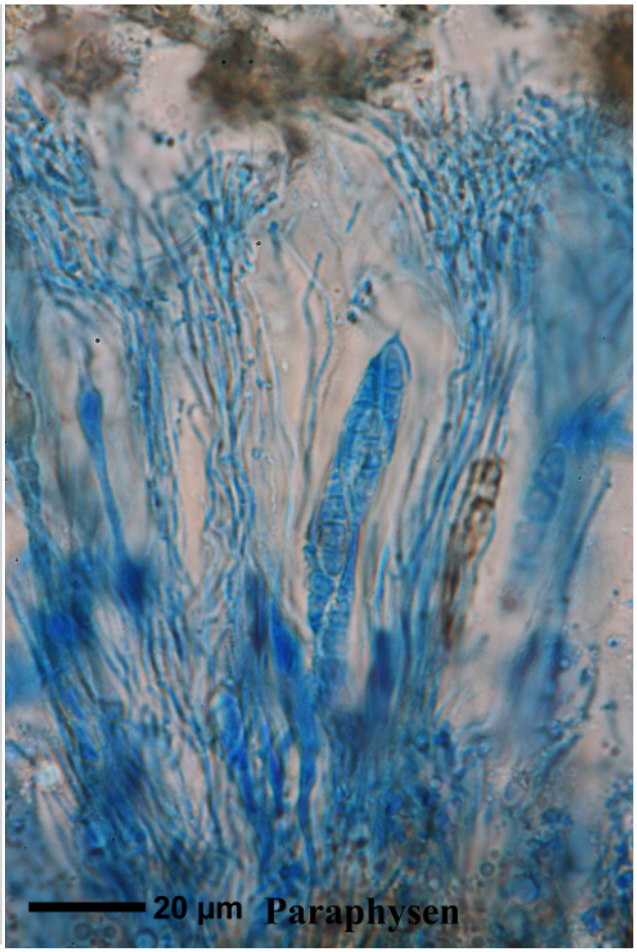


Roccellina terrestris

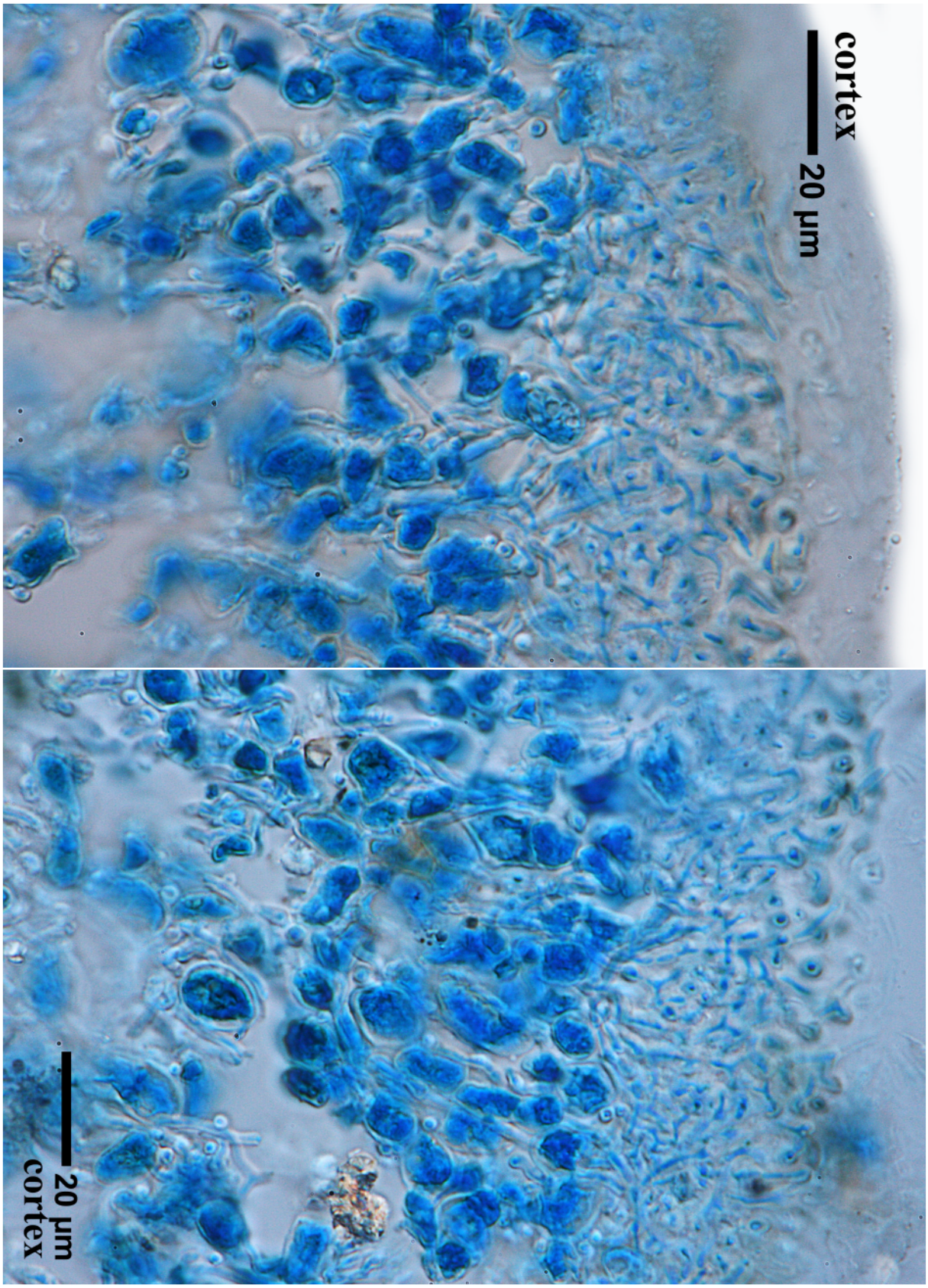








Roccellina terrestris



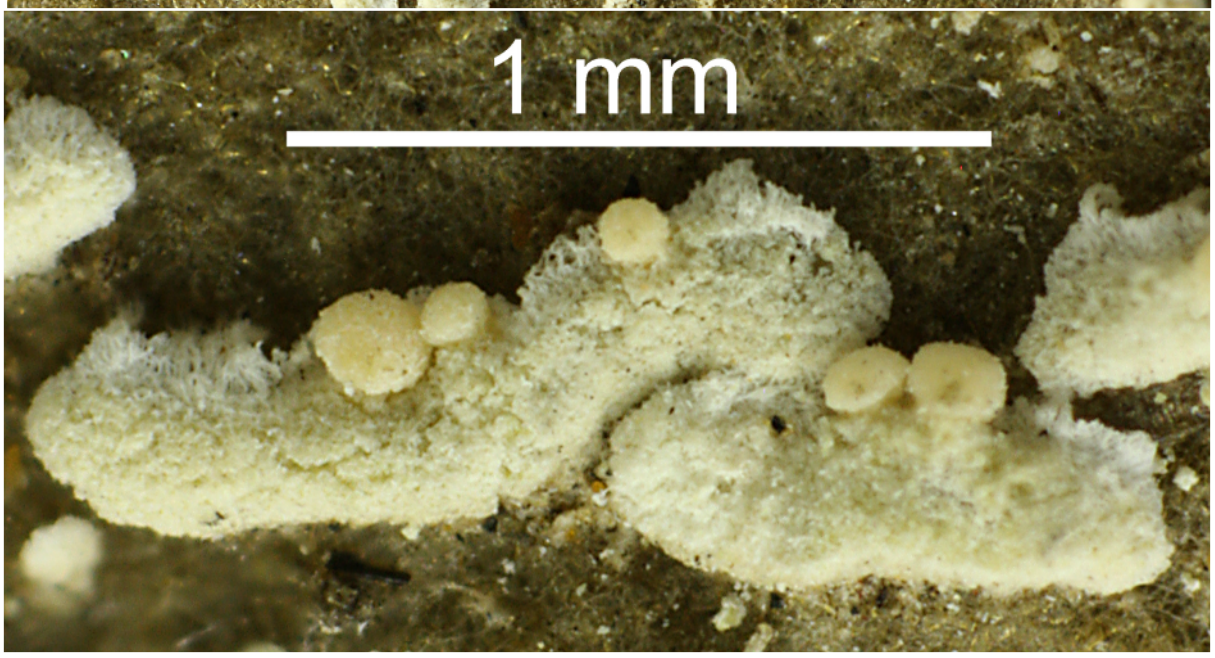
Roccellina terrestris

Roccellinastrum epiphyllum Henssen & Vobis (1982)

Thallus foliicolous, not sorediate, consisting of tiny white globose to elongated, floccose areoles. Photobiont green. Cortex absent. Apothecia round, pale ochraceous. Hypothecium hyaline. Ascospores hyaline, 1-3-septate, 12–16 × 2.5–4.5 µm. No reactions, no lichen substances. – Chile.

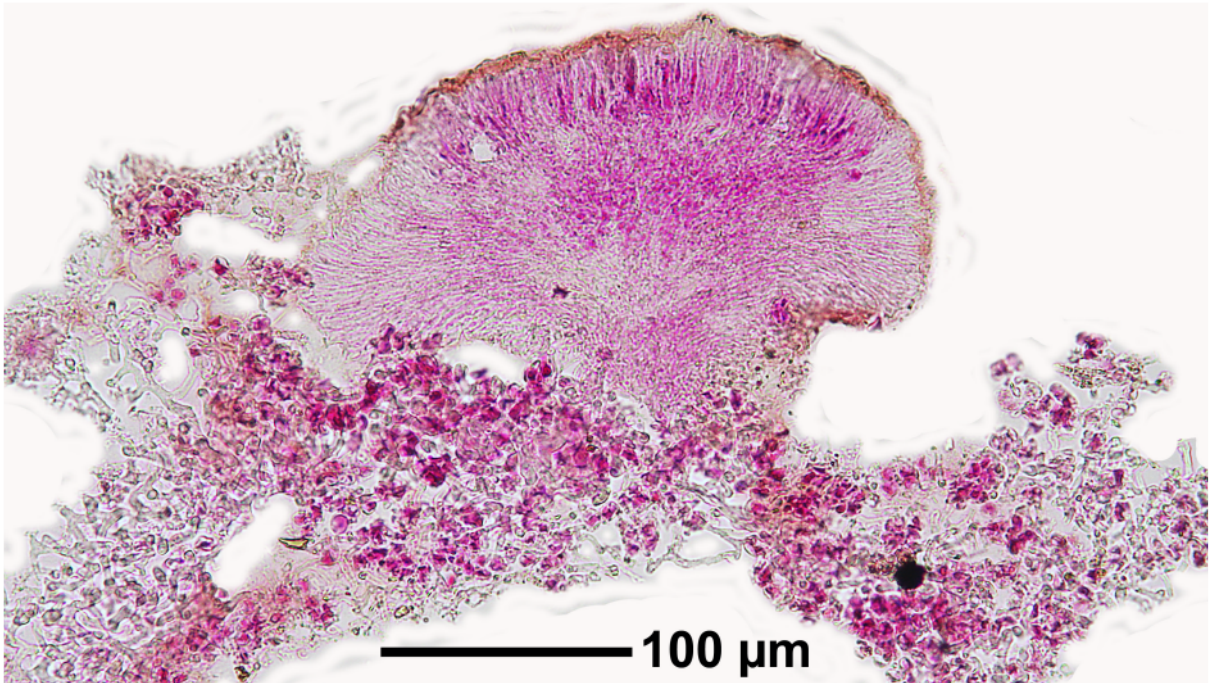
Chile, Coquimbo, Parque National de Fray Jorge, an halbschattigen lebenden Blättern von *Griselinia scandens* (Ruiz et Pav.) Taub. und *Myrceugenia correaefolia* (Hook. et Arn.) Berg im Nebelwald, 510 m, SW, pH 6.0, gesellig. Leg. et det. G. Follmann Aug. 1989. Lichenes Exsiccati Selecti Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 412. [9425]

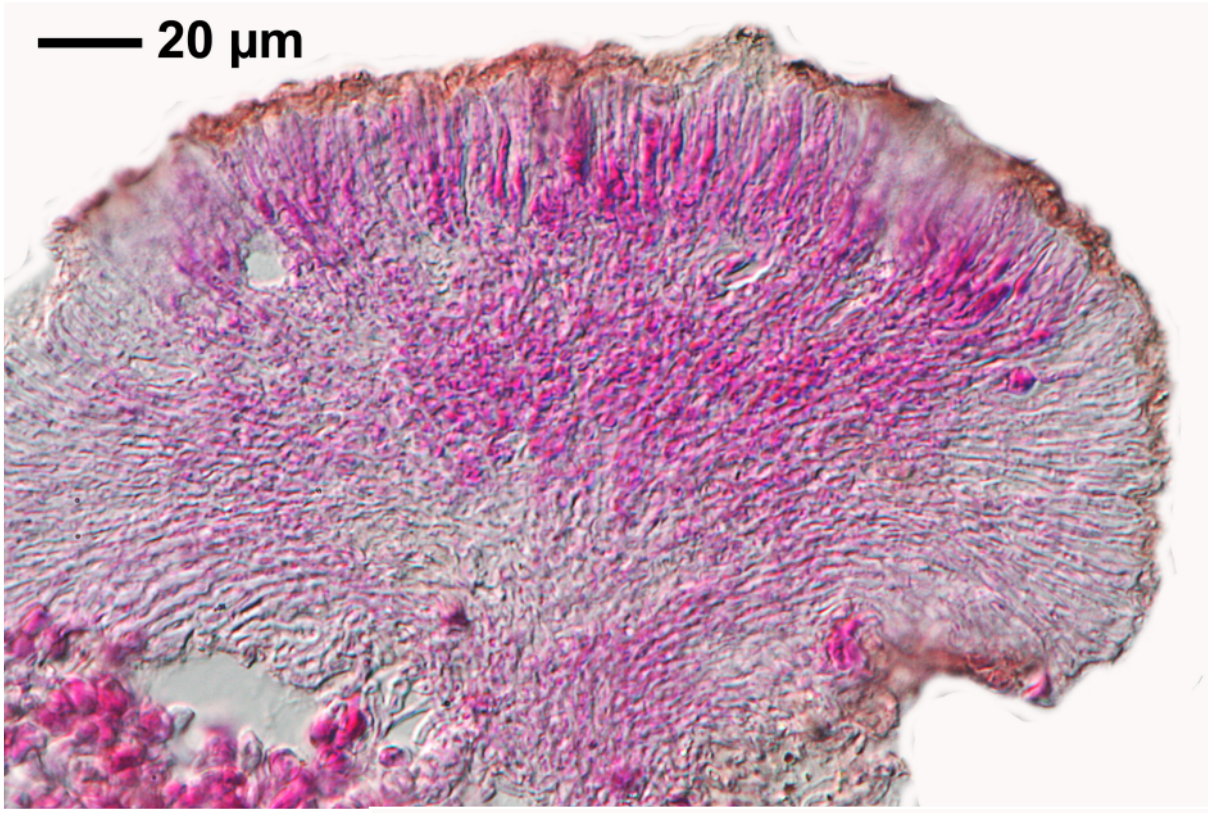


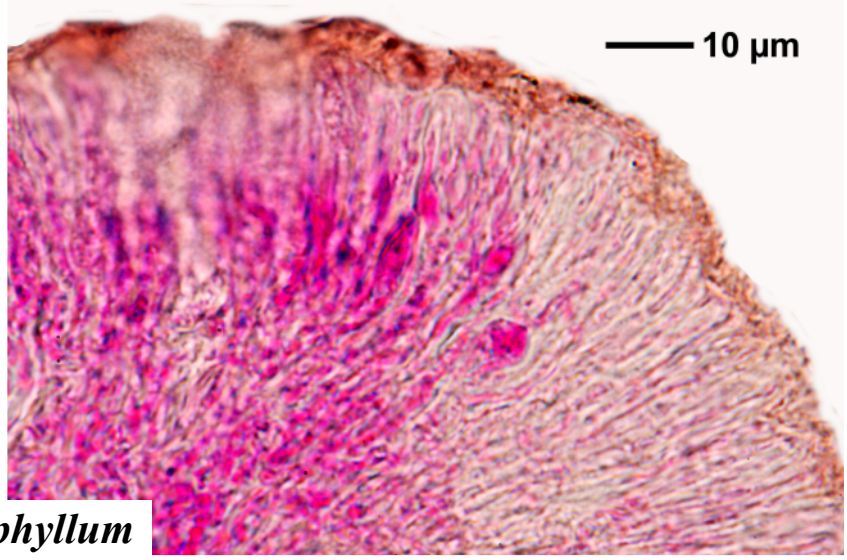




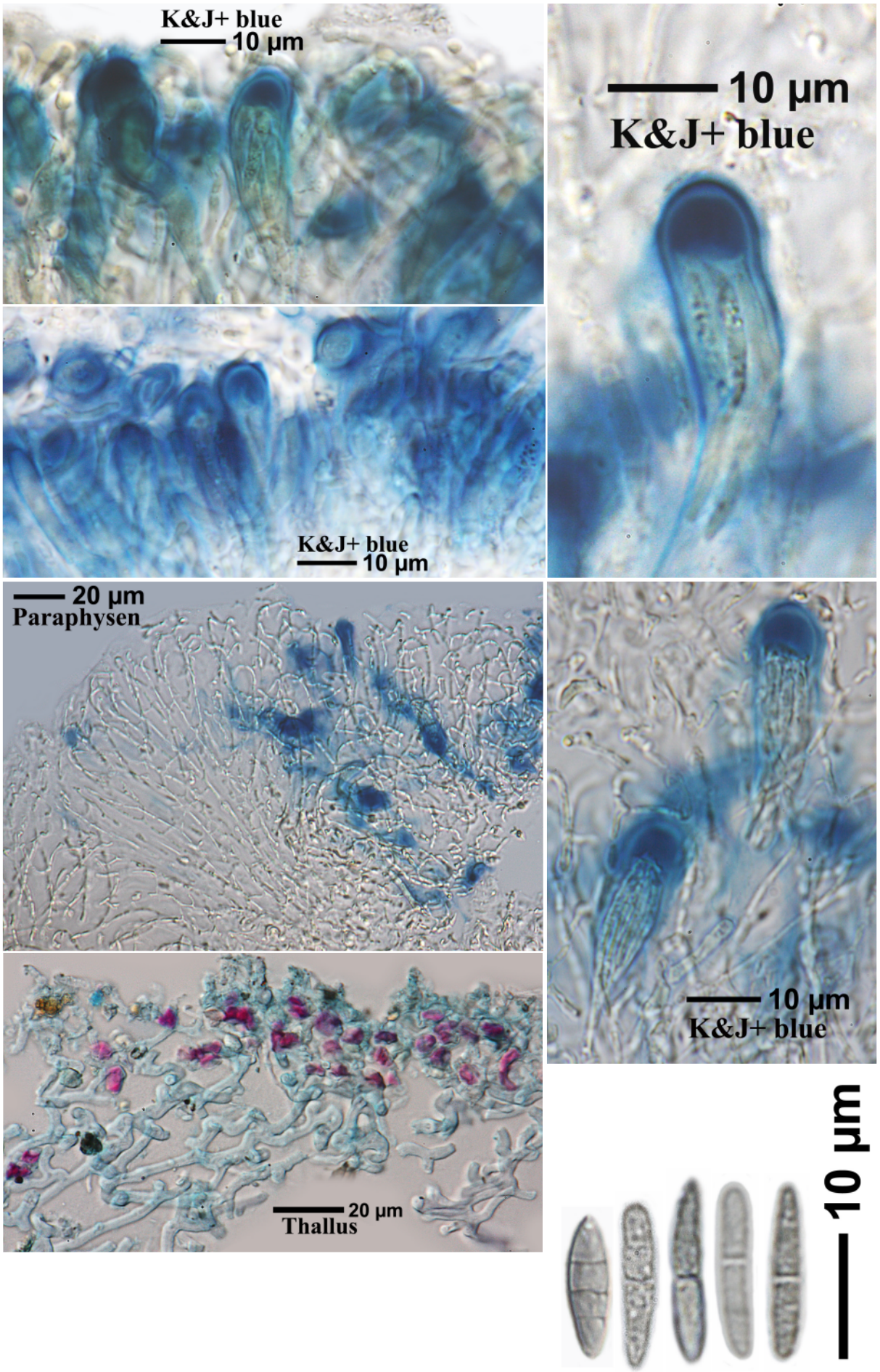
Roccellinastrum epiphyllum







Roccellinastrum epiphyllum

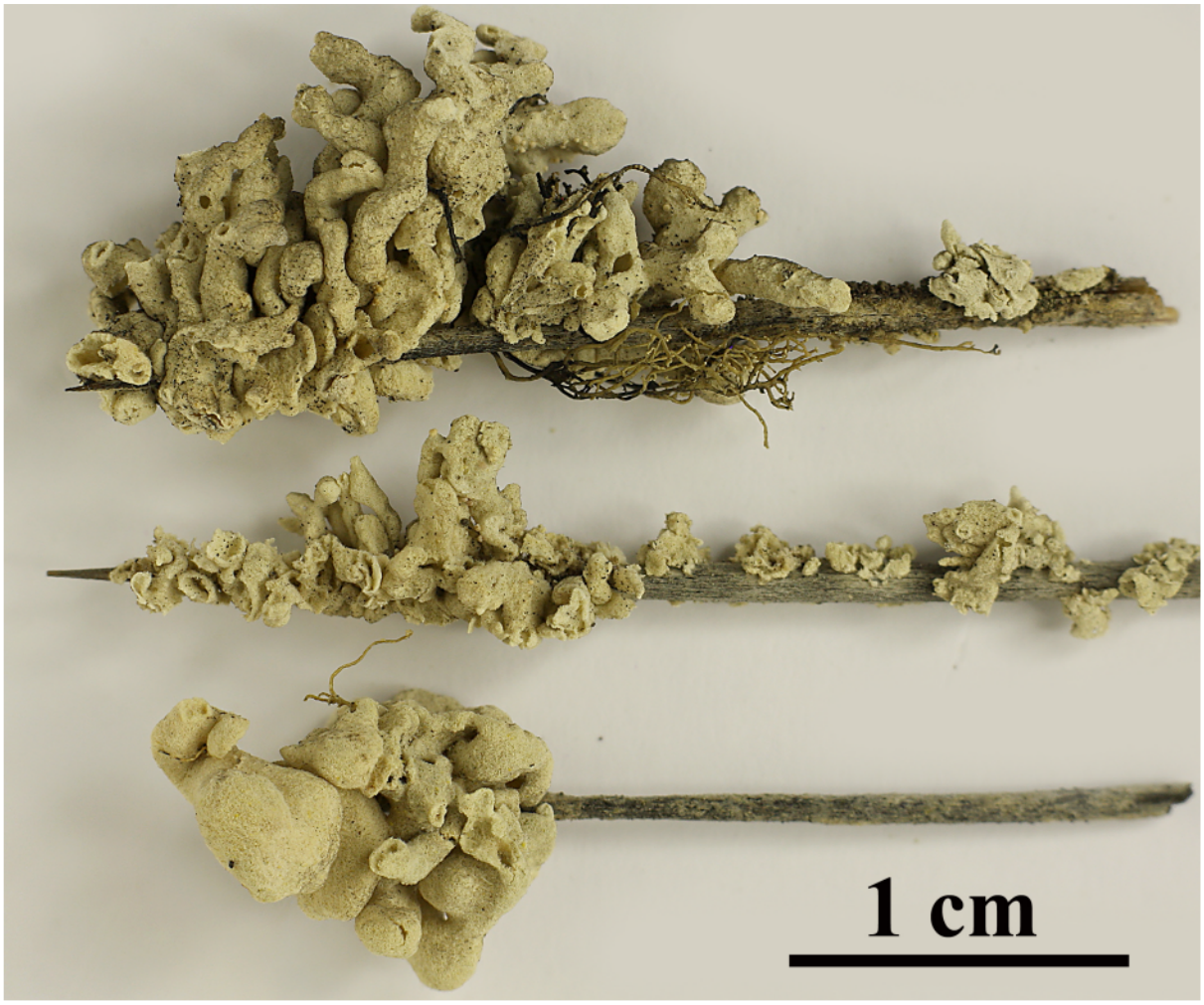


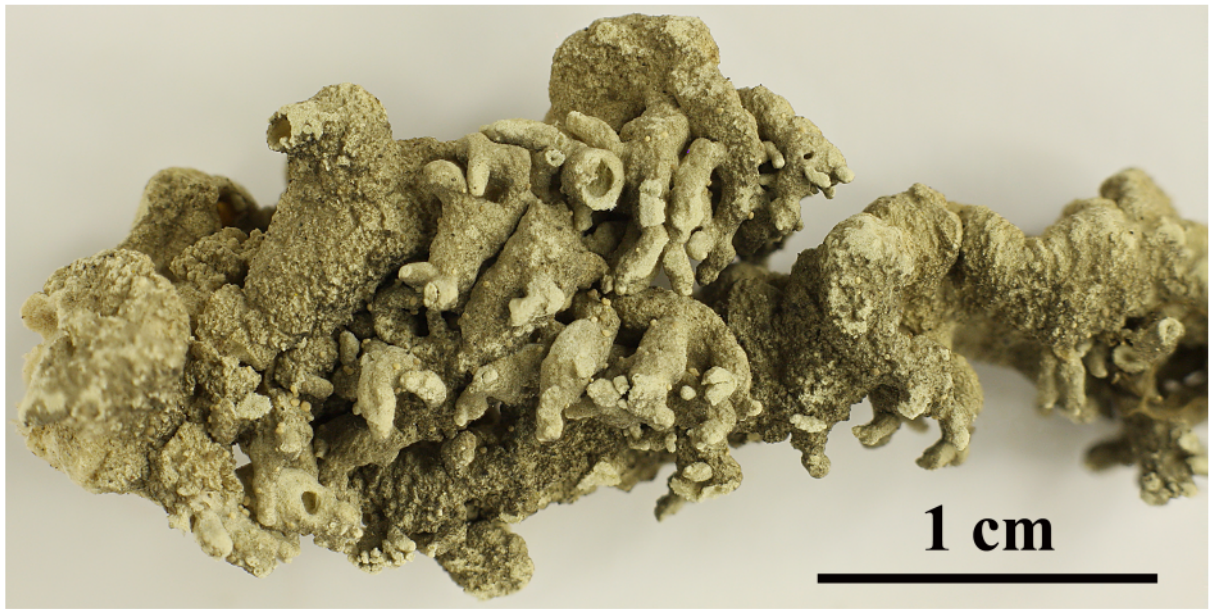
Roccellinastrum epiphyllum

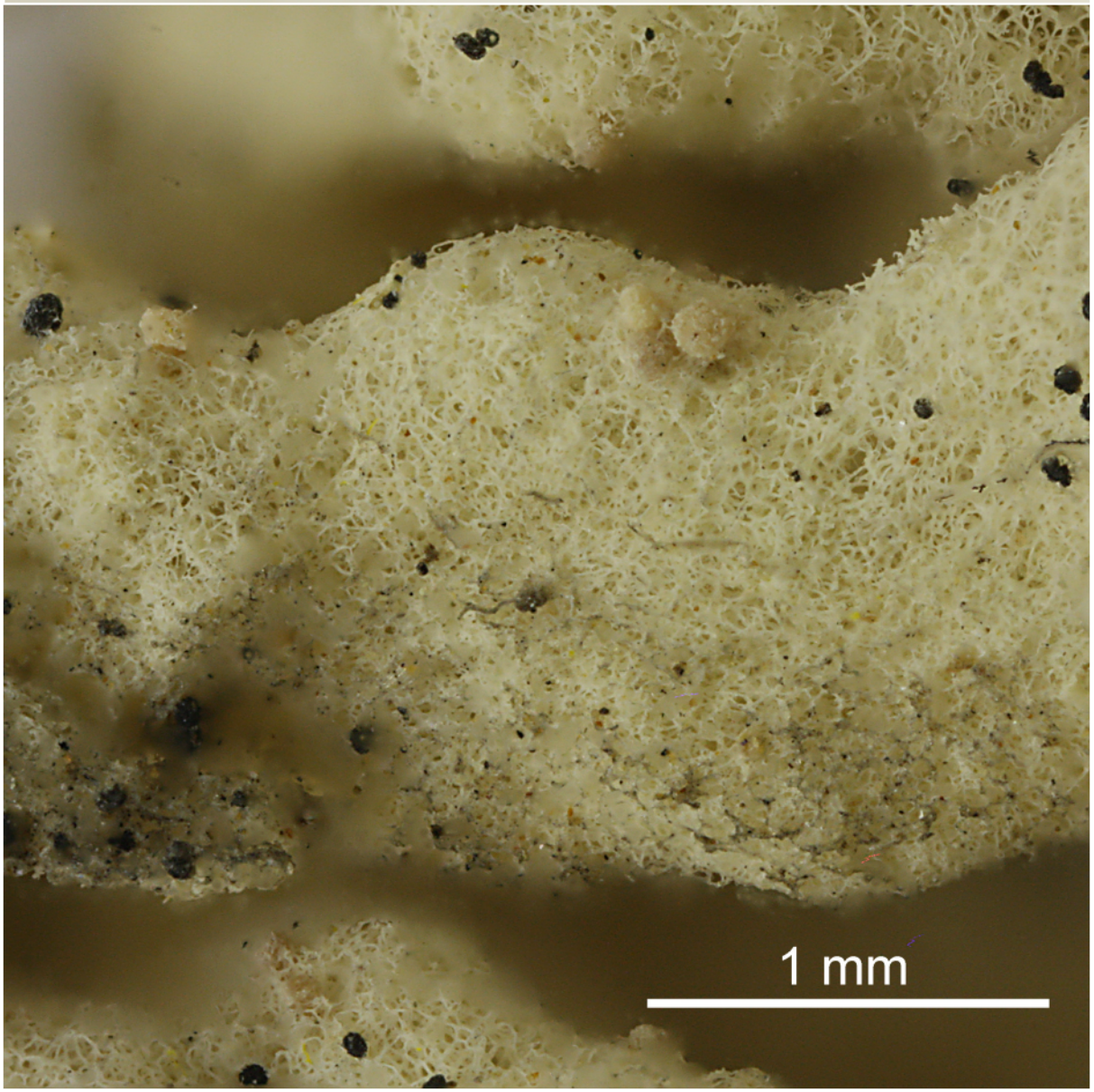
Roccellinastrum spongoideum Follmann (1967)

Thallus corticolous, whitish, not sorediate, texture soft, pulvinate to coralloid, surface dull, medulla internally lax or hollow. Photobiont green. Cortex byssoid, not differentiated from the medulla. Apothecia 0.2 mm, round, pale pink. Hypothecium hyaline.Ascospores hyaline, 1-septate, 5.8–7.7 × 1.9–2.7 µm, 8/ascus. Thallus C –, K + yellow, Pd + red, major substance protocetraric. – Chile.

