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## *Rosellinia* and related genera in New Zealand

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**Abstract** Specimens labelled as *Rosellinia* (Xylariaceae) collected in New Zealand from the herbarium PDD were examined and could be identified as belonging to species of the genera *Astrocystis*, *Helicogermis*, *Rosellinia*, and *Stilbohypoxyton*. One new species each of *Astrocystis* and *Stilbohypoxyton* and four species of *Helicogermis*, three of them as new, are described. Eighteen species of *Rosellinia* could be distinguished. Only two of them, *R. mammoidea* and *R. radiciperda*, are already described from New Zealand. Five taxa could be assigned to known *Rosellinia* species and eleven are described as new. All species are described, illustrated, and compared with similar taxa. Keys to the genera similar to *Rosellinia*, as well as to the species of *Helicogermis* and *Rosellinia*, are provided. The frequency and distribution of these fungi in New Zealand and their host preferences are discussed.

**Keywords** Ascomycetes; *Astrocystis cyatheae*; *Helicogermis* (*Rosellinia*) *aucklandica*; *H. gisbornia*; *H. johnstonii*; *H. mackenziei*; identification key; new species; *Rosellinia communis*; *R. dingleyae*; *R. freycinetiae*; *R. gisbornia*; *R. hughesii*; *R. johnstonii*; *R. nothofagi*; *R. novae-zelandiae*; *R. palmae*; *R. rhopalostilicola*; *R. samuelsii*; *R. novae-zelandiae*; systematics; taxonomy; Xylariaceae

## INTRODUCTION

### Xylariaceae

Fungi belonging to the family Xylariaceae (Xylariales, Ascomycetes) have generally well-developed superficial or immersed stromata, perithecial ascomata, paraphyses, and unitunicate, cylindrical asci with an apical ring that usually stains blue in iodine, i.e., is amyloid. The ascospores are unicellular, or bi-, seldom tricellular, with one or two hyaline cells reduced in size, brown, with a germ slit. Ascospores of some taxa bear slimy non-cellular appendages, and/or a sheath. Their anamorphs are characterised by holoblastic one-celled conidia formed on sympodially or occasionally percurrently proliferating conidiogenous cells (Rogers 2000). Xylariaceous fungi include some of the most conspicuous and common pyrenomycetous fungi in forests worldwide (e.g., Rogers 1979, 2000; San Martín & Rogers 1995; Whalley 1996; Ju & Rogers 1999).

Approximately 40 genera are listed under the Xylariaceae, but comprehensive monographs exist only for a few, including *Anthostomella*, *Biscogniauxia*, *Daldinia*, *Hypoxyton*, *Nemania*, *Kretzschmaria*, *Stilbohypoxyton*, and *Xylaria* (Francis 1975; Ju & Rogers 1996, 2001, 2002; Ju et al. 1997, 1998; Rogers & Ju 1997, 1998; Lu & Hyde 2000; Wollweber & Stadler 2001). Generic delimitation within some Xylariaceae is far from being well defined. Molecular data are clearly needed to elucidate the relationships among *Rosellinia* and closely related genera and to support the taxonomy derived from morphological data.

So far, Xylariaceae have been reported mainly on dicotyledonous angiosperms, less frequently on monocotyledons, sometimes on conifers, but not on pteridophytes (Rogers 1979; Whalley 1996).

### *Rosellinia*

Recent studies on *Rosellinia* have focused on selected geographical areas and were published by Dargan & Thind (1979) and Pande & Rao (1995) from the Indian subcontinent, by Petrini et al. (1989)

and Petrini (1993) from Europe, by San Martín & Rogers (1995) from Mexico, by Vasilyeva (1998) from the Russian Far East, and by Ju & Rogers (1999) from Taiwan.

*Rosellinia* species are cosmopolitan in their distribution and have been reported mainly from deciduous woods of dicotyledonous plants, infrequently from coniferous litter or twigs, and sometimes also from monocotyledonous hosts (e.g., Saccardo 1882, 1891, 1895, 1899, 1902, 1905, 1913, 1928; Rick 1932; Roger 1953; Saccas 1956; Hino & Katumoto 1957; Teng 1964, 1996; Martin 1968; Rogers 1979; Petrini et al. 1989; Petrini 1993).

The taxonomic concept of *Rosellinia* and the terminology applied basically follows Petrini (1993). Accordingly, the specific character combinations of subiculum, anamorph, stromatal size and shape, ascus apical ring morphology, ascospore size and shape, appendages and slimy caps or sheaths, and germ slit are used to characterise a species. The identification of the species is based mainly on ascospore morphology, as this is the most stable character. Stroma and subiculum characters are used for further delimitation.

The stromata of *Rosellinia* spp. are superficial on the substrate, usually uniperitheciate and embedded in a hyphal mat, a subiculum. When young, the anamorphic state, belonging to the form-genera *Geniculosporium* Chesters & Greenh. or *Dematophora* R.Hartig, is produced there. The term stroma refers to the whole carbonised structure including the sterile soft tissue embedding the perithecium. The ectostroma is the outer shell-like part of it and is always black in section. The entostroma is the white, sterile tissue enclosed by the ectostroma and is reduced to the base or completely absent in mature material. In most cases, perithecia are detached from the stromatal wall and their top often collapses and sinks inwards. The peridium may also dissolve and leave the spores in the stromatal cavity. The paraphyses and asci usually disintegrate quickly and only the spore-bearing part of the asci can be observed. Intact stipes of mature asci are infrequently seen. The amyloid ascus apical rings are well developed, especially in species with large ascospores. In those, they exhibit a well-developed rim on the upper margin and usually stain deep blue in Melzer's reagent. Ascospore features, such as shape, size, germ slit, cellular appendage, slimy caps or sheath, are the most important characters to differentiate species.

The division of *Rosellinia* sens. str. in sections as proposed by Petrini (1993) remains unchanged. It is

not applied in the key and listing of species for practical reasons, but is reported for the individual species in the corresponding discussion.

Section *Rosellinia* is characterised by a coarsely woolly to cottony, dark brown, well-developed, persistent subiculum and carbonaceous, thick-walled, non-collapsing stromata. Section *Calomastia* features a woolly to felty, little developed, soon evanescent, brown or light brown to cream or yellow subiculum and possesses also carbonaceous, thick-walled, non-collapsing stromata. Section *Corrugata* has a felty, appressed, persistent or evanescent subiculum formed by finely interwoven hyphae and thin-walled, wrinkled and collapsing stromata (Petrini 1993).

Closely related genera to *Rosellinia* are *Astrocystis* Berk. & Broome, *Collodiscula* I.Hino & Katum., *Entoleuca* Syd., *Guestia* S.J.D.Smith & K.D.Hyde, *Halorosellinia* Whalley, E.B.G.Jones, K.D.Hyde & Læssøe, *Helicogermis* Lodha & D.Hawksw., *Nemania* S.F.Gray, and *Stilbohypoxyton* Henn. They all resemble *Rosellinia* with respect to being uni- to pauciperitheciate, with black, mainly carbonised, non-pigmented stromata with white interior entostroma, at least when young, and asci with amyloid apical rings mostly higher than wide. They all differ from *Rosellinia* primarily by the absence of a subiculum and the anamorphic state. *Entoleuca*, *Guestia*, *Halorosellinia*, *Helicogermis*, and *Nemania* have immersed to semi-immersed stromata and pseudostromata, and perithecia are often embedded in the host tissue. *Astrocystis*, *Collodiscula*, and *Stilbohypoxyton* develop superficial stromata like *Rosellinia*.

#### *Astrocystis*, *Collodiscula*

*Astrocystis* includes at present 16 validly described taxa (Læssøe & Spooner 1994; Dulymamode et al. 1998; Smith & Hyde 2001), including five species herein transferred from *Rosellinia*. *Collodiscula* is a monotypic genus and was formerly assigned to the Amphisphaeriaceae because of its sessile or short stipitate asci, two-celled ascospores lacking a germ slit, and broad and short paraphyses (Samuels et al. 1987). *Astrocystis* and *Collodiscula* share features such as the anamorphic form-genus *Acanthodochium*, the stromatal ontogeny, heavily carbonised stromata, amyloid ascus apical rings, short stipitate asci, and host range, as they are both known only from monocotyledons, especially bamboo-like plants. For these reasons *Collodiscula* is now included in the Xylariaceae (Samuels & Rossman 1992; Læssøe & Spooner 1994;

Hawksworth et al. 1995; Eriksson 1999). These genera are very much alike, differing from *Rosellinia* by the stromatal ontogeny and the anamorphic *Acanthodochium* state. Their asci are short-stipitate and more persistent than in *Rosellinia*.

Læssøe & Spooner (1994) expanded the generic concept of *Astrocystis* by accepting two species with splitting stromata (type species *A. mirabilis* Berk. & Broome, *A. bambusae* (Henn.) Læssøe & Spooner) and taxa having stromata which do not split. This division is accepted by Smith & Hyde (2001). Anamorphs are recorded only from *A. mirabilis* and *A. bambusae* and are classified in the form-genus *Acanthodochium* (Ju & Rogers 1990; Læssøe & Spooner 1994). The anamorphic states of all other species are still unknown (Læssøe & Spooner 1994; Dulymamode et al. 1998; Smith & Hyde 2001). Further studies must confirm whether the species with non-splitting stromata can really be included in *Astrocystis* sens. str. and their taxonomic position should be reconsidered. For the time being, it appears that such species are included in this genus because they are xylariaceous fungi from monocotyledons with small erumpent stromata, small ascus apical rings, and small ascospores, lacking another genus to satisfactorily accommodate them.

#### *Entoleuca*

Rogers & Ju (1996) emended *Entoleuca* and defined it as a genus with stromata developing within the host, containing few perithecia with only the ostioles exposed. It differs from *Rosellinia* basically by immersed stromata, and mature ascospores lacking any appendages.

#### *Guestia*

*Guestia* is a monotypic genus based on a single specimen described from Ecuador by Smith & Hyde (2001). According to the description, it is distinguished from *Rosellinia* by uni- to pauciperitheciate, semi-immersed pseudostromata.

#### *Halorosellinia*

*Halorosellinia* was erected to accommodate one single species frequently occurring on mangroves (Schatz 1988; Whalley et al. 2000). It differs from *Rosellinia* by its pseudostroma instead of a true stroma, perithecia partially immersed in the host tissue, and its anamorph in culture being described as *Geniculosporium*-like with conidiophores aggregating into dense palisades (Whalley et al. 2000).

#### *Helicogermis*

*Helicogermis* was introduced to segregate species having ascospores with a spiral germ slit which were formerly classified in xylariaceous genera with reduced stromata and perithecial base immersed in the host tissue (Hawksworth & Lodha 1983; Læssøe & Spooner 1994). The ascus apical rings differ from those of *Rosellinia* by their shape, lacking a distinctive rim, and having a flared upper margin. In specimens of the type species they are not amyloid, whereas asci of the other three taxa belonging to *Helicogermis* have amyloid apical rings (Læssøe & Spooner 1994; L. E. Petrini unpubl. data). The anamorphic states are unknown.

#### *Nemania*

*Nemania* was emended by Pouzar (1985) to include species of *Hypoxylon* Bull. Sect. Primo-cinerea with stromata lacking pigments and containing many perithecia completely embedded in the host material. Its mature ascospores lack cellular or slimy appendages and are smaller than those of most *Rosellinia* species. The ascus apical rings are also smaller. Anamorphs belong to the form-genus *Geniculosporium* but not to *Dematophora* and are known mainly from cultures. In nature, the anamorphs are rarely observed and usually develop on the stroma. This genus was recently reviewed by Ju & Rogers (2002).

#### *Stilbohypoxyton*

*Stilbohypoxyton*, previously considered a nomen dubium by Læssøe & Spooner (1994), was recently emended and described in detail by Rogers & Ju (1997) who recognised three species. It includes taxa with carbonaceous or soft, leathery stromata, with a surface often cracked and furrowed. Conidiophores develop on upright stromata. Perithecia develop in the base of some of them and their remains are seen as protuberances on the perithecial stromata. Rogers & Ju (1997) were able to culture *S. moelleri* Henn., the type species, and *S. quisquiliarum* (Mont.) J.D.Rogers & Y.M.Ju. Cultures of both taxa produced the conidial state on synnema-like structures. The anamorphic state resembles somewhat *Acanthodochium*, as described for *Astrocystis* and *Collodiscula*. Instead of being sporodochial, however, the conidiophores develop on tiny needle-shaped stromata that initially do not contain perithecia. *Xylocoremium* J.D.Rogers was described for anamorphs of *Xylaria* stromata other than those developing the teleomorph and, in contrast to the anamorphs of *Stilbohypoxyton*, never

contain the teleomorph. The conidiophores arranged in palisades are reminiscent of *Xylaria* pr. p. (e.g., Rogers 1984; Rogers & Callan 1986; Van der Gucht 1996; Rogers et al. 1997). Because of this morphological feature and of stomatal characteristics, such as the thin ectostroma tightly attached to the entostroma, affinities of *Stilbohypoxylon* to *Xylaria* Hill ex Schrank are obvious (Rogers & Ju 1997).

*Stilbohypoxylon* and *Astrocytis* are similar in their conidiogenesis, as conidia are formed on stromata or stroma-like structures which later are replaced by perithecial stromata. The stromatic textures of the teleomorphs, however, differ in being soft and leathery, sometimes carbonaceous in *Stilbohypoxylon* or hard and splintering in *Astrocytis*.

### **Rosellinia in New Zealand**

Knowledge of the Xylariaceae from New Zealand is very limited. Rogers & Samuels (1986) provided some information on the diversity of the family in New Zealand in their regional treatment of *Xylaria* Hill ex Schrank, and Ju & Rogers (1996) examined many *Hypoxylon* collections from there. Lu & Hyde (2000) listed nine *Anthostomella* species. Very little is known about other genera. Over the years, a large amount of mycological work has been carried out in New Zealand and many collections of *Rosellinia*-like fungi have been deposited in herbarium PDD (Landcare Research, Auckland, New Zealand).

The hosts for a large part of these *Rosellinia* specimens are palms and screw pines, such as *Rhopalostylis* spp., *Freycinetia* spp., as well as tree ferns (*Cyathea* spp. or *Dicksonia* spp.). This strongly contrasts with previous reports of the absence of *Rosellinia* from pteridophytes (Rogers 1979; Whalley 1996), palms, and screw pines (Fröhlich & Hyde 2000; Hyde et al. 2000). This may be a consequence of New Zealand's particularly interesting flora. As many plant species, such as the tree ferns *Cyathea dealbata*, *C. medullaris*, and *Dicksonia squarrosa* or the monocotyledons *Freycinetia banksii*, *Rhopalostylis baueri* var. *cheesemanii*, and *R. sapida*, as well as *Agathis australis*, *Pseudopanax arboreum*, *Beilschmiedia* spp., to name only a few (Table 1), are endemic; these substrates promise unique fungi.

To date, three species of *Rosellinia* have been described from New Zealand: *R. aucklandica*, *R. mammoidea*, and *R. radiciperda* (Rabenhorst 1878; Cooke 1879; Masee 1896). So far, they are not reported from other areas in the world. G. Samuels cultured many specimens he collected, and deposited

dry cultures. In the present work, those collections and all others labelled as *Rosellinia* in PDD were examined aiming to establish species concepts of the described taxa, and to discover additional species.

### **MATERIAL AND METHODS**

Dried herbarium specimens and their dried cultures, mainly from herbarium PDD, were studied. Culture and anamorph descriptions were taken from personal notes kindly provided by G. Samuels.

Single ascospore isolates were grown mainly for 20–30 days at 20°C under 12 h dark and 12 h UV and fluorescent light, by G. Samuels.

Macroscopic features were examined under a dissecting microscope. Microscopic characters except conidial states were observed by bright field or interference contrast microscopy, and conidial states by phase contrast microscopy. Ascospores were examined and measured in water. Melzer's reagent was used to study the shape and size of the ascus apical rings, whereas conidiophores and conidia were examined in 100% lactic acid. Colours were judged using bright field microscopy. The negatives of photomicrographs were scanned into a computer and the photographic plates were prepared using Adobe Photoshop® 6.0. Drawings of microscopic characters were prepared with a camera lucida.

Whenever possible, 5 stromata, 30 ascospores, 5 apical rings, and, where applicable, 10 germ slits and conidia were measured for each specimen. Minimum and maximum values, mean, and standard deviation (SD) for each species were calculated. The values are presented in the text as (minimum) mean  $\pm$  SD (maximum) ( $n$  = number of measurements). When only two figures are given, they represent minimum and maximum values. J+ means that the ascus apical rings stain blue in Melzer's reagent. Ascospore measurements do not include appendages. Descriptions of cultures are based on dried isolates. Discriminant analysis was used to detect statistical differences among ascospore sizes of closely related species and 65% confidence ellipses were used to describe graphically differences in ascospore size. All descriptive and confirmatory statistics were computed using SYSTAT® 10 (Wilkinson 2000). SYSTAT® 10 was also used to prepare graphical displays of data.

The sizes of perithecia, paraphyses, and asci were not recorded due to the frequent absence of these structures and their variability. These three

characters, however, are not crucial to identifying a species, as the perithecium size depends on the stroma size, and the ascus size is correlated with the spore size.

The *Rosellinia* species collected in New Zealand were compared with type material of closely related species received on loan from various herbaria. Herbarium abbreviations follow Holmgren et al. (1990). Specimens marked \* were not included in

the statistical analysis, but, where appropriate, their data were used for non-statistical comparisons with the New Zealand specimens. The denomination of the collecting sites in New Zealand follows Crosby et al. (1976).

Abbreviations: CMD, Cornmeal Dextrose Agar; Co., County; MA, Malt Agar; N, North; OA, Oatmeal Agar; PDA, Potato Dextrose Agar; vic., vicinity.

### KEY TO ROSELLINIA-LIKE GENERA

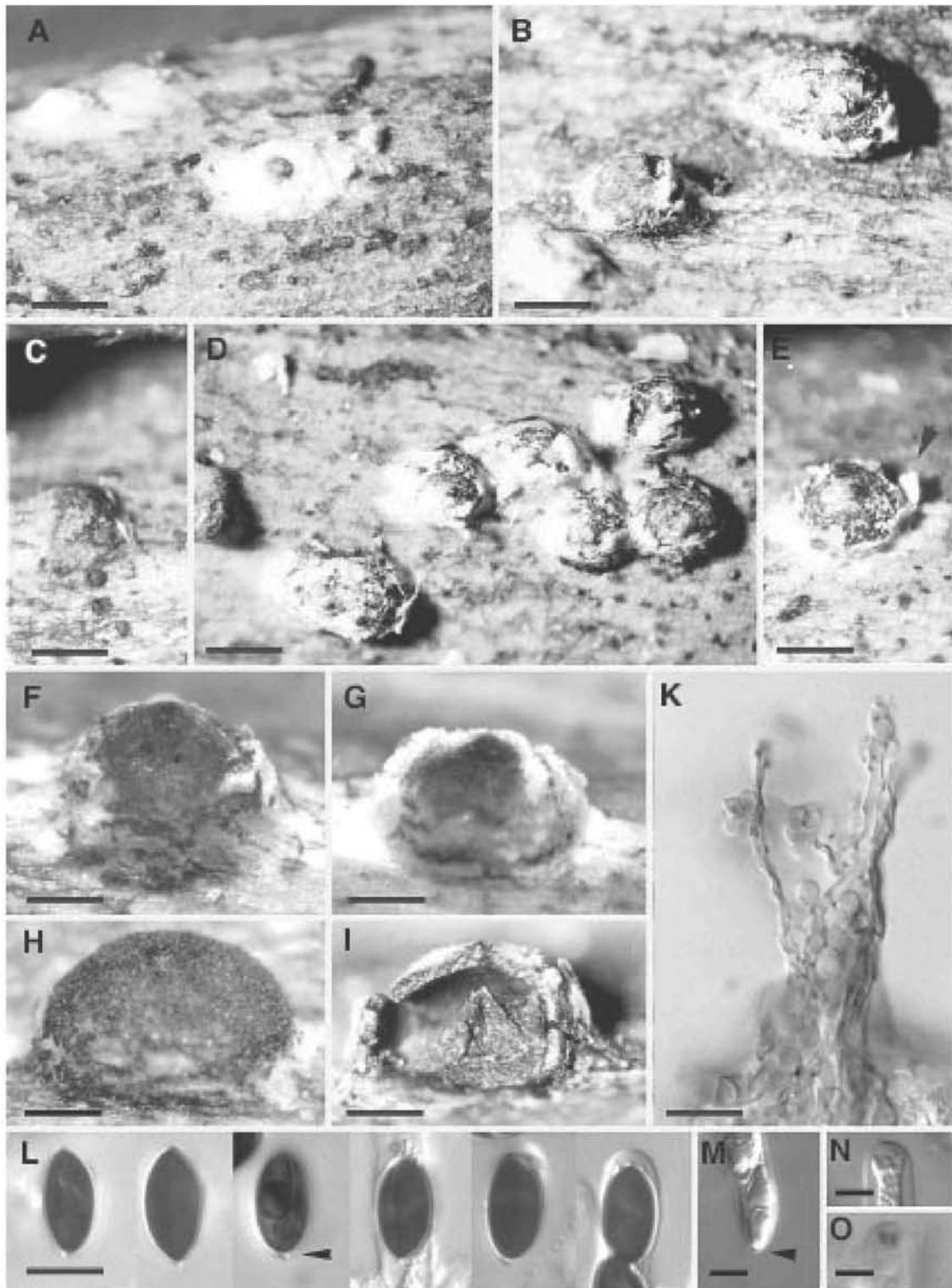
- 1 Stromata embedded in a subiculum, at least when young, superficial, without protuberances or satellite stromata ..... *Rosellinia*
- Stromata not embedded in a subiculum, or only pseudostromata present, erumpent or base immersed in host tissue; if superficial, protuberances or satellite stromata may be present ..... 2
- 2 Pseudostromata present ..... 3
- True carbonised or leathery stromata present ..... 4
- 3 Pseudostromata mainly immersed, exposing only ostioles, peridium of *textura intricata* ..... *Guestia*
- Pseudostromata superficial, only base immersed, peridium of *textura porrecta* ..... *Halorosellinia*
- 4 Stromata with perithecia partially or completely immersed in the host tissue, pauci- or multiperitheciate ..... 5
- Stromata with perithecia not immersed in the host tissue, or only at base, uniperitheciate, or occasionally pauciperitheciate ..... 6
- 5 Stromata with coarsely papillate ostioles, containing a few perithecia ..... *Entoleuca*
- Stromata with finely papillate ostioles, containing few to many perithecia ..... *Nemania*
- 6 Stromata carbonised or leathery, often with cracks and squamules, or protuberances, needle-shaped satellite stromata may be present ..... *Stilbohypoxylon*
- Stromata always strongly carbonised, without cracks and protuberances, satellite stromata absent ... 7
- 7 Ascospores wider than 10 µm, with coiled or sigmoid germ slit ..... *Helicogermisliia*
- Ascospores with straight or sigmoid germ slit, if sigmoid, then narrower as 10 µm ..... 8
- 8 Ascospores one-celled ..... *Astrocystis*
- Ascospores two-celled ..... *Collodiscula*

### TAXONOMY

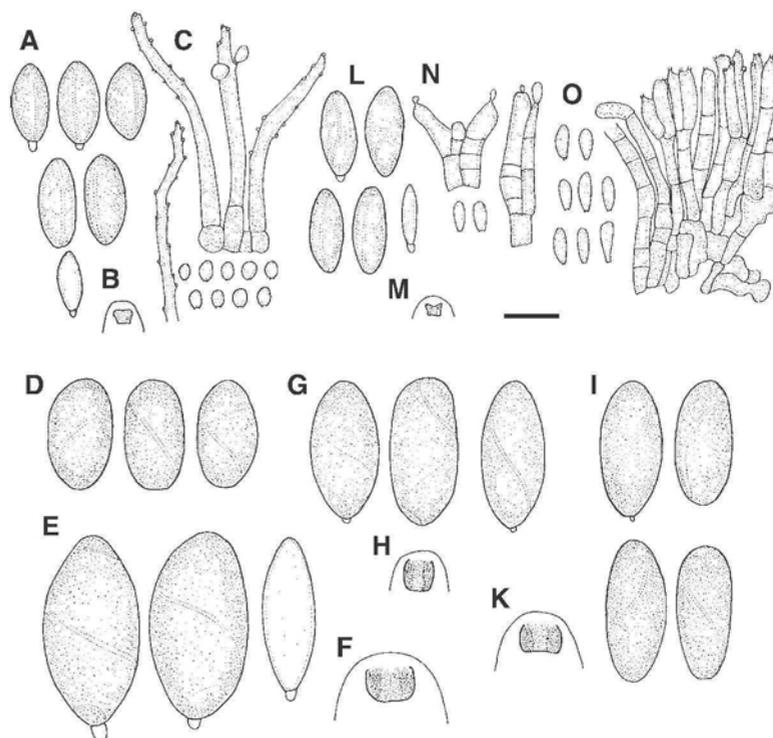
*Astrocystis* Berk. & Broome, *Journal of the Linnaean Society of Botany* 14, 123 (1873)

Stromata developing beneath, and covered by, host cuticle, erumpent and breaking it often in a stellate manner, with conidiophores forming just underneath the host cuticle and remaining attached as cream-coloured squamules, or perithecial stromata developing beneath the conidial stromata, growing through them, and splitting them apart. The conidial

stroma is then later reduced to a rough ring around the perithecial stroma or stromatal bits remain attached to the host cuticle. Ectostroma carbonaceous, black, splintering, entostroma reduced, perithecia detached and collapsing. Ascus apical rings staining blue in Melzer's reagent. Ascospores uni-cellular, brown, with straight or sigmoid germ slit, sometimes with cellular appendages or slimy caps and/or surrounded by a slimy sheath. Anamorph: *Acanthodochium* Samuels, J.D.Rogers & Nagas., *Mycotaxon* 28, 457 (1987). One species is reported from New Zealand.



**Fig. 2** A–C, *Astrocystis cyatheae*, PDD 49673: A, Ascospores, the lowest immature (1st, 2nd from type, PDD 49672); B, Ascus apical ring; C, Conidiophores and conidia on the stroma (PDD 42074); D, *H. aucklandica*, ex Herb. Cooke, K 79240, ascospores; E, F, *Helicogermisita gisbornia*, PDD 41978: E, ascospores, that to the right immature; F, Ascus apical ring; G, H, *H. johnstonii*, PDD 71831: G, Ascospores; H, Ascus apical ring; I, K, *H. mackenziei*, PDD 71919: I, Ascospores (2nd row: type, PDD 61685); K, Ascus apical ring. L–O, *Stilbohypoxydon novae-zelandiae*, PDD 49657: L, Ascospores, lower right one immature; M, Ascus apical ring; N, Conidiophores and conidia on dried OA (PDD 49473); O, Conidiophores and conidia from living culture on OA (PDD 49473; G. J. Samuels). Scale bar = 10 µm.



*Astrocystis cyatheae* L.E.Petrini, sp. nov.

Fig. 1, 2A–C

Stromata e hospitis epidermide erumpentia, epidermidem stellae ad instar secedentia, (375)438 ± 43(500) µm alta, (500)657 ± 75(750) µm lata, cylindracea vel conica apice fere applanato, primo alba ad pallide brunnea ob hospitis epidermidem, nigra cum omnino erumpentia, superficie laevi, solitaria. Ostiola subtiliter papillata. Asci annulus apicalis (2.4)2.7 ± 0.2(2.8) µm altus, parte superiore 2.8–4 µm, inferiore 1.9–2.8 µm latus, margine superiore non protuberanti, iodo pallide coerulescenti. Ascosporae (13)14.6 ± 0.8(16.8) µm longae, (6.7)7.5 ± 0.3(8.2) µm latae, inaequilateraliter ellipsoideae, atrobrunneae, fissura germinativa recta, ascospora tota recurrenti praeditae. Ascosporae nonnullae appendice cellulari 1 × 1 µm dimensione praeditae. Status anamorphosis *Acanthodochium*.

ANAMORPH: *Acanthodochium*.

HOLOTYPE (hic designatus): New Zealand, North Island, Auckland, N of Kaukapakapa, vic. Glorit, Atuanui State Forest, Mt Auckland, on *Cyathea dealbata*, 11 Sep 1980, G. J. Samuels & P. R. Johnston, PDD 49672.

Stromata breaking through the host epidermis, splitting it in a stellate manner (Fig. 1E), exposing the conidial state as white tufts, sometimes with host epidermis attached to its surface as white scales at an early stage. Stromata (375)438 ± 43(500) µm high, (500)657 ± 75(750) µm wide (n = 10), cylindrical to conical with almost flattened top, initially appearing white to light brown due to the attached host epidermis, black when fully emerged, with smooth surface, solitary. Ostioles finely papillate. Ectostroma 25–50 µm thick. Entostroma not seen. Perithecia detached and collapsed in mature

**Fig. 1** *Astrocystis cyatheae*. A–H, Stromata, A–G with white covering of host epidermis, E, stellately split host epidermis (arrow); I, Vertical section of stroma, note stroma shell with detached perithecium reduced to a peg; K, Anamorph from stroma; L, Ascospores, 3rd showing germ slit, 1st to 5th showing cellular appendage; M, Immature ascospore with cellular appendage (arrow); N, Ascus apical ring shown by Nomarski contrast; O, Ascus apical ring in Melzer's reagent. Type, PDD 49672: A–G, I, L–O; PDD 42047: H, K. Scale bars: A–E = 0.5 mm; F–I = 0.25 mm; K, L = 10 µm; M–O = 5 µm.

material. Ascus apical rings  $(2.4)2.7 \pm 0.2(2.8)$   $\mu\text{m}$  high, upper width 2.8–4  $\mu\text{m}$ , lower width 1.9–2.8  $\mu\text{m}$  ( $n = 6$ ), without bulge at upper margin, J+, pale blue. Ascospores (13)  $14.6 \pm 0.8(16.8)$   $\mu\text{m}$  long,  $(6.7)7.5 \pm 0.3(8.2)$   $\mu\text{m}$  wide ( $n = 45$ ), inequilaterally ellipsoidal, dark brown, with straight germ slit, running over the whole spore length, some ascospores with a basal,  $1 \times 1$   $\mu\text{m}$  large, cellular appendage. Conidiophores variable in length, 2.5–5  $\mu\text{m}$  in width, hyaline to light brown at base, as white tufts on young stromata, arising from parenchymatous cell tissue. Conidia  $3\text{--}4 \times 3$   $\mu\text{m}$  ( $n = 10$ ), globose, hyaline to light brown.

