

***Didymium squamulosum* (Alb. & Schwein.) Fr. SM89 (= PDD 117230) – a somewhat bedraggled, long-stalked specimen on a wet dead nīkau palm (*Rhopalostylis sapida*) frond**

Collection site: Remutaka Forest Park, Orongorongo Track (see red arrow on map insert)



Collection date: 18 September 2019

Substrate: on the wet protected surface (of the folded concavity) at the basal portion of a downed dead nīkau palm frond

Collector and Identifier: Dan Mahoney

Voucher materials: Dried herbarium specimen SM89 (= PDD 117230) accompanied by 2 Shear's mounting fluid (SMF) semi-permanent slide mounts; dissecting scope colored 35 mm film (best scanned) of fresh in situ fruiting bodies on the Nikau frond; compound scope digital photos of fruiting structure detail – stalk, capillitium, stellate crystals & spores; Dan's comments.

Dan's comments: The present collection was the first collection of *D. squamulosum* I had identified in which the stipes were at least twice as long as the sporangial length. Other collections (SM13, PDD 110393; SM62, PDD110435; SM66, PDD 110439; SM77, PDD110450) had stipes as long as, or somewhat shorter, than the sporangial length. I soon discovered,

however, that this specimen was just one 'morph' in an extremely common and variable species. Two hundred collections from New Zealand are listed on the Landcare PDD website and 27 synonyms are given in one of the most recent publications "Clark J, Haskins EF 2018 – A taxonomic guide to the species of *Didymium* (Didymiaceae, Physarales, Myxomycetes) I. The stipitate species. Asian Journal of Mycology 1(1): 22–62." That article also includes a dichotomous key to the stipitate *Didymium* species and detailed comments on the extent of the variability (morphological, sequenced, cultural & otherwise) to expect among collections of *D. squamulosum*. Other references I found helpful while exploring this variability included (in chronological order): **1)** Lister, G. 1925. *A monograph of the Mycetozoa*. 1–296. **2)** Nazira ElHage, Christopher Little, Jim D. Clark & Steven L. Stephenson. 2000. Biosystematics of the *Didymium squamulosum* complex. *Mycologia* 92(1): 54–64. **3)** Clark, J., S.L. Stephenson. 2003. Biosystematics of the myxomycetes *Didymium squamulosum*, *Physarum compressum*, and *Physarum melleum*: additional isolates. *Mycotaxon* 85: 85–89. **4)** Clive Shirley's Hidden Forest New Zealand website, 2005. **5)** Winsett K, Stephenson SL. 2008. Using ITS sequences to assess intraspecific relationships among geographical separated collections of the myxomycete *Didymium squamulosum*. *Revista Mexicana de Micología* 27, 59–63. and **6)** Winsett, KE. 2011. Intraspecific variation in response to spore-to-spore cultivation in the myxomycete, *Didymium squamulosum*. *Mycosphere* 2(5), 555–564.

See photos from Clive Shirley 2005 and Kate Winsett 2011 on the next page. These feature some of the 'morphs' that characterize fruiting body variations in this 'species complex'. These 'morphs' and intermediates appear among our collections SM13, SM62, SM66, SM77 and SM89 – the latter in this pdf.

Clive Shirley's description and photos of *Didymium squamulosum* (below left) from his 2005 Hidden Forest New Zealand website - the description is based on pages 163–165 in Stephenson, S.L. 2003. Myxomycetes of New Zealand. *Fungi of New Zealand* Volume 3. Fungal Diversity Research Series 11: 1-238. Pasted in below the description are two of Clive's photos that characterize 2 of the fruiting body 'morphs' which I have seen among our SM collections.

Species: *Didymium squamulosum* (Alb. & Schwein.) Fr.

Description:

SPOROCARPS: stalked or sessile sporangia or short plasmodiocarps. Scattered to gregarious up to 1.5 mm tall, appearing globose or depressed-globose, or discoid and deeply umbilicate below. 0.3 to 1.0 mm in diameter.

STALK: stout calcareous, usually fluted, white, very short and buried in the umbilicus or even lacking, but can be up to two thirds the total height of the fruiting body. **Hypothallus** discoid, membranous to nearly colourless to white.