Chile, Antofagasta, Nature Reserve of Paposo north of Taltal, central fog-belt, preferably close to the tips of longer spines of columnar cacti, particularly Eulychnia iquiquensis (Schum.) Britt. et Rose, often associated with Cenozosia inanis (Mont.) Mass. and Chrysothrix pavonii (E.M.Fries) Laund., about 500 m, NW-SW exposition, decreasing. Leg. et det. G. Follmann Aug. 1989. Lichenes Exsiccati Selecti Ab Ab Instituto Botanico Universitatis Coloniensis Editi Nr. 488. [11662]



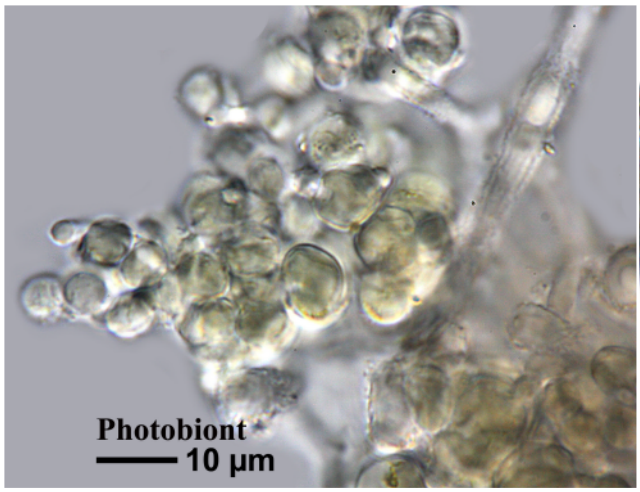


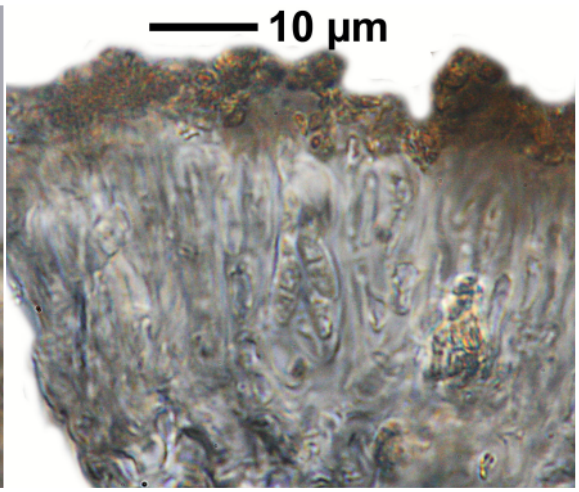


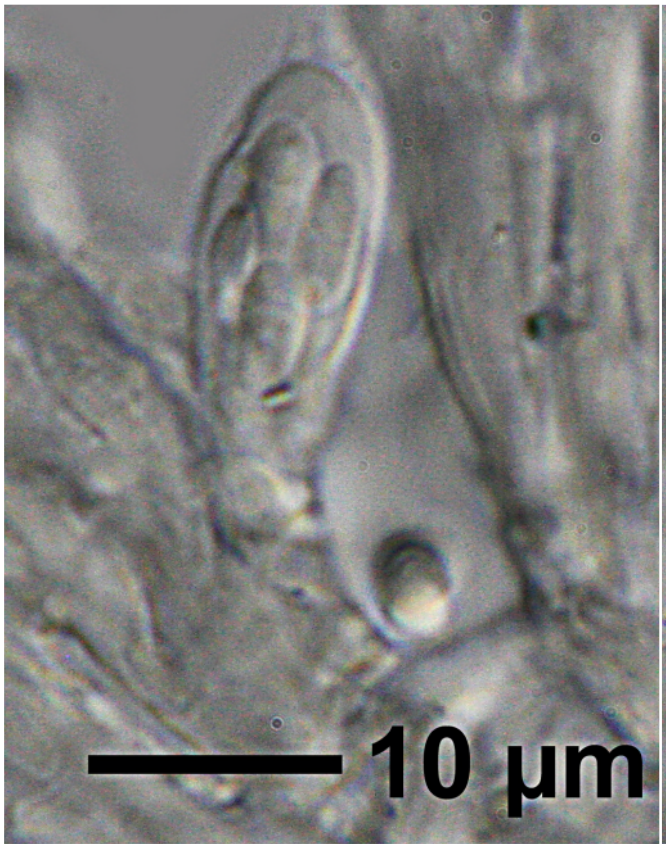
Roccellinastrum spongoideum



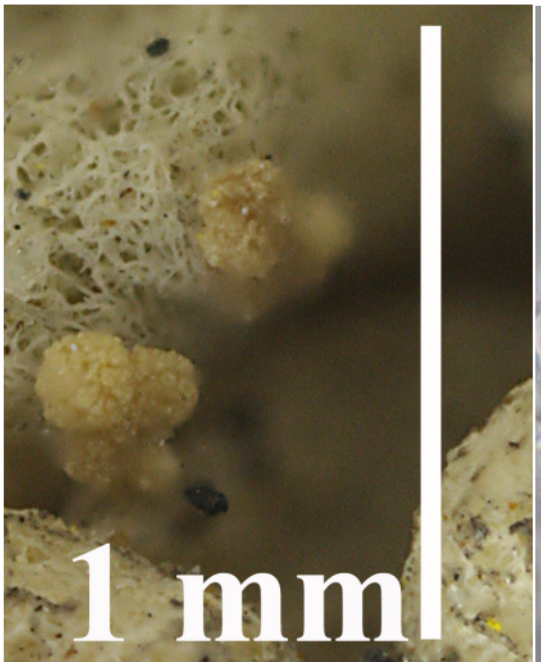
Roccellinastrum spongoideum

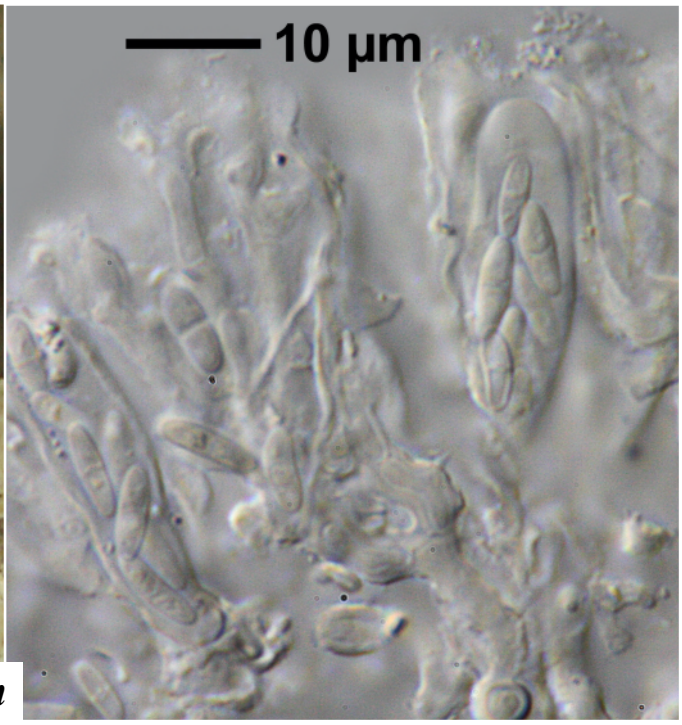




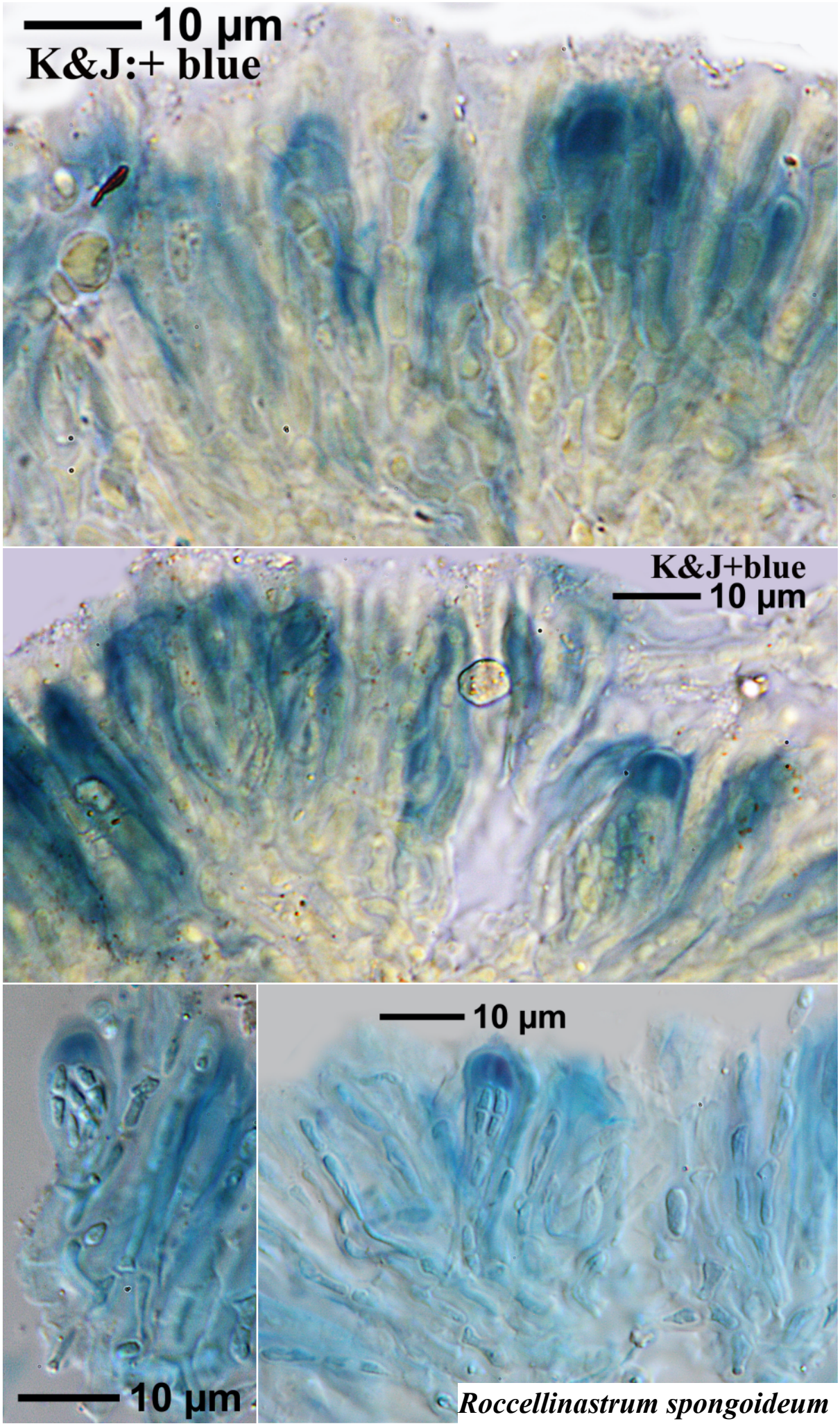








Roccellinastrum spongoideum



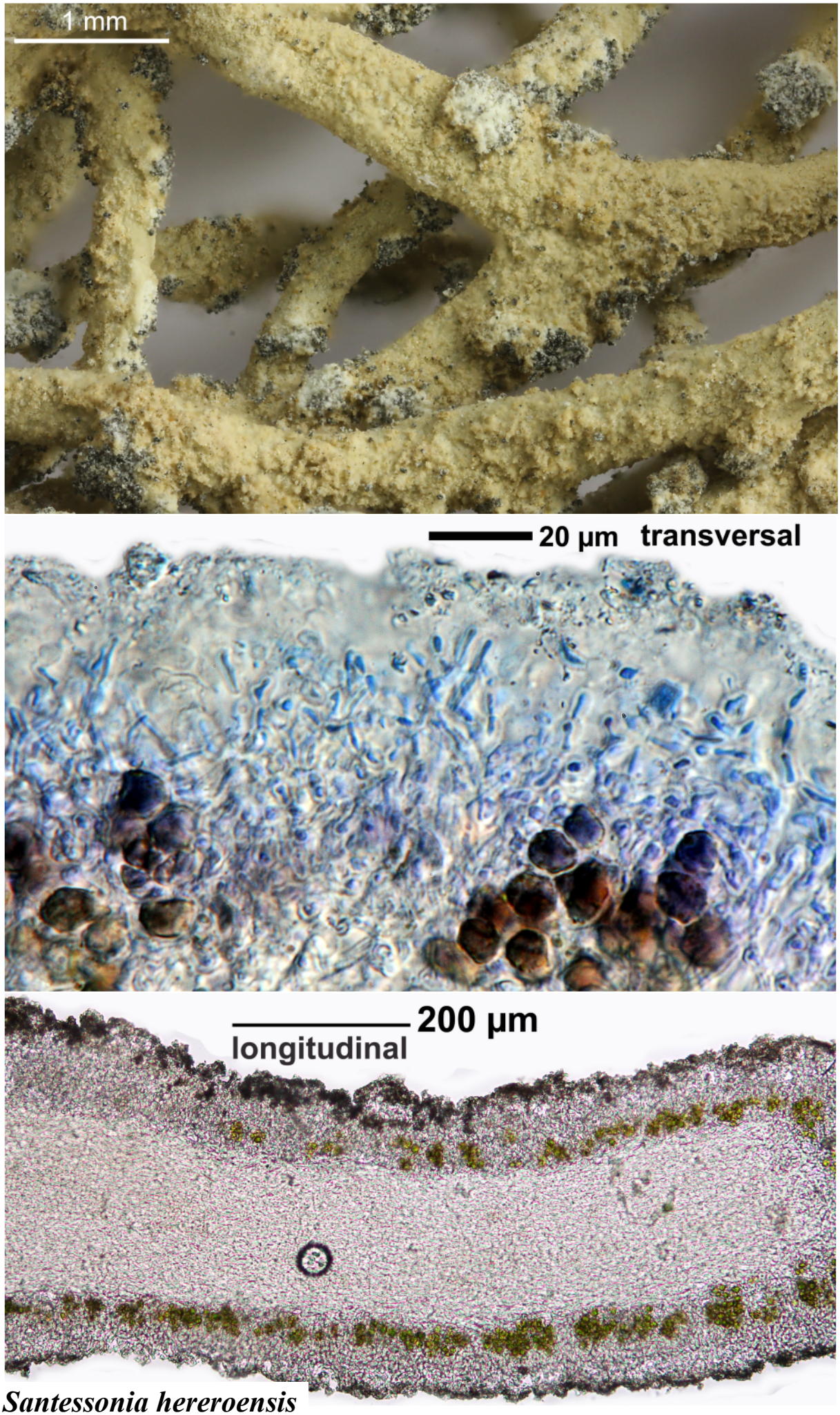
Roccellinastrum spongoideum

Santessonia hereroensis (Vain.) Follmann (1987)
Roccella hereroensis Vain. (1923)
Roccella mossamedana Vain. (1901)

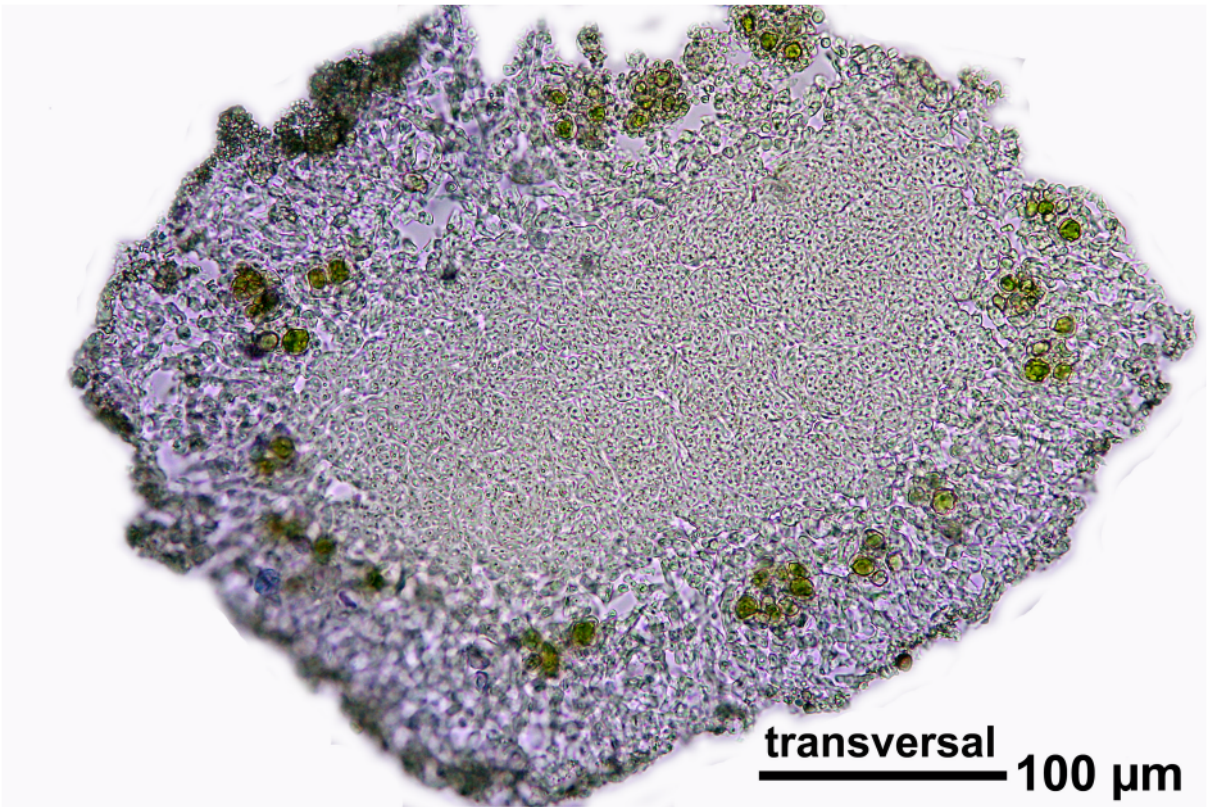
Thallus saxicolous, with *Trebouxia* algae, grey, sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Cortex branched to intermediate type, with thick epinecral layer. Apothecia unknown. Cortex C –, K –, Pd + yellow, medulla C –, major substance psoromic. – Namibia.

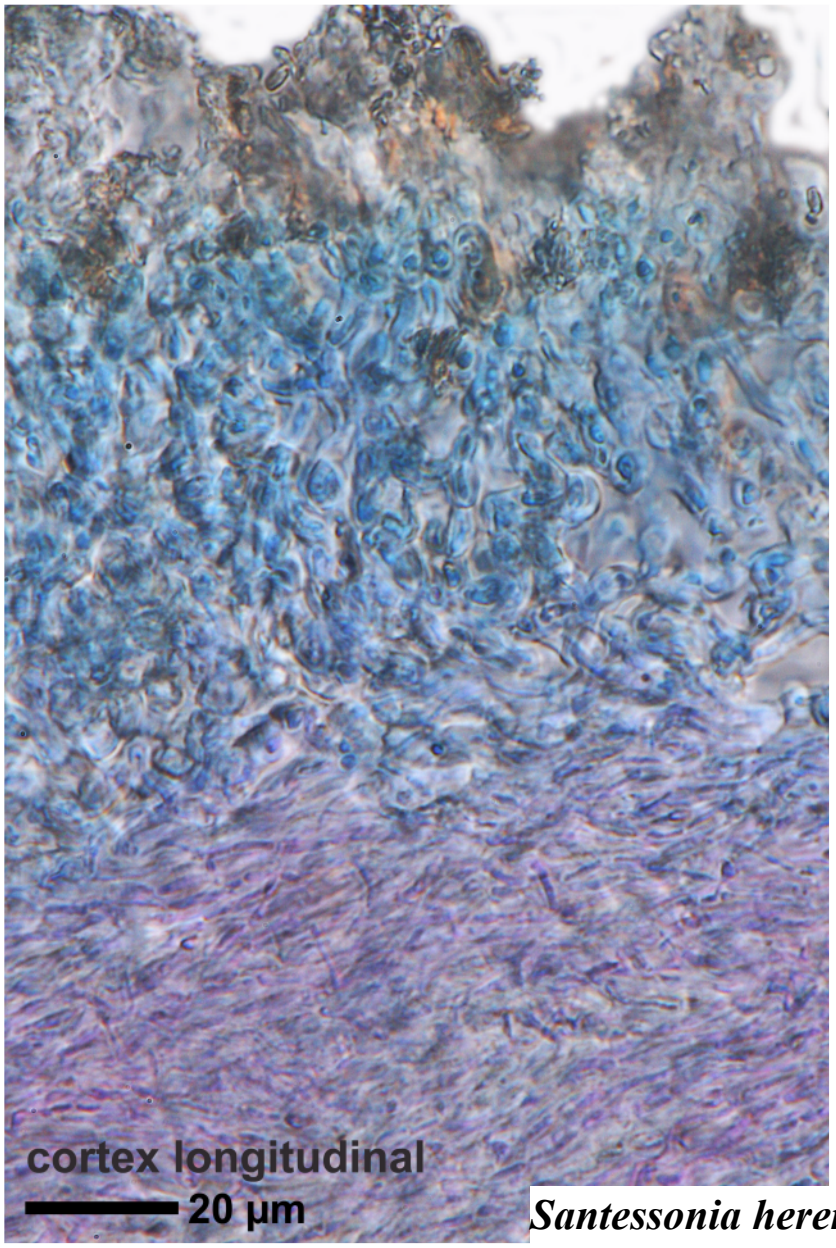
Namibia, 135 km N of Swakopmund, Cape Cross, in desert just east of C34 road, on rock. Leg. C.M. van Herk 3. Sept. 2007, det. A. Aptroot. [ABLsnNam]





Santessonia hereroensis



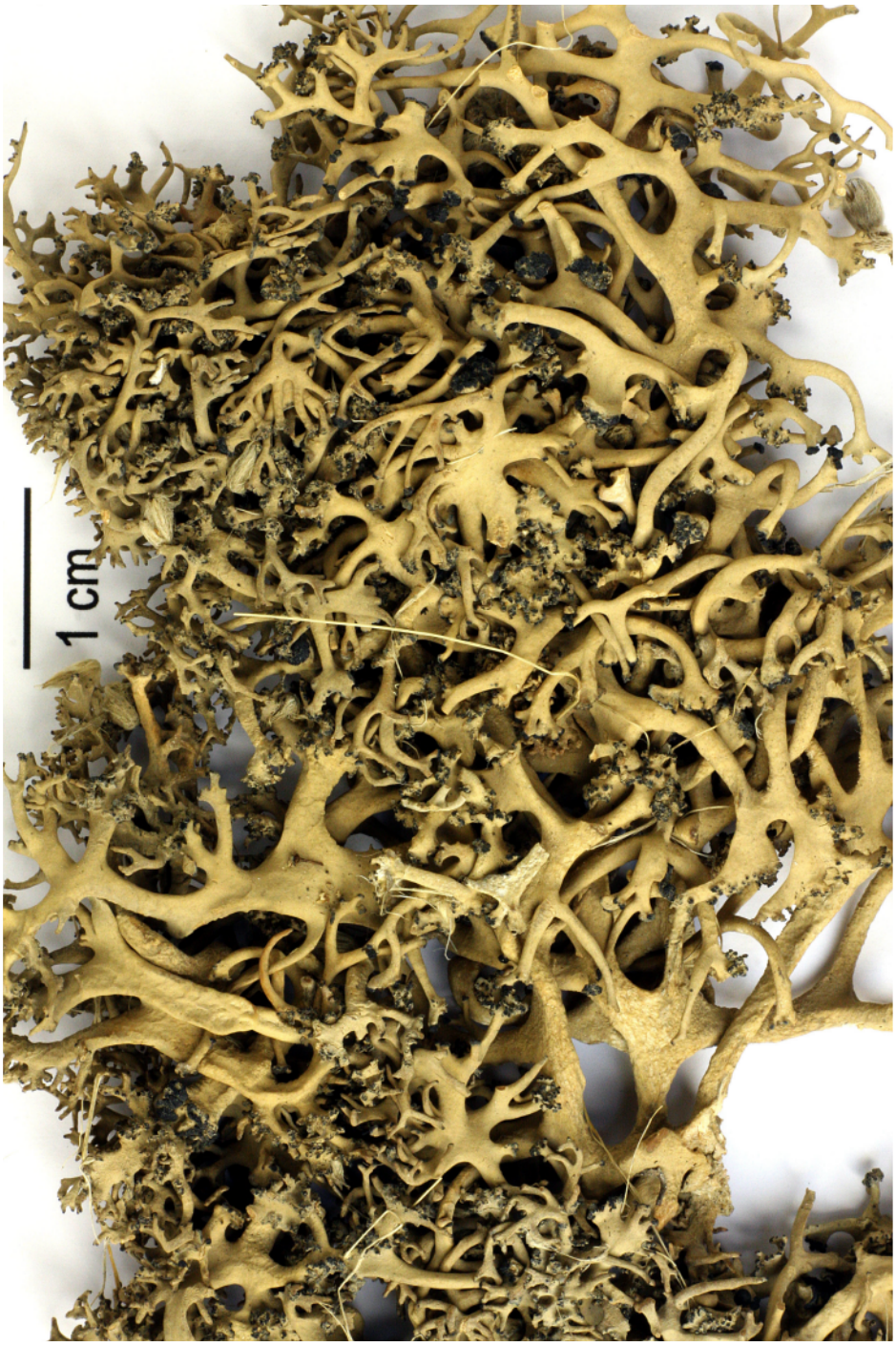


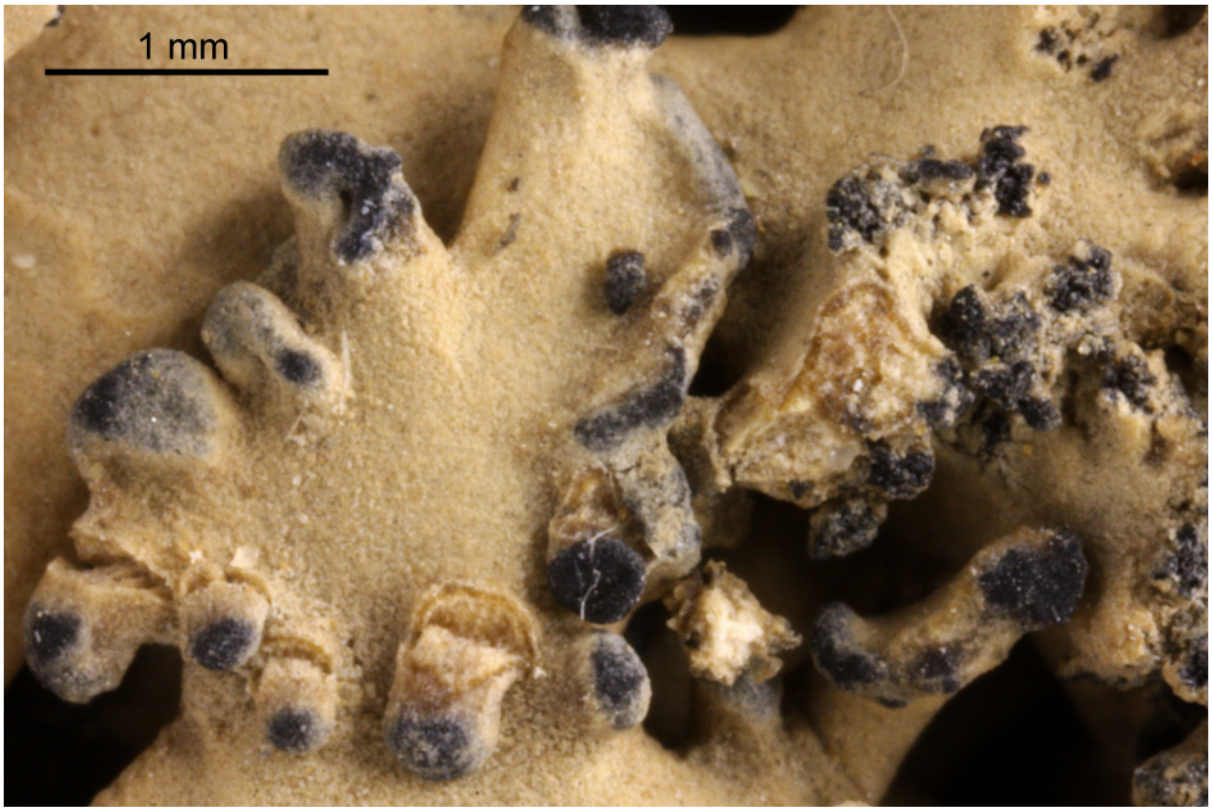
Santessonia hereroensis

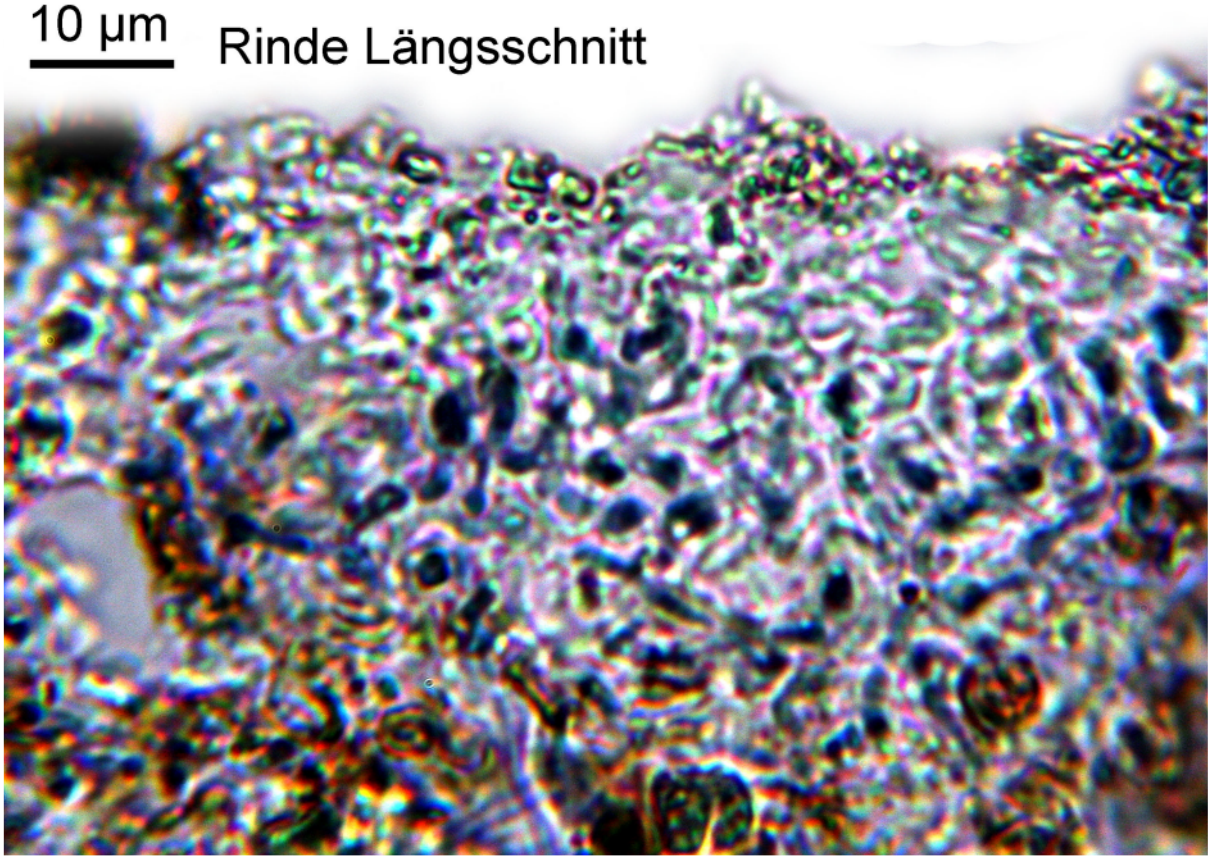
Santessonia namibensis Hale & Vobis (1978)

Thallus saxicolous or corticolous, with *Trebouxia* algae, grey, not sorediate, texture firm, applanate, surface smooth, holdfast internally white to brown. Cortex hyphae densely intricate branched, with thick epinecral layer. Apothecia round. Hypothecium black. Ascospores brown, 1-septate, 12–13 × 5.5–6.5 µm. Cortex C –, K + yellow > red, Pd + orange, medulla C –, major substances norstictic, connorstictic, cryptostictic. – Namibia.