HOST: *Cyathea dealbata*.

MATRIX: Rachides.

ETYMOLOGY: Referring to the host plant, *Cyathea* spp.

SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: N of Kaukapakapa, vic. Glorit, Atuanui State Forest, Mt Auckland, on *Cyathea dealbata*, 11 Sep 1980, G. J. Samuels & P. R. Johnston, PDD 49673; Waitakere Ranges, Anawhata Rd, on *Cyathea dealbata*, 9 Jun 1981, G. J. Samuels & P. R. Johnston, PDD 42047,\* immature, anamorph on host.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *Astrocystis hughesii*: TYPE, Sudan, Yambio, on a stout grass, Dec 1948, J. Tarr 605, K 79229. *A. palmarum*: TYPE, Bermuda, Warwick, Fruitlands, on fallen petioles of palm, 1 Aug 1921, H. H. Whetzel 106, K 33779. *A. rachides*: TYPE, French Polynesia, Motu Papeateci, FH. *Rosellinia albocincta*: TYPE, Sri Lanka, Hakgala, on dead wood of *Amomum* sp., Dec 1917, Petch, K.

NOTES: *Astrocystis cyatheae* has non-splitting stromata and is characterised by ascospores with a cellular appendage. No stromatic remnants were detectable on the host epidermis folded away, as described for other *Astrocystis* species with splitting stromata such as *A. mirabilis* Berk. & Broome. On very young stromata the anamorph was observed as white to cream tufts. Its morphology corresponds to *Acanthodochium*.

That a fern is the host for this *Astrocystis* species is remarkable, as all other species of this

genus are known from monocotyledons. So far, xylariaceous fungi have not been reported on pteridophytes (Rogers 1979).

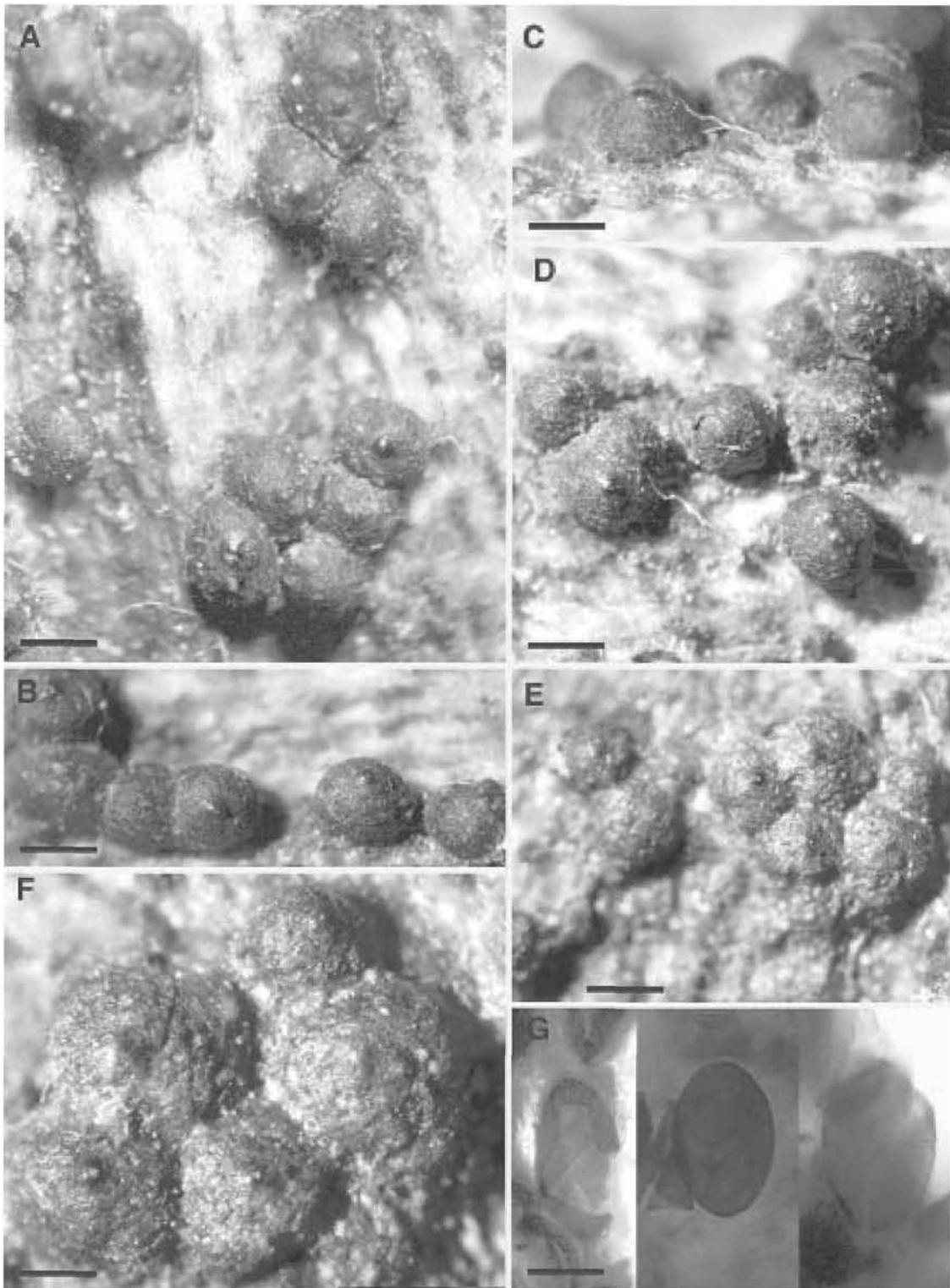
*Astrocystis* species with a spore size roughly similar to that of *A. cyatheae* and non-splitting stromata are *A. hughesii* Læssøe & Spooner, *A. palmarum* Læssøe & Spooner, *A. rachidis* (Pat.) K.D.Hyde & J.Fröhlich, *Astrocystis selangorensis* G.J.D.Smith & K.D.Hyde, and *Rosellinia albocincta* Petch. *Astrocystis hughesii* has smaller stromata and ascospores with a shorter germ slit that is less than spore length. *Astrocystis palmarum* has much larger stromata and ascospores lacking an appendage. *Astrocystis rachidis* has smaller ascospores without an appendage and smaller ascus apical rings. *Astrocystis selangorensis* has larger ascospores with a cellular appendage, and its stromata are soft-walled; the ascus apical rings are also larger (Smith & Hyde 2001). *Rosellinia albocincta* Petch has larger stromata and smaller ascospores without appendages.

*Helicogermis* Lodha & D.Hawksw.,  
*Transactions of the British Mycological Society*  
81, 91 (1983)

Stromata erumpent from the wood with fibres sometimes remaining attached to the stroma surface, thus giving it a whitish appearance ("white ectostroma" mentioned by Læssøe & Spooner (1994)). Stromata massive with a hard splintering ectostroma, entostroma reduced to the base or absent, perithecia detached and later collapsed, paraphyses and asci soon disintegrating. Ascus apical rings nearly rectangular in section, with a flared upper margin, staining pale blue in Melzer's reagent or not staining at all. Ascospores uni-cellular, dark brown with sigmoid to coiled germ slits, sometimes with cellular appendages. Anamorph not known.

So far, four species are known to occur in New Zealand. All specimens were collected on heavily decomposed hardwood. They all differ from the type species, *H. celastri* (S.B. & S.V.S.Kale) Lodha & D.Hawksw., by larger ascospores and less coiled germ slits (Hawksworth & Lodha 1983; L. E. Petrini unpubl. data).

Fig. 3 *Helicogermis* *aucklandica*. A–F, Stromata; G, Ascospores. K 79240. Scale bars: A–E = 0.5 mm; F = 0.25 mm; G = 10  $\mu\text{m}$ . ➤



**Key to the species of *Helicogermis* from New Zealand**

- 1 Ascospores longer than 30  $\mu\text{m}$ , wider than 15  $\mu\text{m}$ , germ slit spiral, making more than 1 turn ..... 2. *H. gisbornia*  
 Ascospores smaller ..... 2  
 2 Ascospores with sigmoid germ slit ..... 3  
 Ascospores with spiral germ slit, making 1 turn ..... 3. *H. johnstonii*  
 3 Ascospores 20–25.5  $\mu\text{m} \times 9.6$ –12.5  $\mu\text{m}$  ..... 4. *H. mackenziei*  
 Ascospores 19–23.5  $\times$  10–14  $\mu\text{m}$  ..... 1. *H. aucklandica*

**1. *Helicogermis* *aucklandica* (Rabenh.)**

L.E.Petrini, comb. nov. Fig. 2D, 3

BASIONYM: *Rosellinia aucklandica* Rabenh., *Hedwigia* 17, 115 (1878).

TYPE: Oceaniae, Aucklandia, *H. Krone*; not located.

Stromata 475–575  $\mu\text{m}$  high, 550–675  $\mu\text{m}$  wide ( $n = 10$ ), erumpent through wood, when young covered by host epidermis, semiglobose to conical, black, solitary, crowded or 3 to 4 fused into small groups. Ostioles finely papillate. Ectostroma 50  $\mu\text{m}$  thick, black. Entostroma not seen. Perithecia detached. Ascus apical rings not seen. Ascospores (19)20.7  $\pm$  1.2(23.5) long, (10)12  $\pm$  1(14)  $\mu\text{m}$  wide ( $n = 21$ ), broadly ellipsoidal, dark brown, with sigmoid germ slit. Anamorph not known.

SPECIMEN EXAMINED: SOUTH ISLAND: SOUTH CANTERBURY: Waitaki, on bark, ex Herb. M. C. Cooke, K 79240, as *Rosellinia mammoidea*.

NOTES: The original specimen from New Zealand collected by H. Krone was not located in any of the major herbaria or in those which may host some of Rabenhorst's exsiccata. One specimen in S, labelled as *Rosellinia aucklandica* from the Philippines, turned out to be *R. merrillii* Syd. The original description of *R. aucklandica* (Rabenhorst 1878) gives no stroma size, but the ascospores are described as 22  $\mu\text{m}$  long and 10–12  $\mu\text{m}$  wide. After extensive study of New Zealand material and additional type specimens of *Rosellinia* spp., the only specimen with ascospores matching the size of those of *R. aucklandica* is the one from the Kew herbarium previously classified as *R. mammoidea*. The specimen consists of two pieces, one in an envelope and one glued on a sheet, both containing stromata erumpent from heavily decomposed wood. The ascospores are not in excellent condition, but the sigmoid germ slit is still clearly visible.

**2. *Helicogermis* *gisbornia* L.E.Petrini, sp. nov.**

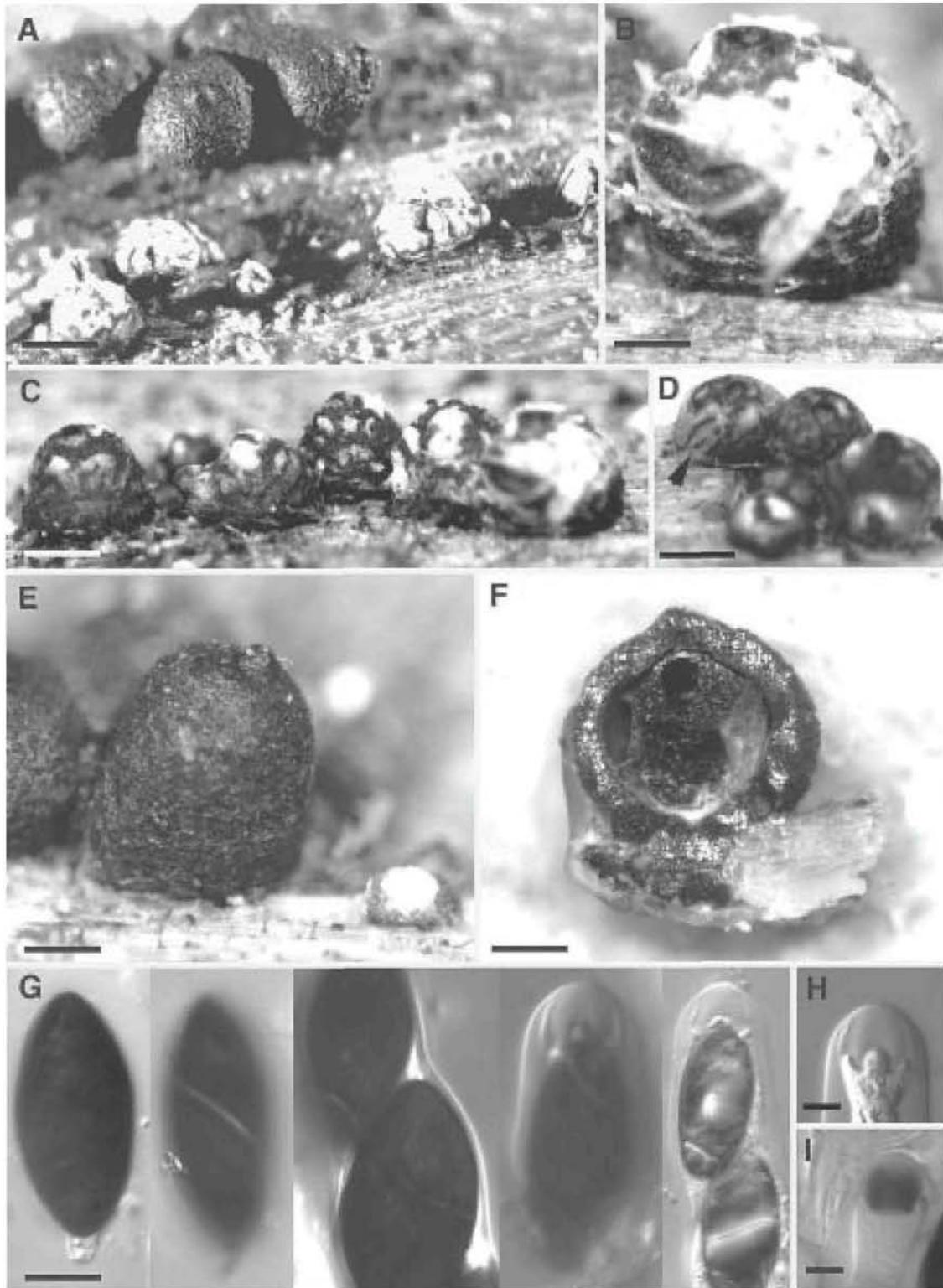
Fig. 2E,F, 4

Stromata e ligno erumpentia, albis vel brunneis hospitis epidermidis partibus tecta, (750)867  $\pm$  69(1000)  $\mu\text{m}$  alta, (750)920  $\pm$  105(1125)  $\mu\text{m}$  lata, subglobosa, conica ad cupulata, brunnea ad nigra, superficie rugosa ad rimulosa, singularia, gregaria. Ostiola grosse papillata. Ectostroma 75–100  $\mu\text{m}$  crassum, nigrum. Annulus apicalis asci 5.7–6.7  $\mu\text{m}$  altus, parte superiore 6.7–8.6  $\mu\text{m}$  et inferiori 4.8–6.7  $\mu\text{m}$  latus, paene rectangularis, margine superiore non protuberanti, parte finali superiore indistincta, iodo pallide coerulescenti. Ascosporae (29.7)32.7  $\pm$  1.6(37.4)  $\mu\text{m}$  longae, (14.4)16.7  $\pm$  1(18.2)  $\mu\text{m}$  latae, late ellipsoideae, atrobrunneae, fissura germinativa spiralliter sporam una circumferentiae et quarta parte recurrenti, appendice semiglobosa, ad 3  $\times$  3  $\mu\text{m}$  dimensione, cellulari praeditae.

HOLOTYPE (hic designatus): New Zealand, North Island, Gisborne: on decorticated wood of *Beilschmiedia tawa*, 30 May 1983, G. J. Samuels, P. R. Johnston, T. Matsushima, & A. Y. Rossmann, PDD 45911, cultures on CMD, PDA.

Stromata (750)867  $\pm$  69(1000)  $\mu\text{m}$  high, (750)920  $\pm$  105(1125)  $\mu\text{m}$  wide ( $n = 10$ ), erumpent through the wood, covered with white or brown remnants of host epidermis, subglobose, conical to cupulate, dark brown to black, with rugose to slightly cracked surface, solitary in small groups. Ostioles coarsely papillate. Ectostroma 75–100  $\mu\text{m}$  thick, black. Entostroma below perithecia white to cream. Perithecia detached and collapsed in mature material. Ascus apical rings 5.7–6.7  $\mu\text{m}$  high, upper width 6.7–8.6  $\mu\text{m}$ , lower width 4.8–6.7  $\mu\text{m}$  ( $n = 10$ ), almost rectangular, without bulge at upper margin, upper end blurred, J+, pale blue. Ascospores (29.7)32.7  $\pm$  1.6(37.4)  $\mu\text{m}$  long, (14.4)16.7  $\pm$  1(18.2)  $\mu\text{m}$  wide ( $n = 60$ ), broadly ellipsoidal, dark brown,

**Fig. 4** *Helicogermis* *gisborniae*. A–E, Stromata, A–C showing young material covered with host material, D, wood at the base (arrow); F, Vertical section of stroma, note stroma shell and detached perithecium; G, Ascospores, 1st with cellular appendage, 2nd to 4th showing coiled germ slit, two spores at extreme right immature; H, Ascus apical ring shown by Nomarski contrast; I, Ascus apical ring in Melzer's reagent. Type, PDD 45911. Scale bars: A, C, D = 0.5 mm; B, E, F = 0.25 mm; G = 10  $\mu\text{m}$ ; H, I = 5  $\mu\text{m}$ .



with spiral germ slit over one and a quarter turn, with a basal, up to  $3 \times 3 \mu\text{m}$  large, semiglobose, cellular appendage.

Cultures on CMD after 36 days at  $15\text{--}18^\circ\text{C}$  under diffused daylight 0.7 cm diam., scant aerial mycelium, dense, opaque, salmon-coloured with scattered, salmon-coloured sporodochial aggregates, sterile. On PDA under same conditions 1 cm diam., salmon-coloured, felty, dense, opaque, sterile.

HOSTS: *Beilschmiedia tawa*, ?*Weinmannia racemosa*.

MATRIX: Decorticated, heavily decomposed wood.

ETYMOLOGY: After the province Gisborne, where both specimens were collected.

OTHER SPECIMEN EXAMINED: NORTH ISLAND: GISBORNE: Urewera National Park, Lake Waikaremoana, Ngamoko Track, on wood of ?*Weinmannia racemosa*, 21 May 1981, G. J. Samuels, P. R. Johnston, E. Horak, A. P. Hawthorne, & R. H. Petersen, PDD 41978.

NOTES: *Helicogermis* *gisbornia* is characterised by its large, wide, dark brown ascospores with a spiral germ slit encircling them more than one time and with a cellular appendage.

**3. *Helicogermis* *johnstonii* L.E. Petrini,**  
sp. nov. Fig. 2G,H, 5

Stromata e ligno paulatim erumpentia, primo hospitis partibus tecta, dein libera, basi saepe immersa, (500)688  $\pm$  119(850)  $\mu\text{m}$  alta, (700)775  $\pm$  104(1000)  $\mu\text{m}$  lata, semiglobosa, conica ad pyriformia, nigra, solitaria ad gregaria, interdum connata. Ostiola grosse papillata ad indistincta, apice stromatico dein obtuse rotundato. Annulus apicalis asci 5–6  $\mu\text{m}$  altus, parte superiore 5–6  $\mu\text{m}$  et inferiore 4–5  $\mu\text{m}$  latus, paene rectangularis, margine superiore non protuberanti, parte finali superiore indistincta, iodo coerulescenti. Ascospores (22.5)26  $\pm$  2(32)  $\mu\text{m}$  longae, (9.5)11.5  $\pm$  8(14)  $\mu\text{m}$  latae, ellipsoideae partibus finalibus late rotundatis, atrobrunneae, fissura germinativa spiralliter unam circumferentiam recurrenti, interdum appendice semiglobosa, ad 1  $\times$  1  $\mu\text{m}$  dimensione, cellulari praeditae.

HOLOTYPE (hic designatus): New Zealand, North Island, Taupo: vic. Kiko Road, Maungatere Road, on decort. wood, soft, white, rotten, 4 May 2001, P. R. Johnston & S. R. Whitton, PDD 74360.

Stromata (500)688  $\pm$  119(850)  $\mu\text{m}$  high, (700)775  $\pm$  104(1000)  $\mu\text{m}$  wide ( $n = 10$ ), emerging gradually from the wood, initially covered by host material, later free, base often immersed, semiglobose, conical to pear-shaped, black, solitary or in small groups, sometimes fused together. Ostioles coarsely papillate or poorly differentiated, then stromata with bluntly rounded apex. Ectostroma 75–100  $\mu\text{m}$  thick, black. Entostroma not formed. Perithecia immersed directly in the host material, detached and collapsed in mature material. Ascus apical rings 5–6  $\mu\text{m}$  high, upper width 5–6  $\mu\text{m}$ , lower width 4–5  $\mu\text{m}$  ( $n = 5$ ), almost rectangular, without bulge at upper margin, upper end blurred, J+, blue. Ascospores (22.5)26  $\pm$  2(32)  $\mu\text{m}$  long, (9.5)11.5  $\pm$  8(14)  $\mu\text{m}$  wide ( $n = 60$ ), ellipsoidal, dark brown with spiral germ slit over one turn, occasionally with one up to  $1 \times 1 \mu\text{m}$ , semiglobose, cellular appendage. Anamorph not known.

HOSTS: *Coprosma* sp., ?*Dracophyllum longifolium*.

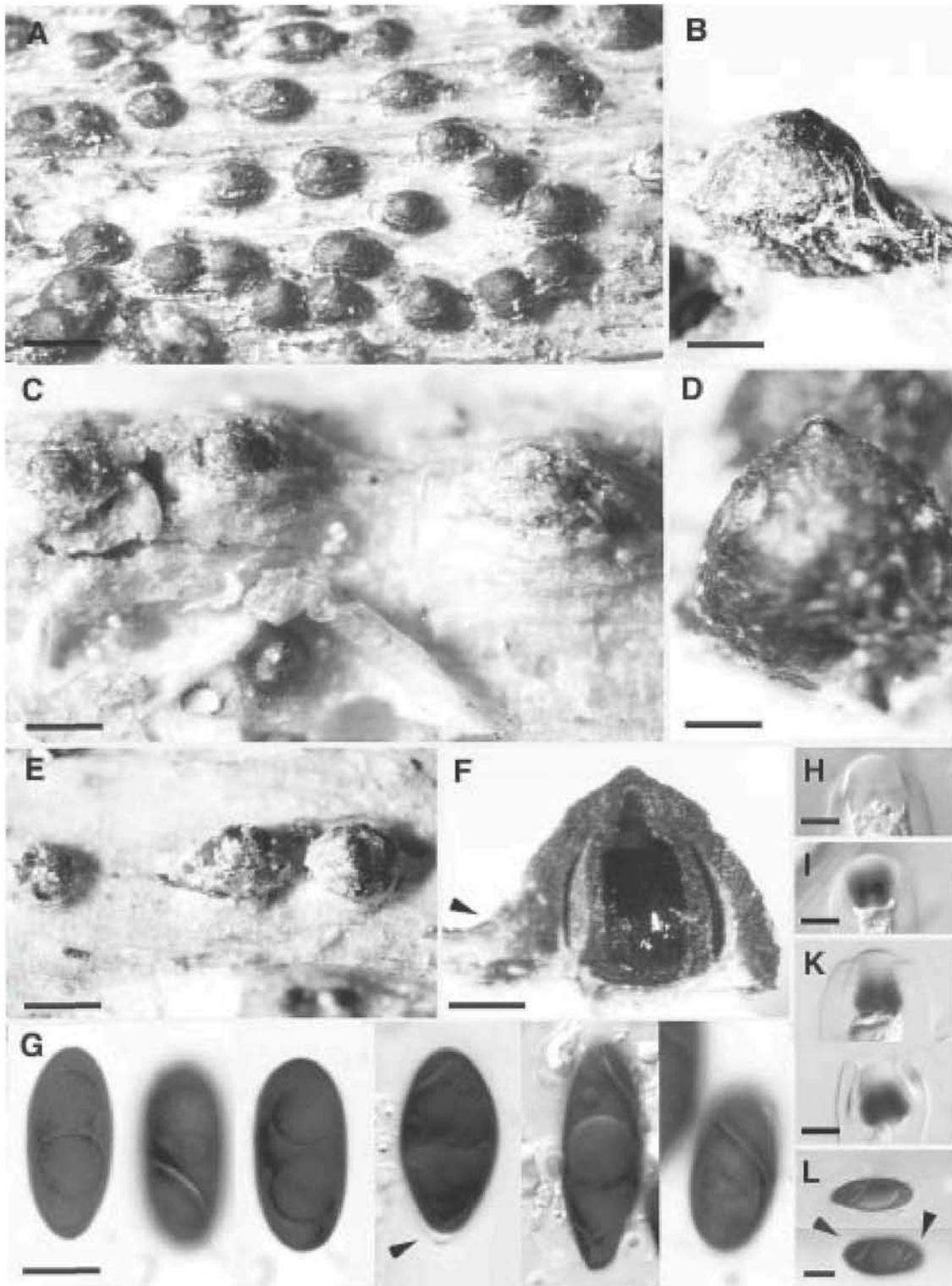
MATRIX: Decorticated, heavily decomposed wood.

ETYMOLOGY: In honour of the New Zealand mycologist P. R. Johnston, who collected three specimens of this species.

OTHER SPECIMENS EXAMINED: CAMPBELL ISLAND: Boardwalk, vic. Beeman Hill, on *Coprosma* sp., 7 Mar 2000, H. Burdsall, PDD 71725; Boardwalk, coast side, Beeman Hill, on (?)*Dracophyllum longifolium*, 6 Mar 2000, P. R. Johnston, E. H. C. McKenzie, & S. L. Stephenson, PDD 71727; Slopes of Mt Honey, old slip on south side, Perseverance Cove, on *Coprosma* sp., decort. wood, 7 Mar 2000, P. R. Johnston & E. H. C. McKenzie, PDD 71831.

NOTES: *Helicogermis* *johnstonii* is characterised by ascospores with a coiled germ slit making about one turn. It has smaller ascospores with a less coiled germ slit than *H. gisbornia* and larger ascospores with a germ slit definitely more coiled than that found in *H. mackenziei*.

**Fig. 5** *Helicogermis* *johnstonii*. A–E, Stromata, B showing host material covering young stroma, D, E, stromata breaking out of wood; F, Vertical section of stroma, note host material covering stroma (arrow) and detached perithecium; G, Ascospores, 2nd, 5th, and 6th showing coiled germ slit, 4th with appendage (arrow); H, Ascus apical ring shown by Nomarski contrast; I, K, Ascus apical rings in Melzer's reagent, K showing ascus apex folded inwards; L, Ascospores showing coiled germ slits (arrows). Type, PDD 74360: A, C, D–I, L; PDD 71831: B, G (4th ascospore), K. Scale bars: A = 1 mm; B, E = 0.5 mm; C, D, F = 0.25 mm; G, L = 10  $\mu\text{m}$ ; H–K = 5  $\mu\text{m}$ .



*Helicogermis* *gaudofroyi* (H.Fabre) Læssøe & Spooner has larger stromata, smaller ascospores, less coiled germ slits; *Anthostomella calligoni* Frolov has a more coiled germ slit than *H. johnstonii* (Petrini et al. 1987; Læssøe & Spooner 1994; L. E. Petrini unpubl. data).

**4. *Helicogermis* *mackenziei* L.E.Petrini, sp. nov.** Fig. 2I,K, 6

Stromata e ligno erumpentia, albis vel brunneis hospitis epidermidis partibus tecta, (475)530 ± 54(600) µm alta, (575)620 ± 33(650) µm lata, subglobosa, conica ad semiglobosa, nigra, superficie rugosa ad rimulosa, singularia, gregaria, in ligno libera, in cortice autem immersa, ostiolis tantum liberis. Ostiola laeviter papillata vel indistincta, rare in disco insidentia. Annulus apicalis asci 4.8–5.8 µm altus, parte superiore 5.7–6.7 µm et inferiore 4.8–6.7 µm latus, paene rectangularis, margine superiore non protuberanti, parte finali superiore indistincta, iodo pallide coerulescenti. Ascospores (20.2)23.4 ± 1.4(25.5) µm longae, (9.6)11 ± 0.7(12.5) µm latae, ellipsoideae partibus finalibus late rotundatis, atrobrunneae, fissura germinativa spiraliter sporam totam recurrenti, interdum appendice semiglobosa, ad 0.5 × 0.5 µm dimensione, cellulari praeditae.

HOLOTYPUS (hic designatus): New Zealand, Chatham Island: Tuku Reserve, 19 Nov 1992, P. R. Johnston & E. H. C. McKenzie, PDD 61685.

Stromata (475)530 ± 54(600) µm high, (575)620 ± 33(650) µm wide (*n* = 5), breaking through the wood, covered with white or brown remnants of host epidermis, conical to semiglobose, black, with surface shrivelled or finely cracked, single, forming small groups, on wood free, otherwise immersed in bark and only ostioles exposed. Ostioles finely papillate or not pronounced, seldom seated on a disk. Ectostroma 50–75 µm thick, black. Entostroma dark brown, soft, confined to base. Perithecia detached and collapsed in mature material. Ascus apical rings 4.8–5.8 µm high, upper width 5.7–6.7 µm, lower width 4.8–6.7 µm (*n* = 4), almost rectangular, without bulge at upper margin, upper end blurred, J+, light blue. Ascospores (20.2)23.4 ± 1.4(25.5) µm long, (9.6)11 ± 0.7(12.5) µm wide (*n* = 30), ellipsoidal with broadly rounded ends, dark brown, with sigmoid germ slit running almost over the

whole spore length, occasionally with a basal, 0.5 × 0.5 µm large, semiglobose, cellular appendage. Anamorph unknown.

HOST: Undetermined.

MATRIX: On bark or wood of small heavily decomposed twigs, c. 1 cm diam.

ETYMOLOGY: In honour of one of the collectors, the New Zealand mycologist E. H. C. McKenzie.