PERIDIUM: membranous, slightly iridescent, transparent usually covered with a thick, white crust of stellate lime crystals that can form a reticulate surface.

COLUMELLA: white or pale, discoid or hemispherical.

CAPILLITIUM: variable the threads slender or coarse, simple or branching, colourless or pallid.

SPORES: Black in mass, dark violaceous brown by transmitted light, minutely warted or spiny. 8 to 11 µm in diameter.

HABITAT: Common, leaf litter and herbivore dung.

DISTRIBUTION: Cosmopolitan, known from Auckland, Coromandel, Dunedin, Gisborne, Nelson, Southland and Wellington.

PLASMIDIUM: Colourless, white or yellow.

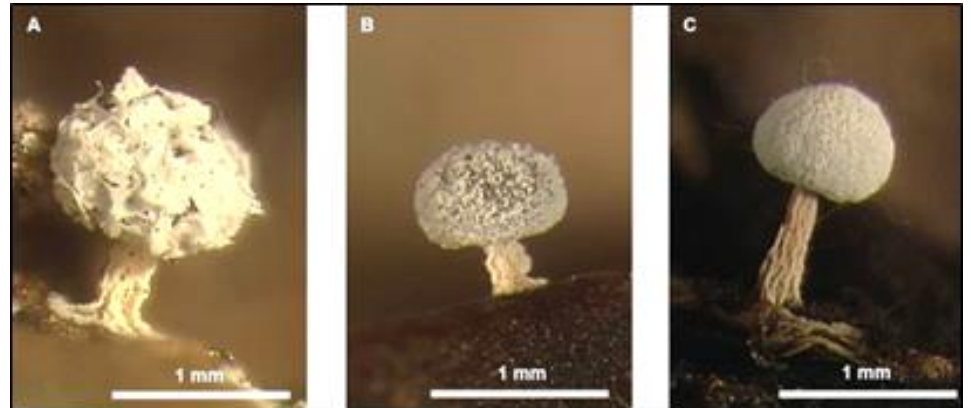


A Two fruiting body 'morphs'. A. Short, stout, calcareous, fluted stalks. Depressed-globose, [umbilicate (arrowed)] sporangia with peridium of white stellate lime crystals. B. Long, fluted, calcareous stalks. Globose sporangia with fluted stalk extensions (the latter arrowed) joining the peridium. The umbilicus here is not apparent.