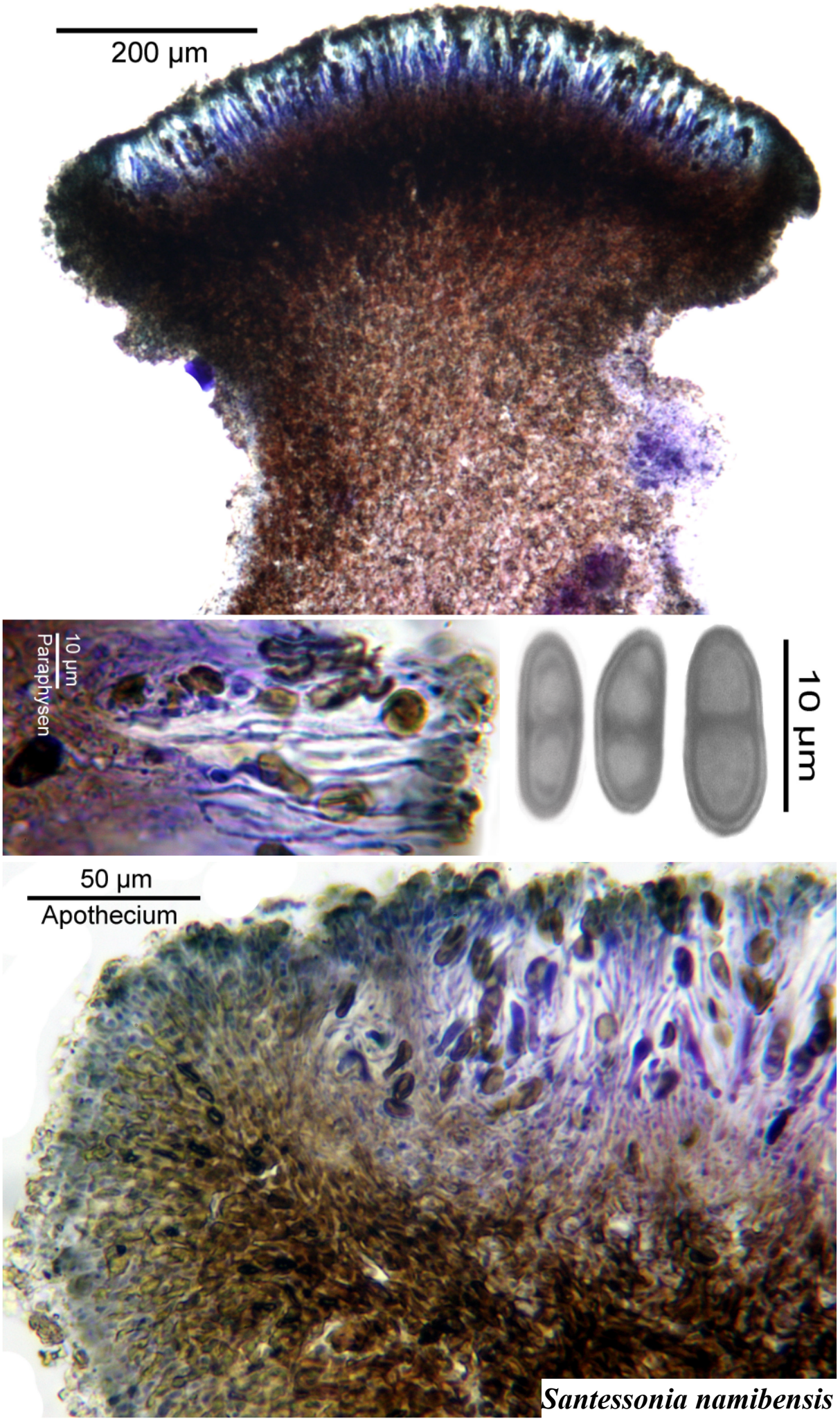
Namibia, outjo district, Skeleton Coast Park, marble ridge, ca. 20 km N of boundary at Ugabmond, on rock, 21°4’0” S, 13°40’0” E, ca. 50 m. Leg.T.H. Nash III, 9. Jun. 1986 nr. 23308, det. T.H.Nash III. [9481]



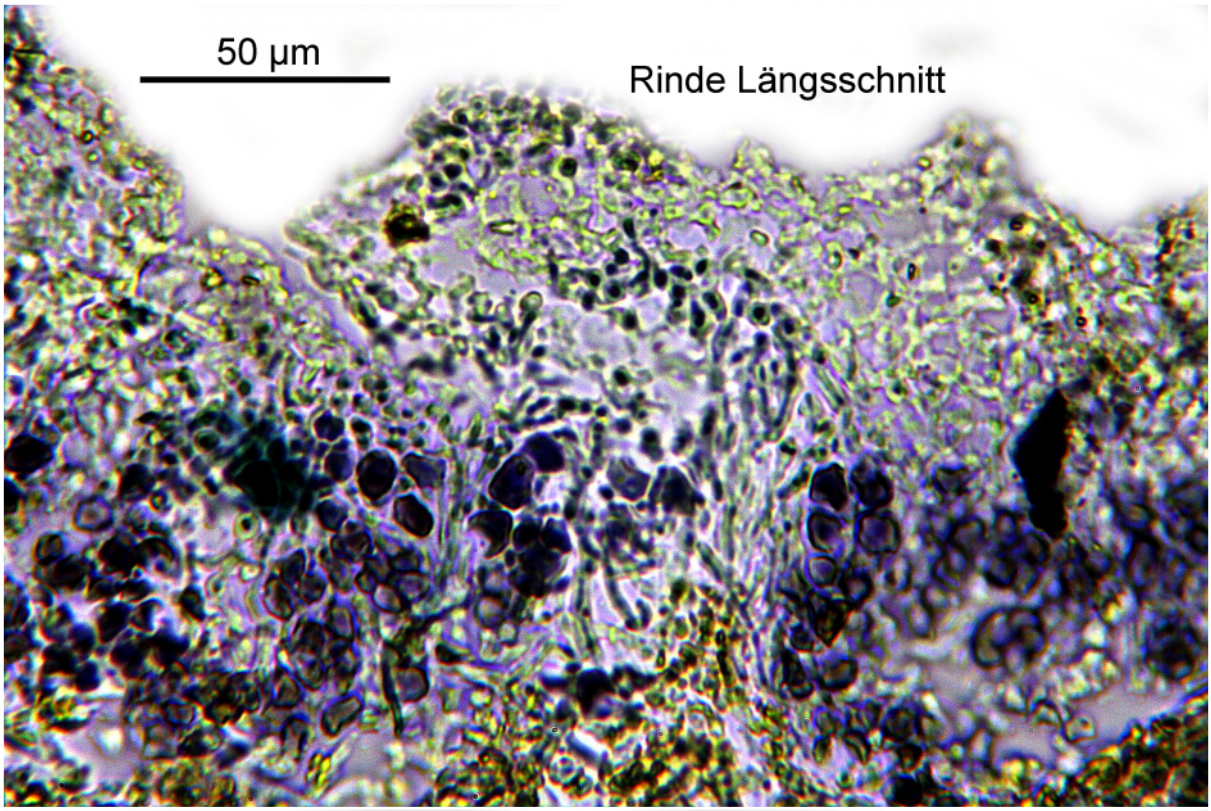


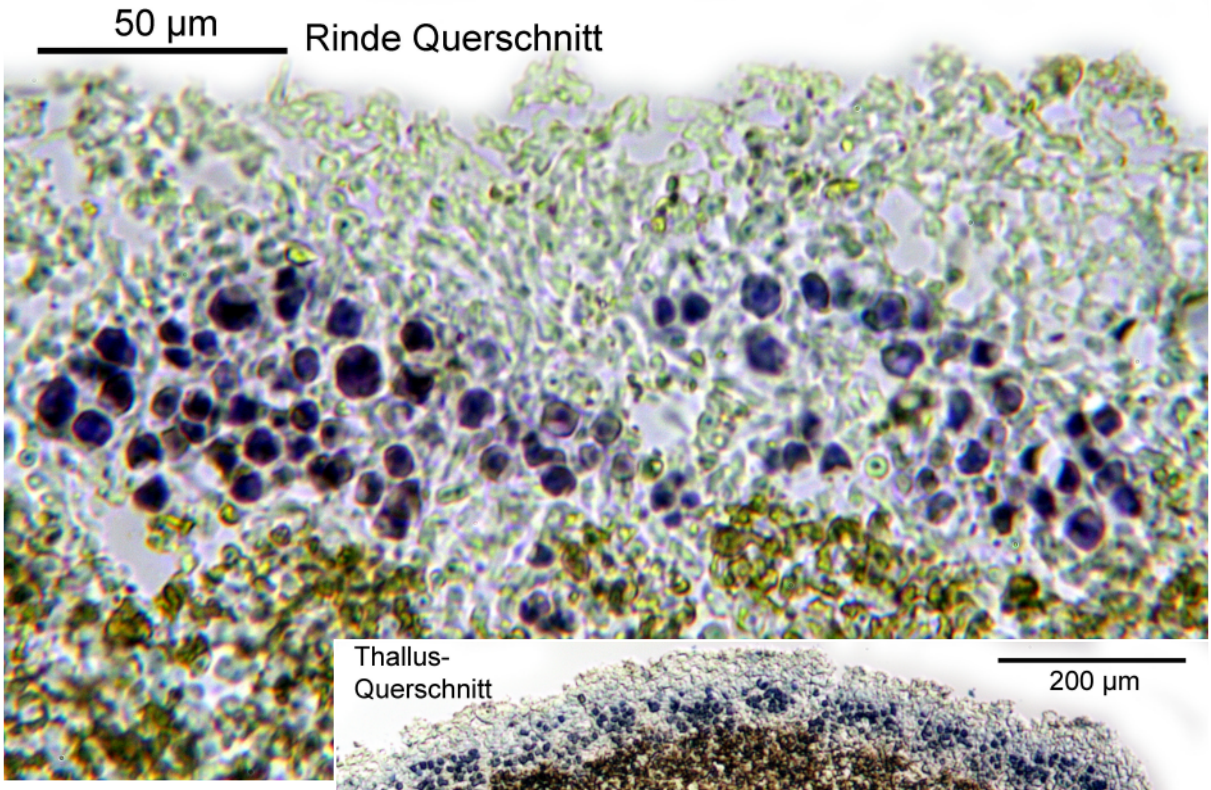


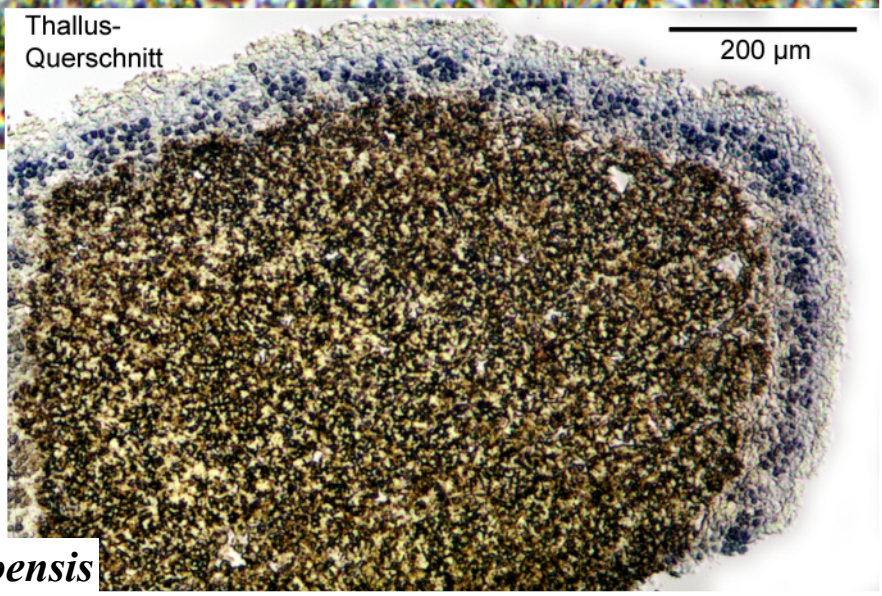
Santessonia namibensis



Santessonia namibensis





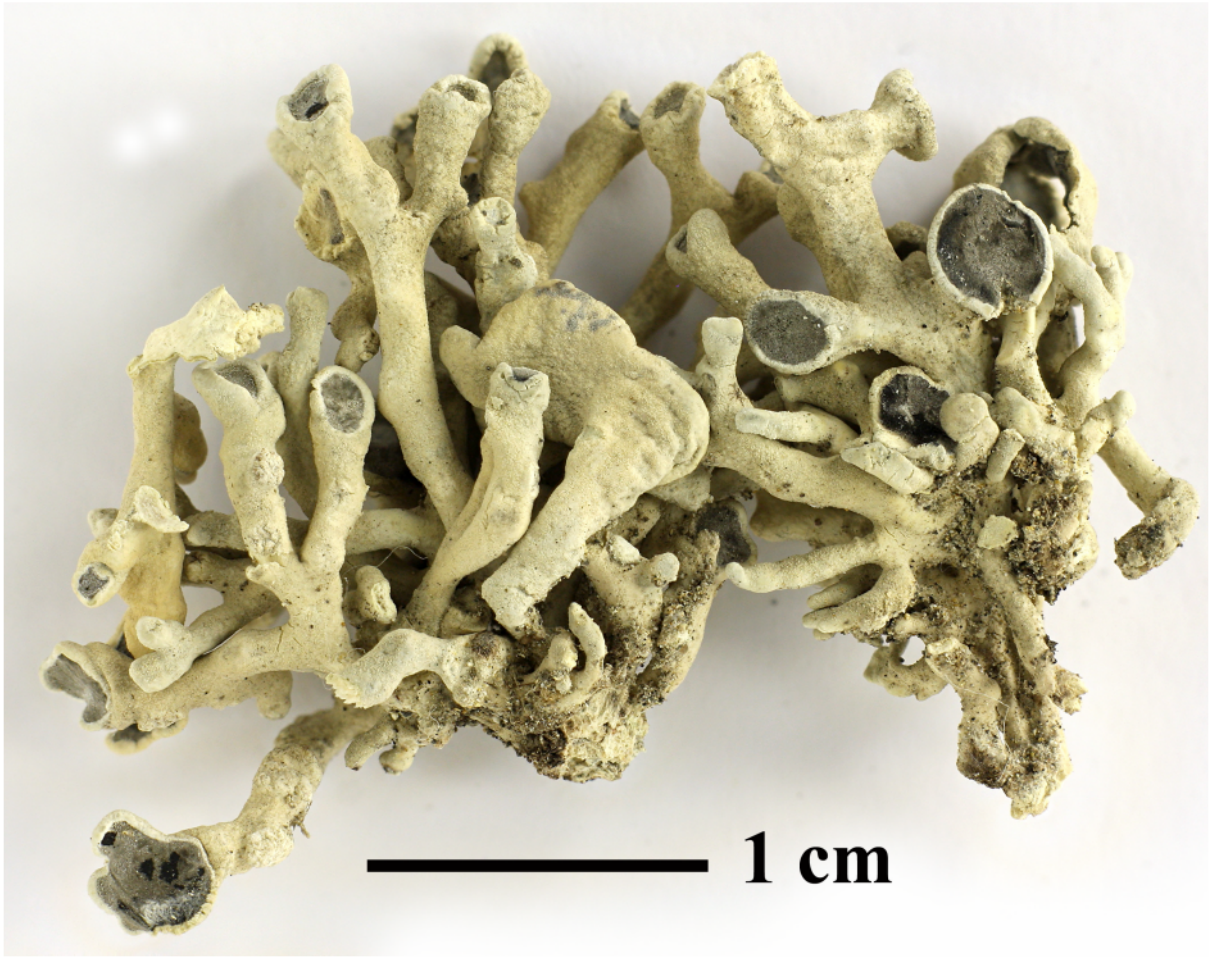


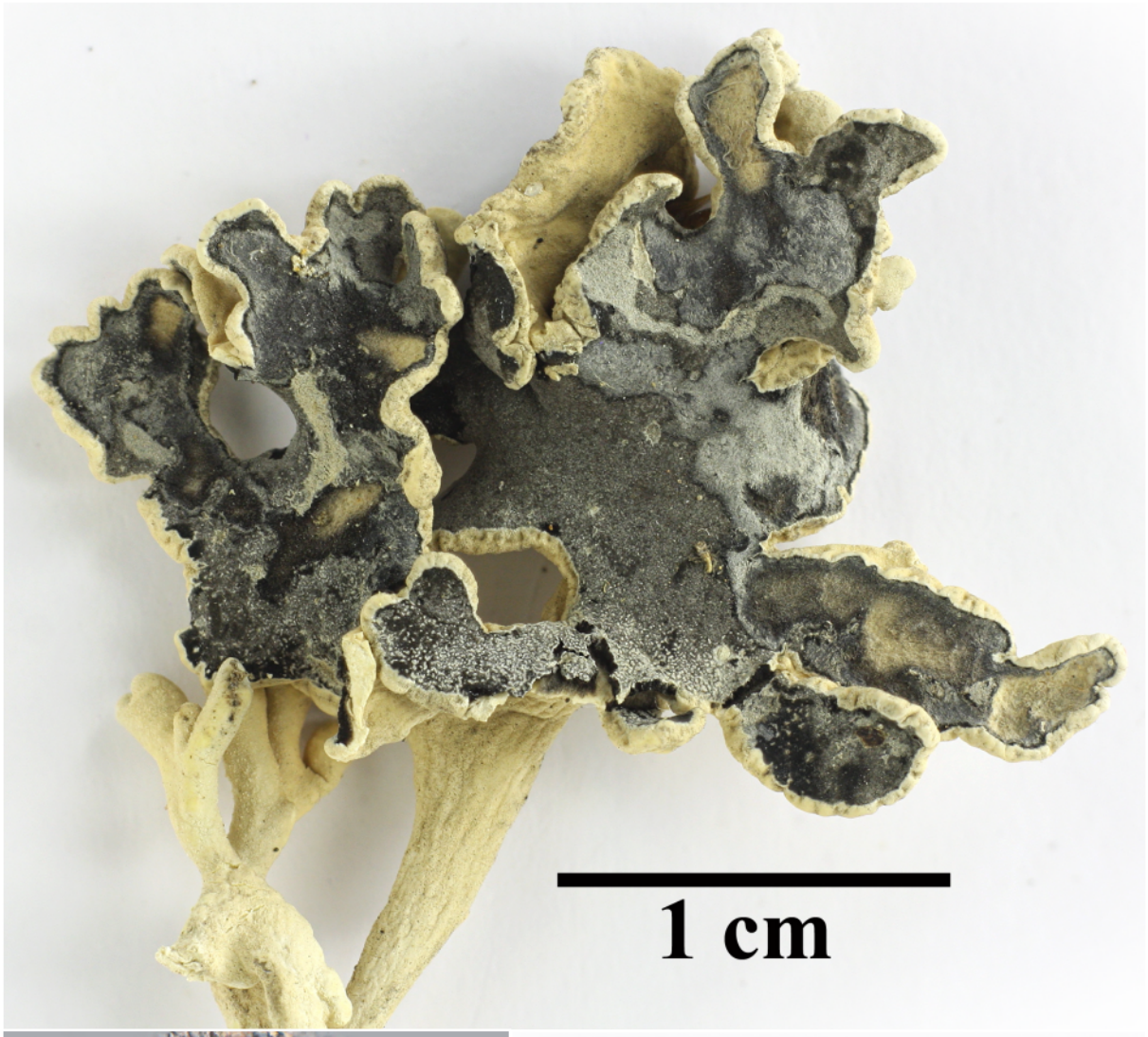
Santessonia namibensis

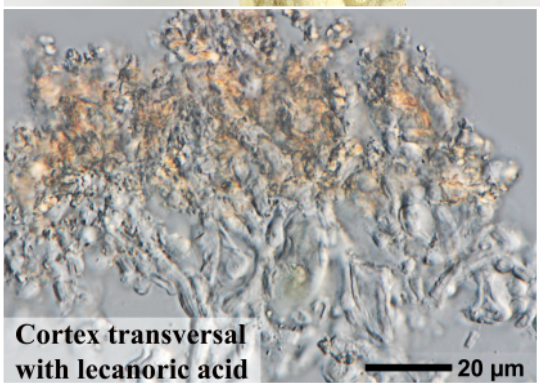
Schizopelte californica Th. Fr. (1875)
Combea californica (Th. Fr.) Follmann & M. Geyer (1986)

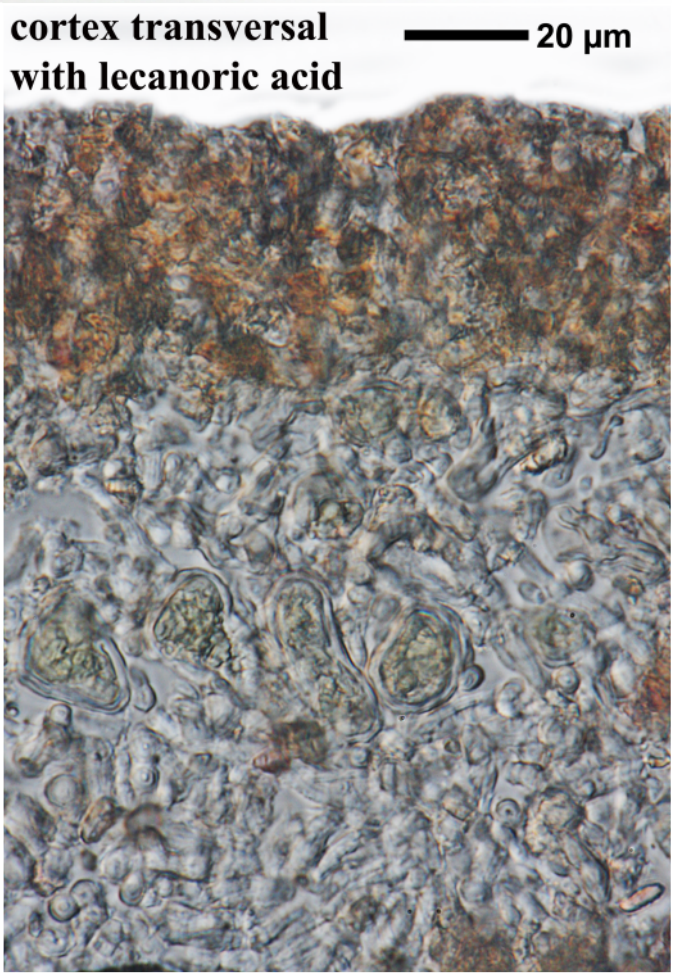
Thallus saxicolous, grey, not sorediate, texture soft, corallinoid, surface smooth, holdfast internally white to brown. Cortex branched type. Apothecia round. Hypothecium black. Ascospores brown, 3–7-septate, 19–21 × 4–5 µm. Cortex C + red, K –, Pd –, medulla C –, K –, P –, major substances erythrin, schizopeltic, lecanoric. – California, Baja California.