ADDITIONAL SPECIMEN EXAMINED: STEWART ISLAND: Garden Round track, on decort. wood, 10 Nov 1998, P. R. Johnston, PDD 71919.

NOTES: *Helicogermis* *mackenziei* has ascospores with a sigmoid germ slit. The stroma ontogeny and morphology and the ascus apical rings, however, are similar to those of the other two species that have coiled germ slits, thus, a placement in *Helicogermis* is justified. The specimen PDD 71919 has larger stromata than the type specimen, but they do not differ in ascospore size and morphology. Therefore, the specimens are considered as conspecific.

*Helicogermis* *aucklandica*, represented by a specimen from the Cooke herbarium (K), has similar but statistically significantly smaller and more broadly rounded ascospores than *H. mackenziei*.

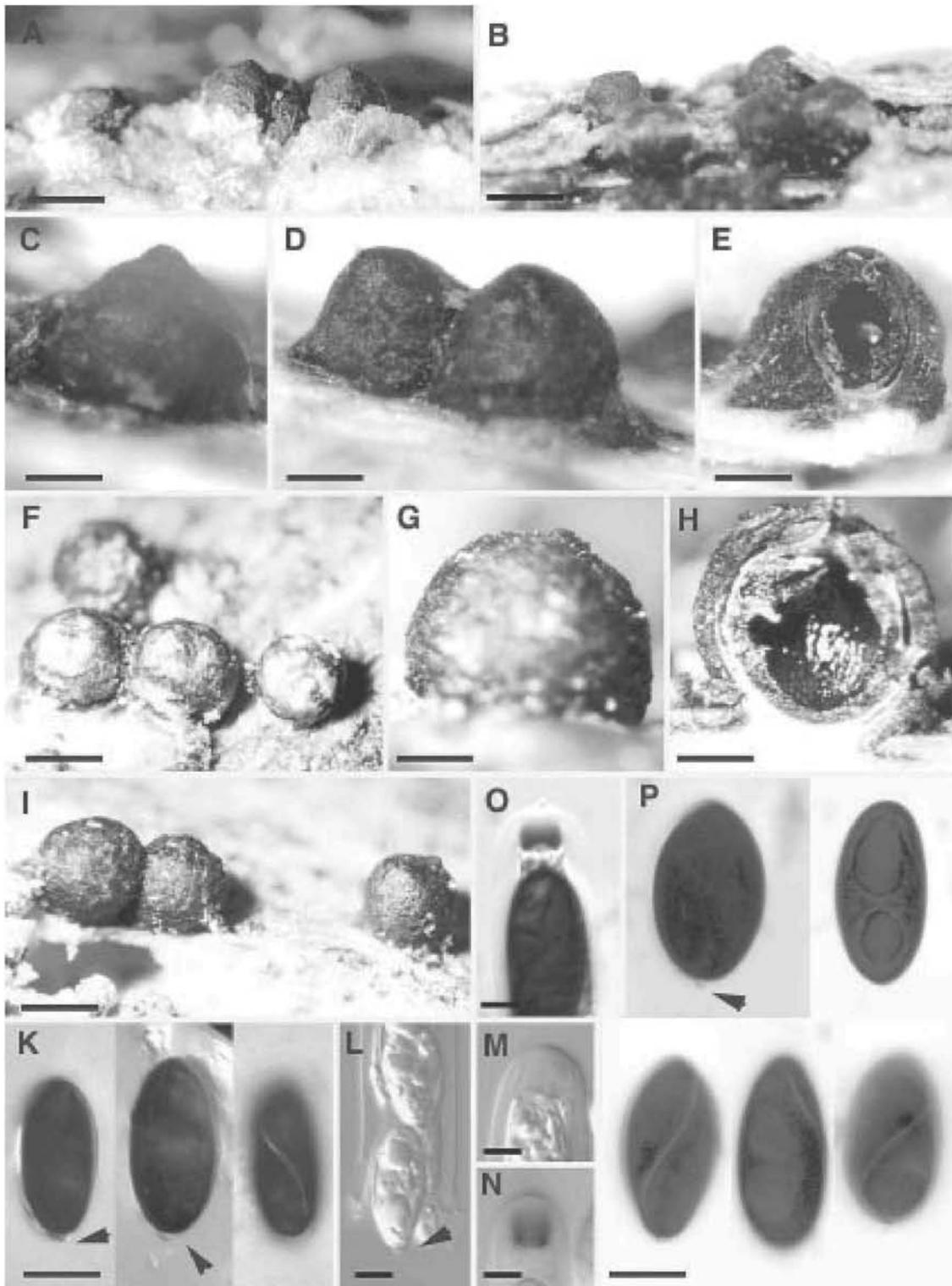
*Rosellinia* De Notaris, *Giornale Botanico Italiano* 1, 334 (1844)

Stromata developing within a subiculum from which the anamorph arises when young, usually uniperitheciate; when small, a few might be fused together. Ectostroma hard, splintering, entostroma reduced at the base, perithecia mostly detached from the stroma wall, often collapsed, paraphyses and asci soon disintegrating, ascus apical rings staining blue in Melzer's reagent. Ascospores unicellular, light to dark brown, with germ slit, cellular appendages and/or slimy sheaths or caps may be present.

ANAMORPHS: *Dematophora* R.Hartig, *Untersuchungen Forstbot. Inst., München*, 125 (1883); *Geniculosporium* Greenh. & Chesters *Trans. Br. Mycol. Soc.* 47, 400 (1964).

For a more detailed description of the genus see Petrini (1993). Eighteen species are recognised from New Zealand.

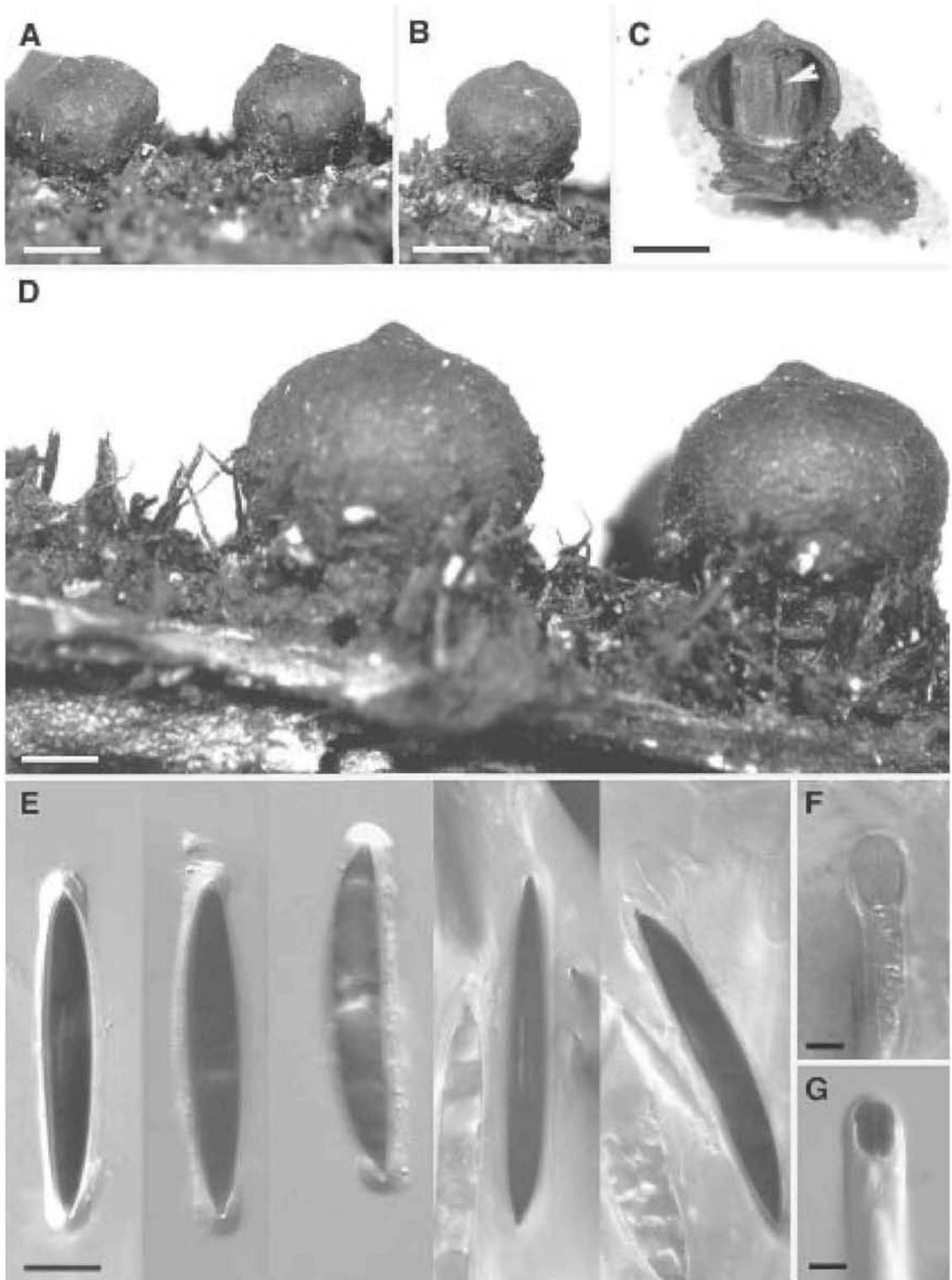
**Fig. 6** *Helicogermis* *mackenziei*. **A–D, F, G, I**, Stromata, **A, B, F**, young stromata emerging from wood; **E, H**, Vertical sections, note detached perithecia; **K, P**, Ascospores, note cellular appendages (arrows); **L**, Young ascospores in the ascus showing cellular appendage (arrow); **M**, Ascus apical ring shown by Nomarski contrast; **N, O**, Ascus apical rings in Melzer's reagent. Type, PDD 61685: **A–E, K–N**; PDD 71919: **F–I, O, P**. Scale bars: **A, B, F** = 0.5 mm; **C–E, G, H** = 0.25 mm; **I** = 1 mm; **K, P** = 10 µm; **L–O** = 5 µm.



Key to species of *Rosellinia* from New Zealand

- 1 Germ slit of ascospores sigmoid ..... 2  
 Germ slit of ascospores straight ..... 3
- 2 Ascospores 20–26  $\mu\text{m}$  long, germ slit reaching the spore ends ..... **2. *R. chusqueae***  
 Ascospores 26–36  $\mu\text{m}$  long, germ slit about  $\frac{2}{3}$  of spore length ..... **4. *R. dingleyae***
- 3 Ascospores with two 3–4  $\mu\text{m}$  long and 3  $\mu\text{m}$  wide conical, cellular appendages ..... **11. *R. nothofagi***  
 Ascospores without such appendages ..... 4
- 4 Ascospores > 30  $\mu\text{m}$  long ..... 5  
 Ascospores < 30  $\mu\text{m}$  long ..... 9
- 5 Ascospores with germ slit 8–12  $\mu\text{m}$  long ..... 6  
 Ascospores with germ slit running over the whole spore length ..... 7
- 6 Ascospores 37–59 (mean 48)  $\mu\text{m}$  long ..... **1. *R. arcuata***  
 Ascospores 53–70 (mean 62)  $\mu\text{m}$  long ..... **5. *R. freycinetiae***
- 7 Ascospores 60–79  $\mu\text{m}$  long ..... **9. *R. longispora***  
 Ascospores < 60  $\mu\text{m}$  ..... 8
- 8 Stromata > 1000  $\mu\text{m}$  high and wide, embedded in a subiculum when mature ..... **14. *R. radiciperda***  
 Stromata < 1000  $\mu\text{m}$  high, subiculum absent at maturity ..... **13. *R. palmae***
- 9 Ascospores > 20  $\mu\text{m}$  long, or, if shorter, with a *Dematophora* anamorph ..... 10  
 Ascospores < 20  $\mu\text{m}$  long, never with a *Dematophora* anamorph ..... 13
- 10 *Dematophora* anamorph present ..... 11  
*Dematophora* anamorph absent ..... 12
- 11 Ascospores with short germ slit and slimy sheath ..... **16. *R. samuelsii***  
 Ascospores with germ slit running over the whole spore length ..... **7. *R. hughesii***
- 12 Ascospores with a cellular appendage, completely surrounded by a slimy sheath; stromata pear-shaped, embedded in a dark brown subiculum ..... **12. *R. novae-zelandiae***  
 Ascospores without a cellular appendage, surrounded by a slimy sheath at both ends and one side; stromata semiglobose to conical, subiculum light-coloured, evanescent, ..... **6. *R. gisbornia***
- 13 Ascospore average length > 15  $\mu\text{m}$ ; stromata columnar to conical, on the surface often forming concentric rings, wavy in outline ..... **3. *R. communis***  
 Ascospore average length < 15  $\mu\text{m}$ ; stromata subglobose, semiglobose or cylindrical with flattened top ..... 14
- 14 Ascospores 9–11.5  $\mu\text{m}$ , germ slit barely visible ..... **17. *R. stenasca***  
 Ascospores larger, germ slit clearly visible ..... 15
- 15 Ascospores regularly with a cellular appendage and with germ slit running over the whole spore length; stromata conical ..... **18. *R. victoriae***  
 Ascospores without or only occasionally with a cellular appendage; stromata cupulate, semiglobose or cylindrical ..... 16
- 16 Ascospores with a germ slit running over the whole spore length; stromata cupulate, shiny, with rounded top and pronounced ostioles ..... **15. *R. rhopalostilicola***  
 Ascospores with germ slit shorter than the spore length; stromata semiglobose with poorly pronounced ostioles or cylindrical with flattened top ..... 17
- 17 Ascospores  $(6.2)7.5 \pm 0.5(9)$   $\mu\text{m}$  wide, with germ slit about  $\frac{2}{3}$  length, situated symmetrically on the spore; stromata with rounded top ..... **10. *R. mammoidea***  
 Ascospores  $(4.8)6.2 \pm 0.6(9)$   $\mu\text{m}$  wide, with germ slit closer to one end than to the other; stromata with flattened top ..... **8. *R. johnstonii***

**Fig. 7** *Rosellinia arcuata*. **A, B, D**, Stromata, D showing synnemata; **C**, Vertical section of stroma, arrow points to collapsed perithecium; **E**, Ascospores, 1st, 4th, 5th showing germ slit; **F**, Ascus apical ring shown by Nomarski contrast; **G**, Ascus apical ring in Melzer's reagent. PDD 45804. Scale bars: A–C = 1 mm; D = 0.5 mm; E = 10  $\mu\text{m}$ ; F, G = 5  $\mu\text{m}$ .



**1. *Rosellinia arcuata*** Petch, *Ann. R. Bot. Garden Peradeniya* 6, 175 (1916) Fig. 7, 8A–D

ANAMORPH: *Dematophora*.

AUTHENTIC SPECIMENS: Sri Lanka, Hakgala, on bark, May 1910, *Petch 3145*, K\*; on twigs, Jan 1914, *Petch 3941*, K\*; on bark, Sep 1908, *Petch 2856*, K\*.

Subiculum persistent, brown to dark brown, wiry, appressed, with synnemata. Stromata (1250)1766 ± 330(2500) µm high, (1125)1740 ± 312(2250) µm wide (*n* = 30), globose to subglobose with almost flattened top, cupulate, often with a short cylindrical base immersed in the subiculum, copper brown, dark brown, black around the ostioles, smooth, solitary to crowded and laterally compressed. Ostioles finely to coarsely papillate. Ectostroma (75)100–125 µm thick, black. Entostroma white, confined to base. Perithecia detached and collapsed in mature material. Ascus apical ring (6.7)8.3 ± 0.8(9.6) µm high, upper width 5.7–6.2 µm, lower width 3.8–5.7 µm (*n* = 16), J+, dark blue. Ascospores (37.4)48.6 ± 4.2(58.5) µm long, (4.8)7.6 ± 0.8(9.6) µm wide (*n* = 167), inequilateral, narrowly ellipsoidal to needle shaped, with narrowly rounded ends, brown to dark brown, with straight, 8–12 µm long germ slit centred on the flat side, both extremities and flat side surrounded by a slimy sheath, 2–3 µm thick at ends, 1 µm thick at side. Synnemata up to 2000 µm, conidia 4–5 × 3–4 µm.

Culture on OA after 20 days under 12 h dark and 12 h UV and fluorescent light 7 cm diam., centre (3 cm) black from confluent tufts of black hyphae shaped as witches' brooms, otherwise white, hyphae very short, sterile. On CMD after 43 days under same conditions covering whole plate (9 cm diam.), black with cottony white margin. Synnemata profusely arising at the margin and on the original inoculum, 0.5–1 mm long, acute, unbranched, black, without stromatic base, composed of 3–4 µm wide smooth, brown, branching, septate hyphae, often sterile. Free conidiophores forming on one area of the original

inoculum, long, heavily and irregularly branched. Conidiogenous cells 18–48 × 3–4 µm (*n* = 9), terminal, geniculate, smooth, subhyaline to pale tan towards the base. Conidia 3.5–5(7) × 2–3.5 µm (*n* = 22), forming at the tip of each synnema as loose, white-grey areas, oblong with flat, non-protuberant base bearing a minute frill being more refractive than the rest of the conidial wall, smooth, subhyaline.

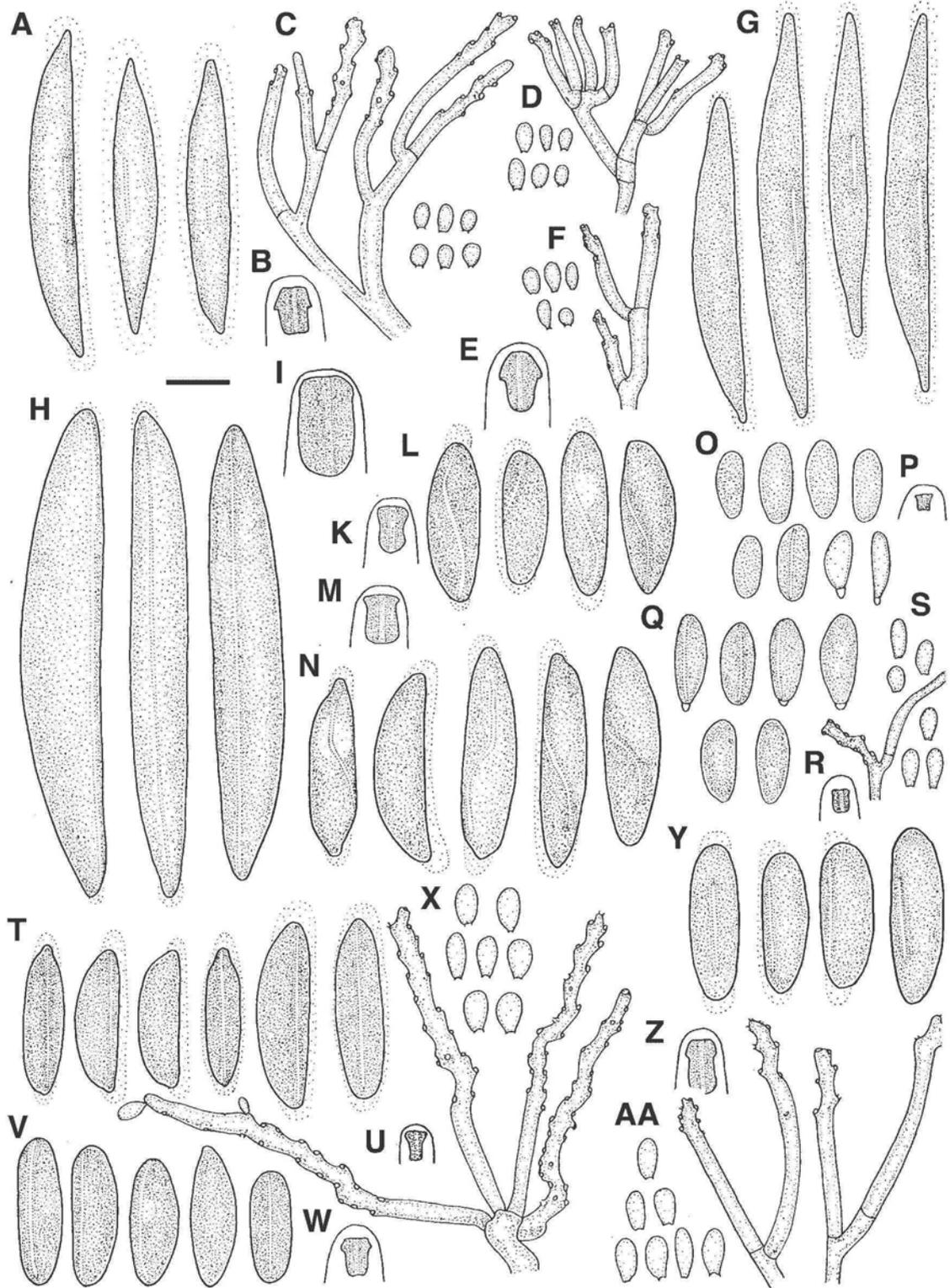
HOSTS: *Freyrcinetia baueriana* subsp. *banksii*, unidentified wood.

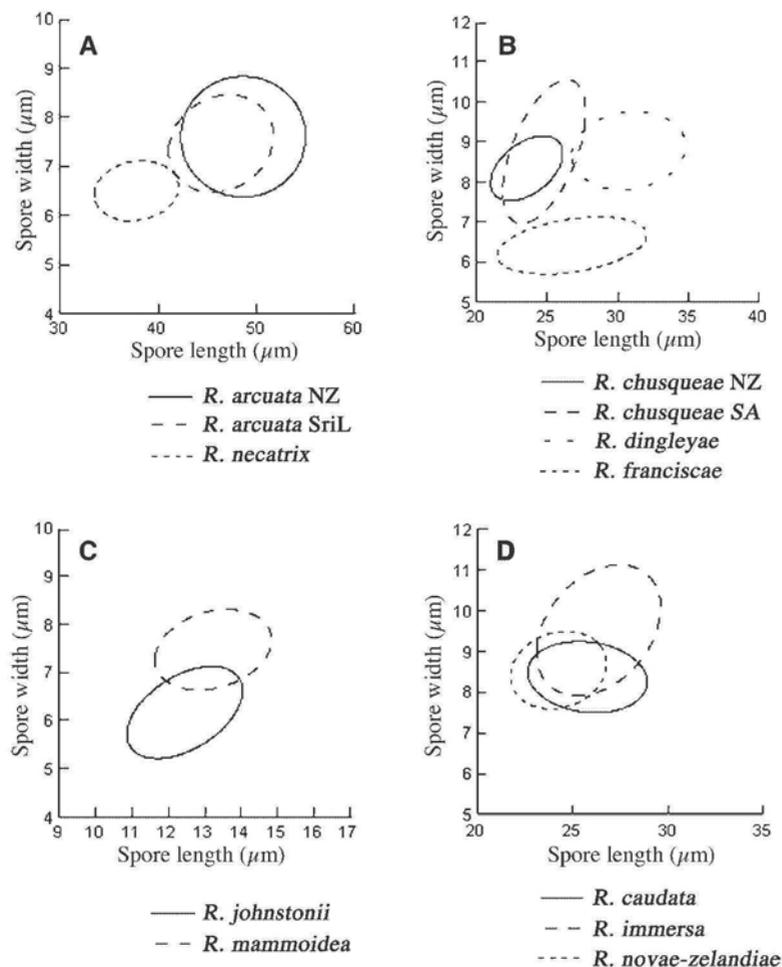
MATRIX: Corticated twigs, roots.

ADDITIONAL COLLECTIONS EXAMINED: NORTH ISLAND: AUCKLAND: Waitemata county, Waitakere Ranges, Walker's Bush, on unknown host, 13 Dec 1973, *J. M. Dingley*, PDD 32101. BAY OF PLENTY: Mamaku State Forest, unknown host, 22 Mar 1963, *J. Gilmour*, PDD 21685; GISBORNE: Urewera National Park, Lake Waikaremoana: on root of dead tree, 29 May 1983, *G. J. Samuels, P. R. Johnston, T. Matsushima, & A. Y. Rossman*, PDD 45803; on root of dead tree, 29 May 1983, *G. J. Samuels, P. R. Johnston, T. Matsushima, & A. Y. Rossman*, PDD 45804. NORTHLAND: South of Kaitaia, Omahuta State Forest, Omahuta Kauri Sanctuary, on *Freyrcinetia banksii*, 12 May 1981, *G. J. Samuels & E. Horak*, PDD 41969, anamorph on host, cultures on OA, CMD; vic. Mangamuka Bridge, Omahuta State Forest, Omahuta Kauri Sanctuary, on tree, 12 May 1981, *G. J. Samuels & E. Horak*, PDD 49960.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *R. asperata*: TYPE, Africa, on wood, Gold Coast, Jul 1900, *W. H. Johnson 178*, *K. R. bothrina*: TYPE, Dec 1868, *K. R. desmazieresii* var. *acutispora*: LECTOTYPE, Brazil, São Leopoldo, *Theissen*, 1906, PACA. *R. gigantea*: HOLOTYPE, Nicaragua, Castillo, winter of 1893, *C. L. Smith 34*, NY. *R. pepo*: TYPE, Guadeloupe, ecorce d'Hymenea Courbarol, *Duss 779*, FH. *R. puiggiani*: TYPE, Brazil, Apiahy, Jan 1883, FH.

**Fig. 8** A–D, *Rosellinia arcuata*, PDD 41969: A, Ascospores; B, Ascus apical ring; C, Conidiophores and conidia on the host; D, Conidiophores and conidia on OA; E–G, *R. freyrcinetiae*, PDD 20580: E, Ascus apical ring; F, Conidiophores and conidia on the host; G, Ascospores; H, I, *R. longispora*, PDD 45780: H, Ascospores; I, Ascus apical ring; K, L, *R. chusqueae*, PDD 49483: K, Ascus apical ring; L, Ascospores; M, N, *R. dingleyae*, Type, PDD 23199: M, Ascus apical ring; N, Ascospores; O, P, *R. stenasca*, PDD 46267: O, Ascospores, second row last two immature; P, Ascus apical ring; Q–S, *R. victoriae*, PDD 21817: Q, Ascospores; R, Ascus apical ring; S, Conidiophores and conidia on the host; T, U, *R. gisbornia*, PDD 43808: T, Ascospores (two to the right from PDD 45917); U, PDD 45917, Ascus apical ring; V–X, *R. hughesii*, Type, PDD 22120: V, Ascospores (last three PDD 21799); W, Ascus apical ring (PDD 21799); X, Conidiophores and conidia on the host (Type, PDD 22120); Y–AA, *R. samuelsii*, Type, PDD 49690: Y, Ascospores; Z, Ascus apical ring; AA, Conidiophores and conidia on the host. Scale bars = 10 µm.





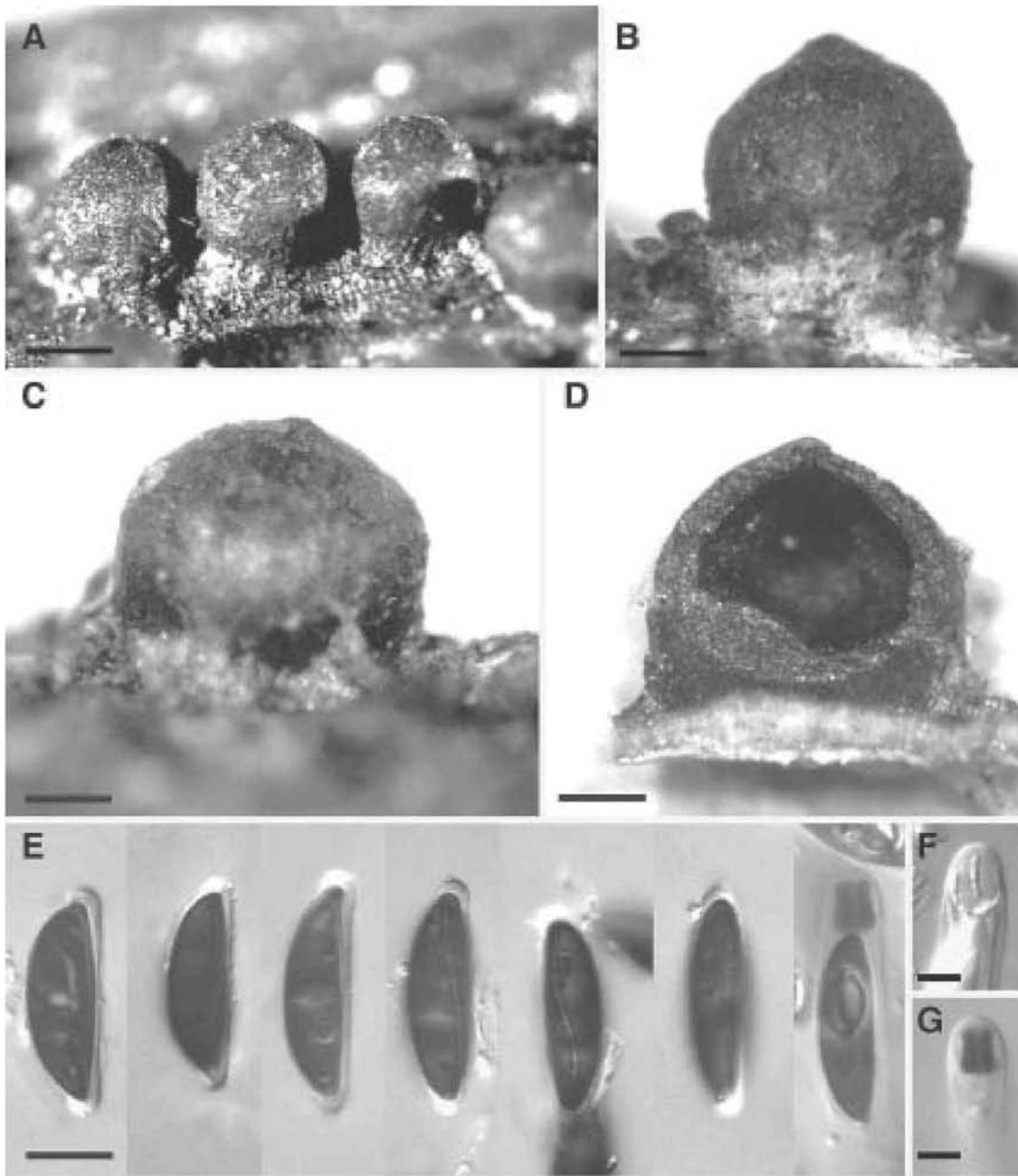
**Fig. 9** 65% confidence ellipses of ascospore length and width. **A**, *R. arcuata* from New Zealand, Sri Lanka, *R. necatrix*\*; **B**, *R. chusqueae* from New Zealand and South America\*, *R. dingleyae*, *R. franciscae*\*; **C**, *R. johnstonii*, *R. mammoidea*; **D**, *R. caudata*, *R. immersa*, *R. novae-zelandiae*. NZ, New Zealand; R., *Rosellinia*; SA, South America; SriL, Sri Lanka; \* data taken from Petrini (1993).