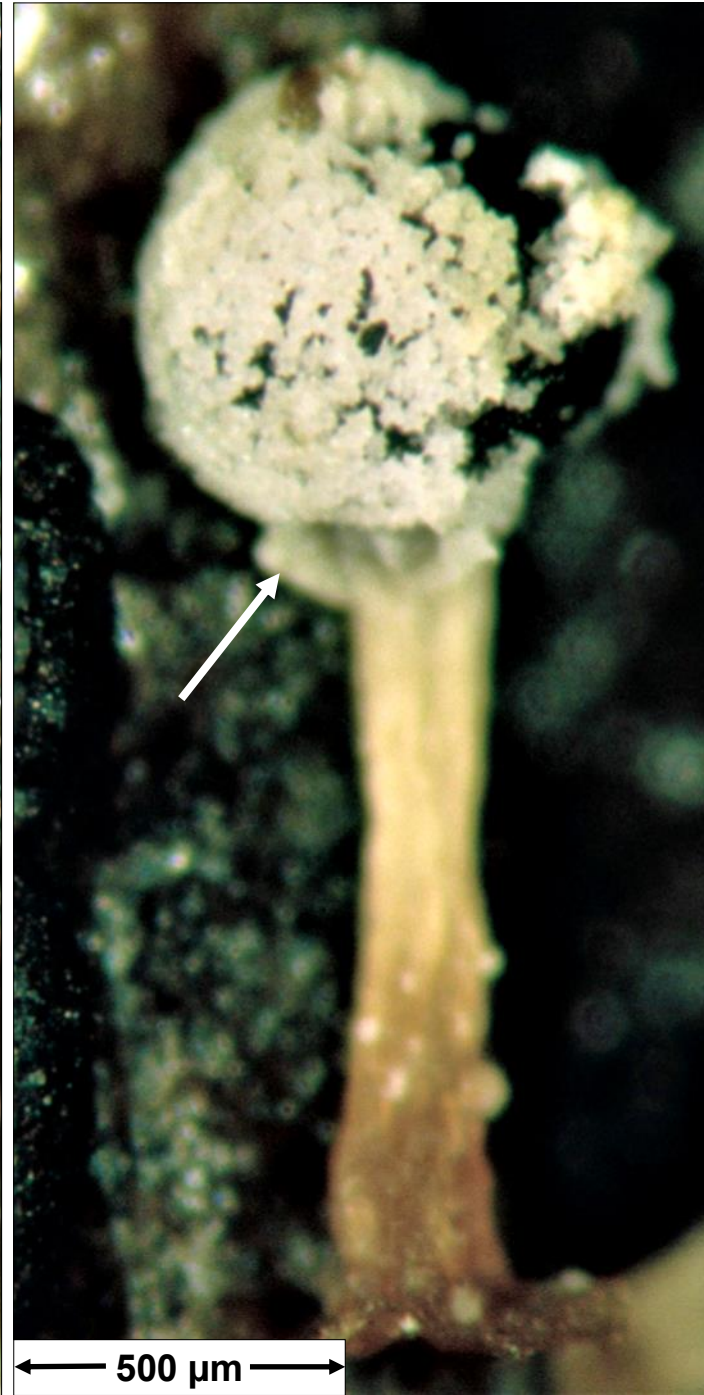


Katherine Winsett 2011, photos below from page 556

Fig 1 (A-C) – Three common morphological forms of *Didymium squamulosum*. Image A shows the typical flaky aspect to the peridium. Stalk variation common to the species is also shown, with images A and B showing the short stout stalk and image C indicating the longer stalk possible in this species. All three images show the fluted stalk typical of *D. squamulosum*. The stalk is commonly found with lime deposits present, most notably apparent in image A.



Our SM collections of *D. squamulosum* reveal all 3 common morphological forms shown above: Fig 1A is represented by PDD 110435 (= SM62); Fig 1B by PDD 110393 (= SM13), PDD 110439 (= SM66) & PDD 110450 (= SM77); and Fig 1C, most recently, by PDD 117230 (= SM89) in this pdf.



Side views of the same vertically-oriented fruiting body - at different magnification and focus. Note that the longitudinal fluting at the stalk apex, which joins the sporangium peridium, is torn free (arrowed). An umbilicus is not apparent in this 'morph'. Stellate calcareous crystals cover both the stalk and sporangial peridium, but are especially obvious here on the latter.



Two fruiting bodies in situ on the dead nikau palm frond. Note 1) the strong longitudinal fluting on the stalk at the right, 2) the obvious white calcareous crystals on the left stalk and on the peridium of both and 3) the black spore masses.