USA, California, San Luis opispo county: Coast area across from Lion Rock and just north of Diabolo Canyon, on acid rock boulers, 35°14’0” N, 120°52’0” W, ca. 10 m. Leg. et det T.H.Nash III, 10. Nov. 1995, Nr. 36988. [9480]

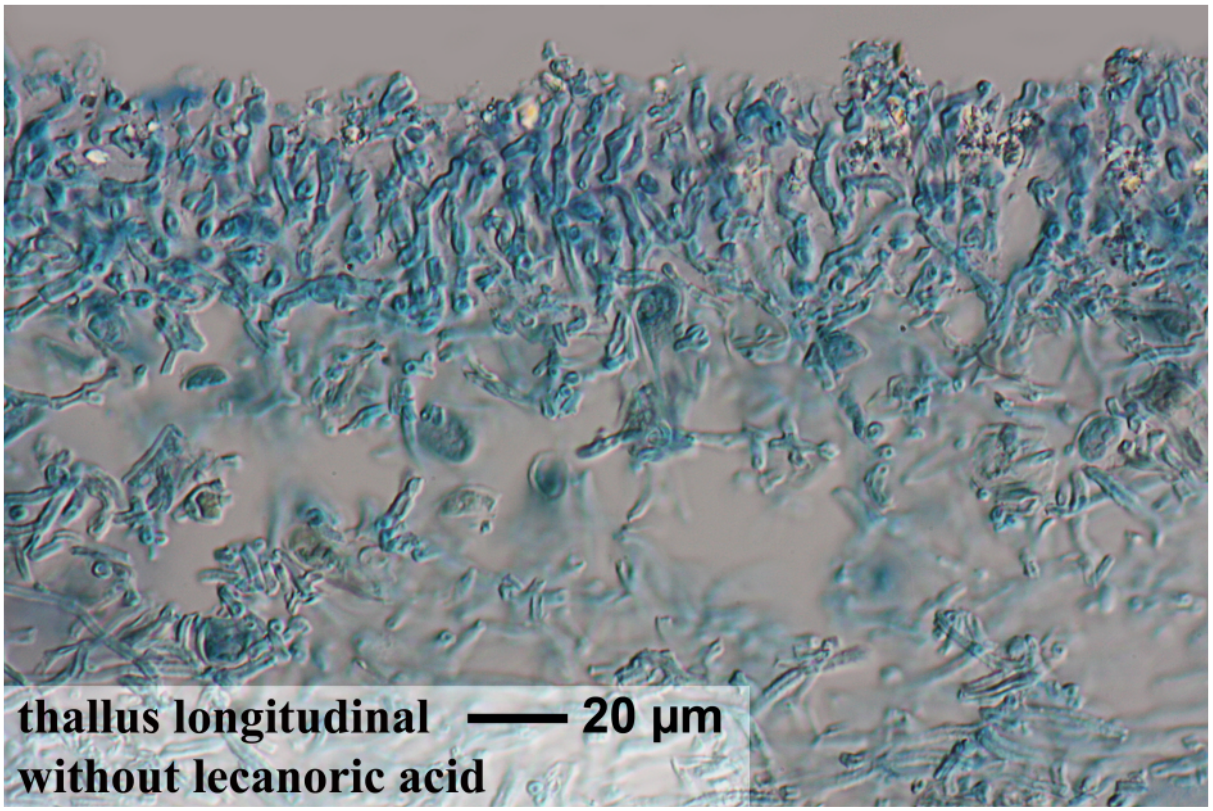


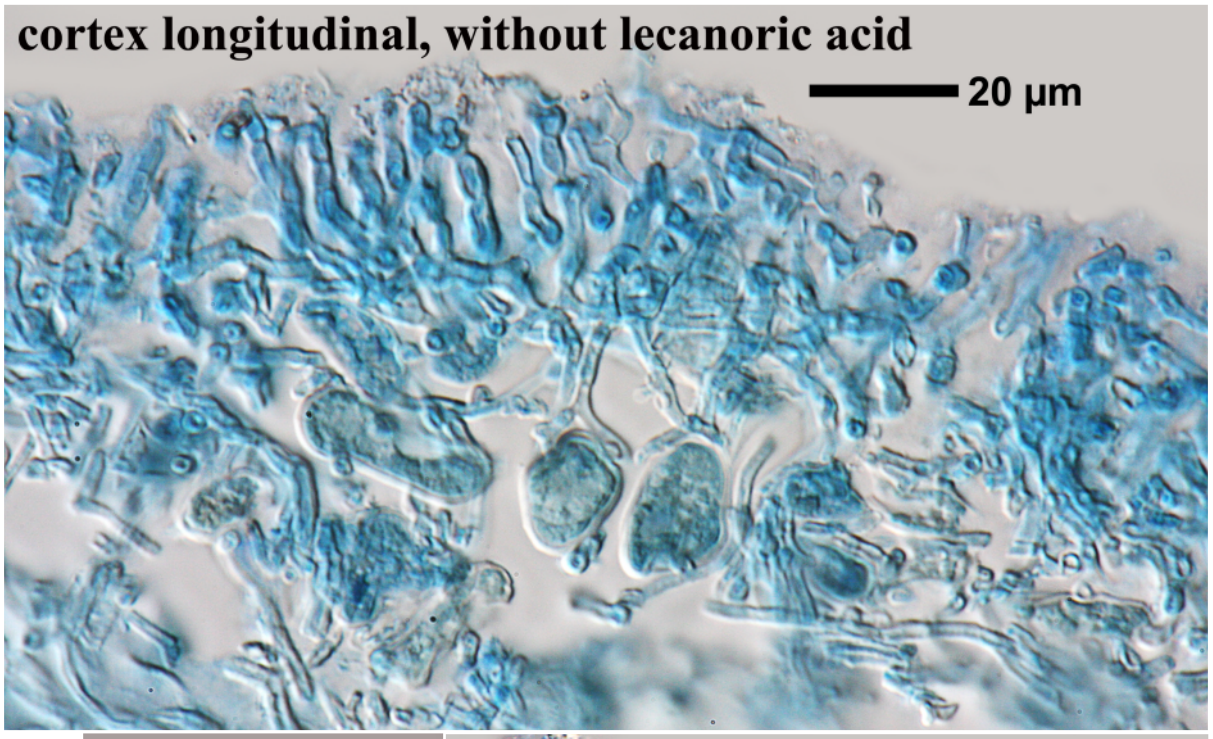


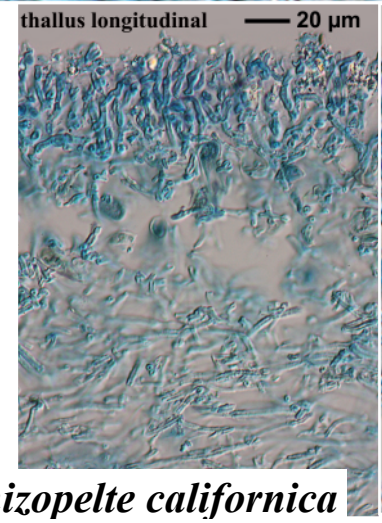


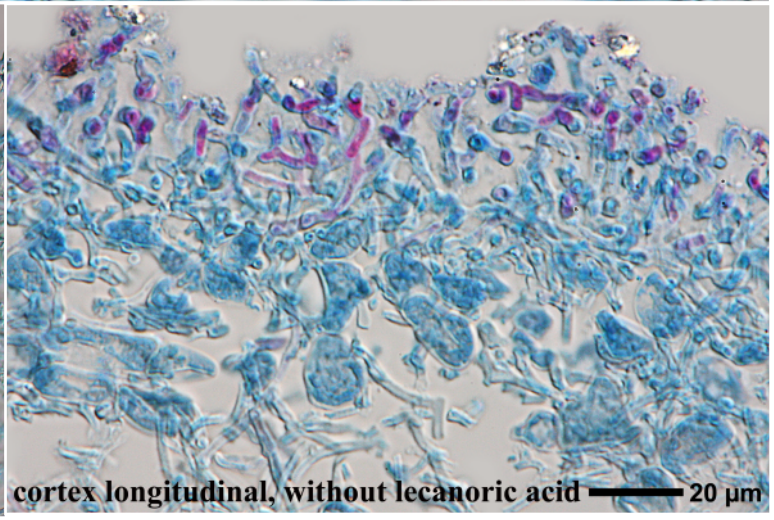


Schizopelte californica

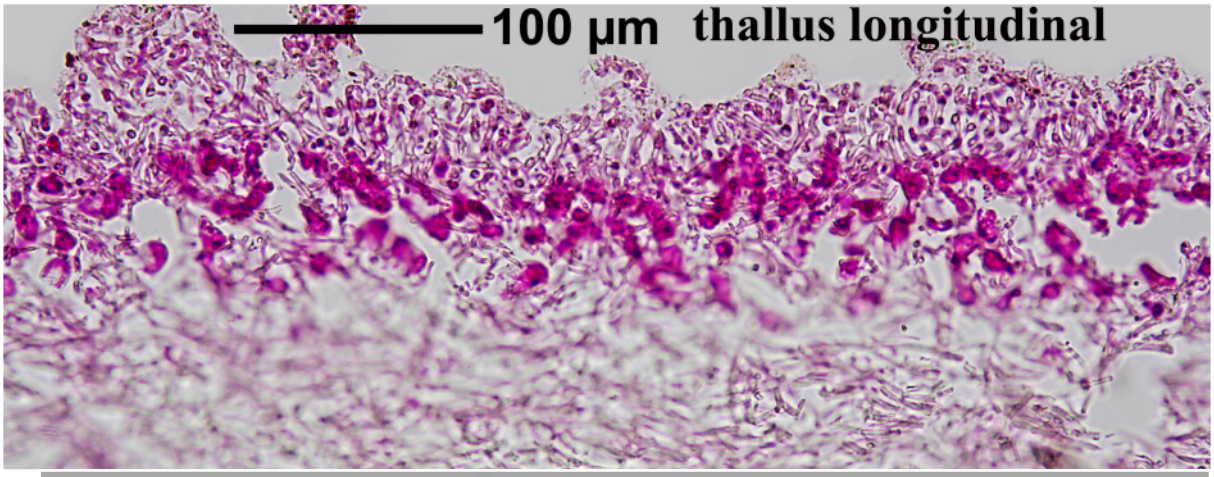


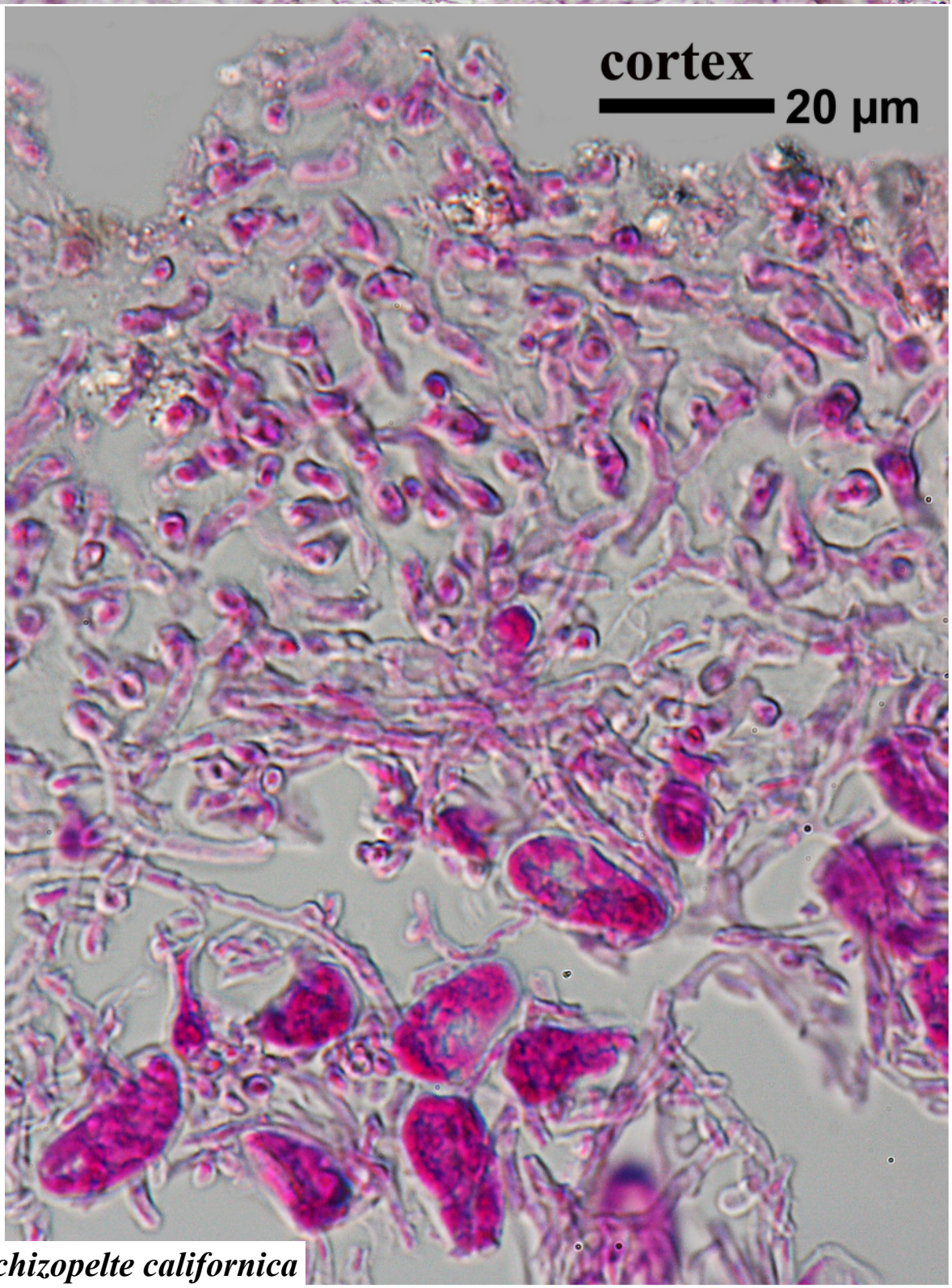






Schizopelte californica





Schizopelte californica







Schizopelte californica

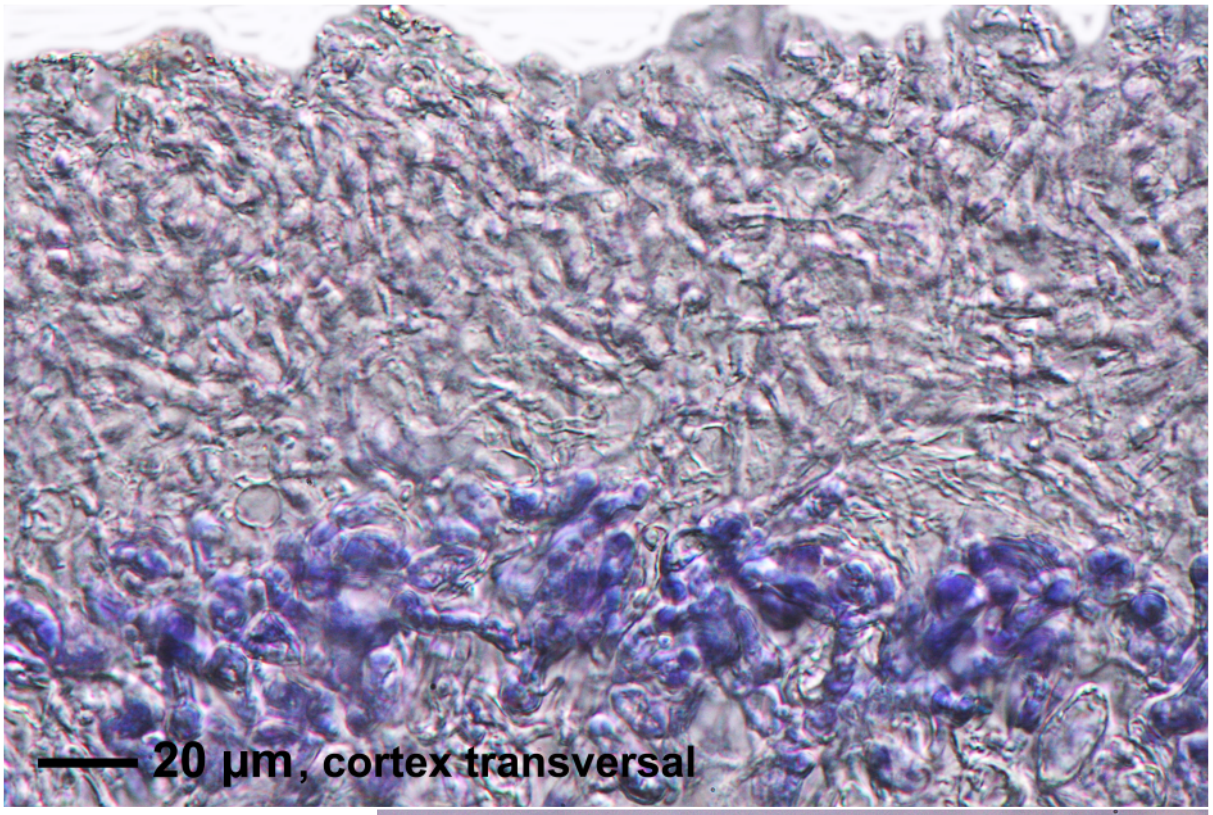
Schizopelte lumbricoides (W.A. Weber) Ertz & Tehler (2011)
Hubbsia californica (Räsänen) W.A. Weber (1987)
Hubbsia lumbricoides W.A. Weber (1965)

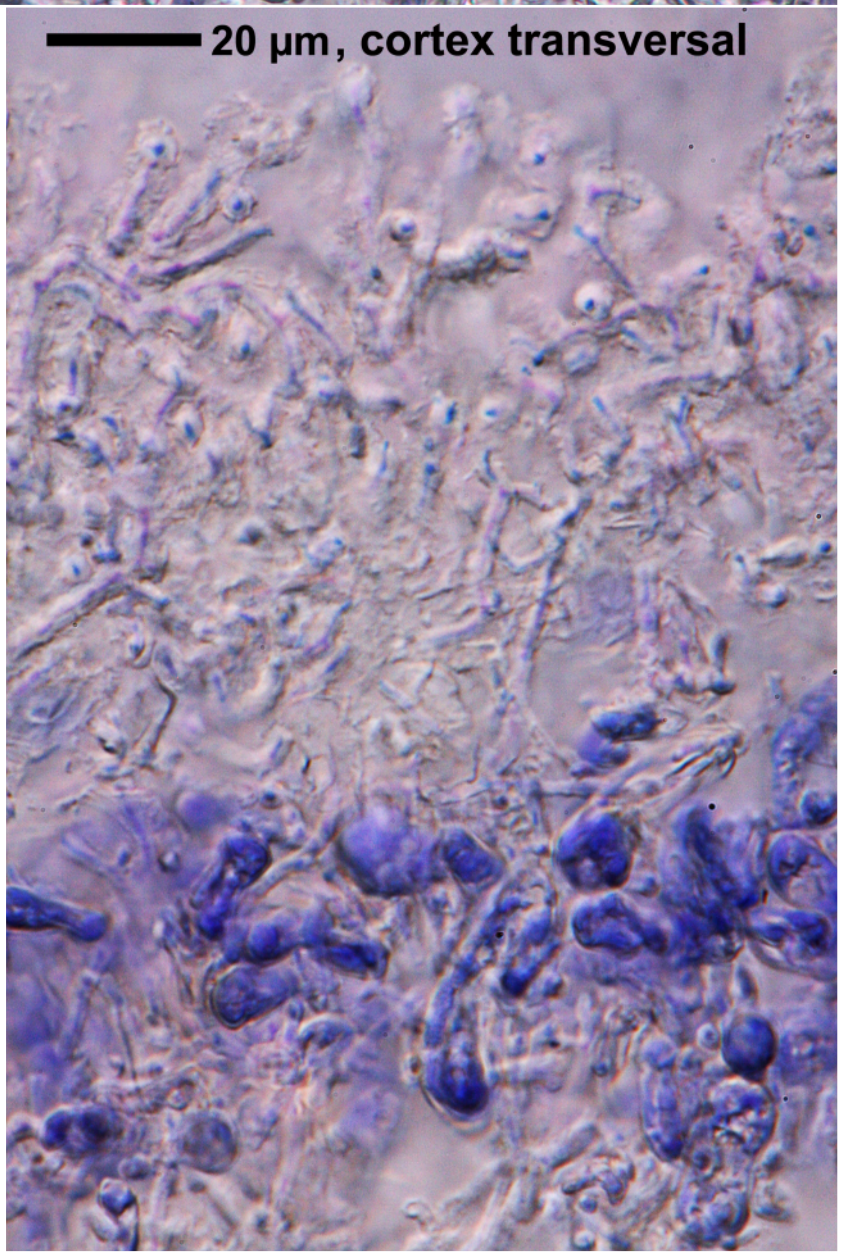
Thallus saxicolous, ochraceous, not sorediate, texture firm, pulvinate surface smooth, medulla internally lax. Cortexhyphae intricate branched, not periclinal. Apothecia linear, branched. Hypothecium black. Ascospores hyaline, 3–4-septate, 15–18 × 4–5 µm. Cortex C + red negative, K –, Pd –, medulla C + red, major substances erythrin, lecanoric. – Baja California, Guadeloupe Island (California).

Mexico, Baja California, Isla Guadeloupe, leg. W. Weber 04.1963 Exs. 85 (Isotype). [ABLsnMex]