NOTES: The New Zealand collections were compared with the Sri Lankan specimens of *R. arcuata* collected by Petch. The subiculum and the *Dematophora* anamorph as well as the ascospore shape and the short germ slit are identical. In addition, the statistical analyses revealed that there are no differences among the collections regarding quantifiable characters such as size of stromata, ascospores, or the ascus apical rings. Macroscopically *R. arcuata* resembles *R. necatrix* Prill., but its ascospores are statistically significantly larger (Fig. 9A).

Roger (1953) and Saccas (1956) reported *R. arcuata* among other host plants on roots of *Camellia sinensis* (L.) Kuntze and *Coffea arabica* L., damaging them severely. The stromata and

ascospore sizes are similar to those reported for the New Zealand and the Petch specimens, but both authors describe a germ slit about twice as long. According to Saccas (1956) the geographical distribution of *R. arcuata* is confined to tropical and humid regions of Africa and Asia. In fact, the Petch specimens are from a mountainous region of Sri Lanka. In New Zealand, *R. arcuata* was mainly collected in the northern part of the North Island in national parks and state forests with subtropical vegetation and has not been reported from cultivated trees.

There are some specimens in PDD labelled as *R. necatrix*, with only the *Dematophora* anamorph present. They originate from *Narcissus* sp., *Vitis vinifera* L., *Juglans regia*, *Malus sylvestris* L., and



**Fig. 10** *Rosellinia chusqueae* PDD 49483. **A–C**, Stromata, **B** showing subiculum remnants at base; **D**, Vertical section of stroma, perithecium attached to stroma; **E**, Ascospores, 4th to 6th showing sigmoid germ slit; **F**, Ascus apical ring shown by Nomarski contrast; **G**, Ascus apical ring in Melzer's reagent. Scale bars: **A** = 0.5 mm; **B–D** = 0.25 mm; **E** = 10  $\mu$ m; **F, G** = 5  $\mu$ m.

*Malus × domestica* Borkh. (PDD 50725, PDD 49923, PDD 26403, PDD 17391, PDD 24985, respectively) and may be, indeed, *R. necatrix*, as these are typical hosts for this species. In fact, root diseases caused by *R. necatrix* were reported by Bösewinkel (1977) and are listed in the New Zealand Plant Disease Database. Most *Rosellinia* species reported as severe root pathogens have ascospores similar to those of *R. arcuata* or *R. necatrix*, slender with tapering ends, short germ slit, and slimy sheath, varying only in size. Molecular biological studies are needed to confirm or reject conspecificity for such taxa.

*Rosellinia asperata* Massee, *R. bothrina* Berk. & Broome, *R. desmazieresii* (Berk. & Broome) Sacc. var. *acutispora* Theiss., *R. gigantea* Ellis & Ever., *R. pepo* Pat., and *R. puiggiari* Pat. possess ascospores with a morphology similar to those of *R. arcuata*. Examination of the type materials from the herbaria FH, K, NY, and PACA revealed that character combinations such as stroma shape and size and ascospore size do not match those of *R. arcuata* (L. E. Petrini unpubl. data).

## 2. *Rosellinia chusqueae* Pat., *Bull. Soc. Myc.*

*France* 11, 224 (1895) Fig. 8K,L, 10 = *R. chusqueae* Spég., *Bol. Acad. Nac. Sci. Córdoba* 25, 51 (1921).

ANAMORPH: Unknown.

Subiculum evanescent, white to light brown. Stromata (625)695 ± 48(750) µm high, (550)760 ± 146(950) µm wide ( $n = 5$ ), cupulate with a short cylindrical base, dark brown, black around the ostioles, solitary. Ostioles finely papillate. Ectostroma to 50 µm thick, black. Entostroma dark brown, confined to base. Perithecia detached and collapsed in mature material. Ascus apical rings 6.7–7 µm long, upper width 4.8–5.6 µm, lower width 3.8–4.8 µm ( $n = 5$ ), J+, dark blue. Ascospores (20.1)23.5 ± 1.6(26.4) µm long, (7.2)8.3 ± 0.5(9.6) µm wide ( $n = 30$ ), inequilaterally ellipsoidal, dark brown, with sigmoid germ slit running over the whole spore length, both extremities and flat side surrounded by a slimy sheath, 2–4 µm thick at ends, 1 µm thick at side.

HOST: Undetermined.

MATRIX: Corticated small twigs.

SPECIMEN EXAMINED: NORTH ISLAND: NORTHLAND: Omahuta State Forest, No. 3 Road, Waikoropupu River, vic. Mangamuka Bridge, on twig, 15 May 1981, *G. J. Samuels & E. Horak*, PDD 49483.

NOTES: Contrary to the re-description of the type by Petrini (1993), in which the subiculum is described as being distinctly brown, the subiculum of the New Zealand collection is of a lighter colour.

*Rosellinia chusqueae* differs from *R. franciscae* L.E.Petrini by its wider ascospores and a longer germ slit (Fig. 9B). *Rosellinia mammaeformis* (Pers.: Fr.) Ces. & De Not. and *R. britannica* L.E.Petrini, Petrini & S.M.Francis have ascospores with a similar size; they possess, however, a straight germ slit and their stromata differ in shape and size (Petrini 1993).

## 3. *Rosellinia communis* L.E.Petrini, sp. nov.

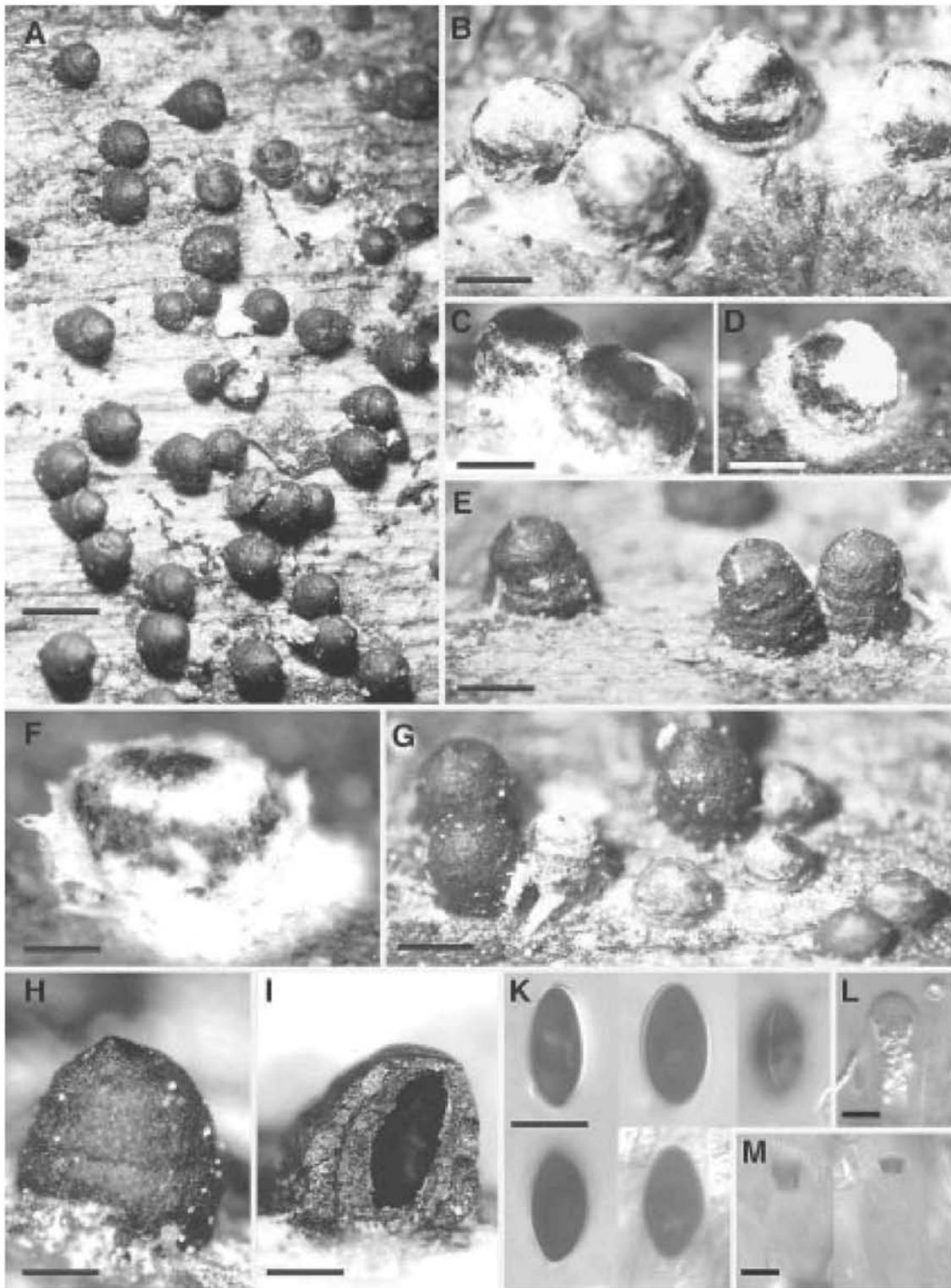
Fig. 11, 12O,R

Subiculum primo album ad cremeum, dein pallide brunneum aetate provecta, lanosum, conidiophora ferens. Stromata (400)687 ± 119.5(1050) µm alta, (550)804 ± 131(1250) µm lata, conica ad columnaria apice obtuse rotundato, parietibus lateralibus undulatis, concentricos annulos ferentibus, atrobrunnea, nigra ostiola circa, omnino nigra aetate provecta, singula vel conferta, interdum 2–3 connata, omnino subiculo dum juvena tectis, dein paulatim exposita. Ostiola laeviter papillata ad acuta sive indistincta. Annulus apicalis asci (1.9)2.7 ± 0.5(3.8) µm altus, parte superiore 3.3–4.8 µm et inferiore 2–2.8 µm latus, iodo pallide coerulescenti. Ascosporae (13.4)17.3 ± 1.3(21.6) µm longae, (6.7)8.9 ± 0.7(11.5) µm latae, asymmetricice ellipsoideae, atrobrunneae, fissura germinativa recta, ascosporam totam recurrenti praeditae. Status anamorphosis Geniculosporium.

ANAMORPH: *Geniculosporium*.

HOLOTYPE (hic designatus): New Zealand, North Island, Northland: Hokianga County, on decorticated wood, 13 May 1983, *G. J. Samuels, T. Matsushima, & R. H. Petersen*, PDD 45775, anamorph on host, culture on OA examined.

**Fig. 11** *Rosellinia communis*. A–H, Stromata, B–D, F, showing subiculum, E, concentric rings on surface; I, Vertical section of stroma, outer shell stroma, inner perithecium; K, Ascospores, 3rd showing germ slit; L, Ascus apical ring shown by Nomarski contrast; M, Ascus apical rings in Melzer's reagent. Type, PDD 45775; PDD 16903: second picture of M. Scale bars: A = 1 mm; B–E, G = 0.5 mm; F, H, I = 0.25 mm; K = 10 µm; L, M = 5 µm.



Subiculum evanescent, restricted, approx. to 1 mm in extension, as white, cream patches in early stages, later light brown, felty, bearing conidiophores, subsequently reduced while stromata progressively emerge, until absent in old material. Stromata (400)687 ± 119.5(1050) µm high, (550)804 ± 131(1250) µm wide ( $n = 134$ ), conical to columnar with bluntly rounded top, side walls often with concentric rings, wavy (Fig. 11E,H), dark brown, black around the ostioles, completely black when old, solitary or crowded, touching each other, sometimes 2–3 fused together, when young completely covered by the subiculum, during development gradually exposed. Ostioles finely papillate to pointed or not pronounced. Ectostroma 50–75 µm thick, black. Entostroma light brown, confined to the base. Perithecia detached and collapsed in mature material. Ascus apical rings (1.9)2.7 ± 0.5(3.8) µm high, upper width 3.3–4.8 µm, lower width 2–2.8 µm ( $n = 63$ ), J+, pale blue. Ascospores (13.4)17.3 ± 1.3(21.6) µm long, (6.7)8.9 ± 0.7(11.5) µm wide ( $n = 710$ ), inequilaterally ellipsoidal, dark brown, with straight germ slit, extending almost over the whole spore length. Conidia 3–4 × 2.5–3 µm.

Cultures on OA after 13 days at 20°C under diffused daylight 0.7–1 cm diam., white to pale pink, sterile, after 30 days 2.5–3 cm, flat, densely cottony, white when sterile, grey from conidial production, reverse white. Conidiophores 100–200 µm long, 3–4 µm wide, forming a continuous layer over the colony surface, mononematous, macronematous, loosely and irregularly branched, smooth, pale olivaceous. Conidiogenous cells 19–60 × 2.5–3 µm when terminal ( $n = 21$ ), terminal and intercalary also bearing terminal and intercalary conidiogenous loci, geniculate with a circular refractive frill at each point of conidial dehiscence. Conidia 3–4(5) × (2)2.5–3 µm ( $n = 44$ ), ovoid to subglobose with a flat, c. 1 µm wide basal frill, refractive. On CMD after 29

days at 20°C under 12 h dark and 12 h UV and fluorescent light 1.5 cm in diam., pale orange, transparent, aerial hyphae short. Conidiophores 80–160 µm high, 1.5–2 µm wide, freely branched, bearing a head of conidia at the tip of each branch, subhyaline to pale tan. Conidiogenous cells 30–55 × 2–3 µm ( $n = 9$ ), terminal, sometimes intercalary, geniculate with a circular refractive frill at each point of conidial dehiscence. Conidia 3–4(5) × 2–3 µm ( $n = 44$ ), subglobose to ovate with protuberant, 1 µm wide flat basal abscission scar bearing a minute frill, smooth, subhyaline. On PDA restricted, white, felty, forming concentric rings, with large grey areas bearing conidiophores.

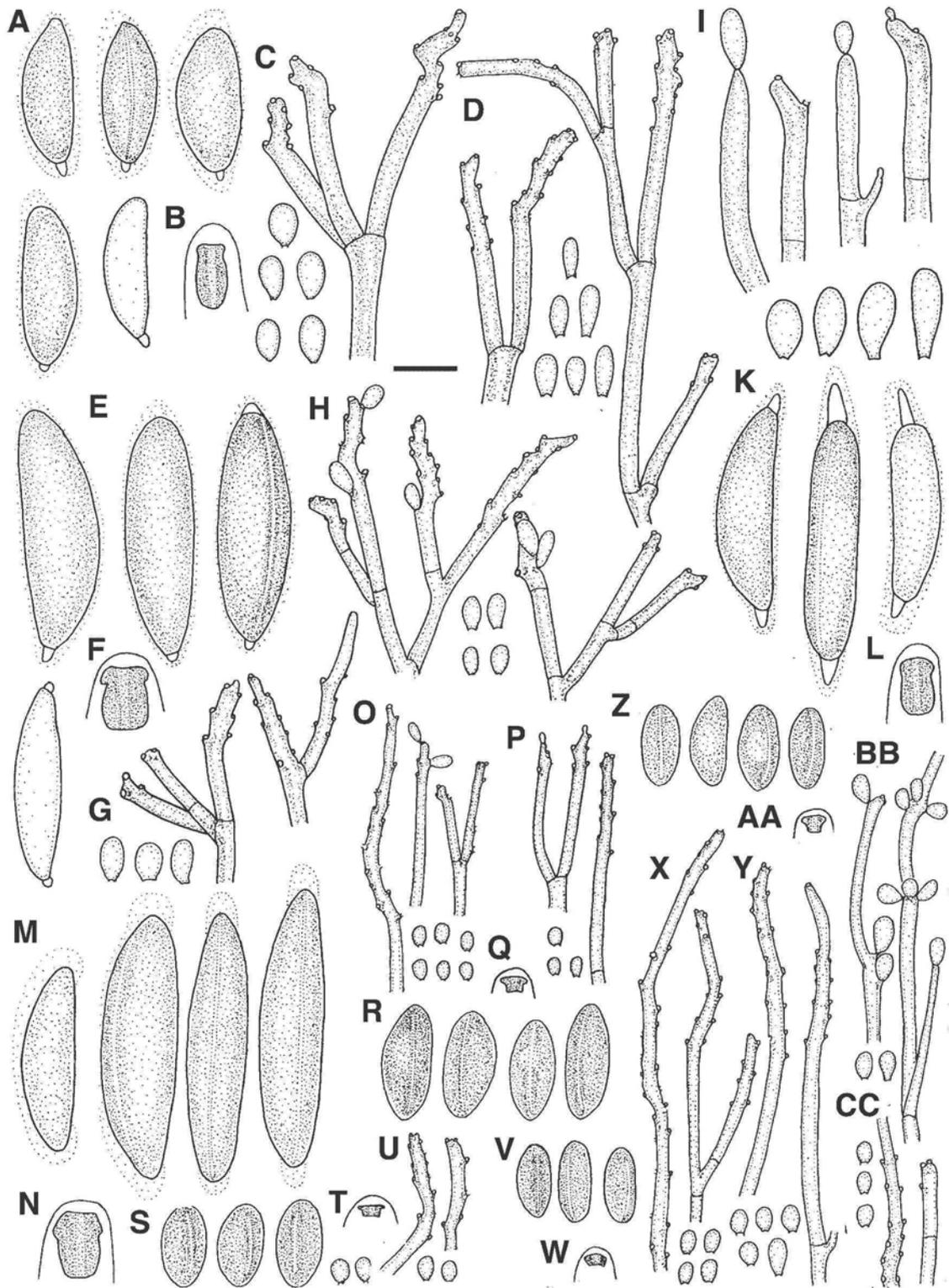
HOSTS: *Beilschmiedia tawa*, *Brachyglottis repanda*, *Freycinetia baueriana* subsp. *banksii*, *Hedycarya arborea*, *Macropiper excelsum*, *Meliclytus ramiflorus*, *Neopanax arboreum*, *Nothofagus solandri*, *Populus* sp., *Rhopalostylis sapida*, *Schefflera digitata*, *Sophora microphylla*.

MATRIX: Corticated or decorticated, heavily decomposed wood.

ETYMOLOGY: *communis* (common), referring to the frequent occurrence of this species.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Huia, on unknown host, Mar 1953, *J. M. Dingley*, PDD 16900; Huia, on unknown host, Jul 1953, *J. M. Dingley*, PDD 16906; Hunua Ranges, Cossey's Creek, on unknown host, 15 Mar 1958, *J. M. Dingley*, PDD 18413, anamorph on host, culture on PDA; One Tree Hill, on *Populus* sp., Oct 1955, *S. D. Baker*, PDD 16905; Orere Point, on *Neopanax arboreum*, 22 Jun 1958, *J. M. Dingley*, PDD 18414, anamorph on host; Purewa Bush, Orakei, D. W. on *Sophora microphylla*, Nov 1948, *D. W. MacKenzie*, PDD 16902; Rangitoto I., on dead wood, 3 Jun 1947, *J. M. Dingley*, PDD 5539, anamorph on host; Titirangi, on *Brachyglottis repanda*, Feb 1951, *J. M. Dingley*, PDD 16897;

**Fig. 12** A–D, *Rosellinia novae-zelandiae*, PDD 43205: A, Ascospores, last one immature; B, Ascus apical ring; C, Conidiophores and conidia on the host (PDD 16422); D, Conidiophores and conidia in culture (PDD 42074); E–H, *R. radiciperda*, PDD 23046: E, Ascospores, last one immature; F, Ascus apical ring; G, Conidiophores and conidia on the host; H, Conidiophores and conidia on PDA (PDD 40012); I, K, L, *R. nothofagi*, PDD 70789: I, Conidiophores and conidia on the host; K, Ascospores (1st one from Type, PDD 1999); L, Ascus apical ring; M, N, *R. palmae*, Type, PDD 54730: M, Ascospores, spore on left immature; N, Ascus apical ring; O–R, *R. communis*, PDD 18413: O, Conidiophores and conidia from the host (PDD 16903); P, Conidiophores and conidia on PDA; Q, Ascus apical ring; R, Ascospores; S–U, *R. mammoidea*, type, K 308: S, Ascospores (spore on right PDD 71726); T, Ascus apical ring; U, Conidiophores and conidia in culture (PDD 71726); V–Y, *R. johnstonii*: V, Ascospores (PDD 18638); W, Ascus apical ring (PDD 18638); X, Conidiophores and conidia on the host (PDD 43197, PDD 49612); Y, Conidiophores and conidia in culture (Type, PDD 49674); Z–CC, *R. rhopalostilicola*, PDD 43199: Z, Ascospores; AA, Ascus apical ring; BB, Conidiophores and conidia in culture (PDD 49659); CC, Conidiophores and conidia on the host. Scale bar = 10 µm.



Titirangi, Titirangi Beach Reserve, on decorticated wood, 18 Sep 1980, *G. J. Samuels, P. R. Johnston, & A. E. Esler*, PDD 49679; Waikowhai, on *Macropiper excelsum*, Nov 1956, *S. D. Brook*, PDD 16895\*; Waitakere Ranges, Fairy Falls Trail, trail off Mountain Road, on decorticated wood, 12 Aug 1981, *G. J. Samuels, R. P. Korf, P. R. Johnston, J. W. Paden, & R. E. Beever*, PDD 49529, culture on CMD; Waitakere Ranges, Piha, rotten wood, 17 Dec 1963, *J. M. Dingley*, PDD 23203; Waitakere Ranges, Piha Rd, Cowan Tr., on *Freycinetia banksii*, 4 Jun 1983, *G. J. Samuels & A. Y. Rossman*, PDD 46318; Waitakere Ranges, Upper Piha, 500 ft, on rotten wood, Aug 1948, *J. M. Dingley*, PDD 16901; Waitakere Ranges, Upper Piha Valley, on *Hedycarya arborea*, 9 Oct 1963, *J. M. Dingley*, PDD 21823; Waitakere Ranges, Kauri Knoll Track, dead wood, 20 Aug 1963, *S. J. Hughes*, PDD 21443; Waitakere Ranges, Huia, Parau Tr., on scales of *Rhopalostylis sapida*, 23 Oct 1980, *G. J. Samuels & P. R. Johnston*, PDD 49687, cultures on OA, CMD; Waitakere Ranges, Mountain Rd, Walkers Bush, on decort. wood, 4 Aug 1982, *G. J. Samuels, P. R. Johnston, & E. H. C. McKenzie*, PDD 44418; Waitakere Ranges, Shaw Rd, on unknown host, Jul 1955, *J. M. Dingley*, PDD 16907; Waitakere Ranges, Cascades, on wood, 12 Aug 1981, *G. J. Samuels, P. R. Johnston, & J. W. Paden*, PDD 41985, anamorph on host. BAY OF PLENTY: Rotorua, Rotoehu, on unknown host, 22 May 1964, *J. M. Dingley*, PDD 23308; Rotorua, Te Whaiti, on *Beilschmiedia tawa*, Jun 1950, *J. M. Dingley*, PDD 16896. COROMANDEL PENINSULA: Little Barrier I., on *Beilschmiedia tawa*, Jun 1956, *F. J. Newhook*, PDD 16903, anamorph on host; Whitianga Rd, on *Schefflera digitata*, Aug 1954, *J. M. Dingley*, PDD 16904. SOUTH ISLAND: MID CANTERBURY: Upper Waimakiriri River, on dead wood, 1882, *T. Kirk*, PDD 457; upper Waimakariri, *J. Kirk 72*, K 79241\*; Craigieburn Range, Cave Stream, on rotting wood of *Nothofagus solandri*, *E. Horak*, 31 Mar 1983, ZT\*. KAIKOURA: Hapuku, on *Melicytus ramiflorus*, 29 Mar 1959, *J. M. Dingley*, PDD 23568. SOUTH CANTERBURY: Waitaki, *S. Berggren 250*, UPS\*.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *R. griseo-cincta*: TYPE, Brazil, Rio Grande do Sul i

Santo Angelo pr. Cachoeira, Gust. Ain Malme, *S. R. indica*: ISOTYPE, India, on dead, decaying wood, Uttar Pradesh, Naini Tal, Sat Tal, *J. S. Dargan 13115*, 17 Aug 1973, *K. R. picta*: TYPE, Sri Lanka, Nilgherries, *E. S. Berkely*, *K. R. rickii*: ISOTYPE, Brazil, in arbore frondosa, São Leopoldo, 1905, *S.*

NOTES: *Rosellinia communis* is characterised by its conical to columnar, black stromata covered by a whitish cream subiculum when young. The side walls regularly show concentric rings, thus giving their surface a wavy appearance. *Rosellinia communis* can be distinguished easily from *R. johnstonii* and *R. mammoidea* by its larger, differently shaped stromata and ascospore size.

Many specimens of *R. communis* were assigned to *R. mammoidea*, as the spore size erroneously published for the latter by Cooke (1879) corresponds to that of *R. communis* ascospores. Cooke (1879) gave 16–18 × 8 µm for the Travers collection (the type of *R. mammoidea*), whereas the spores of this specimen actually measure 11–14 × 7–8 µm (see *R. mammoidea* below).

The closest species is *R. picta* (Berk.) Cooke described from Sri Lanka. The type material has regular, conical to semiglobose stromata lacking wavy side walls and ascospores with pinched ends. The stroma and ascospore size, however, do not differ among the two species as revealed by analysis of variance and discriminant analysis, respectively (results not shown).

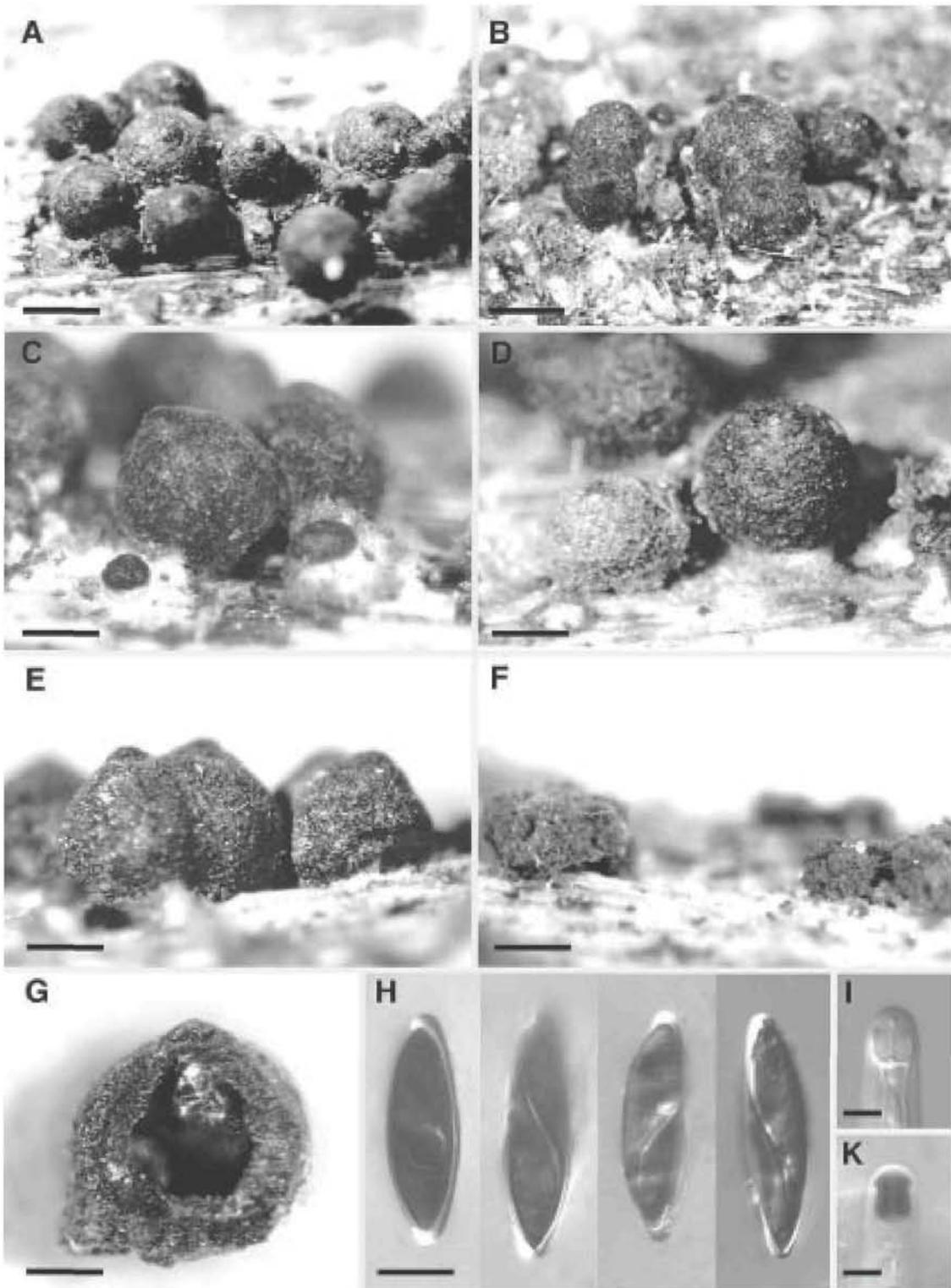
The type material of *R. griseo-cincta* Starbäck, *R. indica* Thind, and *R. rickii* Bres. show roughly the same shape for stromata and ascospores; the stromata, however, are larger and lack the wavy surface and the ascospores are smaller (L. E. Petrini unpubl. data). *Rosellinia communis* differs from *R. subiculata* by stroma shape, size, and subiculum colour as well as much larger ascospores (Petrini 1993).