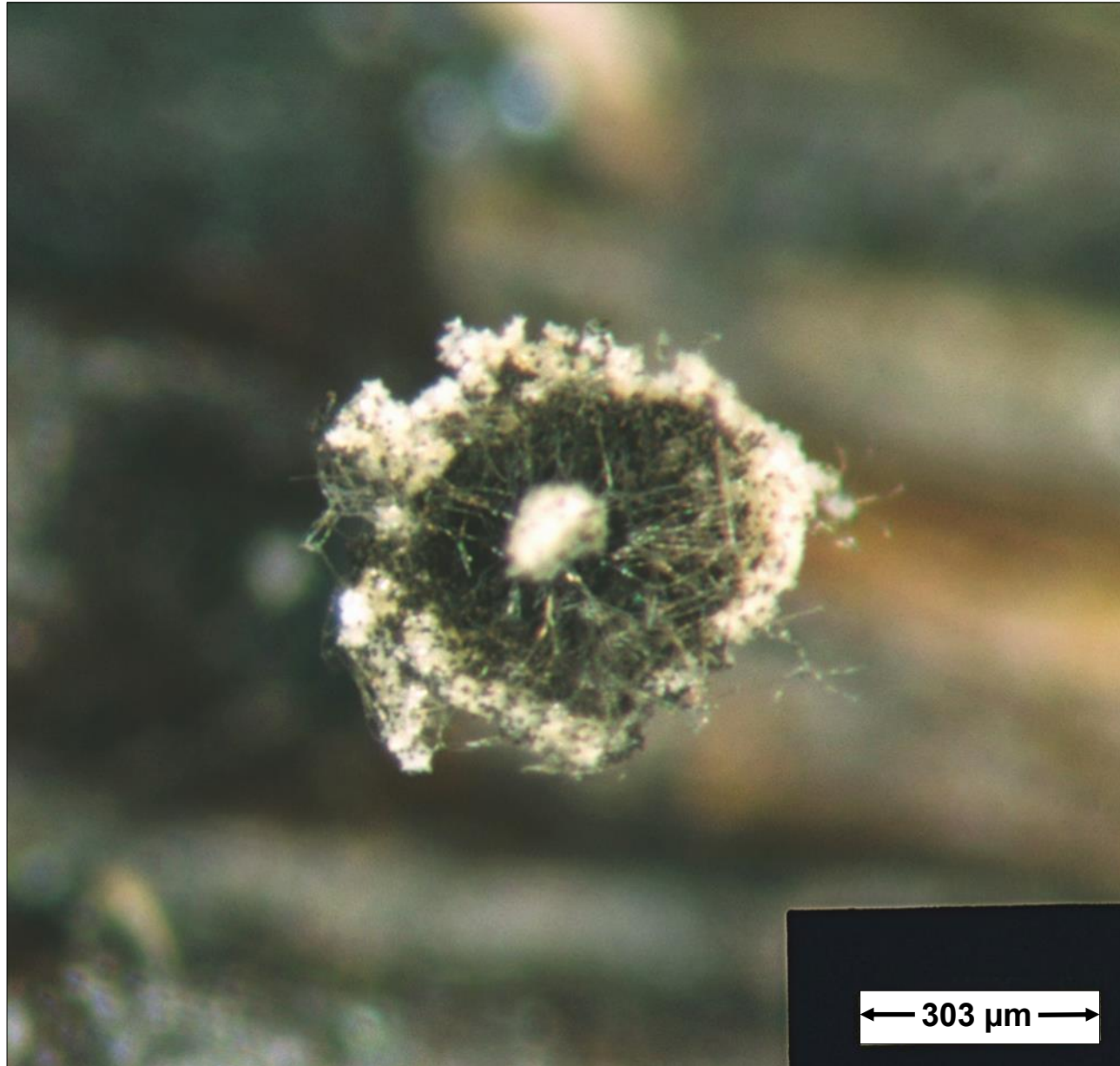


A fruiting body in situ on the dead nikau palm frond. Note the abundant covering of white stellate calcareous crystals on the fluting at the tip of the stalk (blue arrows). From that point the crystals join those covering the peridium. Note also where crystals on the peridium have eroded away to expose the black spore mass (white arrow) held in place inside the thin, hyaline, transparent peridium.