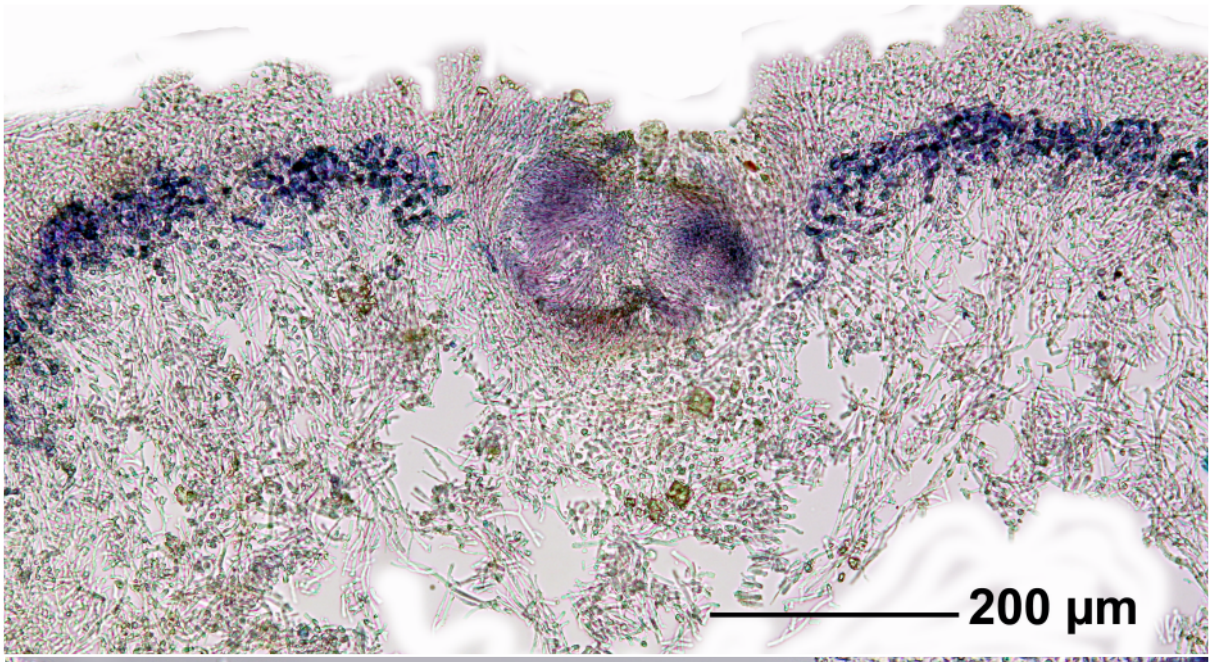


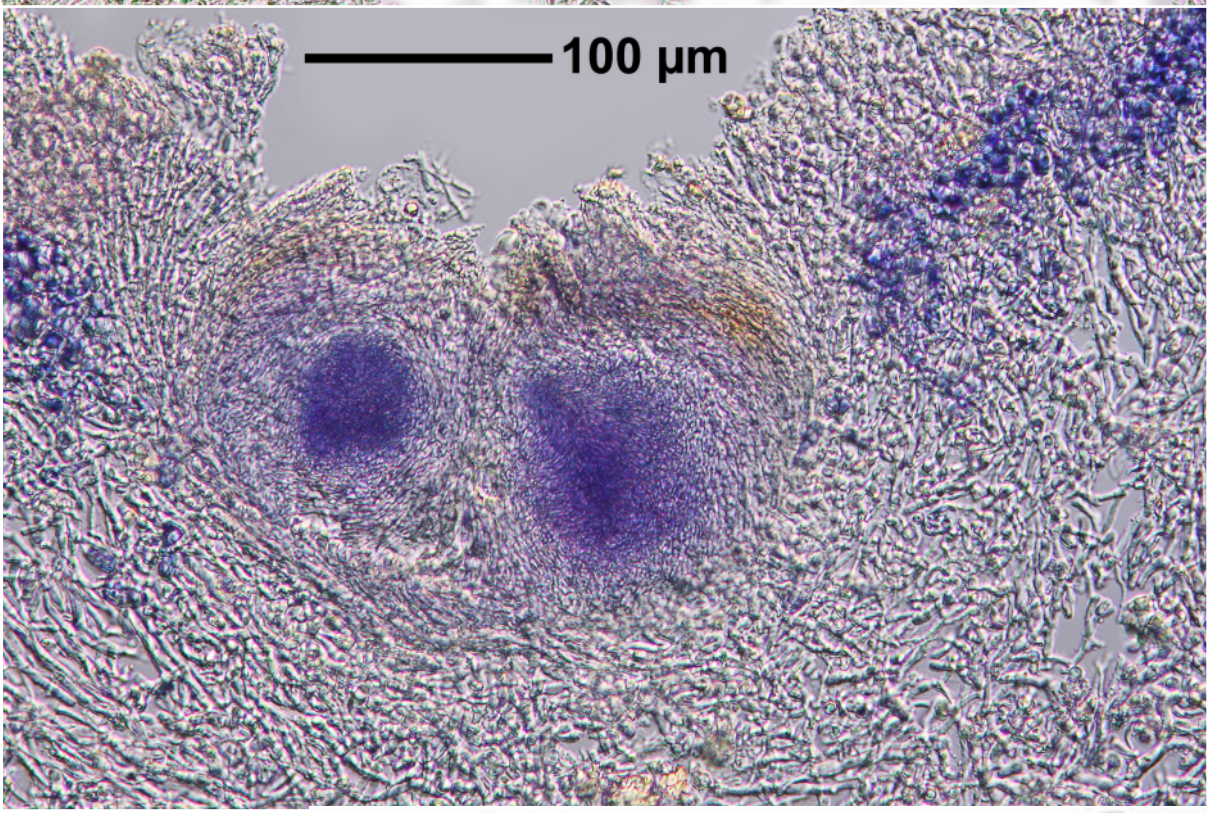


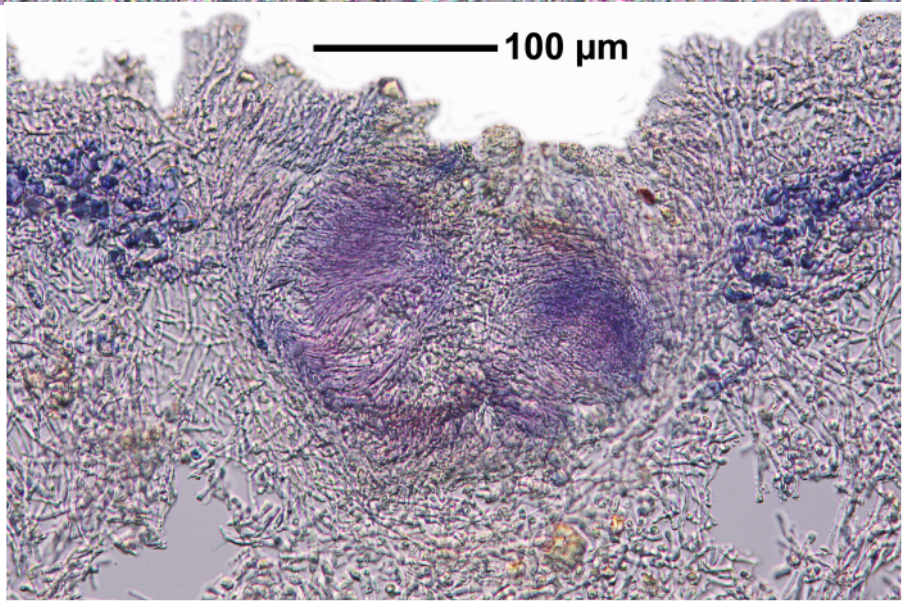




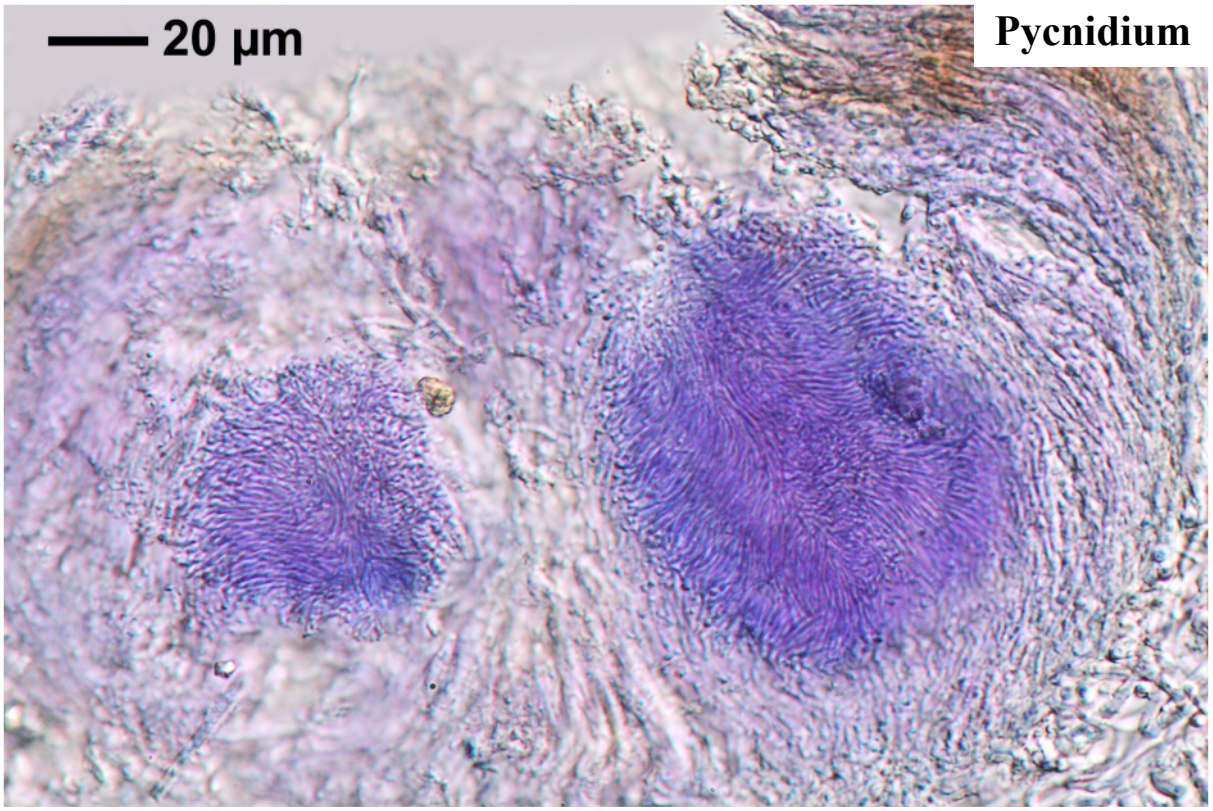
Schizopelte lumbricoides

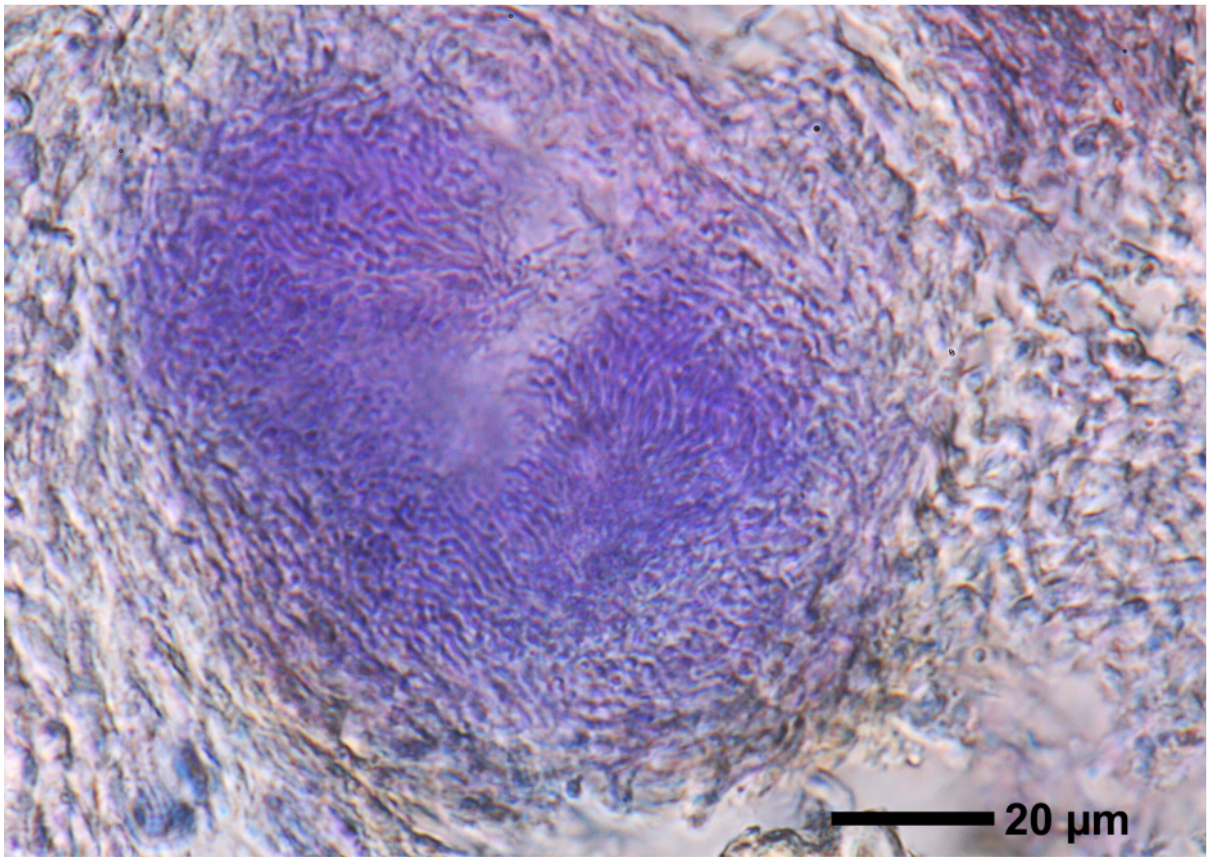






Schizopelte lumbricoides





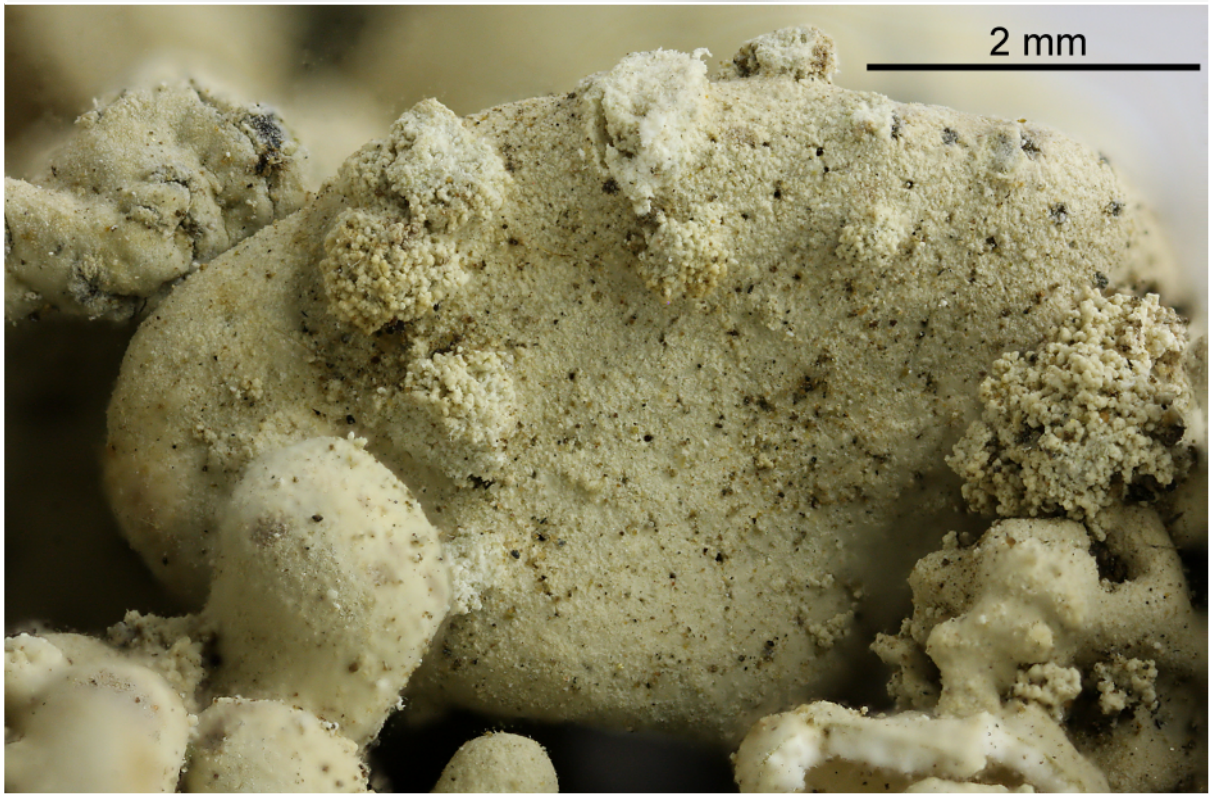
Schizopelte lumbricoides

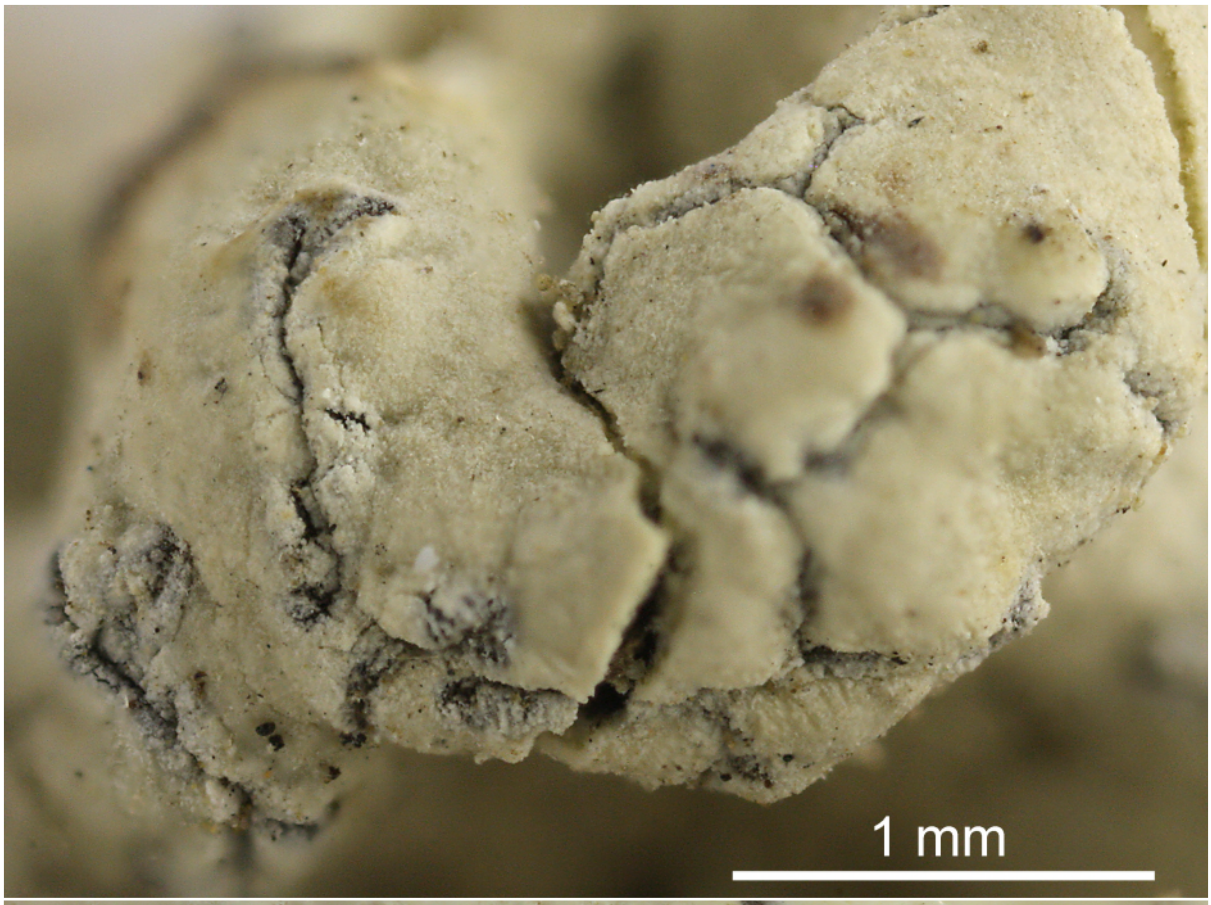
Schizopelte parishii (Hasse) Ertz & Tehler (2011)
Hubbsia parishii (Hasse) Follmann (1997)
Reinkella parishii Hasse (1914)

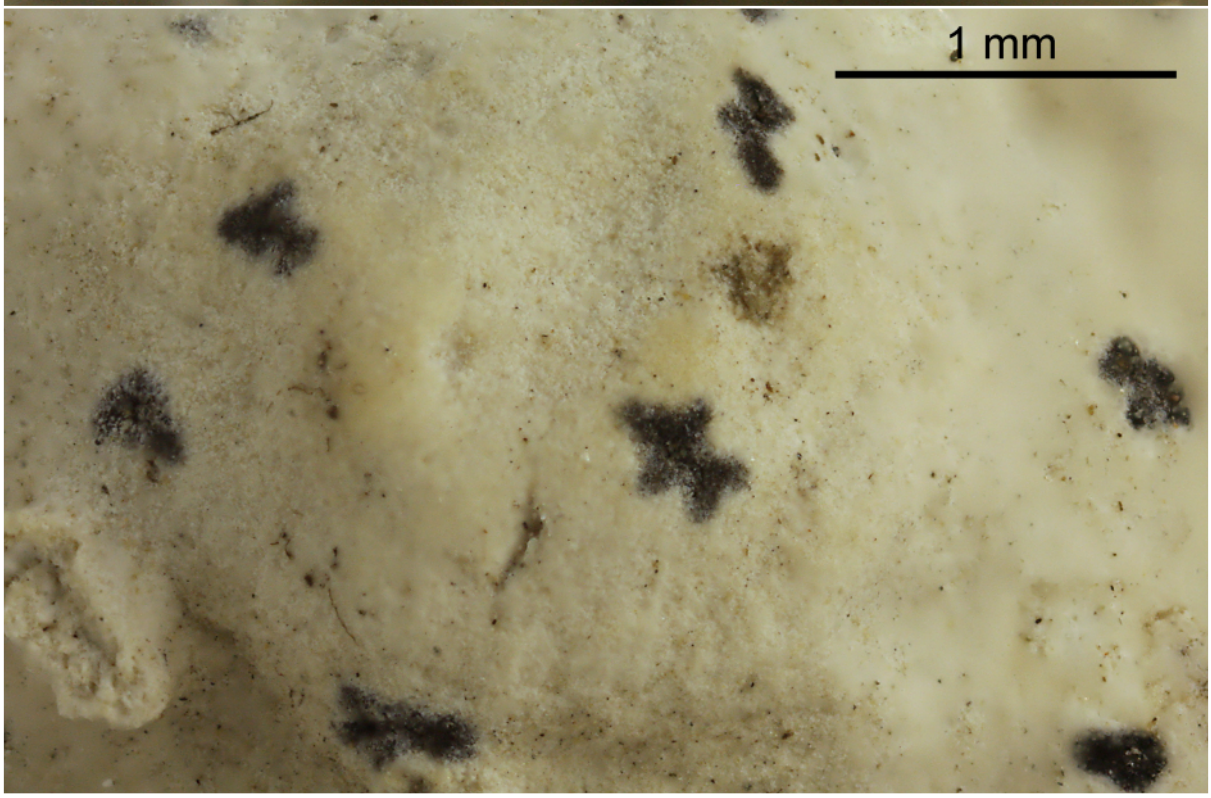
Thallus saxicolous, ochraceous, sorediate, texture firm, pulvinate surface smooth, medulla internally lax. Cortex intricate branched hyphae, not periclinal. Apothecia linear, branched. Hypothecium black. Ascospores hyaline, 3–4-septate, 16–17 × 4–5 µm. Cortex C + red, KC+ red, K –, Pd –, medulla C + red, IKI –, major substances erythrin, lecanoric. – Baja California, Guadeloupe Island (California).

Mexico, Baja California, Punta Santa Tomas, coastal scrub community (Agave shawii, Salvia, Simmondsia, etc.), 0-100 m, pre-batholithic rocks, primarily volcanic, secondarily sedimentary, 31°33’30” N, 116°42’ W. Leg et det. A.Aptroot 2. Jan. 1989. [ABL24233]

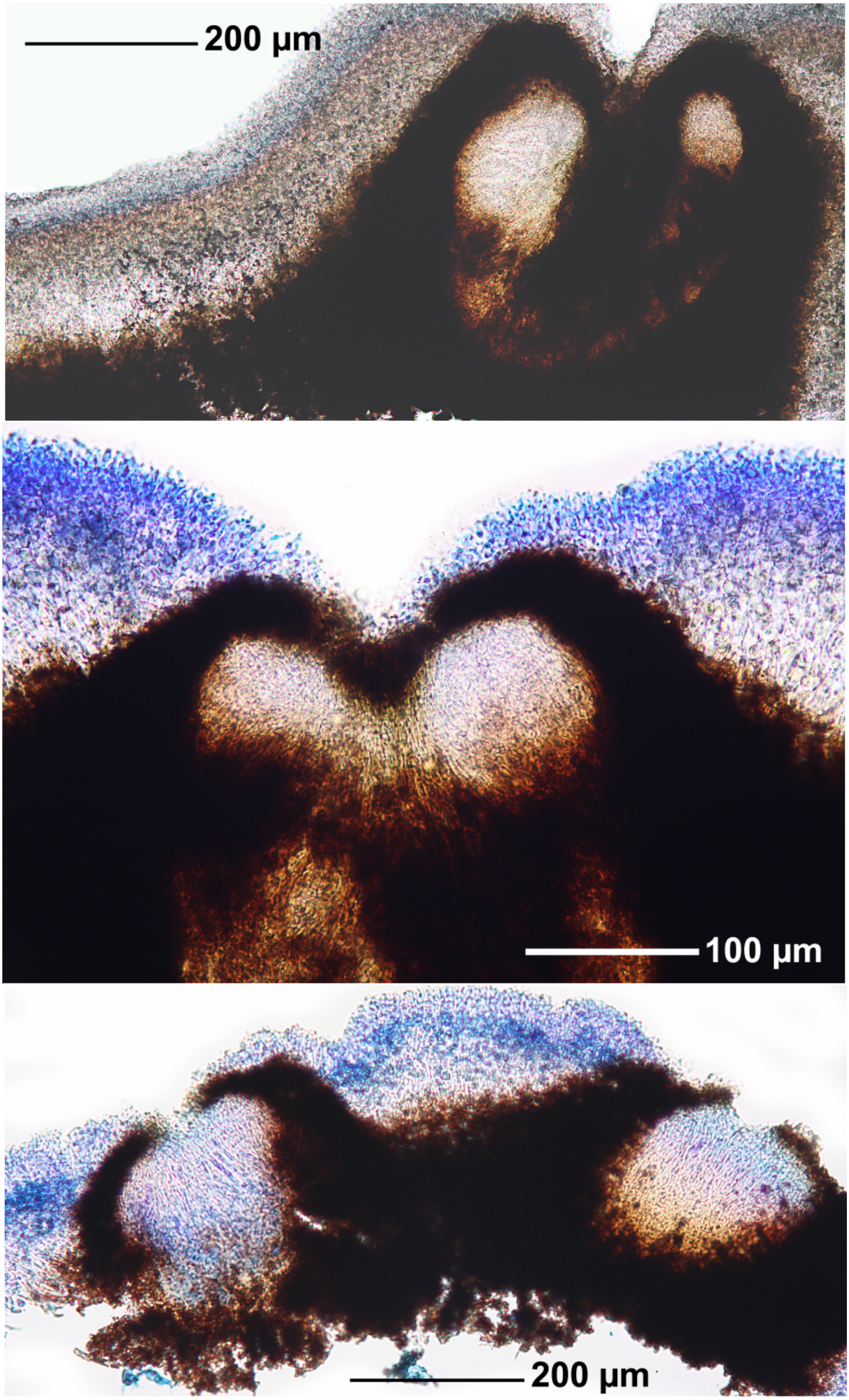




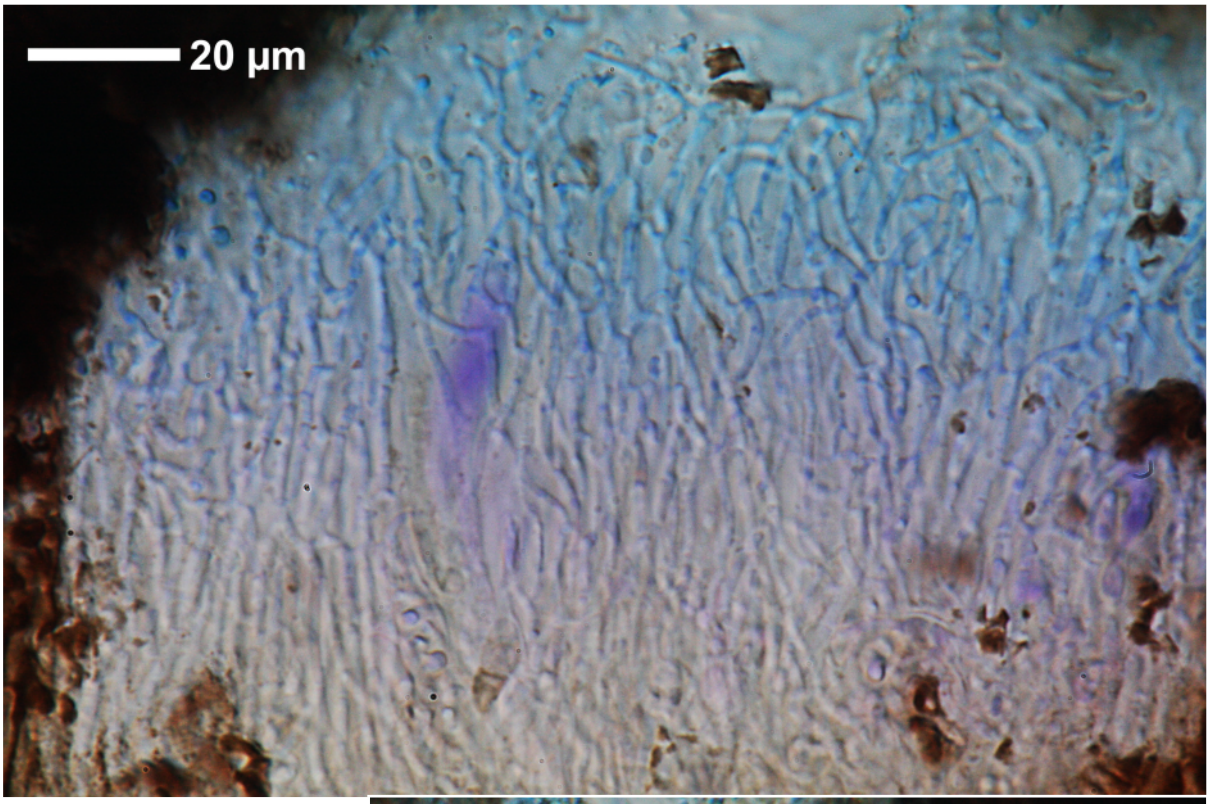


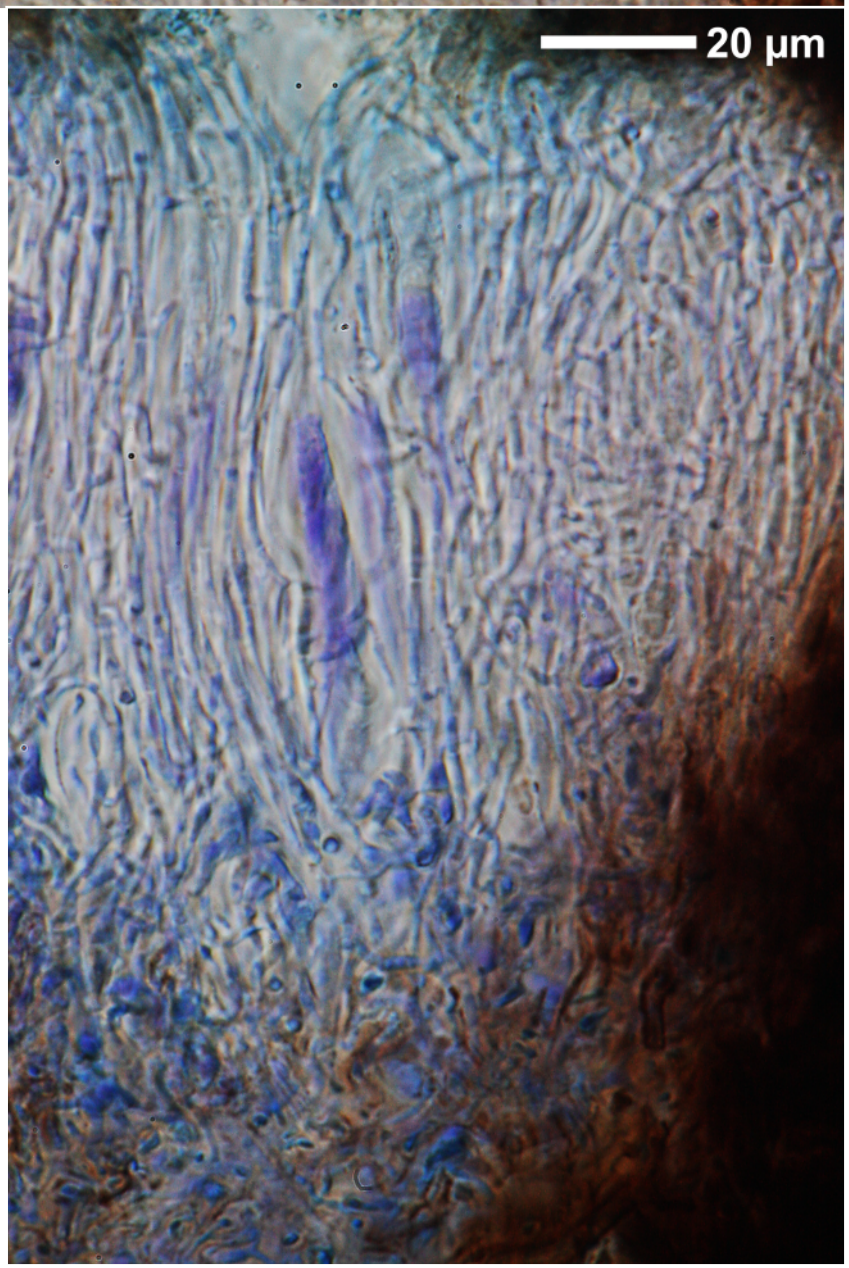


Schizopelte parishii

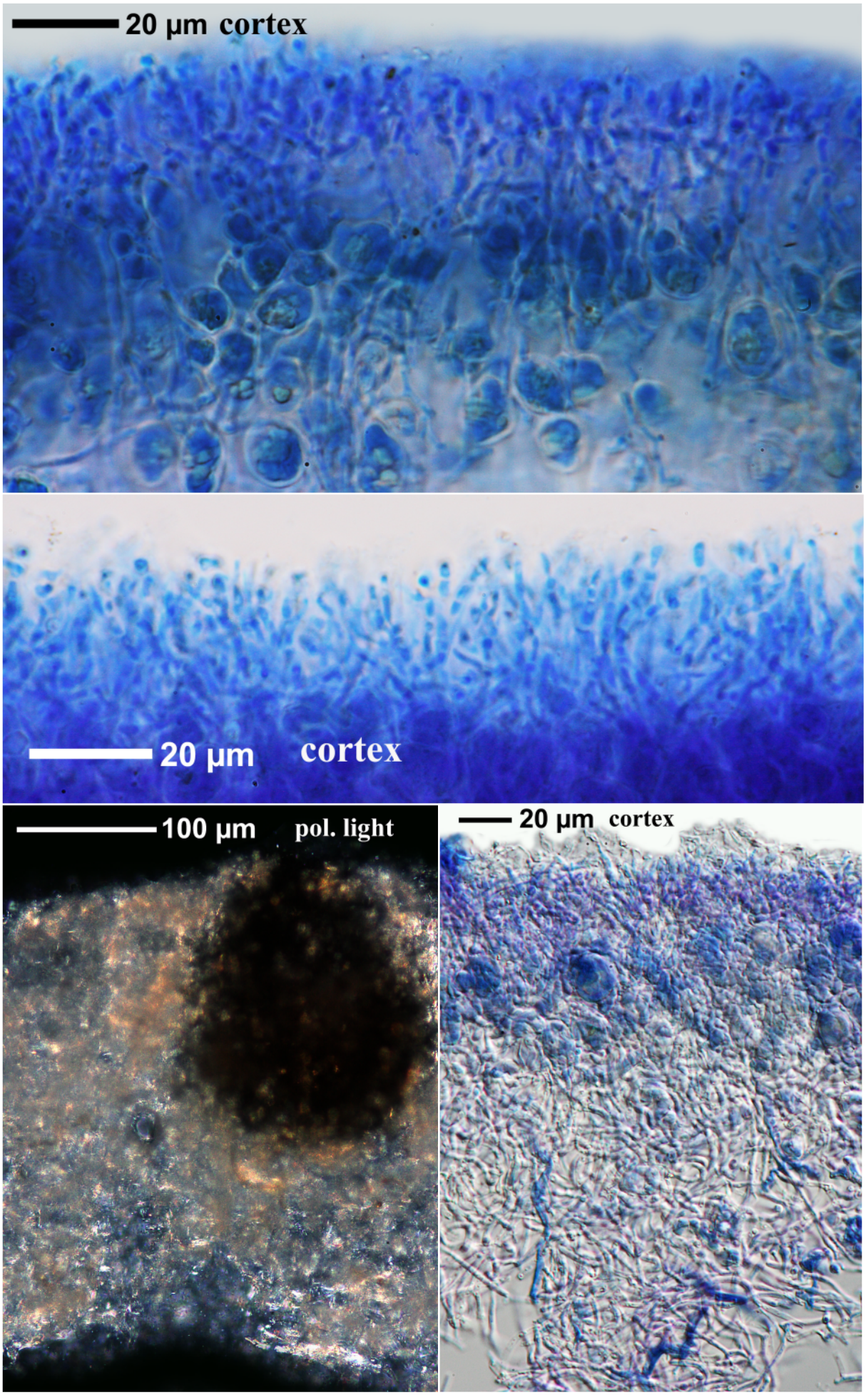


Schizopelte parishii





Schizopelte parishii

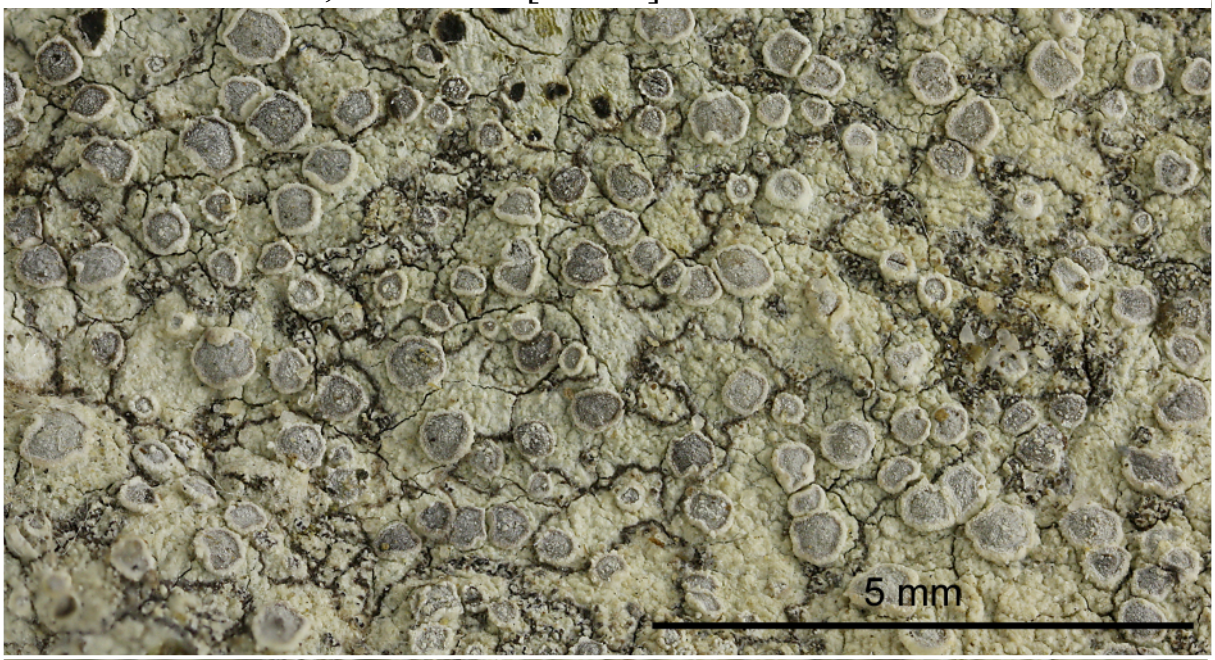


Schizopelte parishii

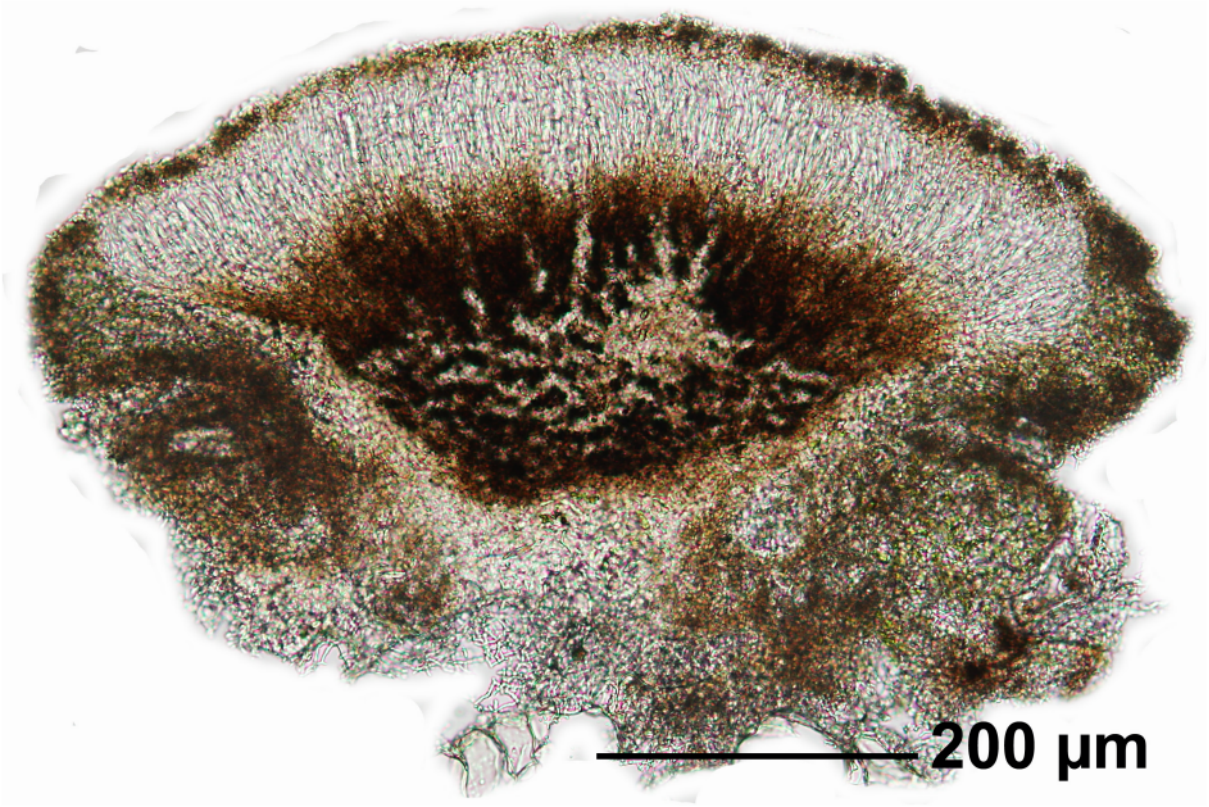
Sigridea californica (Tuck.) Tehler (1993)
Dirina californica Tuck. 1866
Schismatomma californicum (Tuck.) Zahlbr. (1924)
Platygrapha californica (Tuck.) Nyl. (1868)