#### 4. *Rosellinia dingleyae* L.E.Petrini, sp. nov.

Fig. 8M,N, 13

Subiculum evanescent, circa stroma restrictum, badium, lanosum, primo stromata juvena omnino tegens, aetate provecta abest. Stromata (475)617 ± 99(750) µm alta, (425)602 ± 78(675) µm lata, subglobosa ad cupulata, brunnea dum juvena, nigra

**Fig. 13** *Rosellinia dingleyae*. **A–F**, Stromata, C showing remnants of subiculum; **G**, Vertical section of stroma; **H**, Ascospores, 2nd to 4th showing germ slit; **I**, Ascus apical ring shown by Nomarski contrast; **K**, Ascus apical ring in Melzer's reagent. Type, PDD 23199. Scale bars: A, B, F = 0.5 mm; C–E, G = 0.25 mm; H = 10 µm; I, K = 5 µm.



actate provecta, interdum in disco insita, singularia ad 2–3 connata, conferta, paulatim e subiculo emergentia. Ostiola acuta ad papillata. Annulus apicalis asci (6.7)7.5 ± 0.5(8.1) µm altus, parte superiore et inferiore 4.8–5.7 µm latus, iodo valde coerulescenti. Ascospores (26)30.7 ± 2.6(36) µm longae, (6.7)8.8 ± 0.6(10) µm latae, asymmetricae ellipsoideae, apicibus obtuso-acuminatis, brunneae ad atrobunneae, fissura germinativa sigmoidea, duas e tribus partibus ascosporae totae recurrenti praeditae, utrisque apicibus et parte plana vagina mucosa circumdatae.

HOLOTYPE (hic designatus): New Zealand, North Island, Auckland: Piha, on *Macropiper excelsum*, J. M. Dingley, 17 Dec 1963, PDD 23199.

Subiculum evanescent, extension restricted to stromata, chocolate brown, felty, covering completely young stromata, absent in mature material. Stromata (475)617 ± 99(750) µm high, (425)602 ± 78(675) µm wide ( $n = 10$ ), subglobose to cupulate, brown when young, black at maturity, sometimes seated on a disk, solitary or 2–3 fused together, crowded, during development gradually emerging from the subiculum. Ostioles pointed to papillate. Ectostroma 25–50 µm thick, black. Entostroma brown. Perithecia detached in older material. Ascus apical rings (6.7)7.5 ± 0.5(8.1) µm high, upper and lower width 4.8–5.7 µm ( $n = 5$ ), J+, dark blue. Ascospores (26)30.7 ± 2.6(36) µm long, (6.7)8.8 ± 0.6(10) µm wide ( $n = 60$ ), inequilaterally ellipsoidal, often with pinched ends, brown to dark brown, with sigmoid germ slit about  $\frac{2}{3}$  of the spore length, both extremities and flat side surrounded by a slimy sheath.

Culture on OA cream-coloured, felty to velutinous, sterile.

HOST: *Macropiper excelsum*.

MATRIX: Decorticated wood.

ETYMOLOGY: In honour of the New Zealand mycologist J. M. Dingley, who collected the type specimen and several other *Rosellinia* specimens deposited at PDD.

ADDITIONAL SPECIMEN EXAMINED: NORTH ISLAND: NORTHLAND: Hokianga County, vic.

Mangamuka Bridge, Mangamuka Gorge Track, on indet. wood, 14 Apr 1982, G. J. Samuels & P. R. Johnston, PDD 44329, culture on OA.

NOTES: *Rosellinia dingleyae* differs from *R. chusqueae* and *R. franciscae* by its larger ascospores (Fig. 9B). Ascospores of *R. dingleyae* have a shorter germ slit than those of *R. chusqueae*, but larger than that of ascospores of *R. franciscae*.

##### 5. *Rosellinia freycinetiae* L.E.Petrini, sp. nov.

Fig. 8E–G, 14

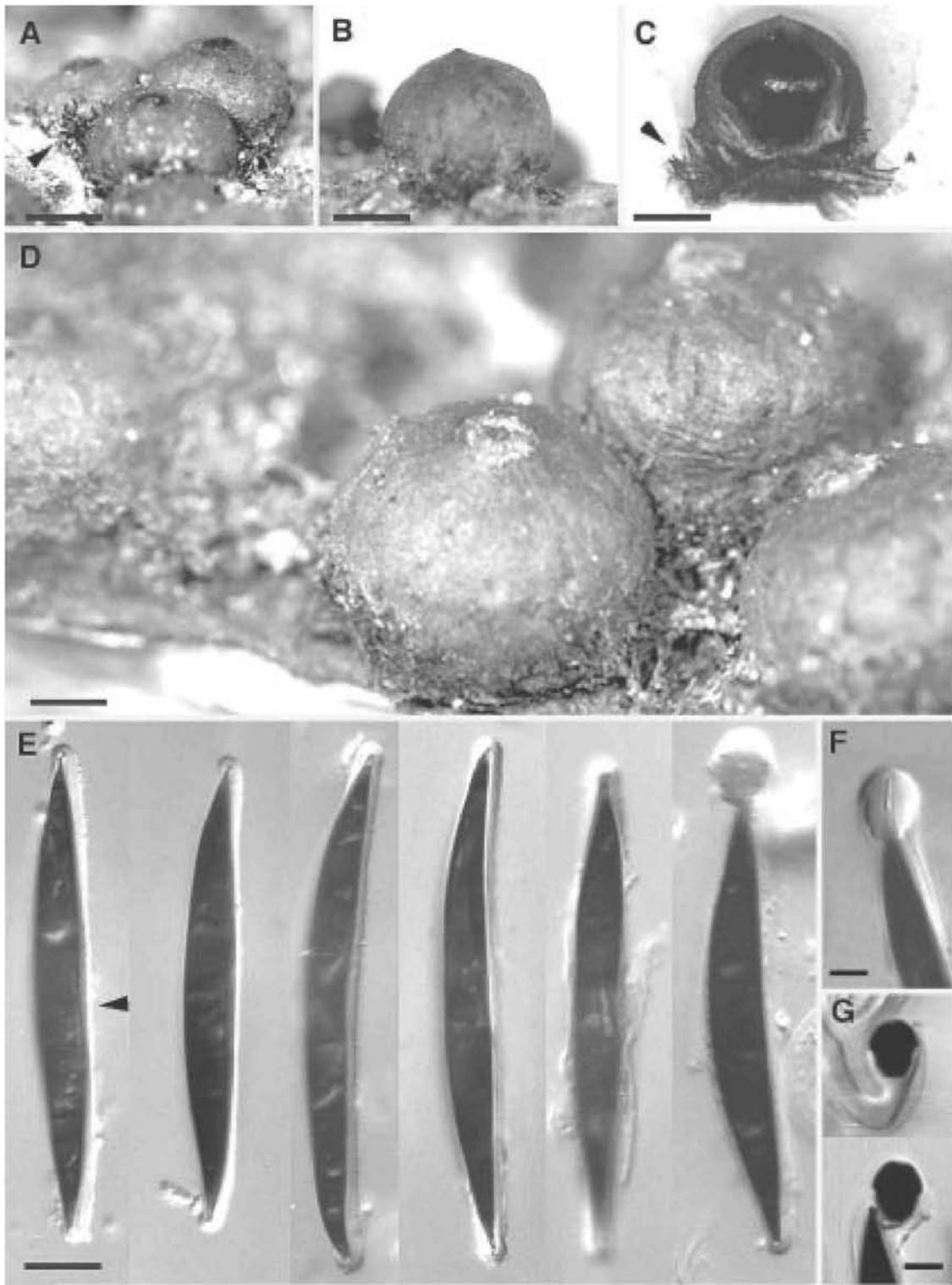
Subiculum perdurans, lanosum ad appressum, synnemata ferens. Stromata (1500)1785 ± 185(2000) µm alta, (2050)2180 ± 124(2375) µm lata, globosa vel subglobosa apice appanato, cupreobrunnea ad atrobunnea, nigra ostiola circa, singularia, conferta. Ostiola laeviter papillata, indistincta. Annulus apicalis asci 7.6–8.6 µm altus, parte superiore 6.5–7 µm et inferiore 4.8–5.7 µm latus, iodo valde coerulescenti. Ascosporae (52.8)61.7 ± 4.3(70) µm longae, (6.7)8 ± 0.5(8.6) µm latae, asymmetricae, anguste ellipticae ad aciculares, apicibus anguste rotundatis, brunneae, fissura germinativa recta 9–12 µm longa, in parte plana insita praeditae, utrisque apicibus et parte plana vagina mucosa 2–3 µm in apicibus et 1 µm in latere crassa circumdatae. Status anamorphosis *Dematophora*.

ANAMORPH: *Dematophora*.

HOLOTYPE (hic designatus): New Zealand, North Island, Auckland: Walkers Bush, Henderson, on *Freycinetia banksii*, 30 Jan 1963, F. J. Morton, PDD 20580.

Subiculum persistent, woolly to felty appressed, with synnemata. Stromata (1500)1785 ± 185(2000) µm high, (2050)2180 ± 124(2375) µm wide ( $n = 5$ ), globose to subglobose with flattened top, copper brown, dark brown, black around the ostioles, solitary, crowded. Ostioles finely papillate, poorly differentiated. Ectostroma up to 150 µm thick, black. Entostroma cream, confined to sides and base, gradually reduced and absent in older material. Perithecia detached and collapsed in mature material. Ascus apical rings 7.6–8.6 µm long, upper width 6.5–7 µm, lower width 4.8–5.7 µm ( $n = 3$ ), J+, dark blue. Ascospores (52.8)61.7 ± 4.3(70) µm long,

Fig. 14 *Rosellinia freycinetiae*. A, B, D, Stromata, A showing synnemata (arrow); C, Vertical section of stroma, outer shell stroma, inner shell perithecium, remnants of synnemata to the left (arrow); E, Ascospores, 5th showing germ slit; F, Ascus apical ring shown by Nomarski contrast; G, Ascus apical ring in Melzer's reagent. Type, PDD 20580. Scale bars: A–C = 1 mm; D = 0.5 mm, E = 10 µm; F, G = 5 µm.



(6.7)8 ± 0.5(8.6) µm wide ( $n = 30$ ), inequilateral, narrowly ellipsoidal to needle shaped, with narrowly rounded ends, brown, with straight, 9–12 µm long germ slit centred on the flat side, both extremities and flat side surrounded by a slimy sheath, 2–3 µm thick at ends, 1 µm thick at side. Synnemata 500–1000 µm high, conidia 4–5.5 × 2.5–3 µm.

HOST: *Freycinetia baueriana* subsp. *banksii*.

MATRIX: Decorticated, heavily decomposed wood.

ETYMOLOGY: Referring to the host plant.

NOTES: *Rosellinia freycinetiae* exhibits the typical character combination of *Rosellinia* spp. with a *Dematophora* anamorph: large, coarse stromata and large, slender ascospores with a short germ slit and both extremities and flattened side surrounded by a slimy sheath. It can be distinguished from *R. arcuata* and *R. necatrix* by its larger ascospores and from *R. gigantea* and *R. pepo* by its smaller stromata, being about half the size of the stromata of the two latter species. For a discussion on the differences from other related species, see *R. arcuata*.

#### 6. *Rosellinia gisbornia* L.E.Petrini, sp. nov.

Fig. 8T,U, 15

Subiculum evanescent, restrictum, cremeum ad pallide brunneum. Stromata (550)690 ± 100(850) µm alta, (600)738 ± 84(825) µm lata, semiglobosa vel cupulata ad conica, nigra, parte inferiore laeviter rugosa, solitaria vel in parvis gregibus conferta, subiculo dum juvena omnino tecta e subiculo emergentia aetate provecta, finaliter subiculo absentia. Ostiola laeviter papillata ad indistincta. Annulus apicalis asci (4.8)6.2 ± 1.4(8.6) µm altus, parte superiore 2.8–4.8 µm et inferiore 2.8–3.8 µm latus, iodo manifeste ad pallide coerulescenti. Ascospores (21.2)25.5 ± 2.3(31.7) µm longae, (6.7)7.7 ± 0.5(8.6) µm latae, asymmetricae ellipsoideae, brunneae ad atrobunneae, fissura germinativa recta, totam ascosporam recurrenti et in parte plana insita praeditae, utrisque apicibus et parte plana vagina mucosa 2–3 µm in apicibus et 1–2 µm in parte plana lata circumdatae.

ANAMORPH: Unknown.

HOLOTYPE (hic designatus): New Zealand, North Island, Gisborne: Urewera National Park, c. 15 km SE of Ruatahuna, along SH 38, Taupeupe Saddle,

indet. wood, 3 Nov 1983, *G. J. Samuels, P. R. Johnston, & P. K. Buchanan*, PDD 43800.

Subiculum evanescent, of restricted extension, cream to light brown, gradually disappearing, absent in mature material. Stromata (550)690 ± 100(850) µm high, (600)738 ± 84(825) µm wide ( $n = 15$ ), semiglobose, cupulate to conical, black, lower part slightly rugose, solitary or densely crowded in small groups, when young completely covered by the subiculum, becoming exposed when growing and subiculum gradually worn away. Ostioles finely papillate or not pronounced. Ectostroma 50–75 µm, black, brittle. Entostroma dark brown, absent in old material. Perithecia detached and collapsed in mature material. Ascus apical rings (4.8)6.2 ± 1.4(8.6) µm high, upper width 2.8–4.8 µm, lower width 2.8–3.8 µm ( $n = 13$ ), J+, blue to pale blue. Ascospores (21.2)25.5 ± 2.3(31.7) µm long, (6.7)7.7 ± 0.5(8.6) µm wide ( $n = 90$ ), inequilaterally ellipsoidal, brown to dark brown, with straight germ slit running over the whole spore length on flat side, ending shortly before ends, both extremities and flat side surrounded by a slimy sheath, 2–3 µm thick at ends, 1–2 mm thick at side.

Culture on OA white to cream with brown patches in the centre, felty to velutinous, reverse cream, sterile. On PDA hyaline to white, centre brown, felty, appressed, reverse centre brown, light brown towards margin, sterile.

HOSTS: Undetermined.

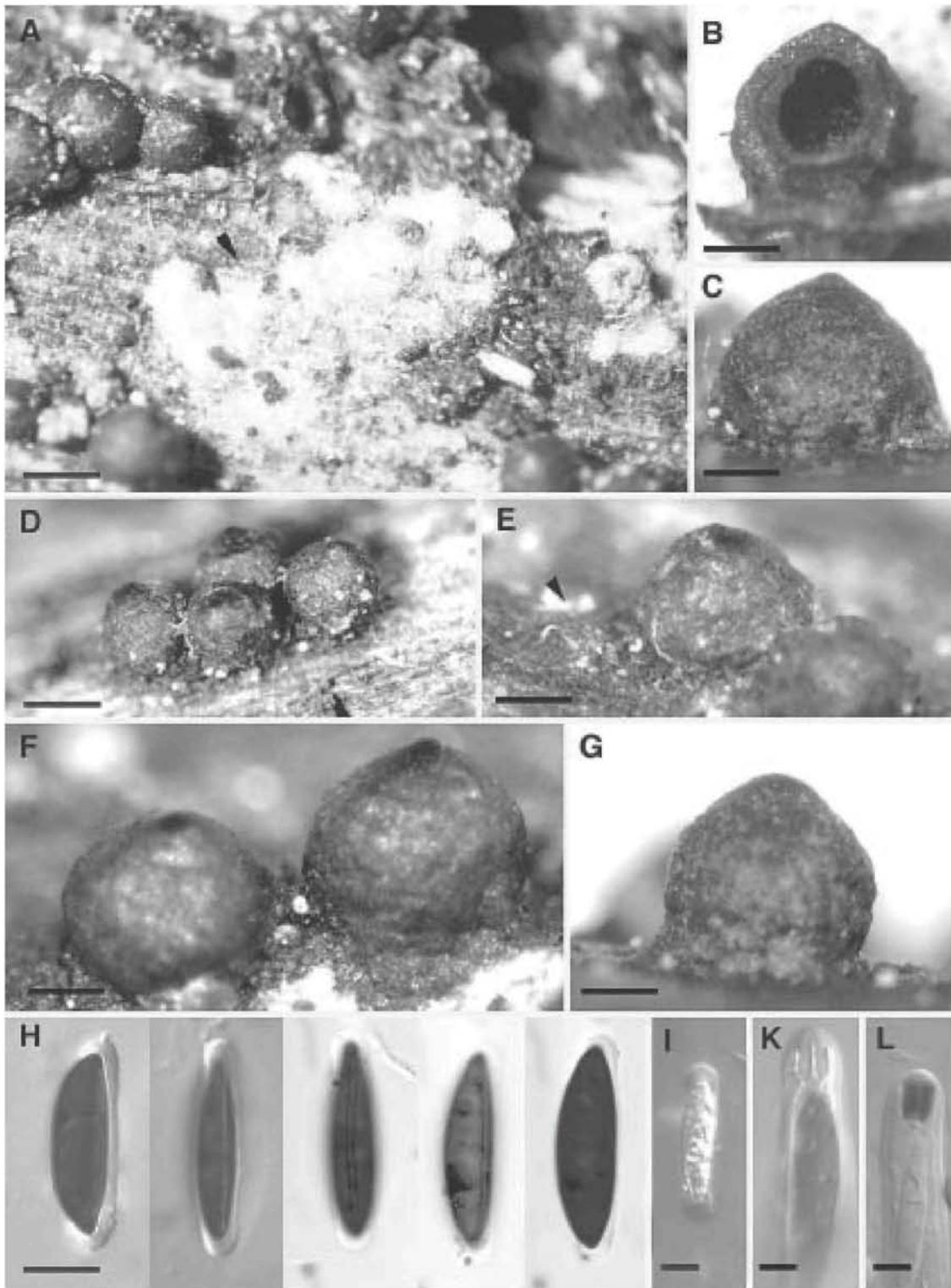
MATRIX: On bark or wood of twigs, c. 1.5 cm diam.

ETYMOLOGY: Referring to Gisborne Province, where the type specimen was collected.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: GISBORNE: Urewera National Park, L. Waikaremoana, on indet. tree, 4 Nov 1982, *G. J. Samuels, P. R. Johnston, & P. K. Buchanan*, PDD 43808. SOUTH ISLAND: BULLER: on decorticated wood, 17 Apr 1983, *G. J. Samuels, R. E. Beever, P. R. Johnston, & R. H. Petersen*, PDD 45917, cultures on OA, PDA.

TYPE AND OTHER SPECIMENS EXAMINED OF RELATED SPECIES: *R. hyalospora*: TYPE, Brazil, São Leopoldo, 1907, *Rick 19012*, PACA; Brazil, São Leopoldo, *Rick*, Herb. Theissen 12, FH; San

**Fig. 15** *Rosellinia gisbornia*. **A, C–G**, Stromata, A, E, showing subiculum (arrows); **B**, Vertical section of stroma, outer shell stroma, inner shell perithecium; **H**, Ascospores, 2nd to 4th showing germ slit; **I**, Immature ascospore; **K**, Ascus apical ring shown by Nomarski contrast; **L**, Ascus apical ring in Melzer's reagent. Type, PDD 43800. Scale bars: A = 1 mm; D = 0.5 mm; B, C, E–G = 0.25 mm; H = 10 µm; I, K, L = 5 µm.



Salvador, 24 Sep 1943, *Rick*, PACA, as *R. tricolor* Theissen.

NOTES: *Rosellinia gisbornia* is characterised by an evanescent, cream to light brown subiculum and ascospores with slimy caps and sheath on one side. The germ slit runs straight over the whole spore length. The ascospores present in the specimen PDD 45917 are up to 4 µm longer than those seen in the other two collections.

*Rosellinia gisbornia* differs from *R. chusqueae* and *R. dingleyae* by having ascospores with straight germ slit and asci with smaller apical rings. It can be distinguished from the morphologically similar *R. britannica* by the stromatal shape and size, and the characters of the subiculum (Petrini 1993). *Rosellinia hyalospora* Theiss. has ascospores with a similar size, but they are light brown and lack the slimy sheath. Its stromata are also smaller (L. E. Petrini unpubl. data).

#### 7. *Rosellinia hughesii* L.E.Petrini, sp. nov.

Fig. 8V,X, 16

Subiculum perdurans, atrobrunneum, filo metallico simile, synnemata ferens. Stromata (750)850 ± 60(950) µm alta, (700)1007 ± 194(1250) µm lata, cupulata, subglobosa vel globosa, atrobrunnea, ostiola circa nigra, singularia, saepe conferta, in subiculo omnino dum juvena immersa, aetate paulatim emergentia. Ostiola laeviter papillata. Annulus apicalis asci (4.8)5.9 ± 0.5(6.7) µm altus, parte superiore 4.3–4.8 µm et inferiore 2.8–3.8 µm latus, iodo valde coerulescenti. Ascospores (17.3)20.5 ± 1.4(24) µm longae, (6.7)7.6 ± 0.5(8.6) µm latae, asymmetricae ellipsoideae et lato applanato, late rotundatae, atrobrunneae, fissura germinativa recta totam ascosporam recurrenti praeditae. Status anamorphosis *Dematophora*.

ANAMORPH: *Dematophora*.

HOLOTYPE: South Island: Mid Canterbury: Kaituna, Waiwera County, on unknown host, 31 Oct 1963, *H. C. Smith*, PDD 22120; PARATYPE: South Island: Mid Canterbury: Kaituna Valley, Banks Peninsula, on *Hoheria populnea*, 15 Oct 1963, *S. J. Hughes*, PDD 21799.

Subiculum persistent, dark brown, wiry, with synnemata. Stromata (750)850 ± 60(950) µm high, (700)1007 ± 194(1250) µm wide ( $n = 10$ ), cupulate, subglobose to globose, dark brown, black around the ostioles, solitary, often crowded, when young completely embedded in the subiculum, gradually emerging while growing. Ostioles finely papillate. Ectostroma 75–100 µm thick, black, hard, brittle. Entostroma cream, confined to base, absent in mature material. Perithecia detached and collapsed in mature material. Ascus apical rings (4.8)5.9 ± 0.5(6.7) µm high, upper width 4.3–4.8 µm, lower width 2.8–3.8 µm ( $n = 10$ ), J+, dark blue. Ascospores (17.3)20.5 ± 1.4(24) µm long, (6.7)7.6 ± 0.5(8.6) µm wide ( $n = 60$ ), inequilaterally ellipsoidal with one flat side, often broadly rounded, dark brown, with straight germ slit running over the whole spore length. Synnemata up to 1000 µm high, conidia 7–8 × 3–4.5 µm.

HOST: *Hoheria populnea*.

MATRIX: Decorticated, heavily decomposed wood.

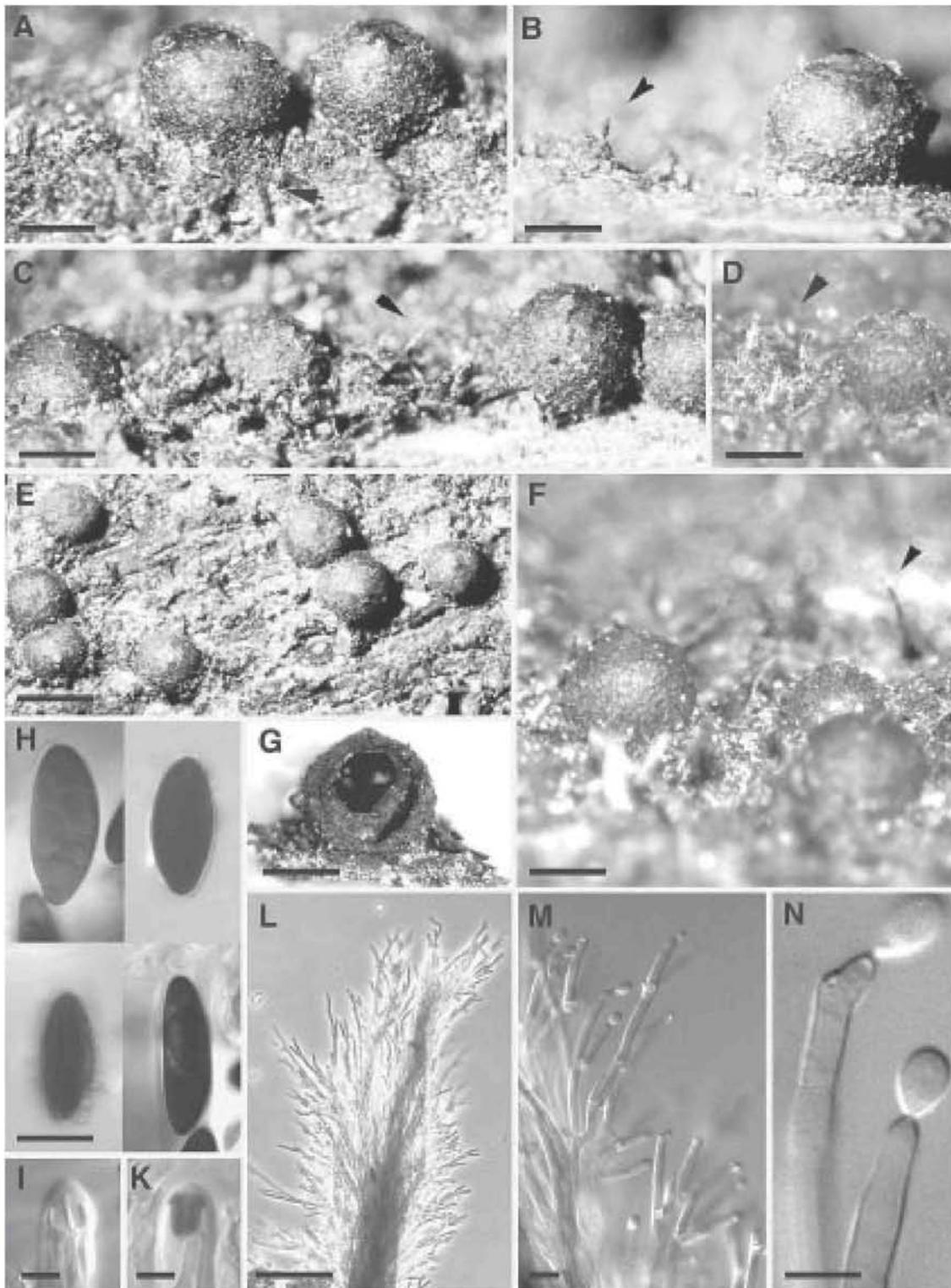
ETYMOLOGY: In honour of the mycologist S. J. Hughes, who collected the paratype.

NOTES: *Rosellinia hughesii* is characterised by its *Dematophora* anamorph and the shape and size of its ascospores with a long germ slit. Only ascospores without slimy sheath or caps were observed. This, however, may be due to the age of the material. It would not be surprising in the future to find material having ascospores with slimy sheaths or caps.

Most *Rosellinia* species with a *Dematophora* anamorph have long, slender ascospores with a very short straight germ slit as seen in *R. arcuata*. In this respect, *R. hughesii* resembles *R. buxi* Fabre, as both have similar ascospore shapes. The latter, however, has larger ascospores with a short germ slit, taller stromata, and smaller synnemata. The size of conidia is almost the same in both species (Petrini 1993).

*Rosellinia hughesii* differs from *R. gisbornia* by its persistent dark brown subiculum with the *Dematophora* conidial state, larger stromata, and smaller ascospores, and from *R. mammaeformis* by the larger stromata, persistent subiculum, and anamorph.

**Fig. 16** *Rosellinia hughesii*. A–F, Stromata, A–D, F, showing synnemata (arrows); G, Vertical section of stroma, note on the left side stroma shell and detached perithecium; H, Ascospores; I, Ascus apical ring shown by Nomarski contrast; K, Ascus apical ring in Melzer's reagent; L–N, *Dematophora* anamorph. Paratype, PDD 21799: A–G; Type, PDD 22120: H–N. Scale bars: A–D, F, G = 0.5 mm; E = 1 mm; H, M, N = 10 µm; I, K = 5 µm; L = 100 µm.



**8. *Rosellinia johnstonii*** L.E.Petrini, sp. nov.

Fig. 12V–Y, 17

Subiculum evanescent, cream to light brown, with grey patches bearing conidiophores and, when very young, ascomatal initials can be seen, on some hosts developing under the epidermis, later erumpent. Stromata (400)563 ± 73(725) µm high, (550)760 ± 91.5(950) µm wide ( $n = 85$ ), cylindrical to barrel-shaped with flattened, disk-like top, 350–550 µm diam., often with discoid base, dark brown to black, shiny, solitary or crowded in small groups, sometimes 2–3 fused together, young stromata covered by the felty subiculum and progressively emerging during development until completely free at maturity; sometimes additionally covered by host epidermis, thus appearing white. Ostioles finely to coarsely papillate. Ectostroma 50–75(100) µm thick, black. Entostroma initially white, then cream, brown, absent in mature material. Perithecia detached and collapsed in mature material. Ascus apical rings (1)2 ± 0.4(2.8) µm high ( $n = 41$ ), upper width 2.4–

ANAMORPH: *Geniculosporium*.

HOLOTYPE (hic designatus): New Zealand, North Island, Auckland: N of Kaukapakapa, vic. Glorit, Atuanui State Forest, Mt Auckland, on bark, 11 Sep 1980, *G. J. Samuels & P. R. Johnston*, PDD 49674, culture and anamorph on CMD. PARATYPE (hic designatus): North Island, Northland: Hokianga Co., Waipoua State Forest, vic. Forest Headquarters, on decorticated wood, 29 May 1982, *G. J. Samuels, H. P. Hawthorne, P. R. Johnston, & R. H. Petersen*, PDD 43197, anamorph on host, on CMD, cultures on OA, CMD.

Subiculum evanescent, cream to light brown, with grey patches bearing conidiophores and, when very young, ascomatal initials can be seen, on some hosts developing under the epidermis, later erumpent. Stromata (400)563 ± 73(725) µm high, (550)760 ± 91.5(950) µm wide ( $n = 85$ ), cylindrical to barrel-shaped with flattened, disk-like top, 350–550 µm diam., often with discoid base, dark brown to black, shiny, solitary or crowded in small groups, sometimes 2–3 fused together, young stromata covered by the felty subiculum and progressively emerging during development until completely free at maturity; sometimes additionally covered by host epidermis, thus appearing white. Ostioles finely to coarsely papillate. Ectostroma 50–75(100) µm thick, black. Entostroma initially white, then cream, brown, absent in mature material. Perithecia detached and collapsed in mature material. Ascus apical rings (1)2 ± 0.4(2.8) µm high ( $n = 41$ ), upper width 2.4–

2.8 µm, lower width 1.9–2.8 µm, without bulge at upper margin, J+, pale blue. Ascospores (9.6)12.5 ± 1(16) µm long, (4.8)6.2 ± 0.6(9) µm wide ( $n = 385$ ), inequilaterally ellipsoidal, brown to dark brown, with straight germ slit, typically extended to the entire length of the spore, but often situated closer at one end than at the other (Fig. 17H). Conidia 3–4.5 × 2.5–3.5 µm.