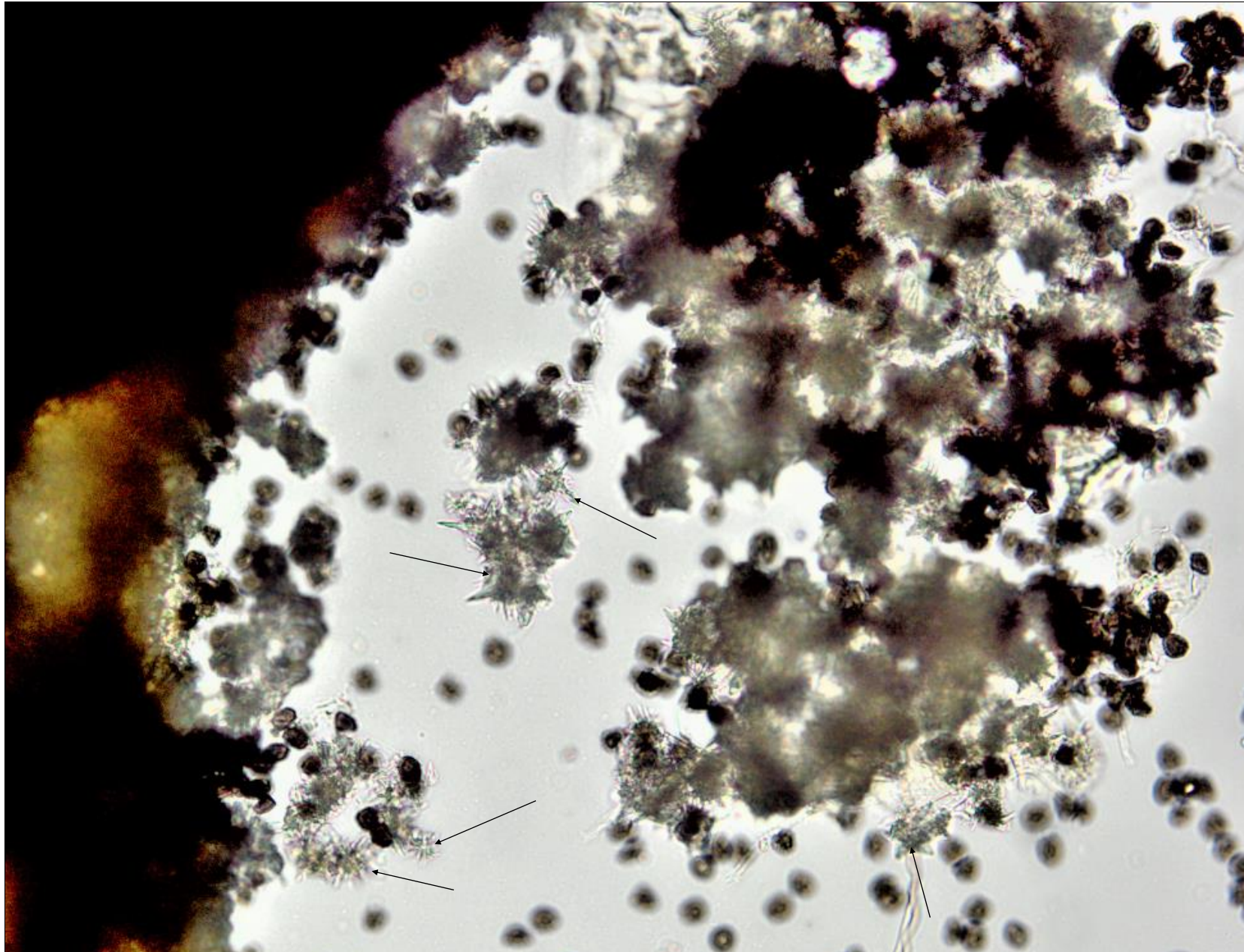


A rather typical fruiting body for this 'morph' although with fewer white stellate calcareous crystals on the stalk fluting than were seen on the previous page.