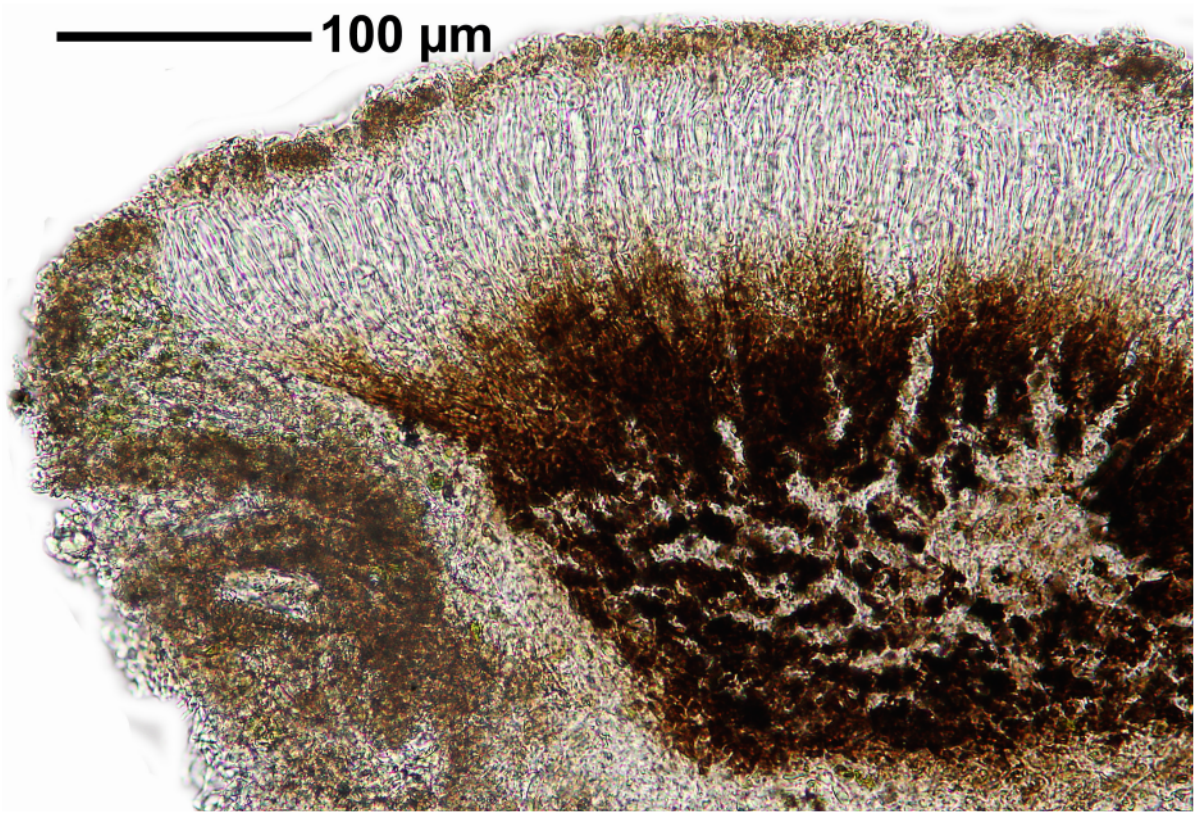
Ap.disc strongly pruinose, exciple with algae, Hypothecium brown-black. Spores 13-15 x 3-4 µm, hyaline, 3-septate. Thallus K- or yellowish, C-, KC- Pd+ yellow, psoromic. – California.

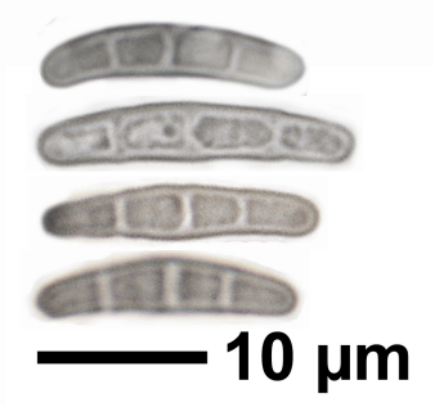
USA, California, Santa Barbara County, on cultivated Panax by Noble Hall, campus of University of California, Santa Barbara. Leg. Shirley Tucker 15.02.2003, #37890A. [16804]



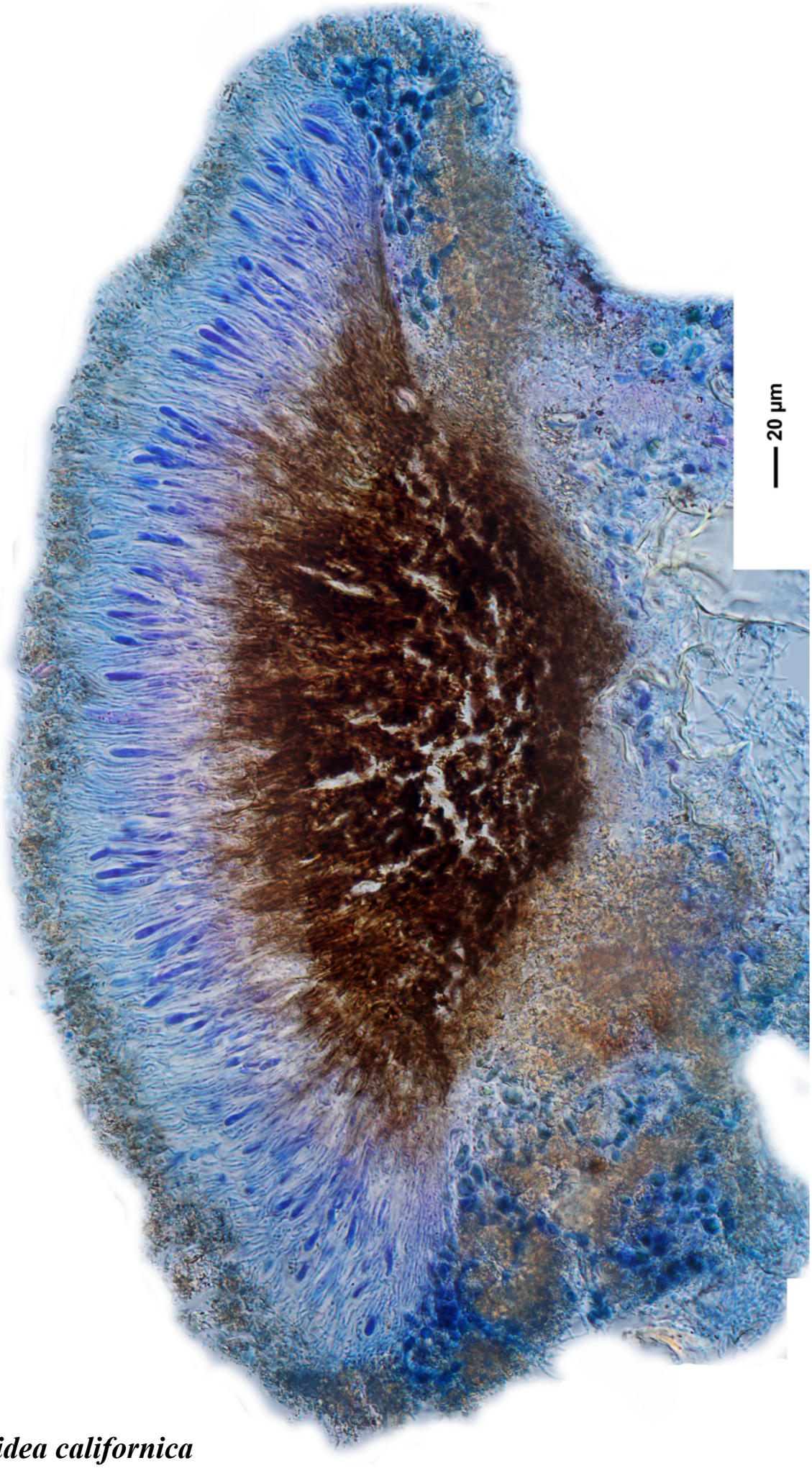




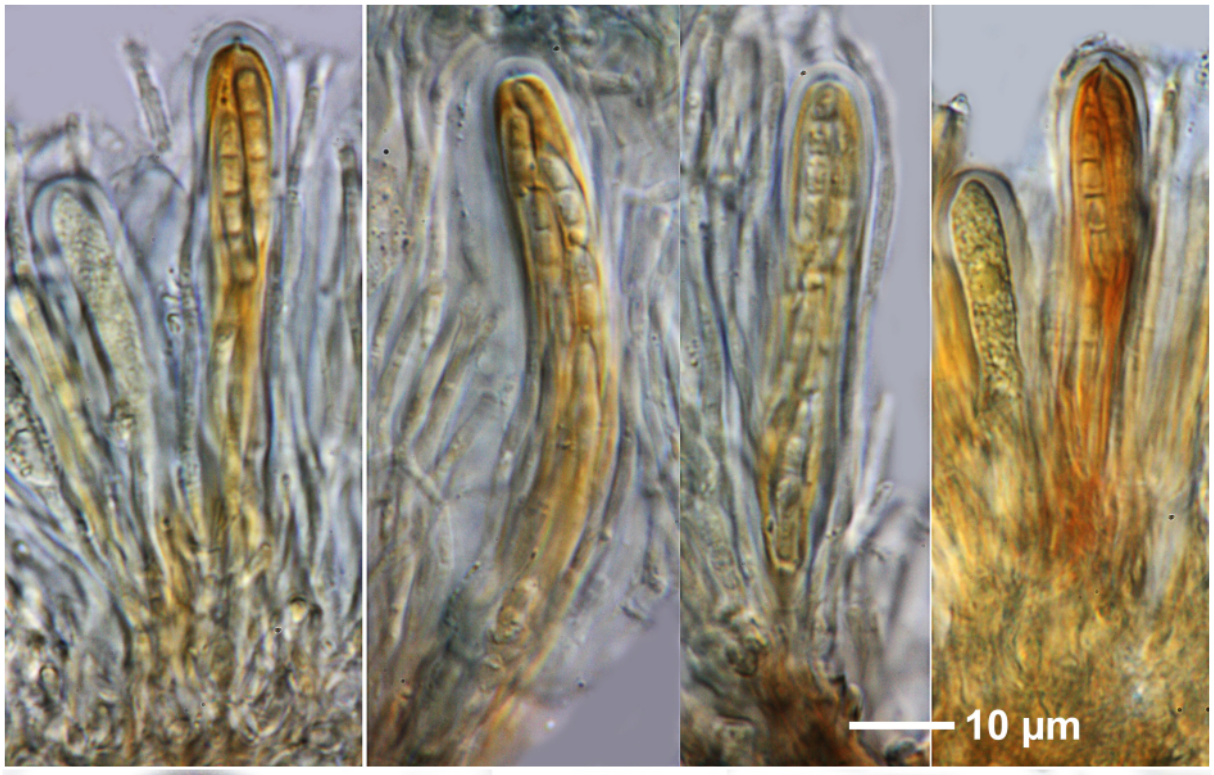


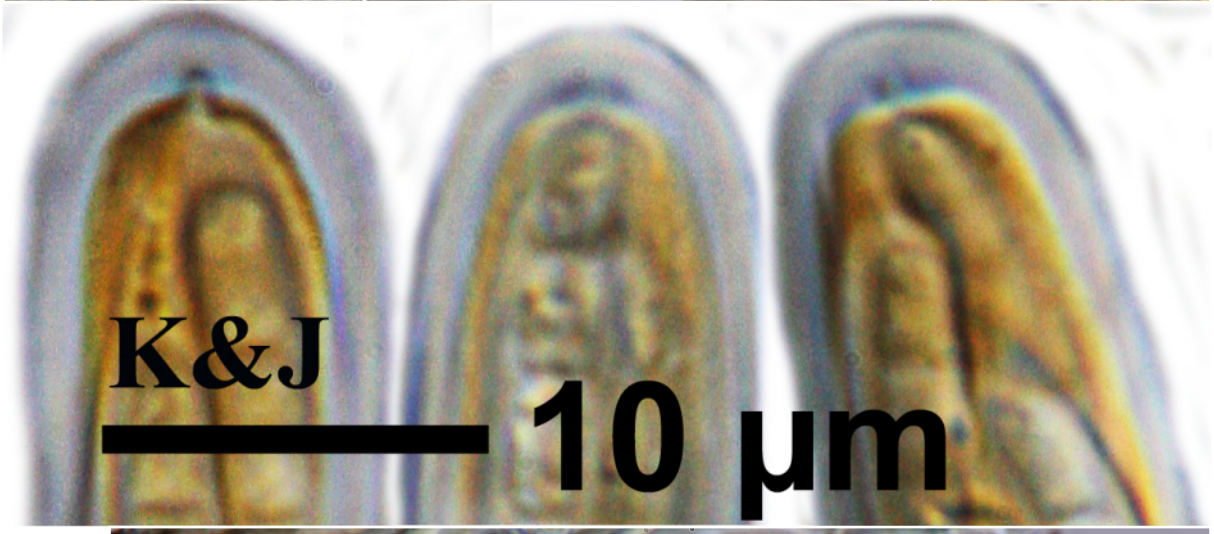


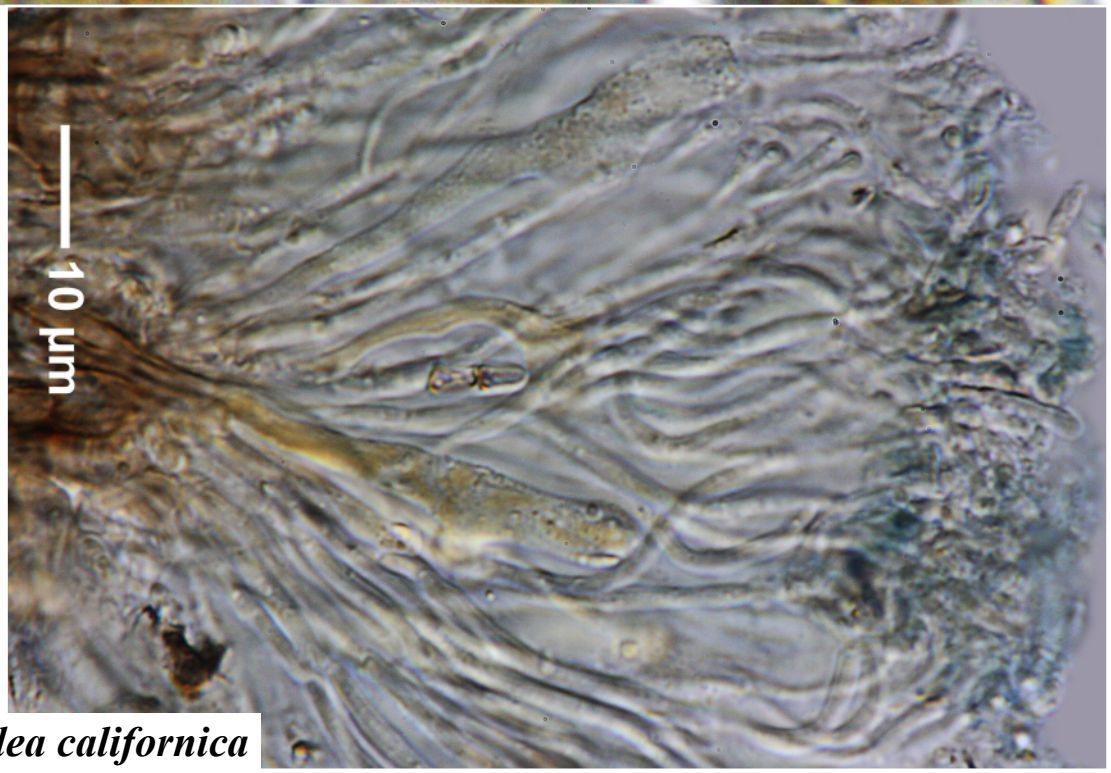
Sigridea californica



Sigridea californica







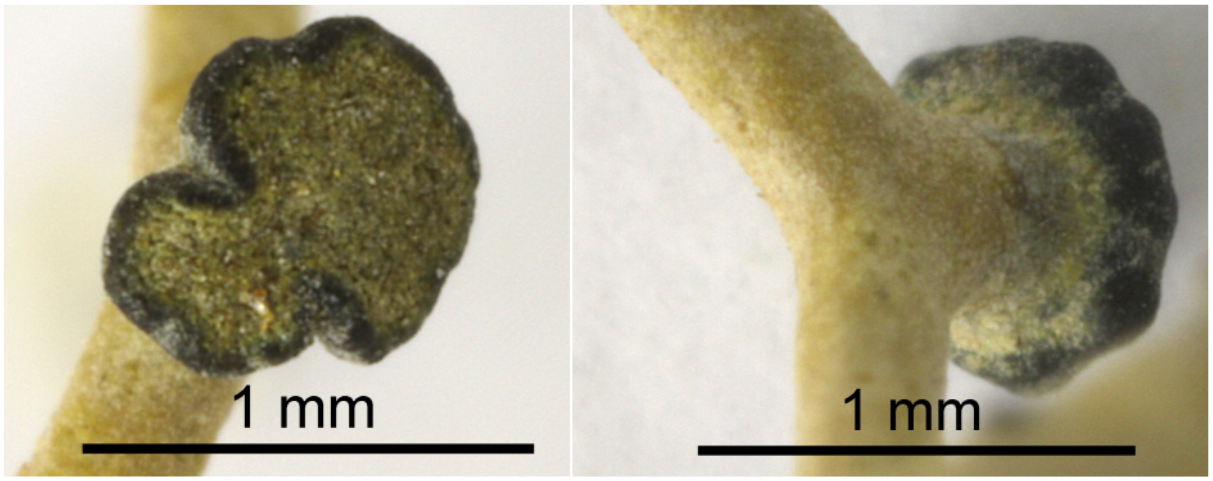
Sigridea californica

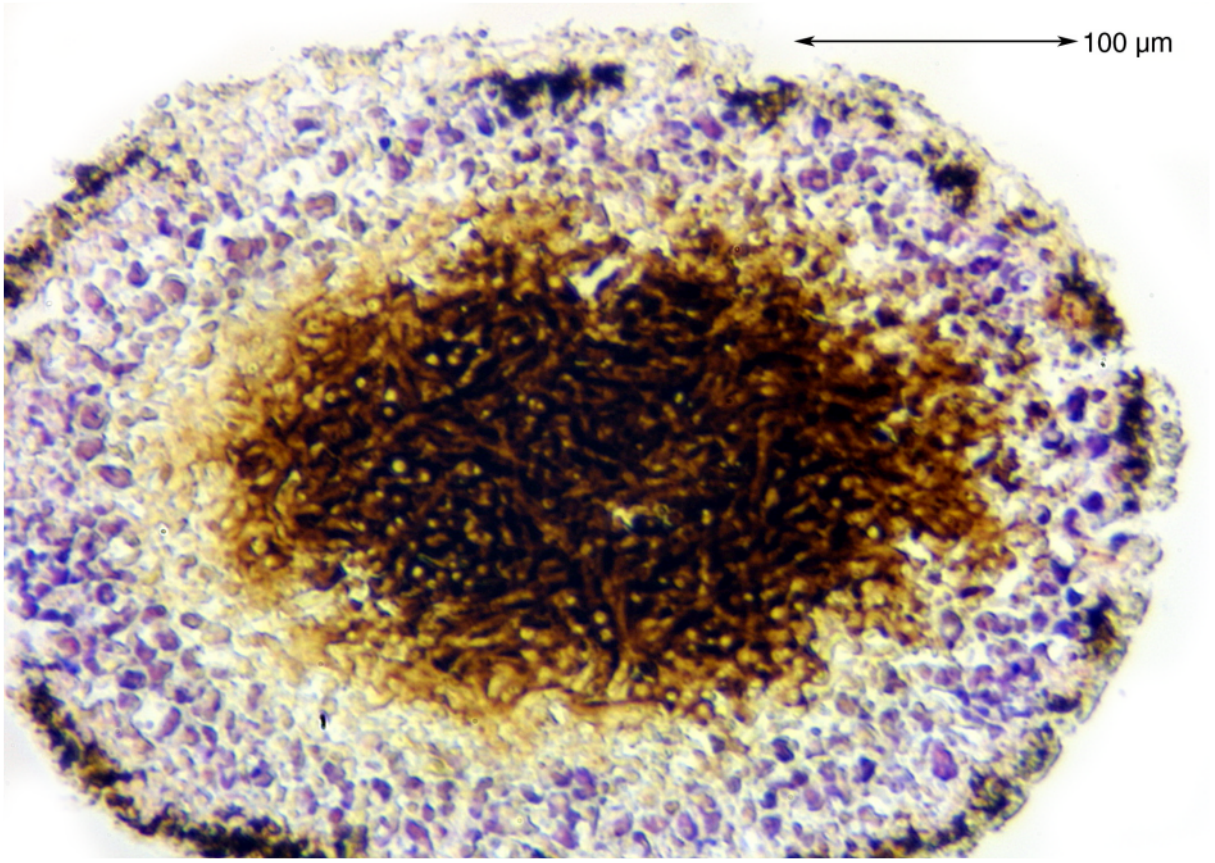
Simonyella variegata J. Steiner (1902)

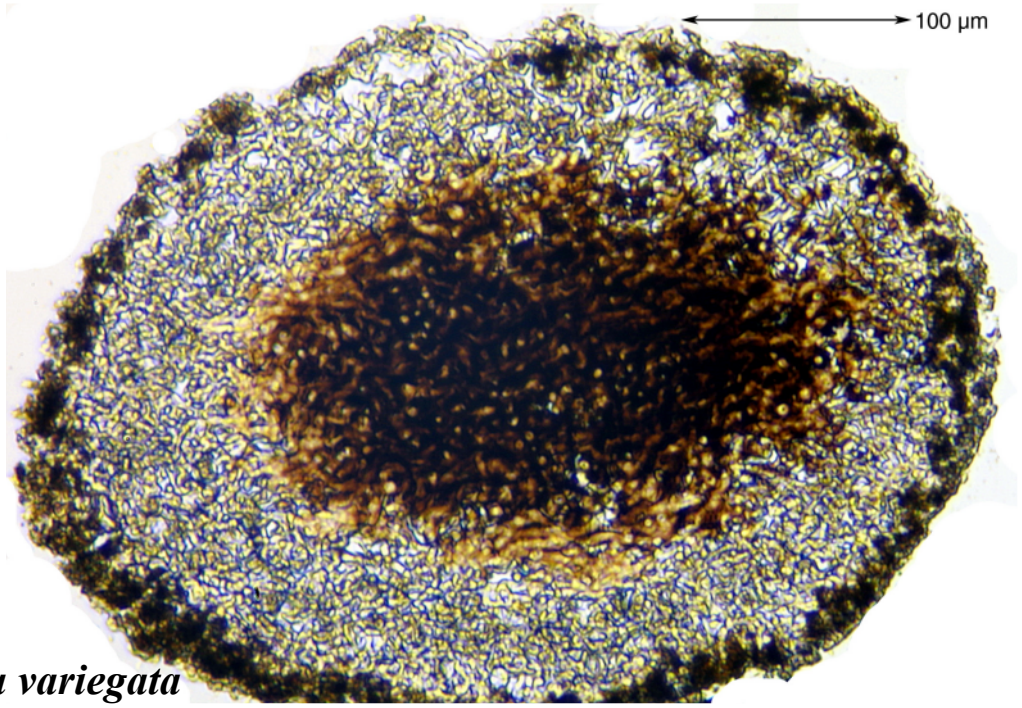
Thallus saxicolous, grey, not sorediate, texture firm, cylindrical, surface smooth, holdfast internally white to brown. Lobes with a brown-black, carbonized axis consisting of intricate plectenchyma. Cortex branched type. Apothecia round. Hypothecium black. Ascospores brown, 3-septate, 13–17 × 5–7 µm. Cortex C –, K –, Pd –, medulla C –, IKI + violet, major substance simonyellin. – Socotra, Yemen, Oman.