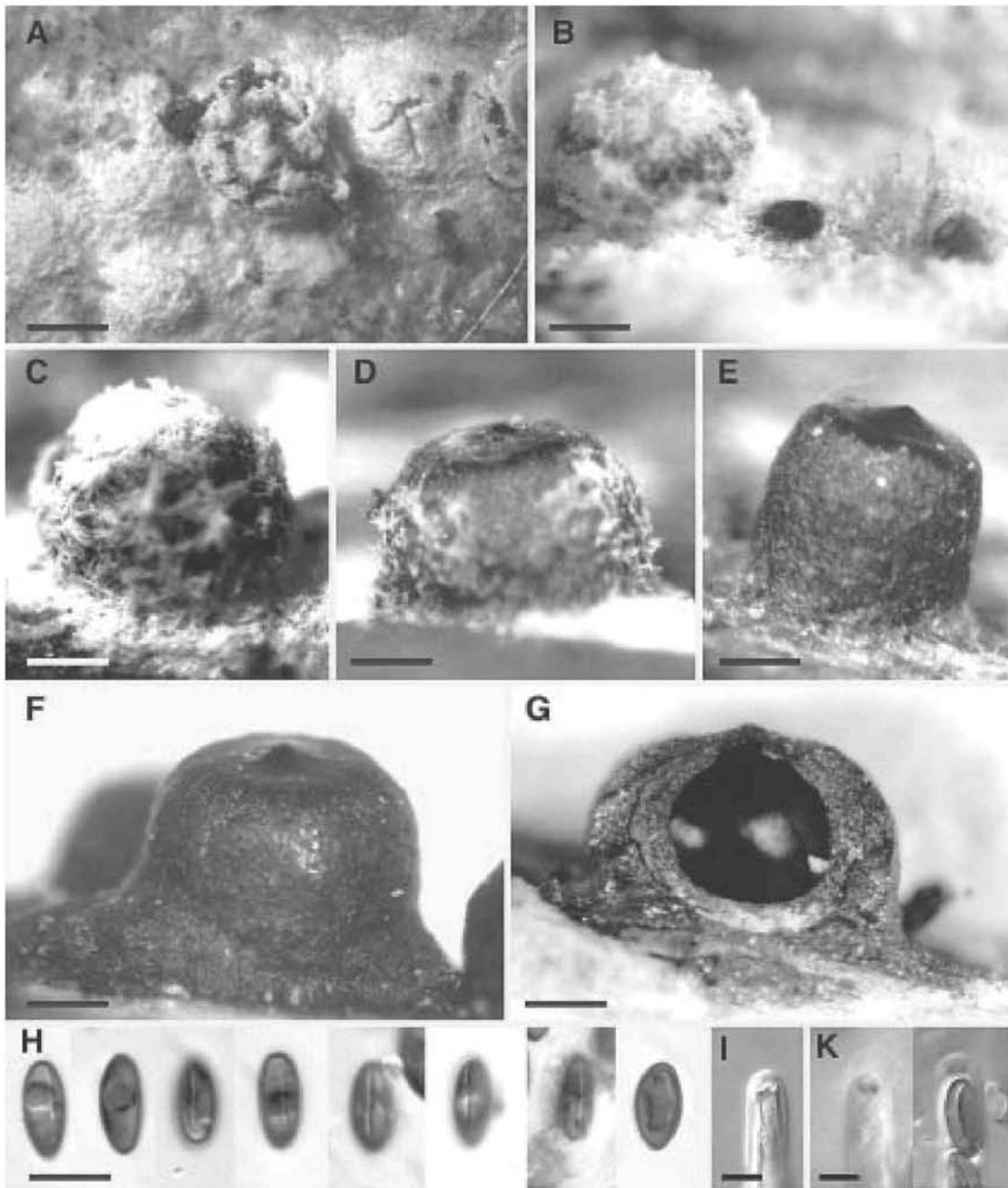
Cultures on OA after 20 days at 20°C under diffused daylight with centre slightly raised, hyphae restricted, margin flat, white, some red pigment spreading, sterile. On CMD under same conditions, 1.5 cm diam., flat, appressed, without aerial mycelium, centre opaque, waxy, margin translucent, slightly orange, after 34 days 2 cm diam. After 24 days 2–2.5 cm, centre flat, compact, grey-green due to fruiting structures, outside loosely cottony, white. Conidiophores over 200 µm long, 2–3 µm wide, mononematous, unbranched or roughly dichotomously branched, smooth, subhyaline to pale tan towards base. Conidiogenous cells cylindrical, terminal and intercalary, geniculate with conspicuous, circular refractive frill at each point of conidial dehiscence. Conidia 3.5–4.5(6) × 2–3(4) µm ( $n = 43$ ), subglobose to elliptical, rarely clavate, with protuberant, flat basal abscission scar bearing a minute frill, smooth, subhyaline. On PDA white to cream with large grey-brown areas bearing the conidiophores, felty, forming concentric rings, reverse light brown.

HOSTS: *Agathis australis*, *Coprosma arborea*, *Dysoxylon spectabile*, *Elaeocarpus dentatus*, *Nothofagus truncata*, *Pittosporum umbellatum*.

MATRIX: Decorticated heavily decomposed wood, bark.

ETYMOLOGY: In honour of the New Zealand mycologist P. R. Johnston.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Kawakawa Bay, on decorticated wood, 5 May 1983, *G. J. Samuels, P. R. Johnston, T. Matsushima, & R. H. Petersen*, PDD 45801, PDD 45802; Titirangi, Titirangi Beach Reserve, on decorticated wood, 24 Mar 1981, *G. J. Samuels, B. Segedin, & H. Thiers*, PDD 49612, anamorph on host; Waitakere Ranges, Kauri Grove Trail, on decorticated wood, 27 Nov 1980, *G. J. Samuels, P. R. Johnston, & M. Rattray*, PDD 62377, culture on CMD; Waitakere Ranges, Piha Valley, Winstone Trail, 18 Mar 1992, *P. R. Johnston*, PDD 60016. COROMANDEL PENINSULA: Little Barrier Island, Thumb Track, 500 ft, on *Nothofagus truncata*, 30 Aug 1958, *J. M. Dingley*, PDD 18638,



**Fig. 17** *Rosellinia johnstonii*. **A–F**, Stromata, **A–C**, showing subiculum; **G**, Vertical section of stroma, outer shell stroma, inner perithecium; **H**, Ascospores, note asymmetrical placement of germ slit, especially, 3rd, 5th, 7th spores; **I**, Ascus apical ring shown by Nomarski contrast; **K**, Ascus apical rings in Melzer's reagent. PDD 18444: **A**; Paratype, PDD 43197: **B–D**; Type, PDD 49674: **E–I**, **K**; PDD 45801: two ascospores to the right. Scale bars: **A** = 0.5 mm; **B–G** = 0.25 mm; **H** = 10 μm; **I**, **K** = 5 μm.

culture on PDA, PDD 18639; Little Barrier Island, Thumb Track, 500 ft, on *Coprosma arborea* 30 Aug 1958, *J. M. Dingley*, PDD 18655, culture on PDA; Little Barrier Island, Shag Track, on *Pittosporum umbellatum*, 29 Aug 1958, *F. J. Newhook*, PDD 18642, culture on PDA; Little Barrier Island, Shag Track, 100 ft, on *Pittosporum umbellatum*, 29 Aug 1959, *F. J. Newhook*, PDD 18663; Little Barrier, Summit Track, 200 ft, on dead wood, Nov 1947, *J. M. Dingley*, PDD 16892; Little Barrier Island, on *Dysoxylon spectabile*, 28 Aug 1958, *J. M. Dingley*, PDD 18666; Thames, Waiomo, on *Elaeocarpus dentatus*, 26 Aug 1958, *J. M. Dingley*, PDD 18656\*. NORTHLAND: Omahuta State Forest, Omahuta Kauri Sanctuary, on *Agathis australis*, 10 May 1981, *G. J. Samuels & E. Horak*, PDD 41967. AUCKLAND ISLANDS: Auckland Island, Port Ross, Beacon Point, on decort., rotten wood, 22 Mar 2000, *P. R. Johnston*, PDD 71829.

NOTES: Distinctive features of *R. johnstonii* are the flattened top of the stroma and the asymmetrical position of the germ slit on the ascospore. It is closer to one spore end and more distant towards the other (Fig. 17H). The subiculum can be observed only in young material. At first sight, this species may be confused with *Astrocystis* spp. However, it clearly belongs to *Rosellinia* as young stromata develop in a subiculum and the anamorph belongs to the form genus *Geniculosporium*, contrary to *Astrocystis*, in which the stromata break through the host epidermis and may split in a stellate manner, and the anamorphs belong to form genus *Acanthodochium* (Ju & Rogers 1990; Læssøe & Spooner 1994). The anamorph in culture differs from the one of *R. communis* by more frequent intercalary conidiogenous areas having more loci.

*Rosellinia johnstonii* also resembles *R. mammoidea*, but it has smaller, narrowly ellipsoidal ascospores with an asymmetrical germ slit and larger stromata with flattened discoid-like tops. The stroma and ascospore sizes are statistically significantly different, as shown by the 65% confidence ellipses (Fig. 9C) and the discriminant analysis (data not shown). *R. subiculata* (Schw.) Sacc. has slightly smaller ascospores than *R. johnstonii*. These two species also differ from each other with respect to

subiculum, stroma shape, and germ slit (Petrini 1993).

**9. *Rosellinia longispora*** Rick, *Brotéria* 1, 189 (1932) Fig. 8IH, 18

TYPE: Brazil: Rick expeditions in Brazil, São Leopoldo, Rio Grande do Sul, 1929, *Rick*, FH\*.

Subiculum evanescent, in young material white to grey, felty, absent in mature and old material. Stromata (600)710 ± 76(800) µm high, (575)730 ± 105(850) µm wide ( $n = 5$ ), conical, black, leaving a ring on the substrate when detached, solitary or crowded in small groups, sometimes fused together, seating on a common stromatal base. Ostioles pointed, hardly differentiated. Ectostroma 25–50 µm, black. Entostroma absent in mature material. Perithecia detached in older material. Ascus apical rings (13.4)14.2 ± 0.8(15.4) µm high, upper width 7.6–8.6 µm, lower width 5.7–7.7 µm ( $n = 5$ ), J+, dark blue. Ascospores (60.5)71.2 ± 3.8(78.7) µm long, (9.6)11.5 ± 0.9(13.4) µm wide ( $n = 30$ ), banana-shaped, brown to dark brown, with straight germ slit extending the whole spore length, both extremities and flattened to concave side surrounded by a slimy sheath.

HOST: *Rhopalostylis sapida*.

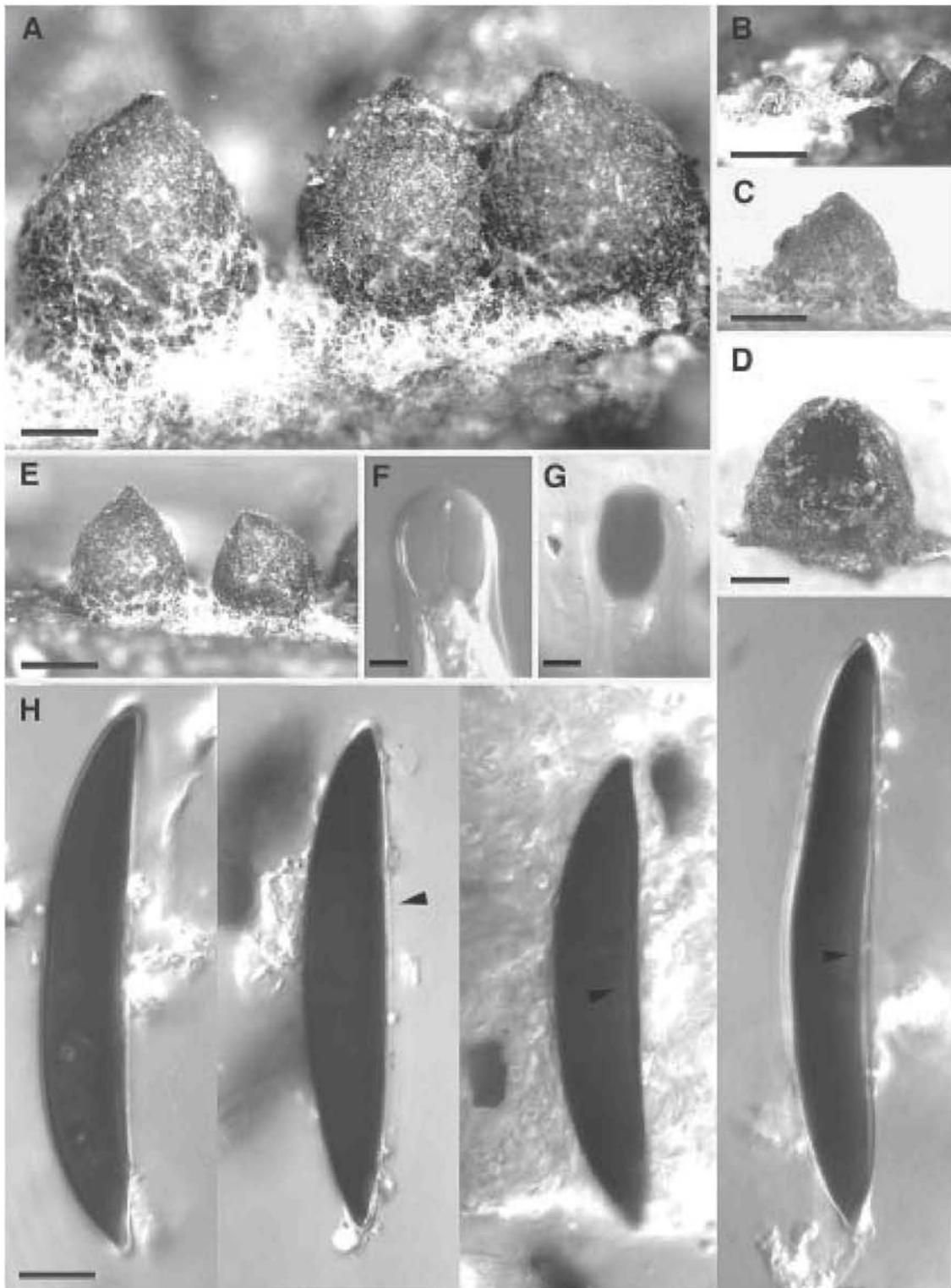
MATRIX: Rachides.

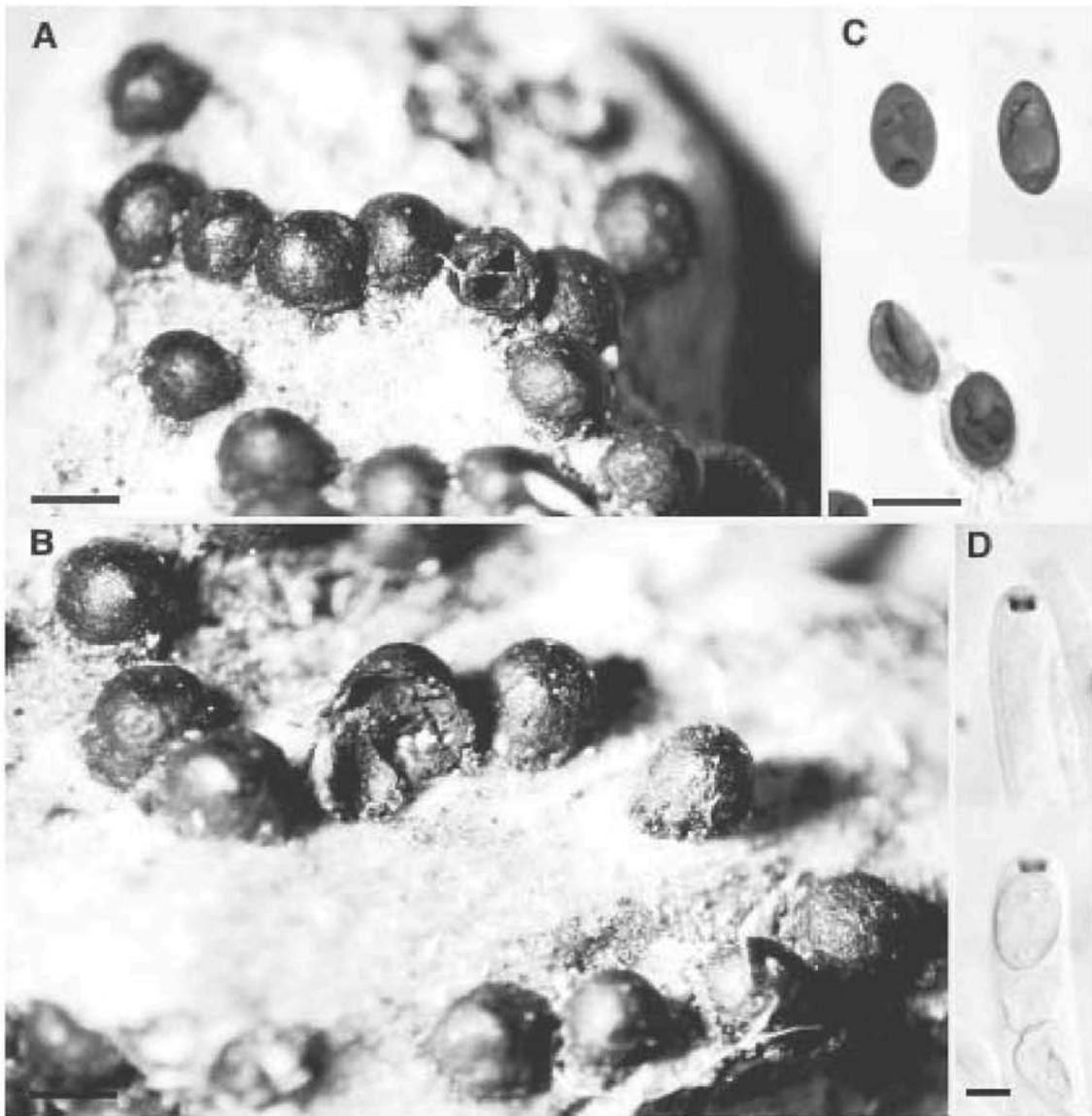
ADDITIONAL SPECIMENS EXAMINED: BRAZIL: São Leopoldo, in ligno frondoso, cf. *Acer biella*, 1929, *Rick*, PACA 19025\*, probably isotype, includes hand-written description; São Leopoldo, Rio Grande do Sul, 1929, *Rick*, FH\*; São Leopoldo, 1929, *Rick*, PACA 19004\*; São Leopoldo, 1929, *Braun*, PACA 19058\*. NEW ZEALAND: NORTH ISLAND: NORTHLAND: Hokianga Co., on *Rhopalostylis sapida*, 11 May 1983, *G. J. Samuels*, PDD 45780.

TYPE SPECIMEN EXAMINED OF RELATED SPECIES: *R. emergens*: TYPE, Sri Lanka, on sticks, *G. H. K. Thwaites* 298, K 62782.

NOTES: *Rosellinia longispora* is characterised by long ascospores with a germ slit extending the whole spore length and a poorly developed, evanescent subiculum. It was possible to compare the New Zealand specimen with original material of *R. longispora* from the Rick collections held at FH and

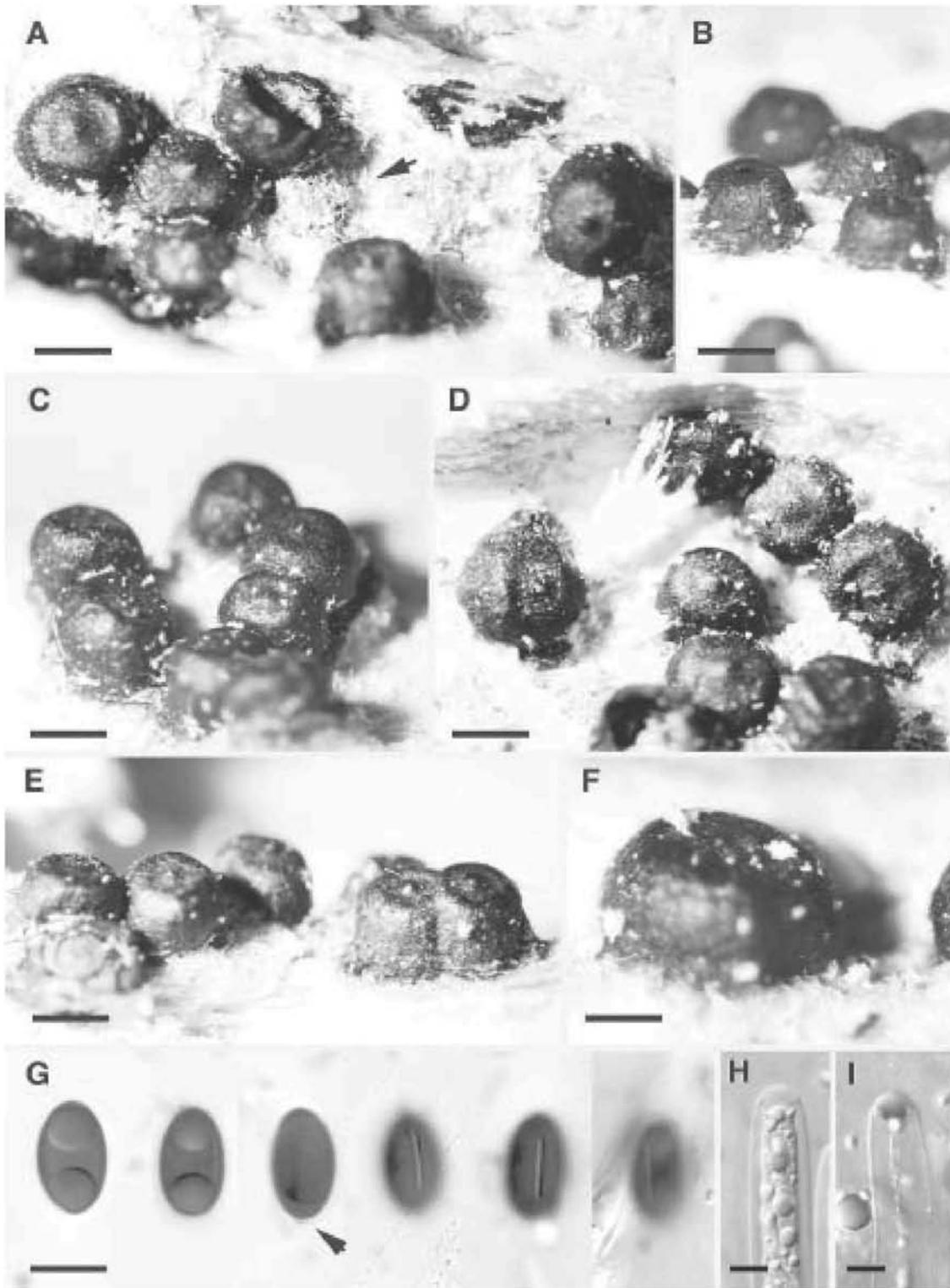
**Fig. 18** *Rosellinia longispora*. A–C, E, Stromata, A, B, E showing subiculum; D, Vertical section of stroma; F, Ascus apical ring shown by Nomarski contrast; G, Ascus apical ring in Melzer's reagent; H, Ascospores, 2nd showing slimy sheath, 3rd, 4th, showing germ slit (arrows). PDD 45780. Scale bars: A = 0.25 mm; B = 1 mm; C, E = 0.5 mm; D = 0.25 mm; F, G = 5 µm; H = 10 µm.





**Fig. 19** *Rosellinia mammoidea*. **A, B**, Stromata; **C**, Ascospores; **D**, Ascus apical rings in Melzer's reagent. Type, K 308. Scale bars: **A, B** = 0.5 mm; **C** = 10  $\mu$ m; **D** = 5  $\mu$ m.

**Fig. 20** *Rosellinia mammoidea*. **A–F**, Stromata, **A** with remnants of subiculum (arrow); **G**, Ascospores, 3rd showing cellular appendage (arrow), 4th to 6th showing short germ slit; **H**, Ascus apical ring shown by Nomarski contrast; **I**, Ascus apical ring in Melzer's reagent. PDD 71726. Scale bars: **A–E** = 0.5 mm; **F** = 0.25 mm; **G** = 10  $\mu$ m; **H, I** = 5  $\mu$ m.



PACA. The discriminant analysis revealed that there is no statistically significant difference in the size of the ascospores; analysis of variance demonstrated the same for stromata, and ascus apical rings (results not shown). The *Rick* material is on decorticated dicotyledonous wood, whereas the New Zealand specimen is on palm fronds.

The type material of *R. emergens* (Berk. & Broome) Sacc., K, has morphologically similar ascospores, but the subiculum is persistent and well developed, dark brown, and wiry (L. E. Petrini unpubl. data). *R. formosana* Y.-M. Ju & J. D. Rogers has wider, differently shaped stromata and larger ascospores than *R. longispora* (Ju & Rogers 1999).

**10. *Rosellinia mammoidea*** (Cooke) Sacc., *Syll. Fung. 1*, 263 (1882) Fig. 12S–U, 19, 20

BASIONYM: *Psilosphaeria mammoidea* Cooke, *Grevillea* 8, 67 (1879).

ANAMORPH: *Geniculosporium*.

HOLOTYPE: New Zealand, North Island, Wellington: on wood, *Travers* 308, Herb. Cooke 1885, K 69372.

Subiculum evanescent, white, cream to light brown to grey. Stromata (350)482 ± 80(650) µm high, (500)658 ± 105(900) µm wide ( $n = 25$ ), cylindrical to semiglobose, black, shiny, solitary or crowded in small groups, rarely 2–3 fused together. Ostioles finely papillate. Ectostroma 50–75 µm thick, black. Entostroma not seen. Perithecia detached in mature material. Ascus apical rings 2–3 µm high, upper width 2.8–4 µm, lower width 1.9–3 µm ( $n = 17$ ), without bulge at upper margin, J+, blue. Ascospores (11)13 ± 1(16) µm long, (6.2)7.5 ± 0.5(9) µm wide ( $n = 150$ ), inequilaterally ellipsoidal, brown to dark brown, with 8–10 µm long straight germ slit (Fig. 20G), some of them with a basal, 1 × 1 µm large, cellular appendage (Fig. 20G).

Culture on MA white, felty, grey areas with conidiophores. Conidia 3.5–5 × 3–4 µm.

HOSTS: *Metrosideros robusta*, unidentified dicotyledonous wood.

MATRIX: Decorticated heavily decomposed wood.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: WELLINGTON: Days Bay, on dead wood, Mar 1925, *D. W. McKenzie*, PDD 2097; Days

Bay, on dead wood, May 1947, *J. M. Dingley*, PDD 16891. AUCKLAND ISLANDS: Auckland Island, Erebus Cove, on decort. wood, 20 Mar 2000, *H. Burdsall*, PDD 71726, culture; Enderby Island, Sandy Bay, on *Metrosideros robusta*, 21 Mar 2000, *P. R. Johnston*, PDD 71830.

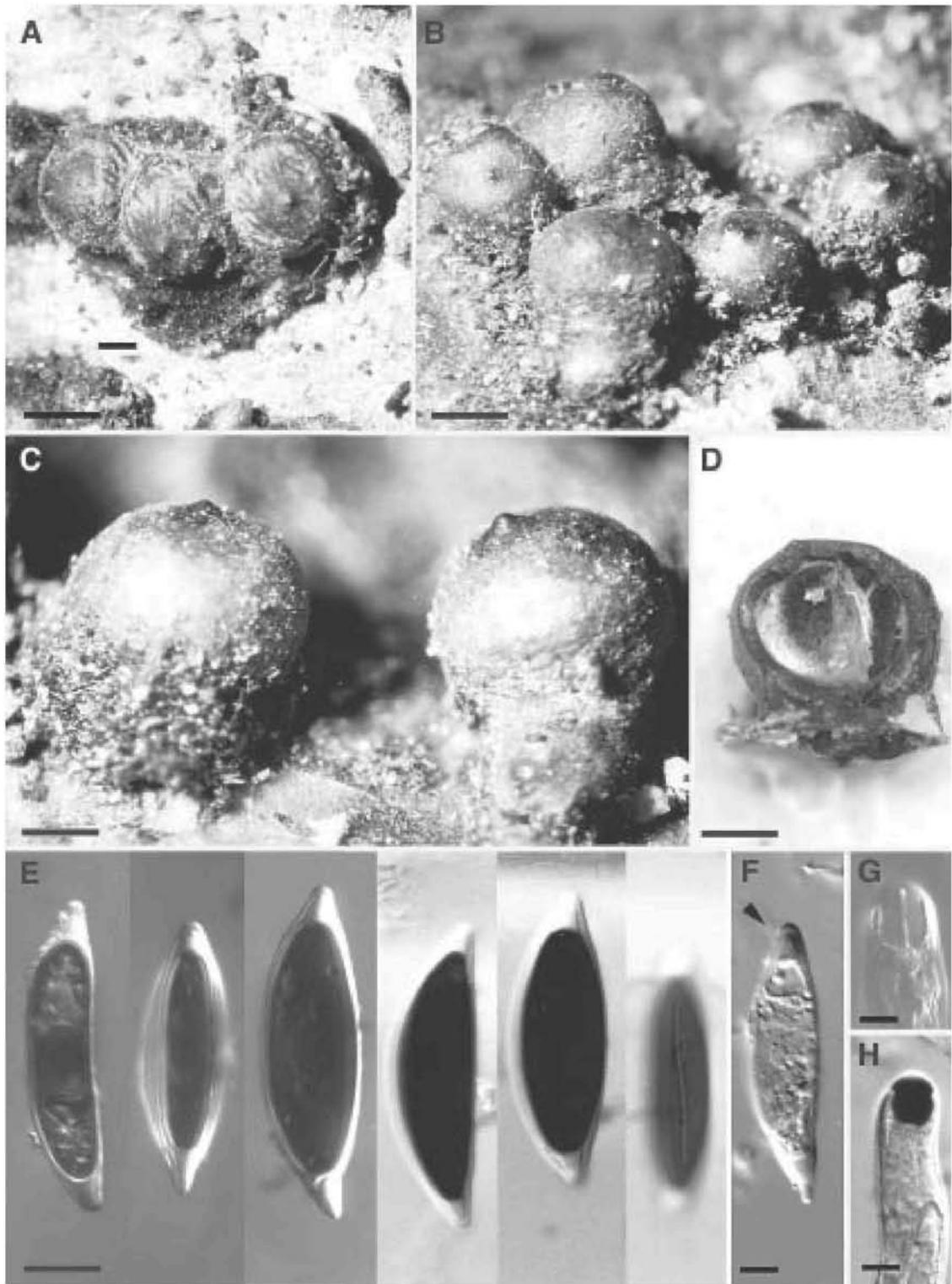
NOTES: *Rosellinia mammoidea* is characterised by a cream to light brown subiculum present only in a very early state, and dark brown ascospores with rounded side walls with a germ slit about two thirds of their length.