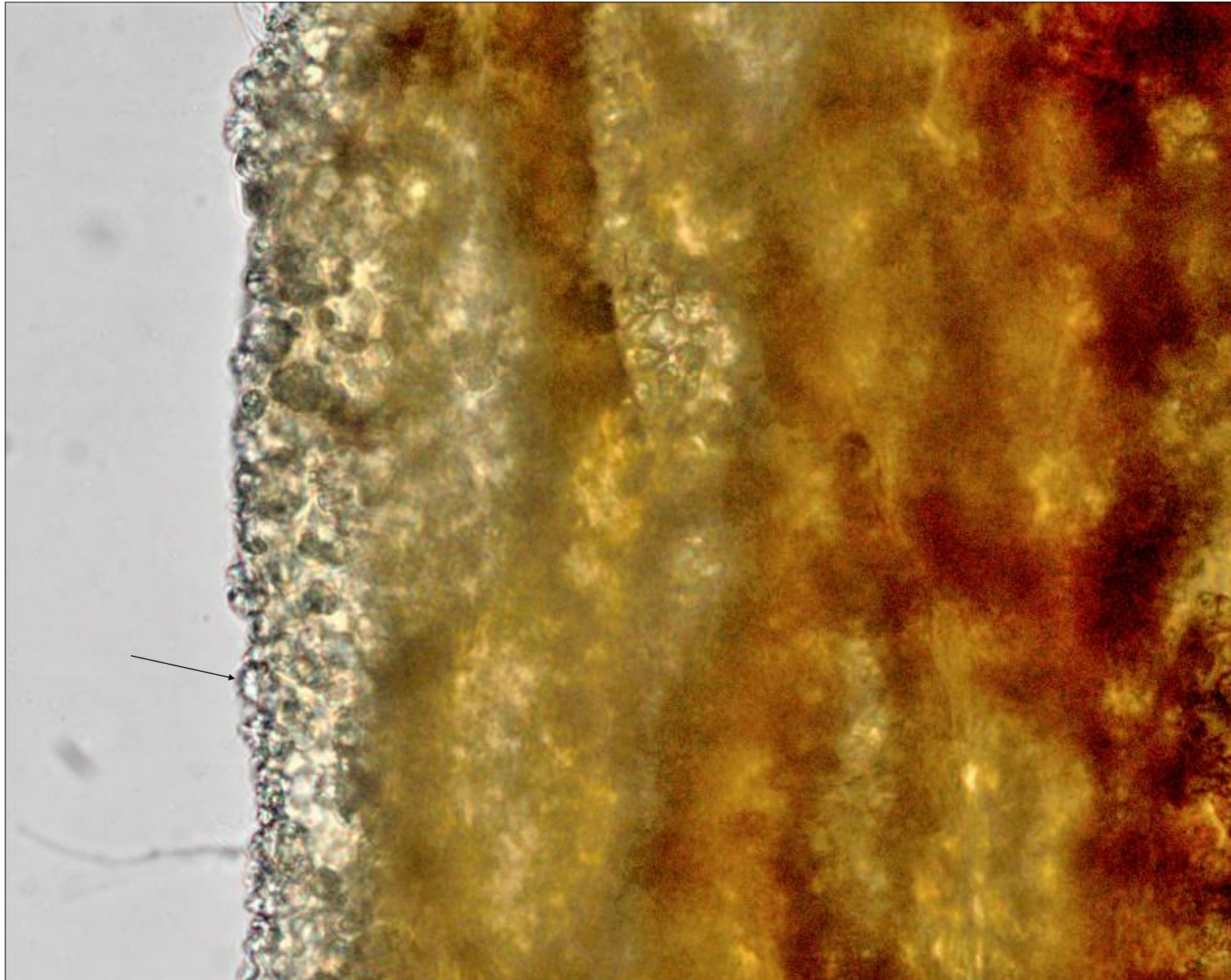
Shown here also, attached to the sporangium, are several small indistinct ascomata of an unidentified ascomycete (?) – arrowed. Ascospores, but no asci, were seen within the ascomata and on the dead nikau frond beneath.