Yemen, Aden, Socotra. Mumi plateau, Ant Kashara, Hermil, 5 km E of Shibam, 30 km E of Hadibu. On limestone blocks, Exp. NW, 12°34’ N, 54°14’ E, alt. 400 m, leg. Bruno Mies 09.04.1993, ex Herbarium Bruno Mies Nr. 12645. [ABL12645]

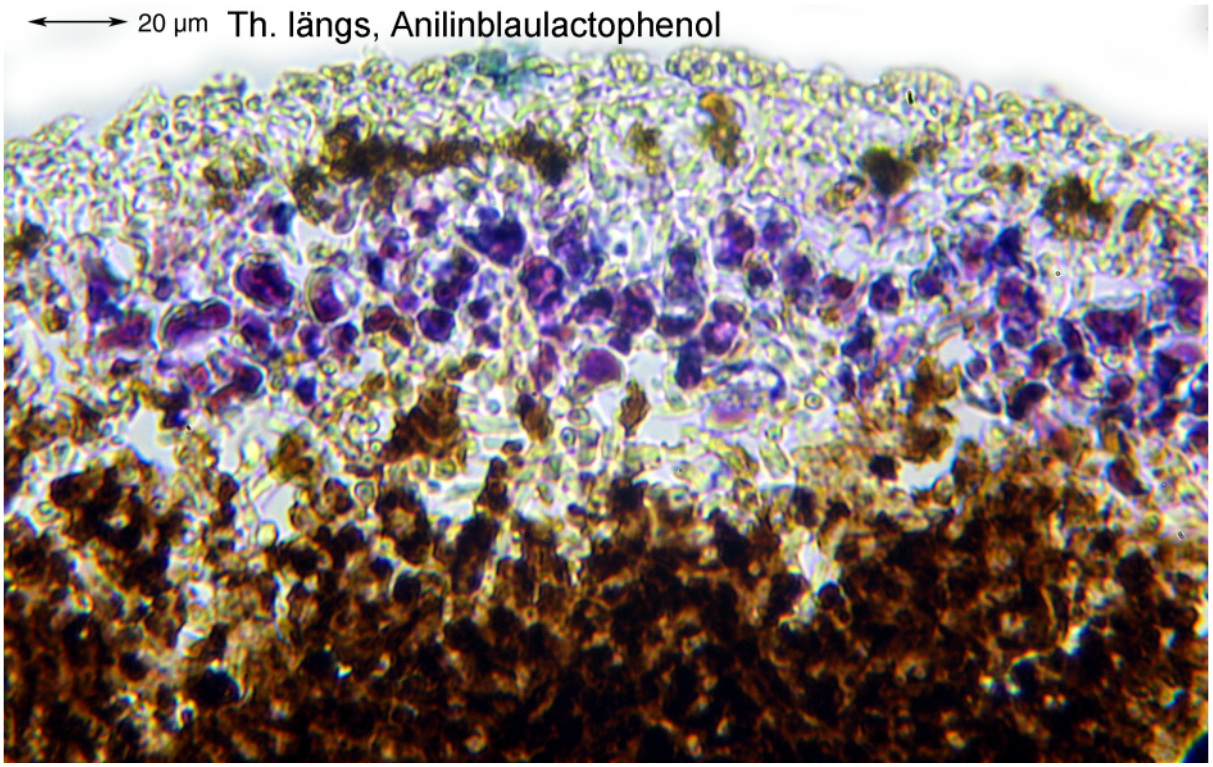


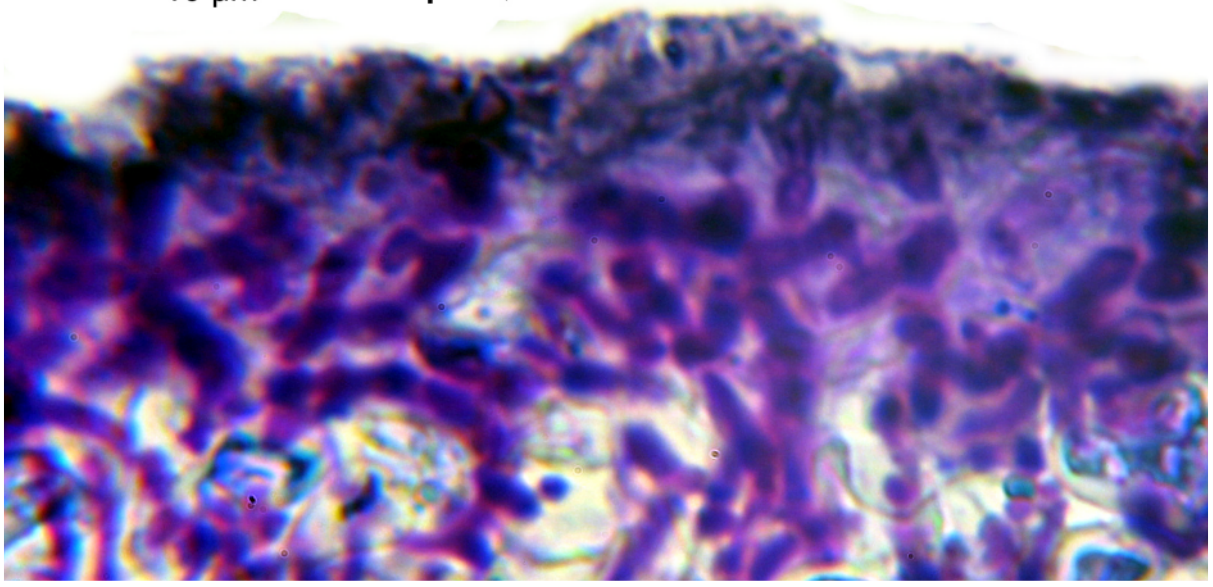


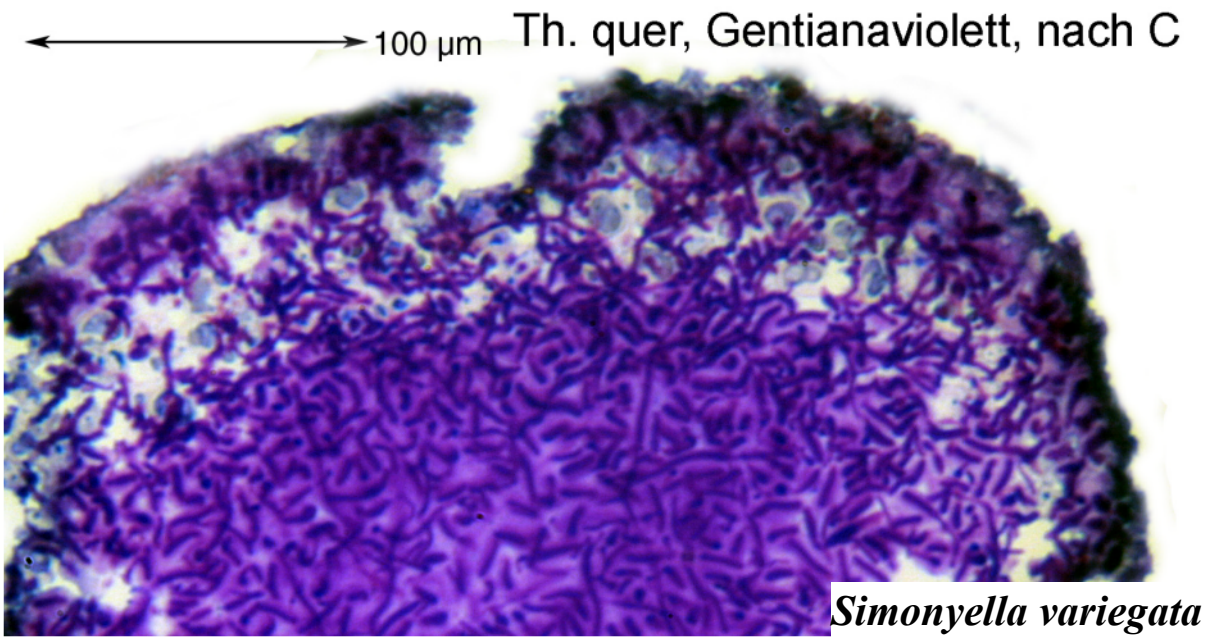




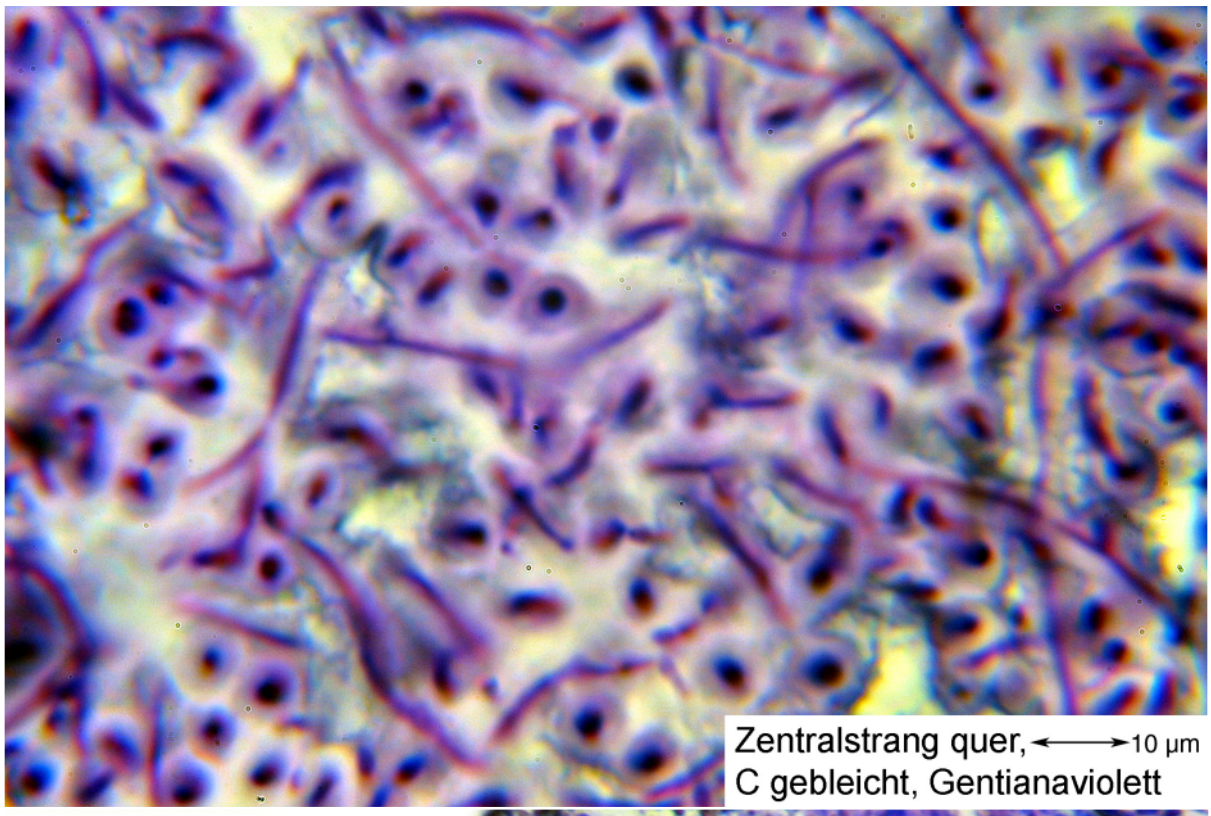
Simonyella variegata

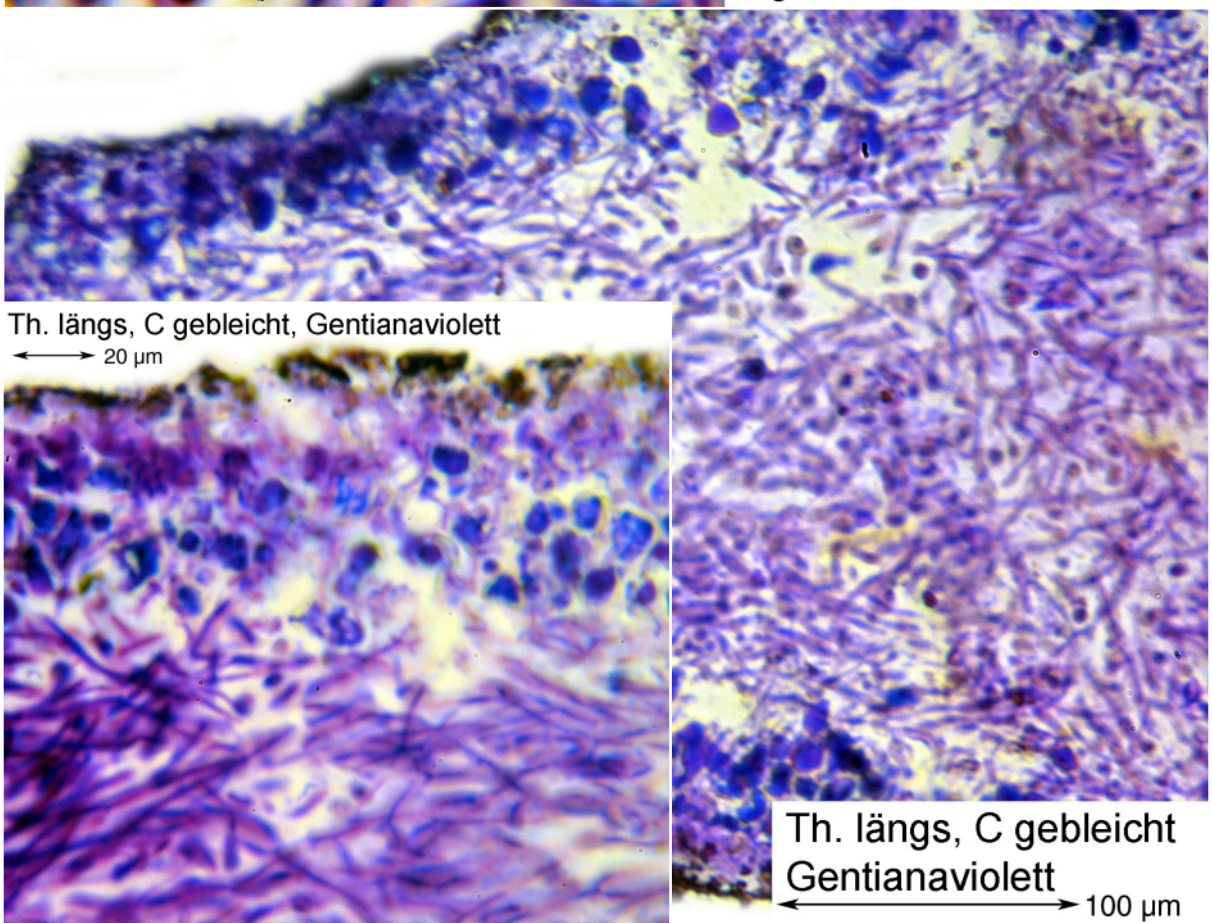




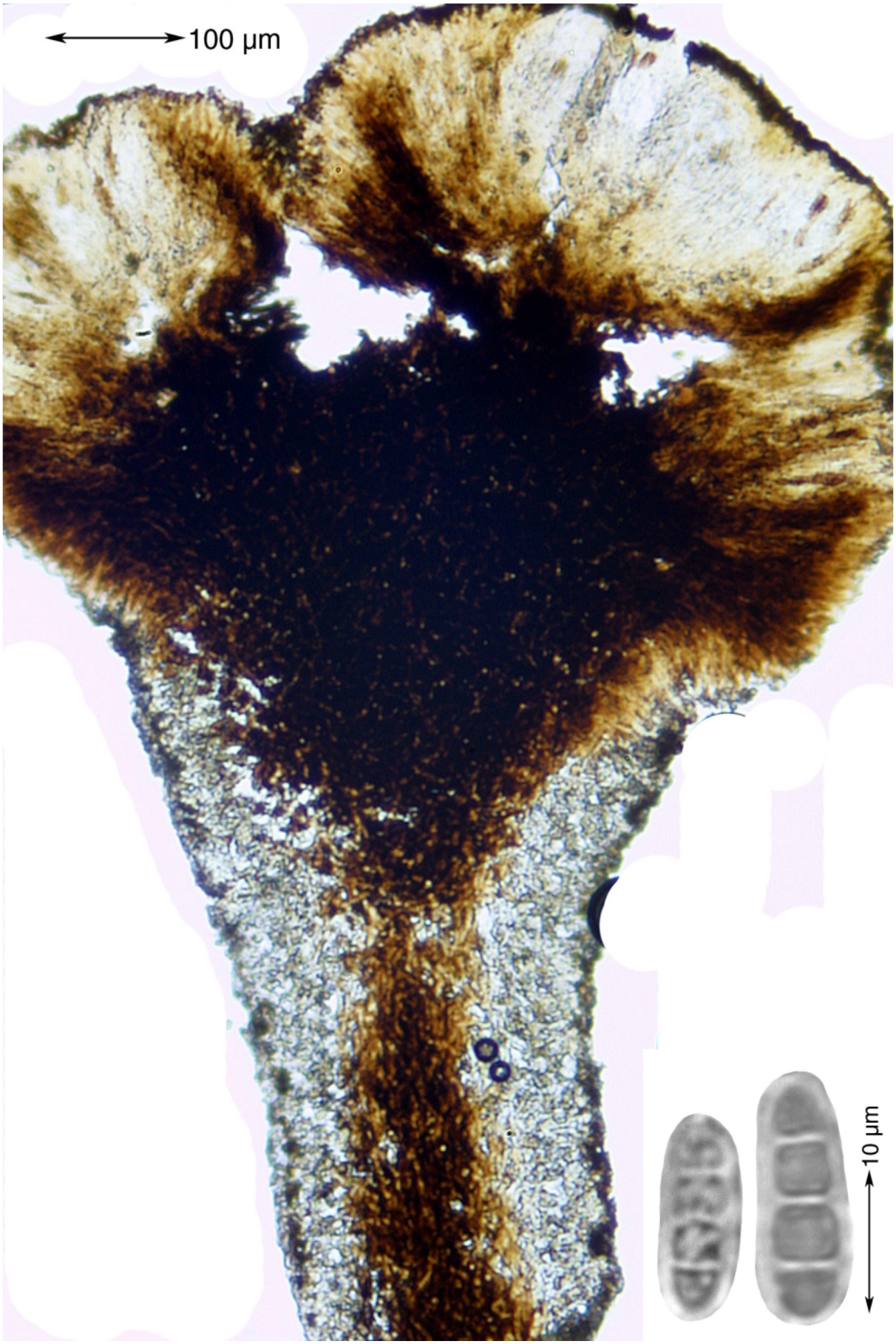


Simonyella variegata

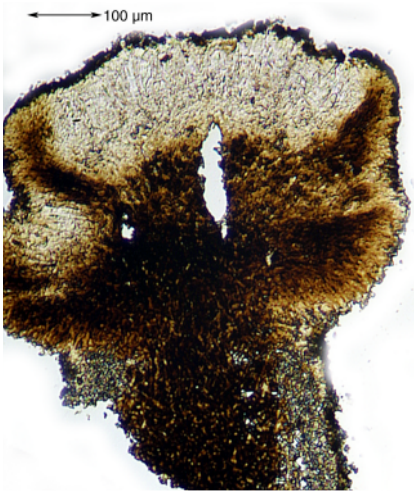


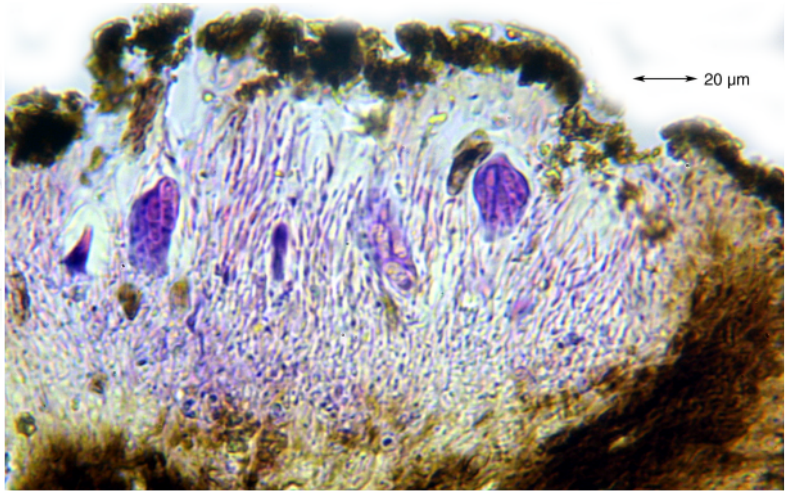


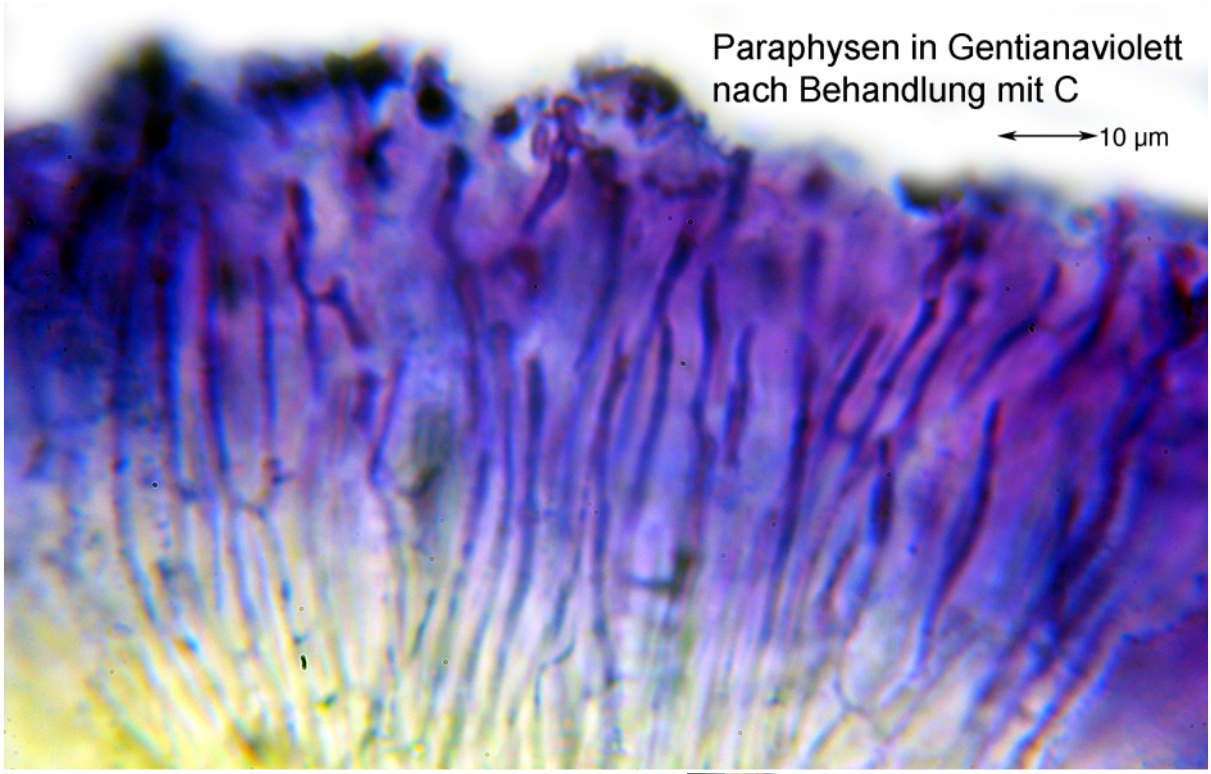
Simonyella variegata

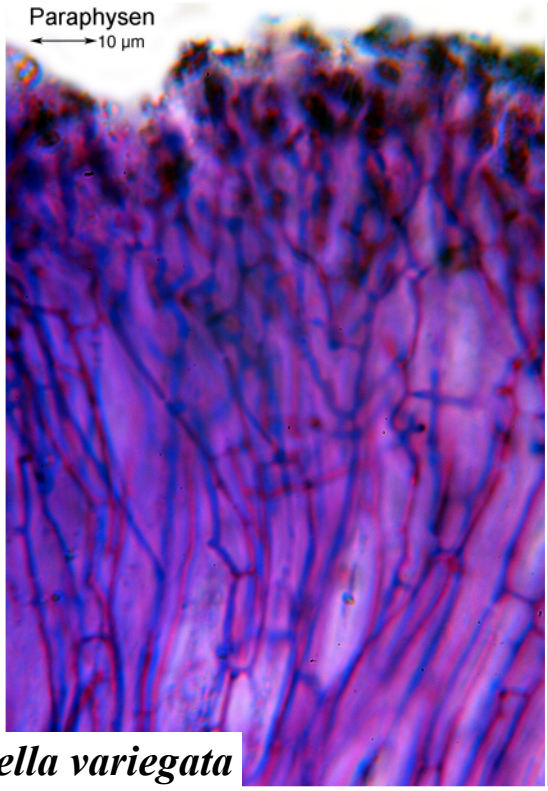


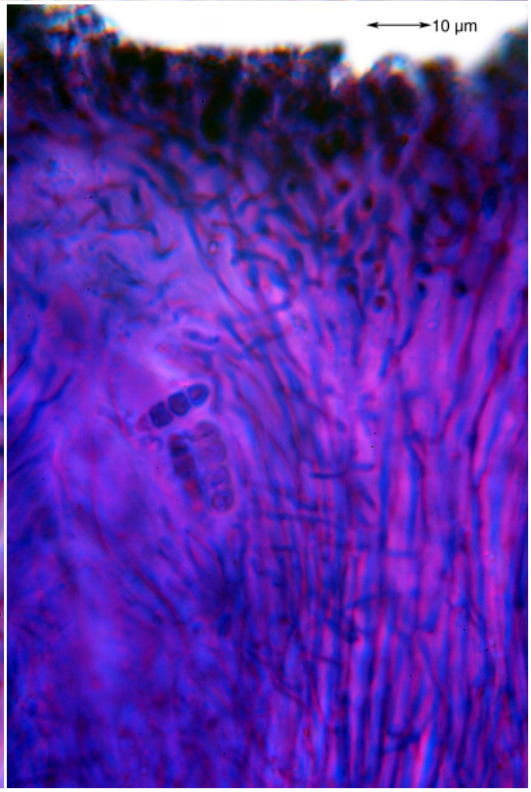
Simonyella variegata











Simonyella variegata

Siphula ceratites (Wahlenb.) Fr. (1831)
Roccella grayi Stirt. (1883)
Dufourea ceratites (Wahlenb.) Sommerf. (1823)

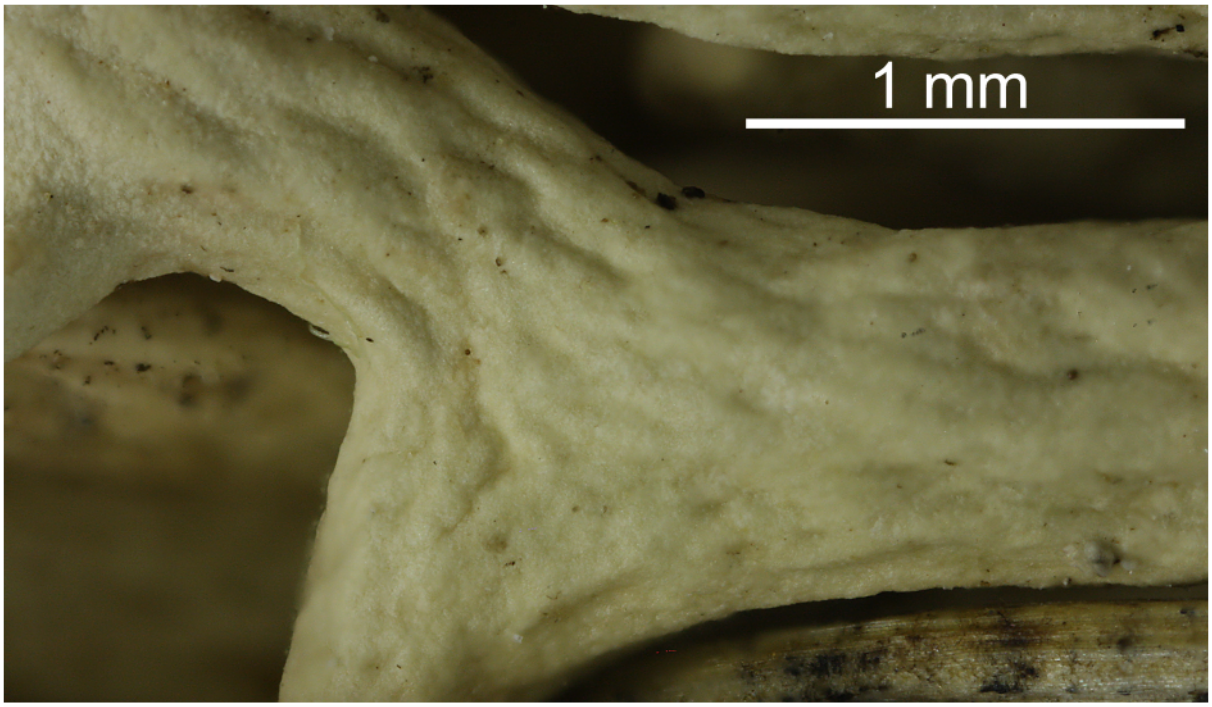
Thallus to 3 cm tall, branches to 2 mm diam, surface fissured, specially in older parts, apices rounded, cortex paraplectenchymateous, photobiont chlorococcoid. Apothecia unknown. Cortex K+ brownish, C –, KC –, Pd –; medulla K –, C –, KC –, P –, UV+ white to yellowish white; subcortex KC+ yellowish-orange; siphulin. – Circumpolar Fennoscandia, N America, Asia.