In the original description the ascospore size ranges from 16 to 18 × 8 µm (Cooke 1879). The Kew herbarium has three specimens labelled as *R. mammoidea* from the period when Cooke described the fungi from New Zealand (Cooke 1879). One originates from Wellington, collected by Travers, the second from the South Island, *J. Kirk* 72, the third from Waitaki, ex herb. M. C. Cooke. The *Travers* collection is cited by Cooke and is labelled as the type. The ascospore size in this specimen ranges from 11 to 14 × 6.5 to 8 µm, clearly much smaller than the dimensions given in the literature. The *Kirk* specimen is *R. communis*: its ascospores measure 16–21 × 8.5–10 µm. The third specimen has ascospores measuring 19–23 × 10–13 µm with a sigmoid germ slit and is *Helicogerm slit aucklandica*. At first sight, all three have similar stromata. The wrong ascospore size indicated in the literature was very likely the reason why most *Rosellinia* from New Zealand identified as *R. mammoidea* are actually *R. communis*.

*Rosellinia mammoidea* can be distinguished from *R. communis* by smaller stromata and smaller ascospores, and from *R. johnstonii* by smaller stromata with mostly rounded tops, larger (usually wider) ascospores, occasionally with a cellular appendage and shorter germ slits positioned symmetrically. The results of the discriminant analysis of the ascospore size indicated statistically significant differences among these three species, as also shown by the 65% confidence ellipses in Fig. 9C. The stromatal size was also statistically significantly different (data not shown). *R. mammoidea* differs also from *R. subiculata* (Schwein. : Fr.) Sacc. by the subiculum colour, larger ascospores, and a shorter germ slit (Petrini 1993).

Martin (1968) treated *R. mammoidea* as a

**Fig. 21** *Rosellinia nothofagi*. **A–C**, Stromata, **C** shows subiculum at left stroma base; **D**, Vertical section of stroma, note stroma shell to the right with detached perithecium; **E**, Ascospores, 6th showing germ slit; **F**, Immature ascospore; **G**, Ascus apical ring shown by Nomarski contrast; **H**, Ascus apical ring in Melzer's reagent. Type, PDD 74976. Scale bars: A, B = 1 mm; C, D = 0.5 mm; E = 10 µm; F–H = 5 µm.



synonym of *Hypoxyton mastoideum* (Fr.) P.M.D.Martin (| *Rosellinia mastoidea* (Fr.) Sacc.) and gave its spore size as  $10\text{--}22 \times 5\text{--}10 \mu\text{m}$ . Such a large variability in ascospore size is most likely the result of including more than one taxon in the species concept. According to Petrini (1993) its basionym, *Sphaeria mastoidea* Fr., remains doubtful. Martin (1968) drew his taxonomic conclusions mainly from material collected in South Africa. Based on my experience, the geographical distribution of most species of *Rosellinia* is restricted. Therefore, the New Zealand material, which originates from an isolated area, is almost certainly different from *Sphaeria mastoidea* which very likely originates from Europe. South African material still needs to be studied in order to establish its identity.

**11. *Rosellinia nothofagi* L.E.Petrini, sp. nov.**

Fig. 12I,L, 21

Subiculum perdurans, aetate provecta deminutum, atrobrunneum rubescens, lanosum ad filo metallico simile, conidiophora dum juvene ferens. Stromata (1050)1330  $\pm$  200(1750)  $\mu\text{m}$  alta, (1175)1440  $\pm$  194(1775)  $\mu\text{m}$  lata, cupulata vel globosa, atrobrunnea, ostiola circa nigra, solitaria ad conferta. Ostiola distincte et grosse papillata. Annulus apicalis asci (7.6)8.2  $\pm$  0.5(9)  $\mu\text{m}$  altus, parte superiore 5–6  $\mu\text{m}$  et inferiore 4–6  $\mu\text{m}$  latus, iodo valde coerulescenti. Ascospores (25)29  $\pm$  2.4(37.5)  $\mu\text{m}$  longae, (6)8.3  $\pm$  0.7(9.6)  $\mu\text{m}$  latae, asymmetricae ellipsoideae, atrobrunneae, fissura germinativa recta totam ascosporam, usque ad extremitates fere sed non omnino recurrenti praeditae, vagina mucosa omnino tenui circumdatae. Apices utriusque conica, cellulari appendice 3–4  $\mu\text{m}$  longa 3  $\mu\text{m}$  lataeque praediti, appendix altera acuta, altera rotundata curtiorque. Status anamorphosis *Geniculosporium*.

ANAMORPH: *Geniculosporium*.

HOLOTYPE (hic designatus): New Zealand, South Island, Otago: Otago Beech Forest, Blue Mts, Tapanui, on *Nothofagus* sp., Jan 1924, G. H. Cunningham & J. C. Neill, PDD 74976.

Subiculum persistent, reduced in mature material, dark reddish brown, felty to wiry, bearing conidiophores in young material. Stromata (1050)1330  $\pm$  200(1750)  $\mu\text{m}$  high, (1175)1440  $\pm$  194(1775)  $\mu\text{m}$  wide ( $n = 15$ ), cupulate to globose,

dark brown, black around the ostioles, solitary to crowded. Ostioles coarsely papillate. Ectostroma to 125  $\mu\text{m}$  thick, black, hard. Entostroma light brown, confined to the base. Perithecia detached and collapsed in mature material. Ascus apical rings (7.6)8.2  $\pm$  0.5(9)  $\mu\text{m}$  high, upper width 5–6  $\mu\text{m}$ , lower width 4–6  $\mu\text{m}$  ( $n = 15$ ), J+, dark blue. Ascospores (25)29  $\pm$  2.4(37.5)  $\mu\text{m}$  long, (6)8.3  $\pm$  0.7(9.6)  $\mu\text{m}$  wide ( $n = 90$ ), inequilaterally ellipsoidal, dark brown, with straight germ slit, extending almost over the whole spore length, ending shortly before the extremities, each extremity with one 3–4  $\mu\text{m}$  long, 3  $\mu\text{m}$  wide, conical, cellular appendage, one of them being more pointed and the other more rounded and shorter, the whole spore completely surrounded by a thin slimy sheath. Conidiogenous cells 4–5  $\mu\text{m}$  wide, light brown. Conidia 10–13  $\times$  5–5.5.

HOST: *Nothofagus*.

MATRIX: Corticated twigs 3–4 cm diam.

ETYMOLOGY: According to the host plant.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: TAUPO: Kaimanawa Ranges, Tree Trunk Gorge, on *Nothofagus* sp., 25 Aug 1999, P. R. Johnston & B. M. Spooner, PDD 70789, anamorph on host. SOUTH ISLAND: NORTH CANTERBURY: Mt Thomas forest, Wooded Gully Track, on bark of fallen branches of *Nothofagus solandri*, 4 May 1995, P. R. Johnston, PDD 70112.

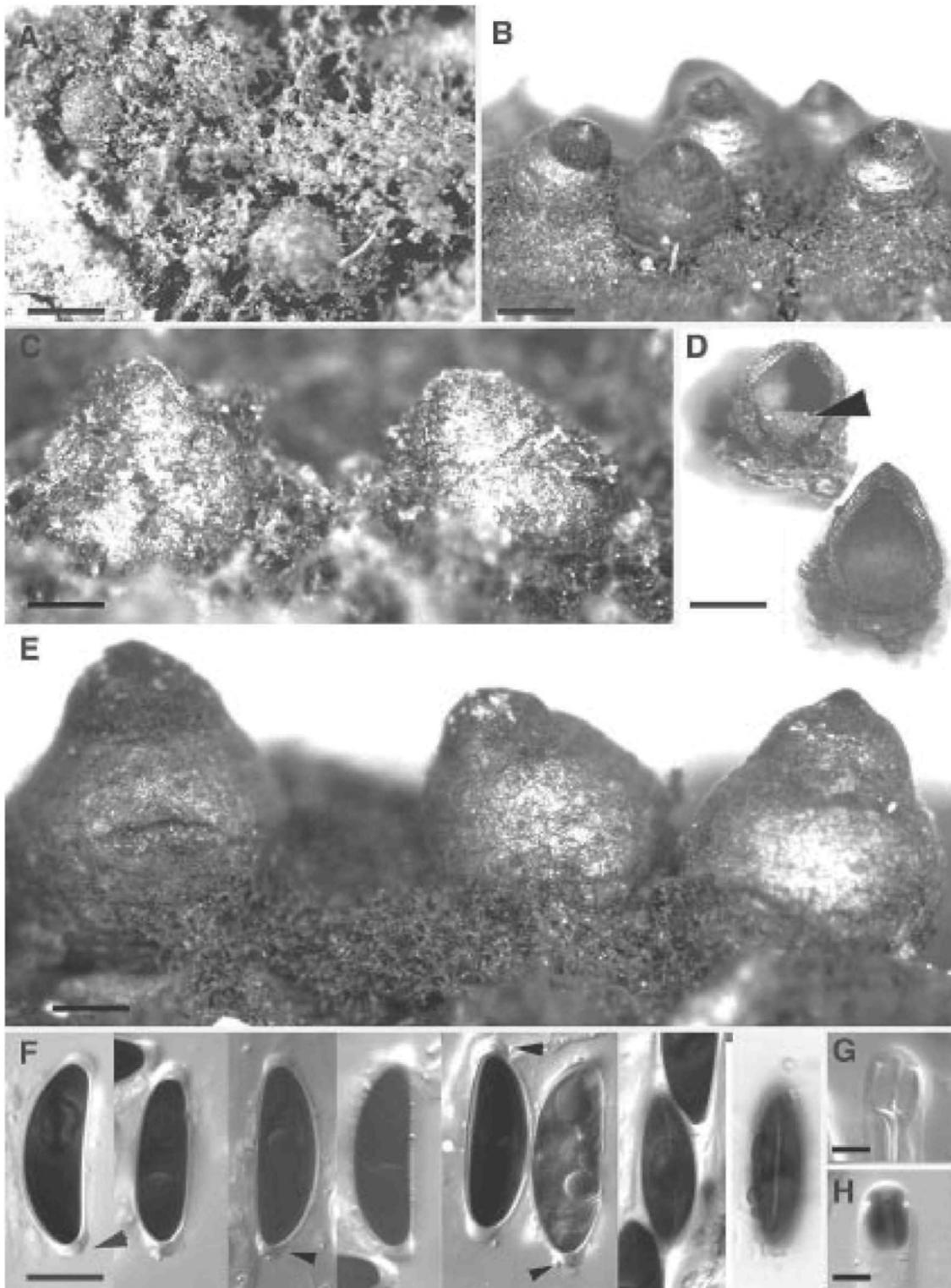
NOTES: *Rosellinia nothofagi* is easily recognised by its ascospores which bear two cellular, conical appendages surrounded by a slimy sheath, massive stromata, and large conidia. *Rosellinia subsimilis* P.Karst. has similar, but, on the average, smaller ascospores, and its stromata are about half the size and more delicate (Petrini 1993). *Rosellinia thelena* (Fr. : Fr.) Rabenh. has also ascospores with smaller, very pronounced appendages. In addition, anamorph and stromata characters are also different (Petrini 1993).

**12. *Rosellinia novae-zelandiae* L.E.Petrini, sp. nov.**

Fig. 12A–D, 22

Subiculum perdurans, purpureobrunneum, grossum, filo metallico simile ad lanosum, appressum, conidiophora cinereum stratum formantia dum

**Fig. 22** *Rosellinia novae-zelandiae*. A–C, E, Stromata; D, Vertical section of stromata, arrow points to collapsed perithecium; F, Ascospores, the two to the right showing germ slit, arrows point to cellular appendages; G, Ascus apical ring shown by Nomarski contrast; H, Ascus apical ring in Melzer's reagent. PDD 16422: A, C, Type, PDD 42074: B, D–H. Scale bars: A, B, D = 0.5 mm; C, E = 0.25 mm; F = 10  $\mu\text{m}$ ; G, H = 5  $\mu\text{m}$ .



juvenc ferens, aetate provecta deminutum. Stromata (675)899 ± 137(1300) µm alta, (625)832 ± 116(1175) µm lata, conica ad pyriformia vel ampulliformia, saepe basi brevicylindrica, interdum rugis levibusque fissuris ad basim praedita, atrobrunnea, ostiola circa nigra, solitaria ad dense gregaria, strato compacto formantia, dum juvena omnino in subiculo insita, dein paulatim emergentia subiculoque deminuto. Ostiola grosse papillata, saepe indistincta apice conico. Annulus apicalis asci (5.7)7.5 ± 1.2(10.5) µm altus, parte superiore 4–5.7 µm et inferiore 4.3–6.7 µm latus, iodo valde coerulescenti. Ascospores (20)24.3 ± 1.7(30) µm longae, (5.7)8.5 ± 0.6(11.5) µm latae, asymmetricae ellipsoideae, brunneae, fissura germinativa recta totam ascosporam recurrenti praeditae, vagina mucosa omnino 2 µm ad apicibus, 1 µm ad latera crassa circumdatae. Apex alter cellulari appendice 1.5–2 × 1.5–2 µm mensa praeditus. Status anamorphosis *Geniculosporium*.

ANAMORPH: *Geniculosporium*.

HOLOTYPE (hic designatus): New Zealand, North Island, Bay of Plenty, Te Puke, Reid Property, Lombardy shelter belt, on *Populus* sp., 15 Jul 1981, G. J. Samuels & S. R. Pennycook, PDD 42074, culture on OA.

Subiculum persistent, purplish brown, coarse, wiry, woolly to felty, appressed, when young producing conidiophores in a grey-brown layer, subiculum reduced in old material. Stromata (675)899 ± 137(1300) µm high, (625)832 ± 116(1175) µm wide ( $n = 80$ ), conical to pear-shaped to ampulliform, often with a short cylindrical base, sometimes with wrinkles on the surface or faint cracks at the base, dark brown, black around the ostioles, solitary but densely aggregated forming a compact layer; when young completely embedded in the subiculum, later gradually exposed and subiculum reduced. Ostioles coarsely papillate, often poorly differentiated and forming a cone-like top. Ectostroma 50–100 µm thick, black. Entostroma c. 75 µm thick, cream to black, confined to stroma base. Perithecia detached and collapsed in mature material, often remaining as a central peg. Ascus apical rings (5.7)7.5 ± 1.2(10.5) µm high, upper width 4–5.7 µm, lower width 4.3–6.7 µm ( $n = 63$ ), J+, dark blue. Ascospores (20)24.3

± 1.7(30) µm long, (5.7)8.5 ± 0.6(11.5) µm wide ( $n = 450$ ), inequilaterally ellipsoidal, brown, with straight germ slit running over the whole spore length, with a basal, 1.5–2 × 1.5–2 µm large, cellular appendage, the whole spore completely surrounded by a slimy sheath, 2 µm thick at extremities, 1 µm thick at the sides. Conidia 6.5–8.5 × 4–5 µm.

Culture on OA after 24 days at 20°C under 12 h dark and 12 h UV and fluorescent light covering plate (9 cm diam.), mottled with black, effused, stromatic and white, flat, dense hyphal splotches, cottony, cinerous hyphae at the contact line between two inocula. Conidiophores in restricted areas, variable in length, without central axis, repeatedly and irregularly branched, widely spread, ultimate cells conidiogenous, smooth, subhyaline to pale tan towards base. Conidiogenous cells 16–43 × 3–3.5 µm ( $n = 13$ ), disposed in 2s or 3s in a roughly verticillate fashion, mostly geniculate over c. 10 µm length of the tips, or less frequent, with swollen tips bearing conidiogenous scars, smooth, with conspicuous, circular refractive frill at each point of conidial dehiscence. Conidia (4)7–10 × 3–4 µm ( $n = 22$ ), oblong to elliptic with a basal frill, smooth, pale tan.

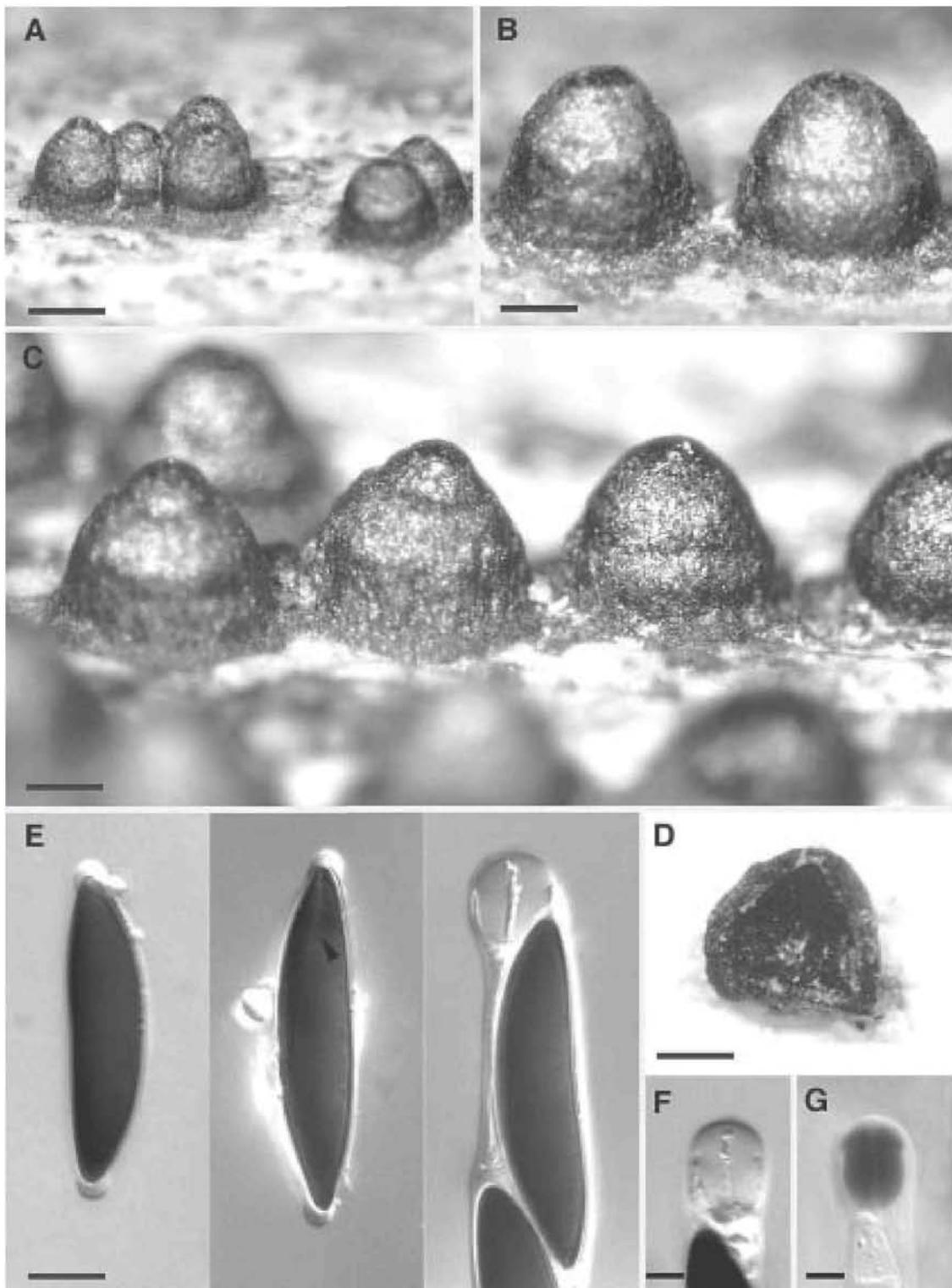
HOSTS: *Actinidia chinensis*, *Albizia lophantha*, *Beilschmiedia tawa*, *Euonymus japonicus*, *Pittosporum crassifolium*, *Populus* sp., *Prunus persica*, ?*Pseudopanax* sp., *Rosa* sp. cultivated, *Salix caprea*, *Salix* spp., *Solanum auriculatum*.

MATRIX: Corticated and decorticated wood, twigs, detached bark.

ETYMOLOGY: Referring to the geographical origin, New Zealand.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Epsom, on cultivated *Rosa* sp., 13 Jan 1963, S. Davison, PDD 20511; Epsom, on *Solanum auriculatum*, 28 Oct 1962, D. Davison, PDD 20576; Mt Albert, Plant Disease Division area, on *Salix* sp., Oct 1955, J. M. Dingley, PDD 16422, anamorph on host; Mt Eden, *Albizia lophantha*, Mar 1942, F. J. Newhook, PDD 4444; Three Kings, on *Pittosporum crassifolium*, Jul 1956, F. J. Newhook, PDD 16411; Three Kings, on *Salix caprea*, Jul 1956, F. J. Newhook, PDD 16412, PDD 16415; Three Kings, on *Prunus persica*, Jul 1956, F. J. Newhook,

**Fig. 23** *Rosellinia palmae*. A–C, Stromata; D, Vertical section of stroma; E, Ascospores, 2nd showing part of germ slit on the upper part (arrow); F, Ascus apical ring shown by Nomarski contrast; G, Ascus apical ring in Melzer's reagent. Type, PDD 54730. Scale bars: A = 0.5 mm; B–D = 0.25 mm; E = 10 µm; F, G = 5 µm.



PDD 16414; Three Kings, on *Euonymus japonicus*, Jul 1956, *F. J. Newhook*, PDD 16888; Waiheke Island, Palm Beach, on dead wood of *Actinidia chinensis*, 5 Jan 2000, *P. R. Johnston*, PDD 71054; Waitakere Ranges, on indet. tree, 29 Apr 1983, *G. J. Samuels & R. H. Petersen*, PDD 45797. BAY OF PLENTY: Whakarewarewa, on *Salix* sp., Jan 1948, *G. B. Rawlings*, PDD 16413. NORTHLAND: Bay of Islands, Puketi State Forest, Loop trail, on decorticated wood, 2 Jun 1982, *G. J. Samuels & P. R. Johnston*, PDD 43205; Hokianga County, Waipoua State Forest, Kauri Ricker Trail, along Waipoua River, on *Beilschmiedia tawa*, 31 May 1982, *G. J. Samuels, A. P. Hawthorne, P. R. Johnston, & R. H. Petersen*, PDD 44410; Hokianga County, on ?*Pseudopanax*, 13 May 1983, *G. J. Samuels*, PDD 45776.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *R. caudata*: TYPE, Sri Lanka, *Cinnamonus camphora*, 1 Jan 1914, *Petch 3879*, *K. R. immersa*: TYPE, Sri Lanka, on twig, Peradeniya, Jan 1912, *Petch 3344*, *K. R. merrillii*: TYPE, Philippines, Prov. Laguna, Luzon, Mt Maquiling, *E. D. Merrill 8660*, S.

NOTES: The most striking feature of *R. novae-zelandiae* is the pear-shaped, conical stroma with coarse ostioles that are often poorly differentiated.

Cultures of *R. novae-zelandiae* resemble those of *R. aquila* and *R. corticium* as all develop black discolorations of the colony. The conidial sizes of the anamorph of *R. novae-zelandiae* and *R. corticium* are similar. Conidia of *R. aquila* are smaller than those of the other two species (Petrini 1993).

Many specimens previously identified as *R. aquila* are *R. novae-zelandiae*. The latter has larger ascospores with one cellular appendage completely surrounded by a slimy sheath. Ascospores of *R. aquila* have two cellular appendages surrounded by slimy caps (Petrini 1993). The ascospores of *R. novae-zelandiae* are similar to those of *R. caudata* Petch, *R. corticium* (Schwein. : Fr.) Sacc., *R. immersa* Petch, and *R. merrillii* Syd., but the stromatal shape of these species is subglobose to semiglobose and they have papillate to pointed ostioles. Mature spores of the type material of *R. caudata* have no cellular appendage and have a rather thick epispore; those of *R. immersa* are larger, as illustrated by the 65% confidence ellipses (Fig.

9D). *R. merrillii* has larger stromata, larger ascus apical rings, and larger ascospores (Petrini 1993; L. E. Petrini unpubl. data).

### 13. *Rosellinia palmae* L.E.Petrini, sp. nov.

Fig. 12M,N, 23

Subiculum non visum. Stromata (500)530 ± 27(550) µm alta, (550)580 ± 21(600) µm lata, conica, apice magno, late conico praedita, nigra, solitaria ad gregibus parvis gregaria, interdum ad tria stromata connata, margine stromatico interdum presenti, in regiones substrati totius conferta. Ostiola indistincta. Annulus apicalis asci (10.5)11.5 ± 0.7(12.5) µm altus, parte superiore 7.6–8.6 µm et inferiore 6.7–7.7 µm latus, iodo valde coerulescenti. Ascosporae (38.4)42.2 ± 2.3(47) µm longae, (9.1)10.3 ± 0.7(11.5) µm latae, asymmetricè ellipsoideae, atrobunneae, fissura germinativa recta totam ascosporam recurrenti praeditae, vagina mucosa 2–3 µm crassa 5–6 µm ad apicibus lataque circumdatae.

ANAMORPH: Unknown.

HOLOTYPUS (hic designatus): New Zealand, Kermadec Islands, Raoul Island, on *Rhopalostylis baueri* var. *cheesemanii*, orchard, 20 Sep 1988, *E. H. C. McKenzie*, PDD 54730.

Subiculum not seen. Stromata (500)530 ± 27(550) µm high, (550)80 ± 21(600) µm wide (*n* = 5), conical with a large, wide conical top, black, solitary or crowded in small groups, sometimes up to three fused together, some of them with stromatal margin, confluent over the whole substrate in crowded areas. Ostioles undifferentiated. Ectostroma 25–50 µm thick, black. Entostroma absent in mature material. Perithecia remaining attached to the stromata. Ascus apical rings (10.5)11.5 ± 0.7(12.5) µm long, upper width 7.6–8.6 µm, lower width 6.7–7.7 µm (*n* = 5), J+, dark blue. Ascospores (38.4)42.2 ± 2.3(47) µm long, (9.1)10.3 ± 0.7(11.5) µm wide (*n* = 30), inequilaterally ellipsoidal, dark brown, with straight germ slit extending over the whole spore length, both extremities and convex side surrounded by a slimy sheath, 2–3 µm thick and 5–6 µm wide at spore ends.

HOST: *Rhopalostylis baueri* var. *cheesemanii*.

MATRIX: Rachides.

ETYMOLOGY: According to the host family.

Fig. 24 *Rosellinia radiciperda*. A–C, Stromata; D, Ascospores; E, Moss. Type, K. Scale bars: A = 1 mm; B, C = 0.5 mm; D = 10 µm; E = 20 µm. ➤



TYPE SPECIMEN EXAMINED OF RELATED SPECIES: *R. lamprostoma*: TYPE, Philippines, Prov. Laguna, Mt Maquiling, Luzon, 23–28 Feb 1912, P. W. Graff 15966, W; COTYPE, BPI.

NOTES: *Rosellinia palmae* is characterised by conical stromata with distinctive tops and undifferentiated ostioles. Ascospores are mid-sized with two slimy caps and a long germ slit. Only the type collection is known and does not show a subiculum. The ascus apical ring, however, is typical of *Rosellinia* spp.

This species differs from *R. radiciperda* by stromatal characters, the absence of a subiculum in mature material, and ascospores without a cellular appendage. In addition to stromatal characters, *R. palmae* can be distinguished from *R. longispora* by smaller ascospores and ascus apical rings and from *R. novae-zelandiae* by larger ascospores of different shape without a cellular appendage. *Rosellinia lamprospora* Syd. resembles *R. palmae*; however, the former has larger, pear-shaped stromata and larger ascospores lacking a slimy sheath (L. E. Petri unpublished data). *R. formosana* has stromata of a similar shape as *R. palmae*, but they are larger and the ascospores are more than twice as long (Ju & Rogers 1999).

**14. *Rosellinia radiciperda* Masee, Kew Bull.**

109, 3 (1896) Fig. 12E–H, 24, 25  
= *Hypoxyton radiciperdatum* (Masee) Martin, *Jl. S. Afr. Bot.* 42, 73 (1976).

ANAMORPH: *Geniculosporium*.