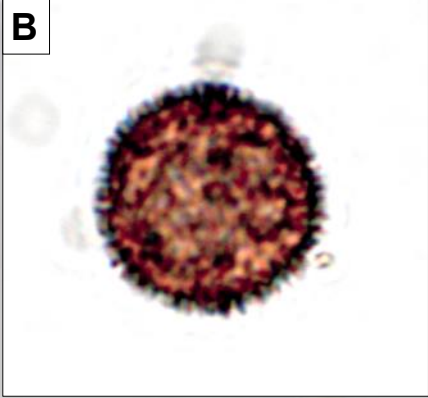
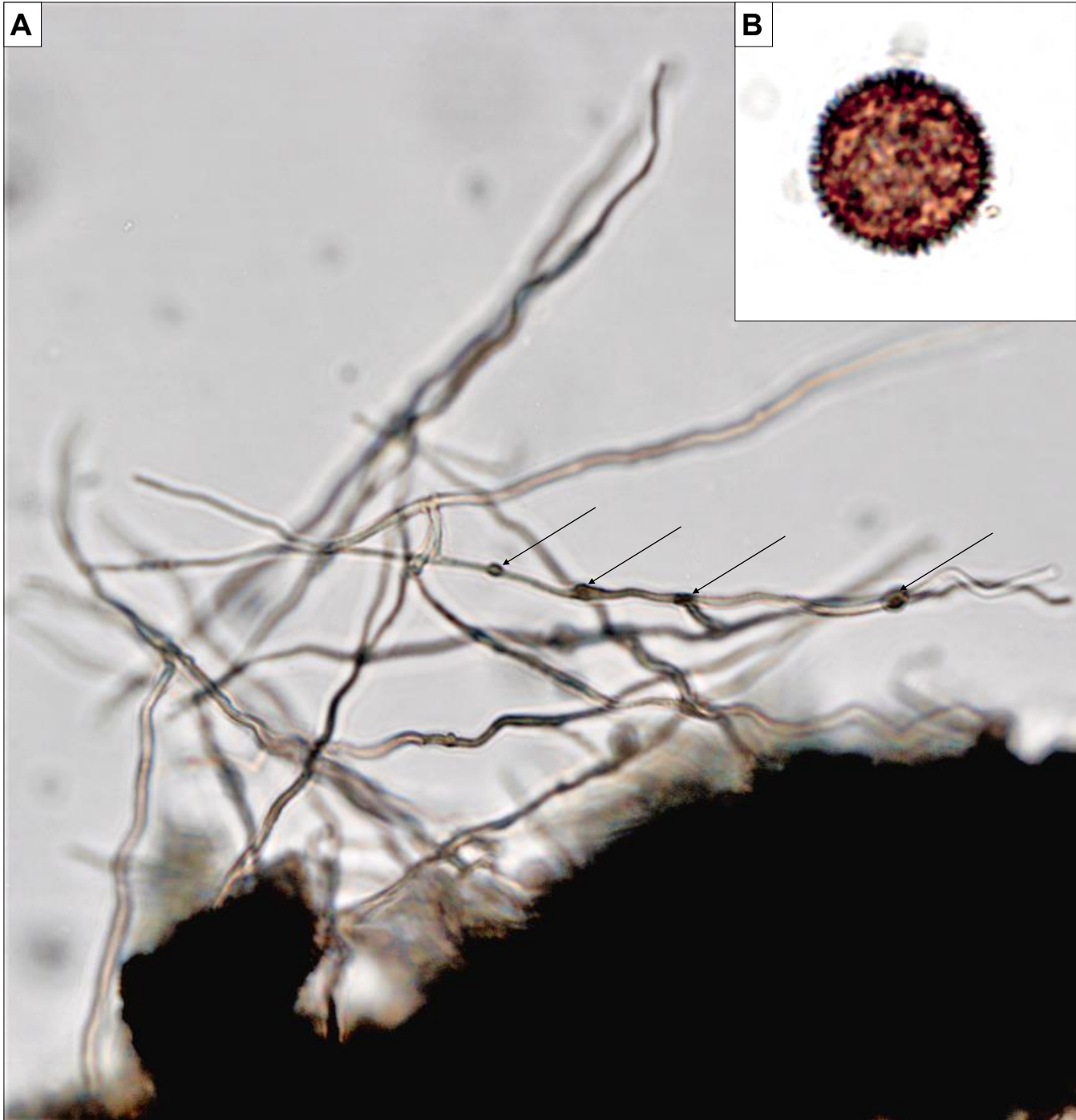
Overhead view with upper part of sporangium gone. Showing capillitial threads, peripheral white stellate lime crystals on the peridium and a central crystalline-covered columella.



Squashed area at the sporangium-stalk interface. Note the stellate crystalline lime bodies (arrowed) and the dark spores. Shear's mounting fluid (SMF), 20X objective & brightfield microscopy.



Stalk edge with thin layer of crystalline lime bodies (arrowed). These lime bodies are also evident on the inner (lighter colored) and outer (darker colored) folds of the fluting. SMF, 40X objective, brightfield microscopy.



A–C. Capillitial threads and spores. A. Capillitial threads, hyaline to lightly pigmented, often with thickenings along their length (arrowed). 70% EtOH, 20X objective, brightfield. B. Spiny spore, 12 μ m including the approx. 1 μ m spines. 10% KOH, 100X obj., brightfield. Color edited to match ‘real color’. C. Spiny spores, 10.5–12 μ m including the spines. SMF, X100 obj., brightfield. Color not edited.