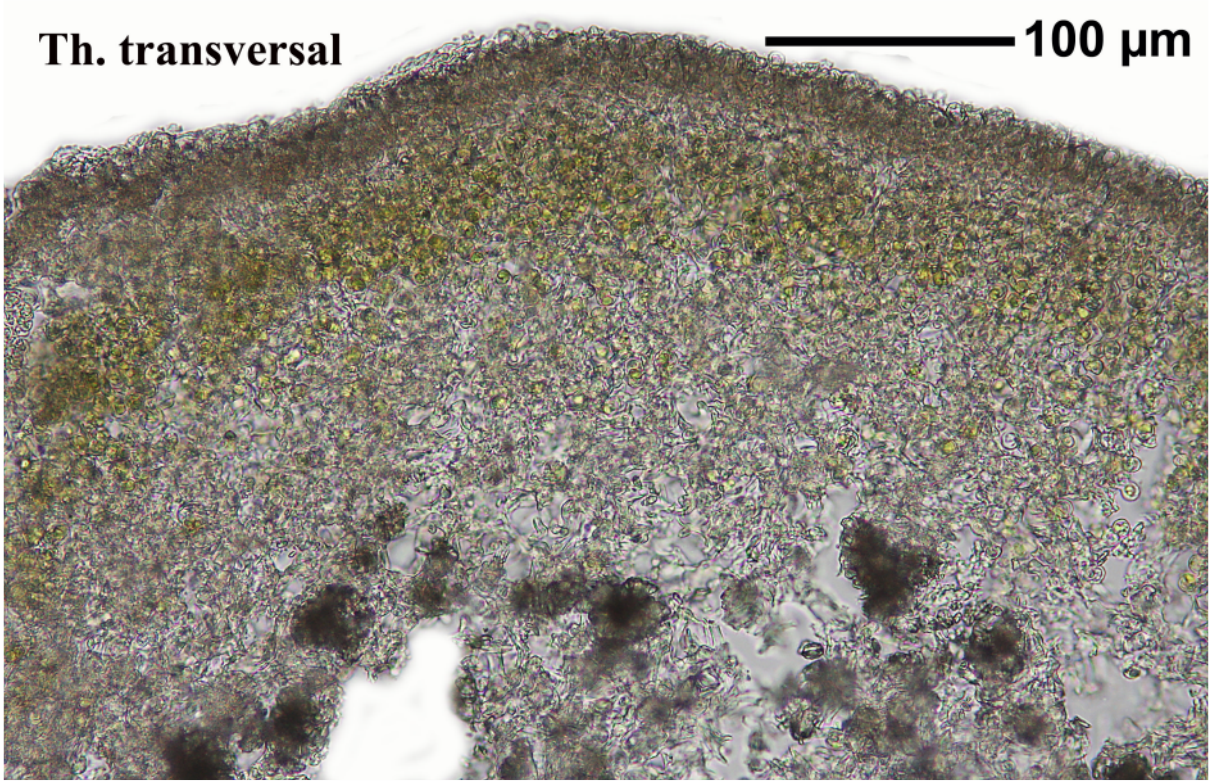
Norway, Nordland, District of Junkerdalen some 30 km north of the Arctic Circle, left bank of Skaitielva, on mossy faces of siliceous rocks temporarily overrun by streamlets from the nearby Tausafjell, caespitose colonies often ice-covered during night, 940-970 m elevation, SW exposition, abundant. Leg. et det. G. Follmann et M. Schulz Sept. 1992. Lichenes Exsiccati Selecti Ab Institito Botanica Universitatis Coloniensis Editi Nr. 490. [11669]



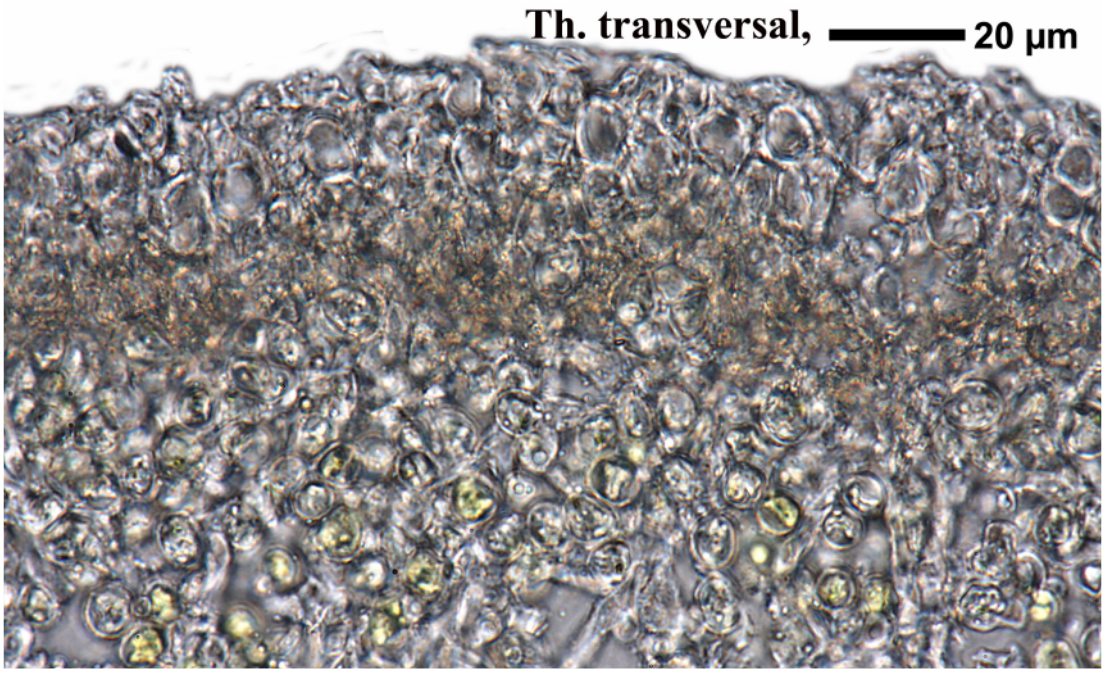


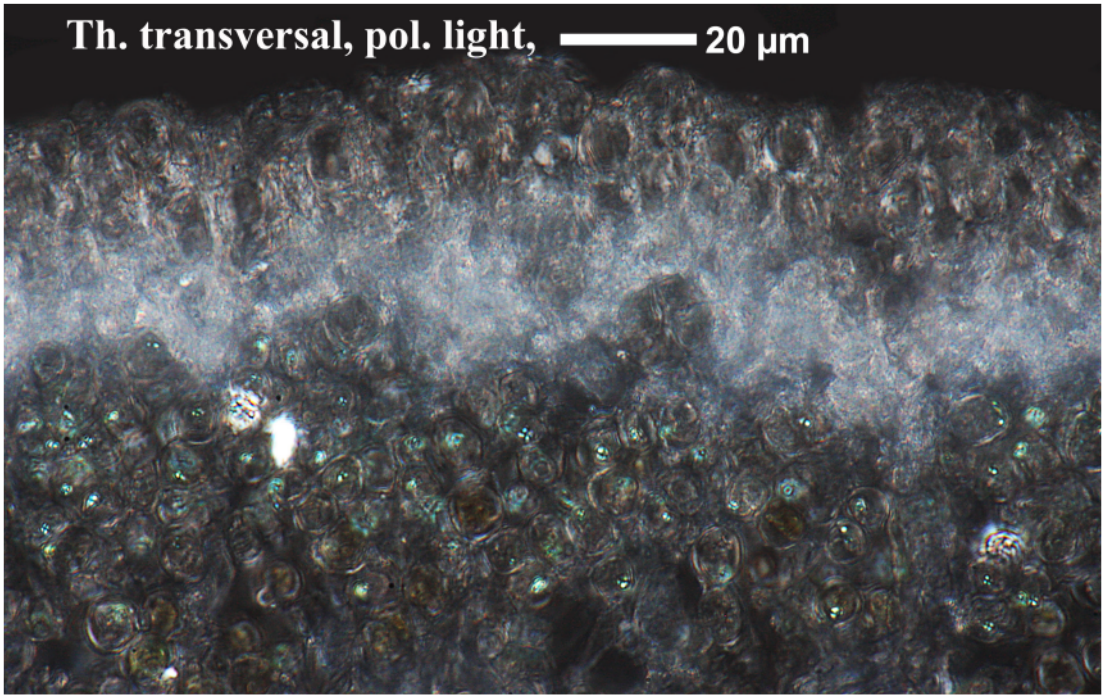
Siphula ceratites

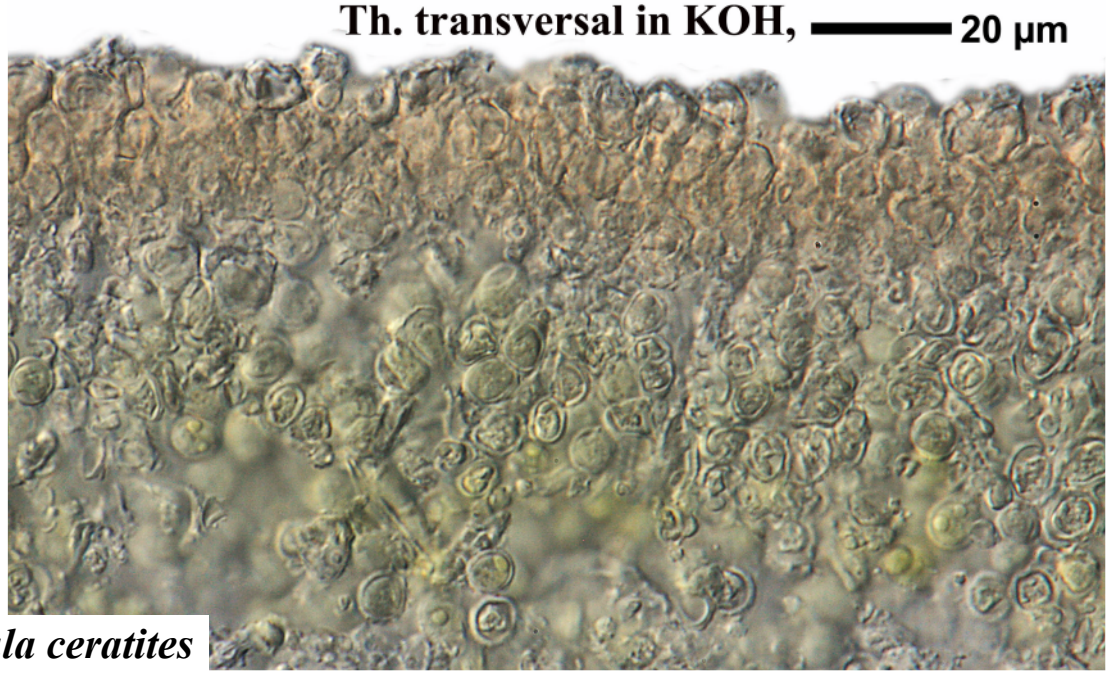




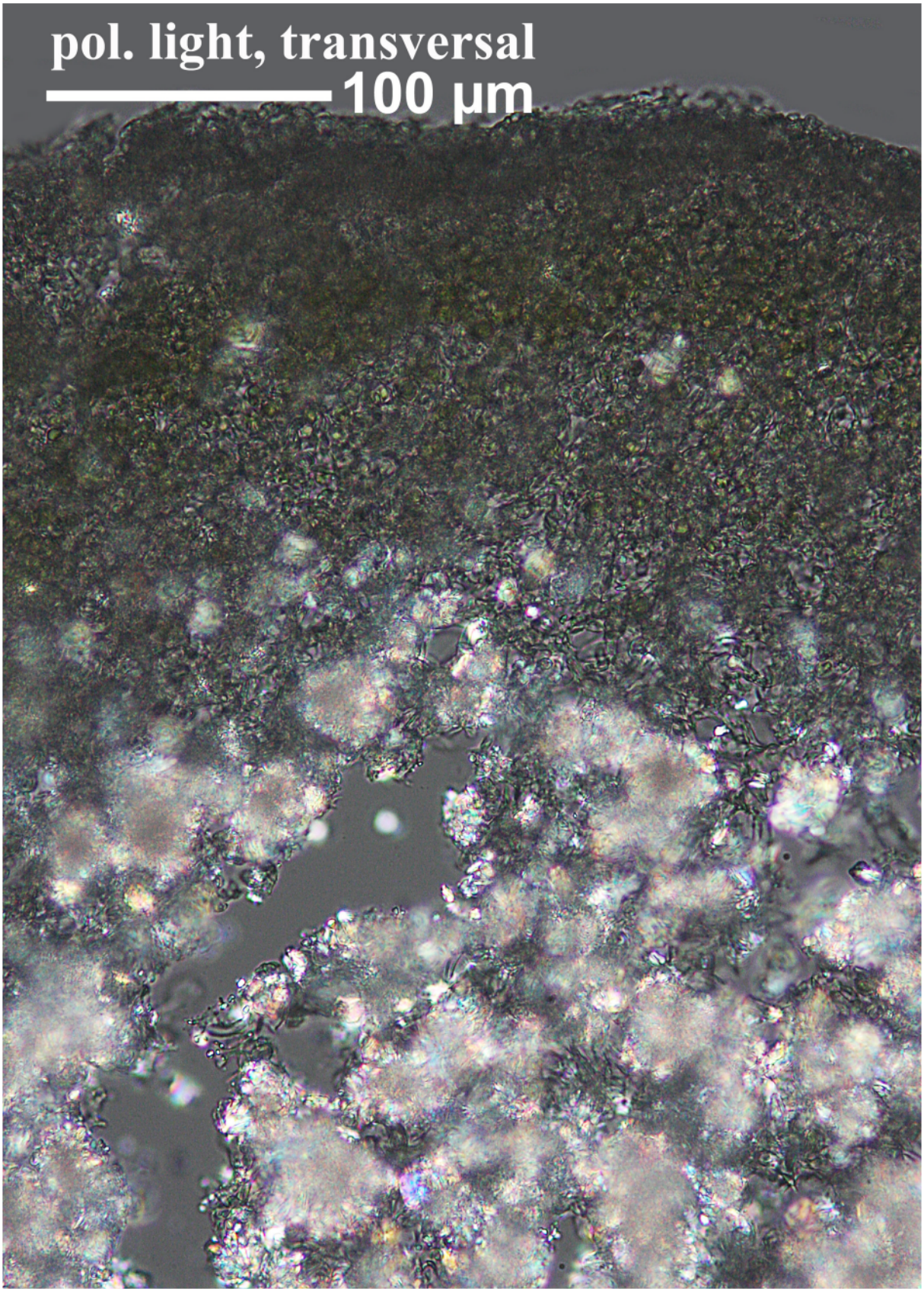
Siphula ceratites



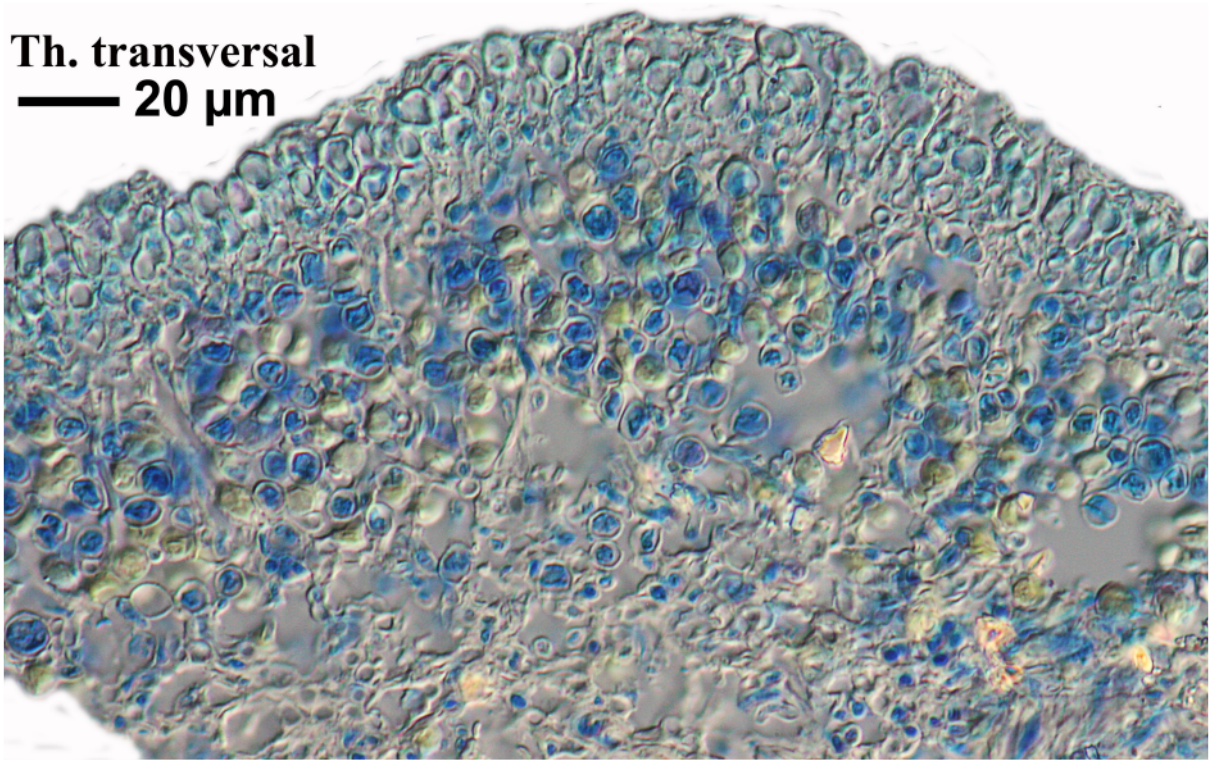


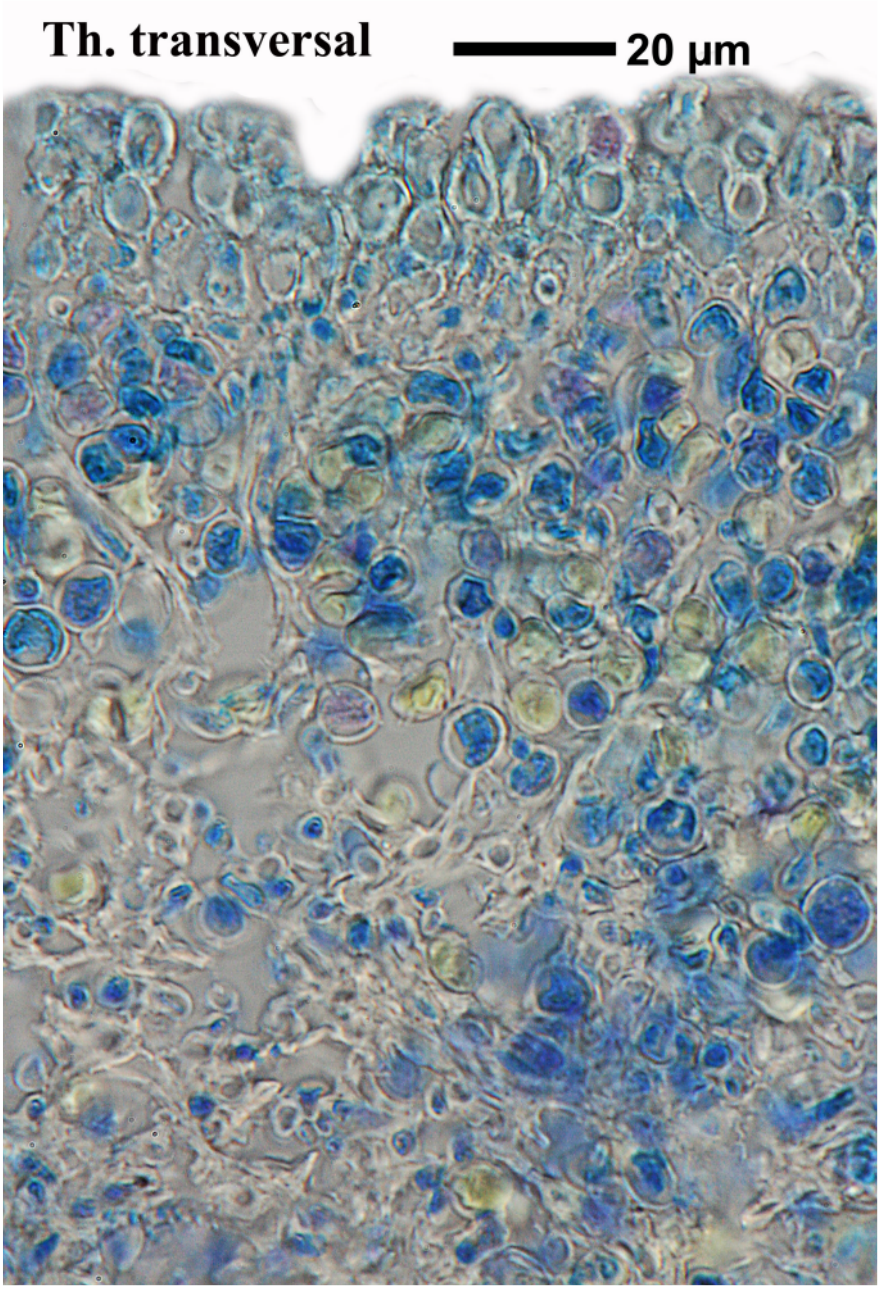


Siphula ceratites

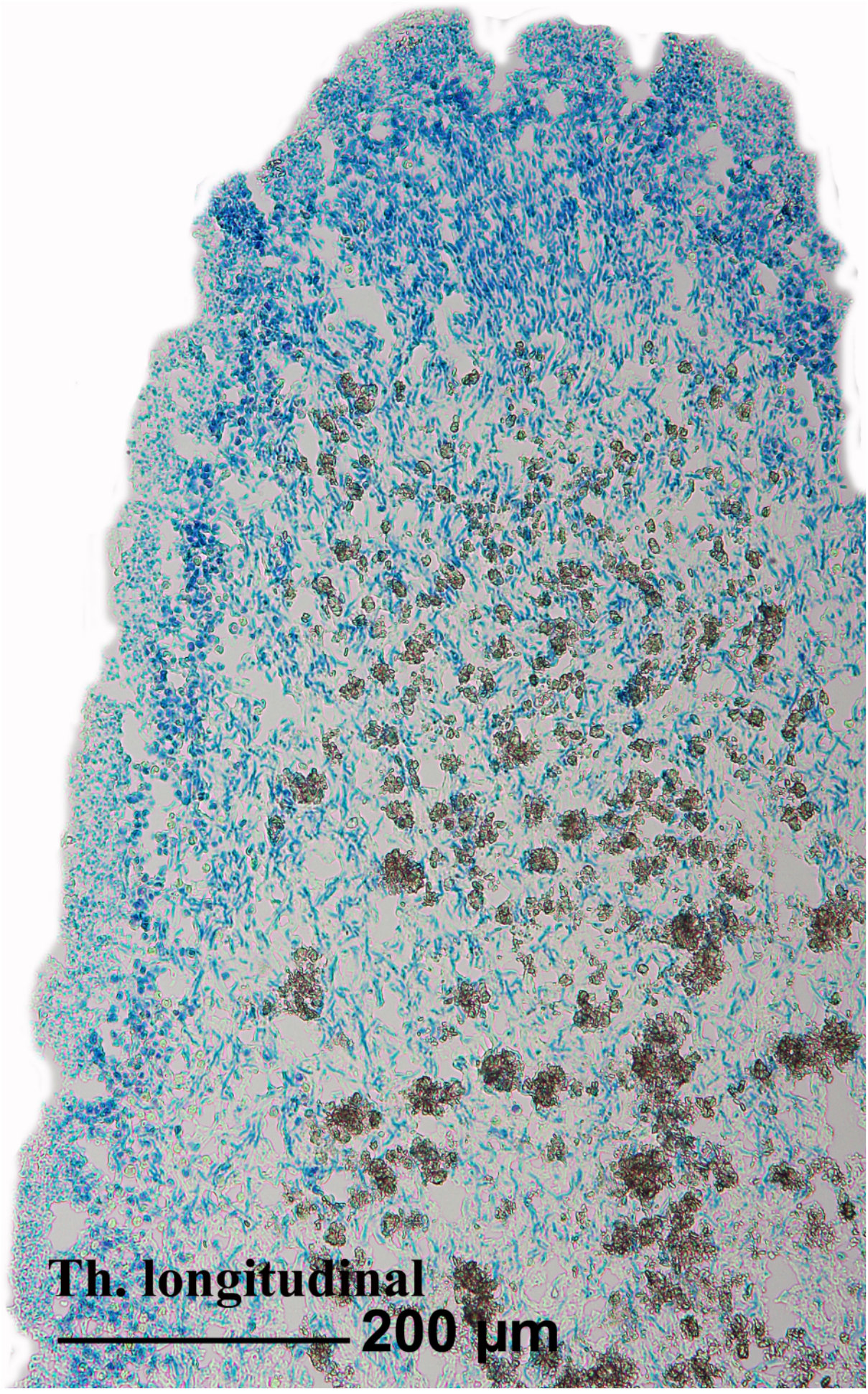


Siphula ceratites

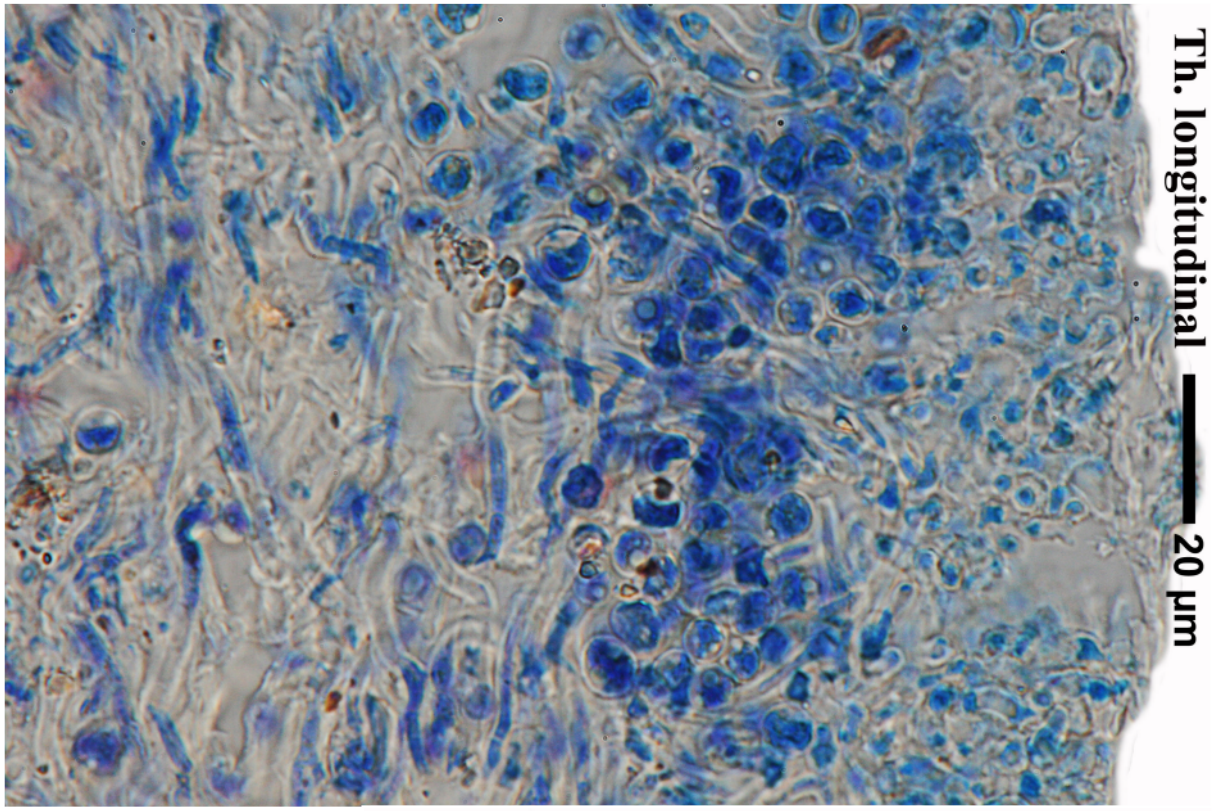


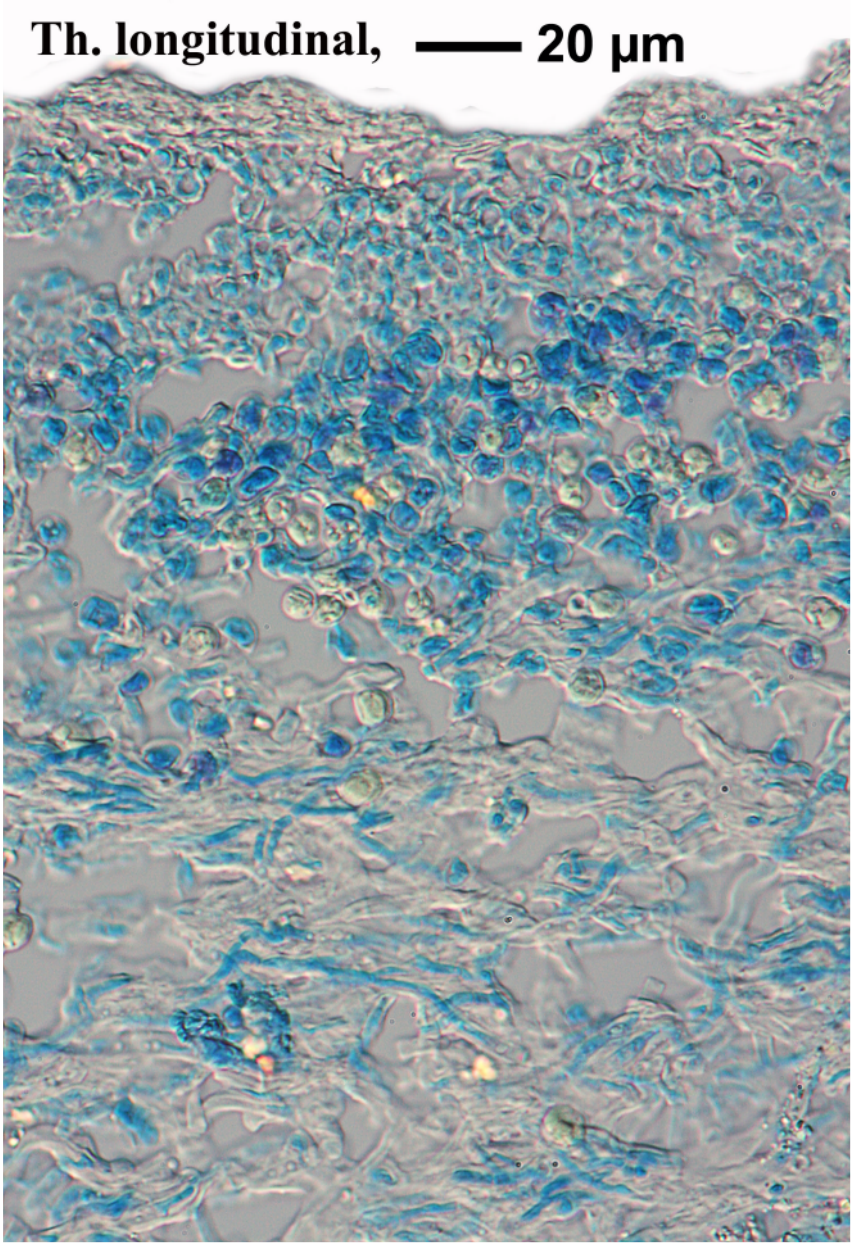


Siphula ceratites



Siphula ceratites





Siphula ceratites

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