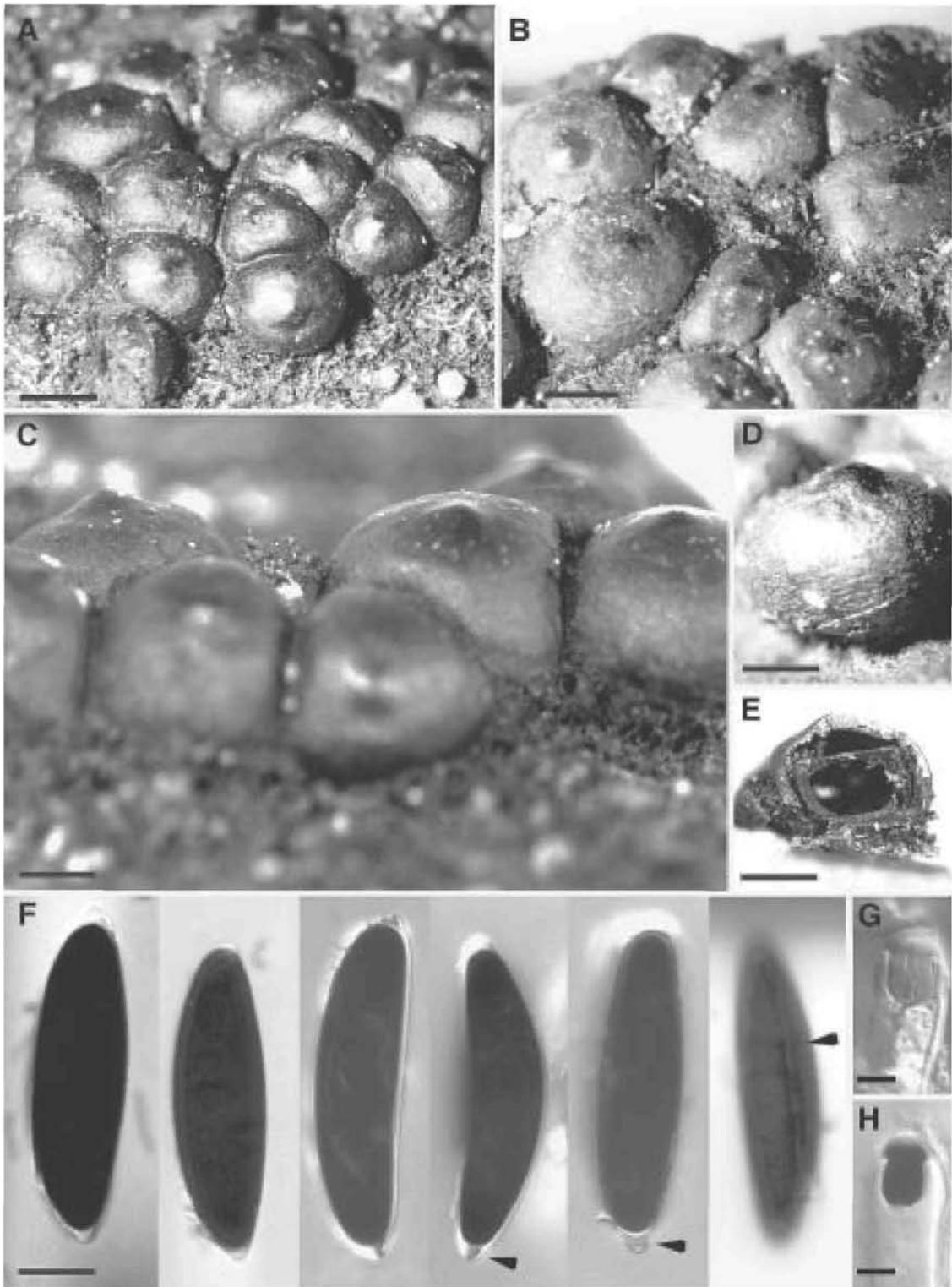
HOLOTYPUS: New Zealand, on *Pirus malus*, W. Colenso, K 69382\*.

Subiculum persistent, reduced in mature material, purplish brown, dark brown, woolly to felty. Stromata (1000)1405 ± 200(2000) µm high, (1125)1628 ± 224(2250) µm wide ( $n = 155$ ), globose, semiglobose to cupulate, often with a short cylindrical base, copper-brown, reddish brown, black and shiny around the ostioles, when old dark brown to dull black, solitary or crowded forming a compact layer, often laterally compressed, when young completely embedded in the subiculum, only ostioles exposed. Ostioles bluntly rounded or often not differentiated and then stromatal apex conical. Ectostroma 100–150 µm thick, black, hard, brittle.

Entostroma brown, confined to base, in mature material absent. Perithecia detached and collapsed in mature material. Ascus apical rings (7.7)10 ± 1.1(12.5) µm high, upper width 5.7–8.6 µm, lower width 4.8–9.6 µm ( $n = 52$ ), J+, dark blue. Ascospores (31.7)39.2 ± 3.2(50) µm long, (6.7)11.9 ± 0.8(16.3) µm wide ( $n = 460$ ), inequilaterally ellipsoidal, dark brown, with straight germ slit extending over the whole spore length, both extremities with one 2–3 × 2–3 µm, semiglobose, cellular appendage, the whole spore surrounded by a 1 µm thick slimy sheath which is absent in older material. Conidia 6–8 × 3.5–4 µm.

Cultures on OA after 26 days at 20°C under 12 h dark and 12 h UV and fluorescent light covering plate (9 cm diam.), surface with velutinous black coating of 4–5 µm thick, shortly branched, melanised hyphae, centre sometimes remaining white, black areas sterile. Conidiophores variable in length forming at the edge of the plate on plastic or on white contact mycelium among different isolates, mononematous, mostly dichotomously branched, smooth, pale tan. Conidiogenous cells 7–51 × 3–4 µm ( $n = 21$ ), terminal or less frequently intercalary, cylindrical, geniculate with conspicuous, circular refractive frill, 1–1.5 µm diam., at each point of conidial dehiscence. Conidia 5–9 × 2.5–3(4) µm ( $n = 44$ ), elliptic to oblong, clavate, with flat, 1–1.5 µm broad base bearing a minute frill, smooth, subhyaline to light tan. On CMD after 9 days at 20°C under diffused daylight, 2–3 cm diam., flat, white, transparent, scant aerial mycelium, margin plume-like; after 25 days and under 12 h dark and 12 h UV and fluorescent light, 4–5 cm diam., grey-brown to dark grey-brown, transparent, no aerial mycelium, margin feathery, dendroidal. Conidiophores up to 250 µm long, scarce, only at colony margin, branched once or twice, each branch producing a penicillus of secondary branches and conidiogenous cells, smooth, pale tan. Conidiogenous cells 8–54 × 3 µm ( $n = 13$ ), geniculate with prominent circular refractive frill, 1–1.5 µm diam., at each point of conidial dehiscence. Conidia (4)6–8(9) × 3–4 µm ( $n = 22$ ), elliptic, with flat, non protuberant, 1–1.5 µm wide base bearing a refractive ring, smooth, subhyaline to pale tan. On PDA after 36 days at 20°C under diffused daylight, rapidly spreading, cottony,

**Fig. 25** *Rosellinia radiciperda*. A–D, Stromata, B and C showing subiculum between them; E, Vertical section of stroma, note stroma shell and detached perithecium; F, Ascospores, 6th showing germ slit, 4th and 5th showing cellular appendage (arrows); G, Ascus apical ring shown by Nomarski contrast; H, Ascus apical ring in Melzer's reagent. PDD 16420: A, B, D–H; PDD 44274: C. Scale bars: A, B, E = 1 mm; C, D = 0.5 mm; F = 10 µm; G, H = 5 µm.



with dark brown patches composed of many shortly branched black hyphae; around the original inoculum velvety, with erect much-branched hyphae, reverse with some brown discolorations. Areas of conidia formation grey-tan, at lines of contact between isolates. Conidiophores mononematous, erect, branched, smooth, hyaline to pale tan.

HOSTS: *Beilschmiedia tarairi*, *Beilschmiedia tawa*, *Brachyglottis repanda*, *Coprosma australis*, *Coprosma lucida*, *Olearia rani*, (*Pirus malus*), *Weinmannia* sp., unidentified hosts.

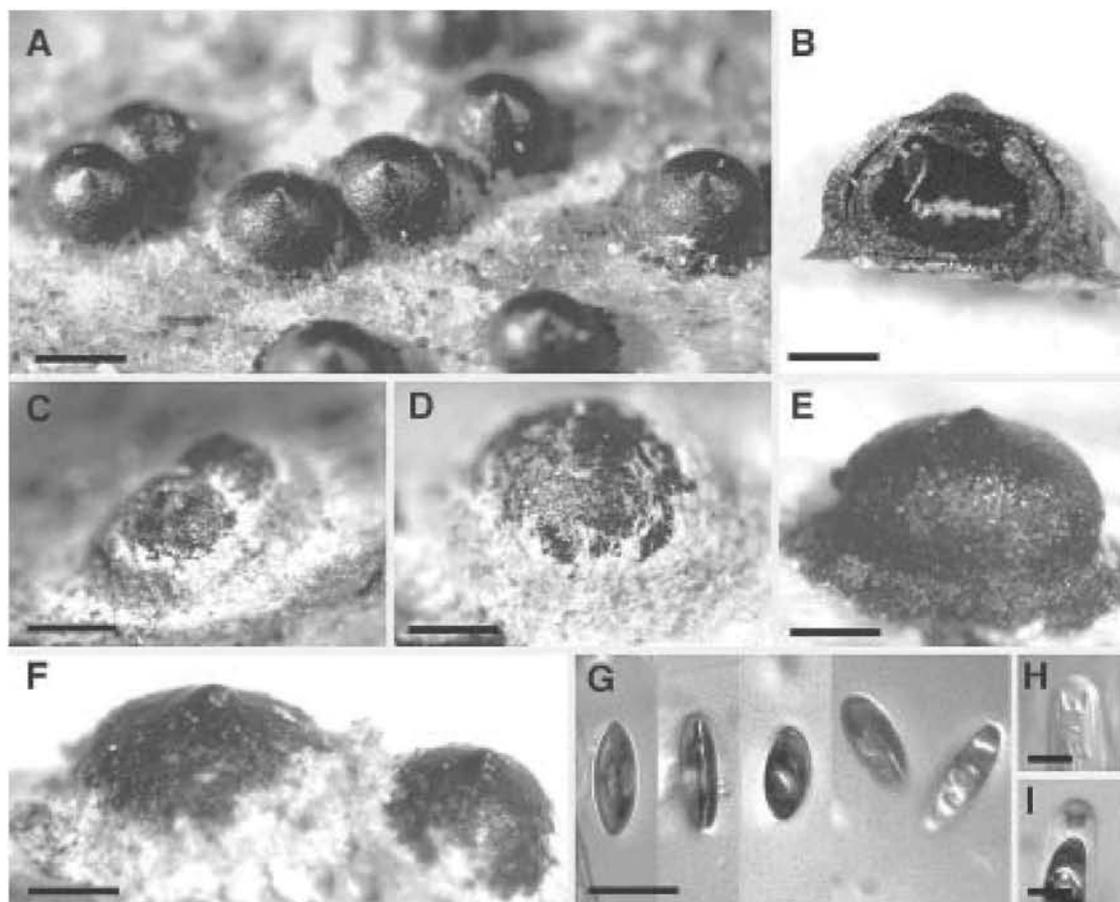
MATRIX: Corticated, decorticated, heavily decomposed wood.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Henderson, on dead wood, 23 Aug 1947, *J. M. Dingley*, PDD 16423; Hunua Ranges, Moumoukai Valley, on *Beilschmiedia tawa*, 12 Oct 1946, *J. M. Dingley*, PDD 4729; Hunua Ranges, on *Beilschmiedia tawa*, 25 Apr 1950, *J. M. Dingley*, PDD 16417; Hunua Ranges, on *Beilschmiedia tawa*, 11 Jun 1949, *J. M. Dingley*, PDD 16425; Kawau Island, on *Beilschmiedia tarairi*, 22 Dec 1947, *J. D. Atkinson*, PDD 16416; Purewa, on dead wood, Feb 1931, *M. Hodgkins*, PDD 10393; Waitakere Ranges, Rua-te-whenua, on *Beilschmiedia tawa*, Aug 1949, *J. M. Dingley*, PDD 16419 (two specimens); Waitakere Ranges, Cascade Kauri Park, on *Coprosma australis*, 17 Mar 1956, *J. M. Dingley*, PDD 16421; Waitakere Ranges, on unknown host, Feb 1931, *M. Hodgkins*, PDD 16889; Waitakere Ranges, Upper Piha Valley, on *Olearia rani*, 9 Oct 1963, *J. M. Dingley*, PDD 21738. BAY OF PLENTY: Rotorua, Rotoehu forest, on *Beilschmiedia tawa*, May 1862, *L. Bassar*, K\*; Rotorua, 1914, *Cheeseman*, K\*; Rotorua, on *Beilschmiedia tawa*, Dec 1949, *G. B. Rawlings*, PDD 16418; Rotorua, Waiotapu, on *Beilschmiedia tawa*, 17 Jun 1950, *J. M. Dingley*, PDD 16420; Rotorua, Rotoehu Forest, on *Beilschmiedia tawa*, 15 May 1962, *C. Bassett*, PDD 20313. COROMANDEL: Kauaeranga Valley, Thames Co., on *Weinmannia*, 2 Sep 1963, *J. M. Dingley*, PDD 28867; Whitianga Road, 1000 ft, on *Coprosma lucida*, 21 Aug 1963, *J. M. Dingley*, PDD 21447; Whitianga Road, 1000 ft, on *Brachyglottis repanda*, 21 Aug 1963, *J. M. Dingley*, PDD 21448, GZU 42478; vic. Thames, on bark of indet. tree, 1 May 1983, *G. J. Samuels* & *R. H. Petersen*, PDD 45800. GISBORNE: Urewera National Park, L. Waikaremoana, vic. Motor Camp, Ngamoko Track, on *Beilschmiedia tawa*, 24 May 1982, *G. J. Samuels* & *C. E. Samuels*, PDD 43175, cultures on OA, CMD (sterile). NORTHLAND:

Hokianga Co., Waipoua State Forest, Kauri Ricker Trail, along Waipoua River, on *Beilschmiedia tawa*, 31 May 1982, *G. J. Samuels*, *A. P. Hawthorne*, *P. R. Johnston*, & *R. H. Petersen*, PDD 44410, cultures on OA (sterile), CMD; Trounson Kauri Park, on *Beilschmiedia tawa*, 17 Mar 1963, *S. Davison*, PDD 20996; Trounson Kauri Park, on *Beilschmiedia tawa*, 20 Dec 1963, *F. J. Morton*, PDD 23046. TAUPŌ: on bark of fallen branch, 23 Aug 1999, *P. R. Johnston* & *B. M. Spooner*, PDD 70783\*; vic. Otorohanga, Rangitoto Station, zigzag track, on bark of fallen branch, 24 May 2000, *P. R. Johnston*, PDD 71728\*; vic. Otorohanga, Rangitoto Station, Saddle Track, on unidentified host, 24 May 2000, *P. R. Johnston*, PDD 71916\*. WAIKATO: Mt Pirongia, trail to Mahaukura, on *Beilschmiedia tawa*, 20 Aug 1980, *G. J. Samuels*, *P. R. Johnston*, & *M. E. Lanigan*, PDD 49665, anamorph on host, cultures on OA, PDA; Te Awamutu, Mt Pirongia, track to Mahaukura, on *Beilschmiedia tawa*, 27 Aug 1979, *G. J. Samuels* & *C. E. Samuels*, PDD 40012, culture on PDA; vic. Te Awamutu, Mt Pirongia, on *Beilschmiedia tawa*, 27 Mar 1982, *G. J. Samuels* & *C. E. Samuels*, PDD 44274, cultures on OA, CMD (sterile); on bark of undet. tree, 26 Apr 1983, *G. J. Samuels* & *P. R. Johnston*, PDD 45466; Waitomo caves, on bark of undet. tree, 26 Apr 1983, *G. J. Samuels*, *P. R. Johnston*, & *R. H. Petersen*, PDD 45467. WELLINGTON: Weraroa, on dead wood, 10 Jul 1919, *G. H. Cunningham*, PDD 897; Weraroa, on dead wood, 2 May 1923, *G. H. Cunningham*, PDD 1104; Weraroa, on dead wood, May 1923, *J. C. Neill*, PDD 1151. CHATHAM ISLANDS: Chatham Island, Kaingaroa, Weisner's Reserve, 5 Apr 1993, *P. R. Johnston*, PDD 63156\*; Nikau Bush, on bark of fallen log, 5 Apr 1993, *P. R. Johnston* & *E. H. C. McKenzie*, PDD 63178\*; Pitt Island: Glory Bay, 2 Jan 1969, *B. G. Hamlin*, PDD 39241\*, as *Hypoxylon bovei* Speg. UNKNOWN LOCALITIES: *J. Kirk*, K\* as *R. mammiformis*; on dead branch, Dec 1885, *W. Colenso*, K\* as *R. mastoidea* Sacc.

NOTES: *Rosellinia radiciperda* is easily recognised by the crowded stromata with a blunt apex and soft slopes, the subiculum with a purplish tinge, and its large, dark brown ascospores with a long germ slit, two cellular appendages, and slimy sheath.

Saccardo (1899) mentioned a *Dematophora* anamorph for *R. radiciperda*. Masee (1896) described a damaging effect of the mycelial stage of this fungus on its host plants similar to that known for *D. necatrix* Hartig. On the North Island only, common orchard trees and also several native trees



**Fig. 26** *Rosellinia rhopalostilicola*. **A, C–F**, Stromata, **C, D, F**, showing subiculum; **B**, Vertical section of stroma; **G**, Ascospores, 2nd showing germ slit; **H**, Ascus apical ring shown by Nomarski contrast; **I**, Ascus apical ring in Melzer's reagent. Type, PDD 49441. Scale bars: **A, C** = 0.5 mm; **B, D–F** = 0.25 mm; **G** = 10  $\mu$ m; **H, I** = 5  $\mu$ m.

and plants, especially growing on the border between indigenous forest and crop land, were affected. Masee (1896), therefore, postulated that the fungus had to be native to New Zealand. In fact, recent collections are from the North Island and exclusively on endemic hosts. He was not able to produce a *Dematophora* state in his inoculation experiment with the New Zealand mycelium and soil sample. Later, however, he received a parcel containing material, also from New Zealand, with fertile stromata collected from the base of a fallen and decayed *Pirus malus*. His illustrations of the ascospores match the spore shape of the type specimen of *R. radiciperda*. The type is rather old, the subiculum is worn away, and a dematiaceous hyphomycete and some mosses are present (Fig. 24E). Features of *R. radiciperda* are well

documented due to the many specimens examined, none of them on roots. Conidiophores typical of *Geniculosporium* were once found in the subiculum; in culture they were also mononematous.

The species most resembling *R. radiciperda* is *R. merrillii*, described from the Philippines. The latter has smaller ascospores and stromata that also lack the bluntly conical apex characteristic of the New Zealand species.

**15. *Rosellinia rhopalostilicola* L.E.Petrini, sp. nov.** Fig. 12Z-CC, 26

Subiculum evanescens, restrictum extensione 2–6  $\times$  1–2 mm, album, cremeum ad pallide brunneum, conidiophora ferens. Stromata (225)507  $\pm$  112(825)  $\mu$ m alta, (375)628  $\pm$  107(875)  $\mu$ m lata, semiglobosa ad cupulata, nigra, nitida, substrato ope disci

applanati maeriale stromatico compositi adhaerentia, solitaria vel in parvis gregibus stromatico strato insitis conferta, interdum plus quam unum perithecium continentia. Ostiola laeviter papillata, interdum parum evoluta. Annulus apicalis asci (1.9)2.3 ± 0.4(2.8) µm altus, parte superiore 2–3.6 µm et inferiore 1.5–2 µm latus, margine superiore non protuberanti, iodo pallide coerulescenti. Ascospores (10.5)13 ± 0.8(15.4) µm longae, (4.3)6 ± 0.5(10.5) µm latae, ellipsoideae, brunneae, fissura germinativa recta, ad totam ascosporam recurrenti vel paululo breviter praeditae. Status anamorphosis *Geniculosporium*.

ANAMORPH: *Geniculosporium*.

HOLOTYPE (hic designatus): New Zealand, North Island, Northland, Waipoua Forest, trail between Yakas Kauri and Forest Headquarters, on *Rhopalostylis sapida*, 24 Jun 1981, G. J. Samuels, A. P. Hawthorne, E. Horak, & R. Petersen, PDD 49441.

Subiculum evanescent, restricted in extension approx. 2–6 × 1–2 mm, in white, cream, to light brown patches, bearing conidiophores, covering stromatal initials, subsequently reduced while stromata progressively emerge and eventually confined to stromatal margins until absent in old material. Stromata (225)507 ± 112(825) µm high, (375)628 ± 107(875) µm wide (*n* = 60), semiglobose, cupulate to conical, black, smooth, shiny, adhering to the substrate with a flat ring composed of hard stromatic material, solitary or in small groups on a common stromatic layer, occasionally containing more than one perithecium. Young stromata covered by a cream to light brown to grey, felty, hyphal mat, progressively emerging during development until completely free at maturity. Ostioles finely papillate, sometimes minimally pronounced. Ectostroma 25–50 µm thick, hard, splintering. Entostroma not seen. Perithecia detached and collapsed in older material, located in the centre of cavity. Ascus apical rings (1.9)2.3 ± 0.4(2.8) long, upper width 2–3.6 µm, lower width 1.5–2 µm (*n* = 26), without bulge at upper margin, J+, pale blue. Ascospores (10.5)13 ± 0.8(15.4) µm long, (4.3)6 ± 0.5(10.5) wide (*n* = 290), ellipsoidal,

brown, with straight germ slit extending the whole spore length or ending shortly before. Conidia 3.5–5.5 × 2.5–3.5 µm.

Cultures on OA after 33 days at 20°C under 12 h dark and 12 h UV and fluorescent light (2.5)6–6.5 cm diam., velvety from short hyphae, dense, felty, white to tan, light grey in the centre, restricted grey pustules with conidiophores. Conidiophores up to 200 µm long, 3 µm wide, mononematous, macronematous, erect, irregularly dichotomously branched, smooth, pale tan. Conidiogenous cells 9–28 × 3 µm (*n* = 28), terminal or integrated, cylindrical, geniculate with circular refractive frill, 1 µm diam., at each point of conidial dehiscence. Conidia (2.5)3–5 × 2–3(4) µm (*n* = 44), subglobose to obovate, with flat, protuberant, c. 1 µm wide base bearing a refractive ring, smooth, subhyaline to pale tan. On CMD after 21 days under same conditions 2 cm diam., transparent, light grey-tan, with erect, short, much branched aerial hyphae, conidial production poor, restricted to few scattered tufts. Conidiophores variable in length, more than 150 µm, repeatedly branched, without main axis, smooth, subhyaline to pale tan. Conidiogenous cells variable in length, 2–3 µm wide, cylindrical, geniculate terminal, rarely intercalary with circular refractive frill at each point of conidial dehiscence. Conidia 3.5–5 × 2.5–3.5 µm (*n* = 22), subglobose to clavate, with flat, protuberant, base bearing a refractive ring, smooth, subhyaline to pale tan.

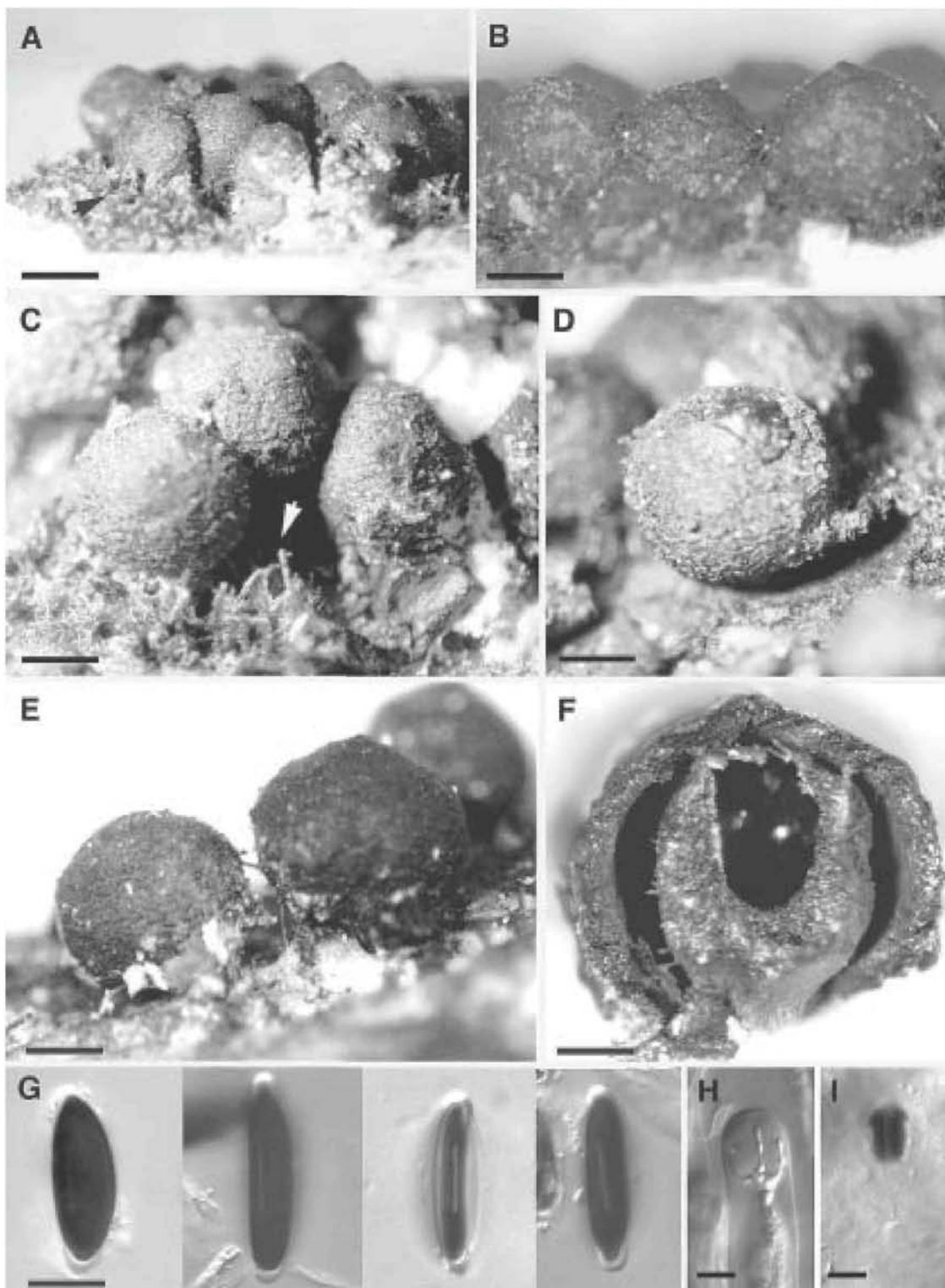
HOSTS: *Rhopalostylis sapida*.

MATRIX: Pieces of rachides.

ETYMOLOGY: Referring to the most frequent host, *Rhopalostylis*.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Waitakere Ranges, Fairy Falls Track, on *Rhopalostylis sapida*, 12 Aug 1981, G. J. Samuels, P. R. Johnston, R. E. Beever, R. P. Korf, & J. W. Paden, PDD 42073; Waitakere Ranges, Fairy Falls Trail, on *Rhopalostylis sapida*, 25 Jan 1980, G. J. Samuels & W. B. Kendrick, PDD 49625, anamorph on host; Waitakere Ranges, Fairy Falls Trail, on *Rhopalostylis sapida*, 7 May 1981, G. J. Samuels, P. R. Johnston & E. Horak, PDD 45719,

**Fig. 27** *Rosellinia samuelsii*. **A–E**, Stromata, **C** showing synnemata (arrow); **F**, Vertical section of stroma, note stroma shell and detached perithecium; **G**, Ascospores, 2nd to 4th showing short germ slit; **H**, Ascus apical ring shown by Nomarski contrast; **I**, Ascus apical ring in Melzer's reagent. Type, PDD 49690. Scale bars: A = 1 mm; B–E = 0.5 mm; F = 0.25 mm; G = 10 µm; H, I = 5 µm. ➤



culture on CMD; Waitakere Ranges, Fairy Falls Trail, on *Rhopalostylis sapida*, 27 Apr 1983, G. J. Samuels, P. R. Johnston, & R. H. Petersen, PDD 45782; Waitakere Ranges, Cascades, on *Rhopalostylis sapida*, 9 Mar 1981, G. J. Samuels & P. R. Johnston, PDD 49599, anamorph on host; Waitakere Ranges, Kauri Grove Trail, on *Rhopalostylis sapida*, 1 Jul 1980, G. J. Samuels & P. R. Johnston, PDD 49658, culture on OA; Waitakere Ranges, Kauri Grove Trail, on *Rhopalostylis sapida*, 1 Jul 1980, G. J. Samuels & P. R. Johnston, PDD 49659, culture on OA. NORTHLAND: Hokianga Co., Waipoua State Forest, between Forest Headquarters and a point c. ½ hr walk N of headquarters along Yakas Track, on *Rhopalostylis sapida*, 30 May 1982, G. J. Samuels, R. H. Petersen, A. P. Hawthorne, & P. R. Johnston, PDD 43199, anamorph on host; Hokianga Co., Waipoua State Forest, Kauri Ricker Track, on sheathing base of *Rhopalostylis sapida*, 22 Jun 1981, G. J. Samuels, R. H. Petersen, A. P. Hawthorne, & P. R. Johnston, PDD 41981. SOUTH ISLAND: BULLER: Karamea, Kohaihai, Nikau Walk, on *Rhopalostylis sapida*, 11 May 1994, P. R. Johnston, PDD 66226.

TYPE SPECIMEN EXAMINED OF RELATED SPECIES: *Rosellinia euterpes*: ISOTYPE, Brazil, Sta Catharina, Blumenau, on leaf of *Euterpe*, May 1888, E. Ule 839, HBG; Jun 1888, E. Ule 839, S, immature.

NOTES: *Rosellinia rhopalostilicola* has black, shiny stromata covered by a cream to light brown subiculum when young. It differs from *R. johnstonii* by apically rounded stromata, larger ascospores, and a symmetrical germ slit; from *R. mammoidea* by cupulate stromata with more pronounced ostioles, ascospores without a cellular appendage, and a germ slit extending the whole spore length; and from *R. communis* by stromatal shape and much smaller ascospores. It can be distinguished from *R. subiculata* by the subiculum colour and larger ascospores (Petrini 1993).

The presence of a subiculum in young stages as well as the *Geniculosporium* anamorph justify placement of this species in *Rosellinia*. Mature specimens without subiculum might be confused with *Astrocystis* spp. at first sight, because they occur

on palm and most species of *Astrocystis* are described from such hosts (Smith & Hyde 2001). The stromata of *R. rhopalostilicola*, however, show the regular nearly cupulate shape of typical *Rosellinia* and have well-pronounced papillate ostioles and the surface is smooth and shiny, without traces of a splitted stroma or adhering host material.

*Rosellinia euterpes* Rehm, also described from a palm, has wider, semiglobose, opaque stromata with less pronounced ostioles, smaller ascus apical rings and smaller ascospores than *R. rhopalostilicola*.

**16. *Rosellinia samuelsii* L.E.Petrini, sp. nov.**

Fig. 8Z-BB, 27

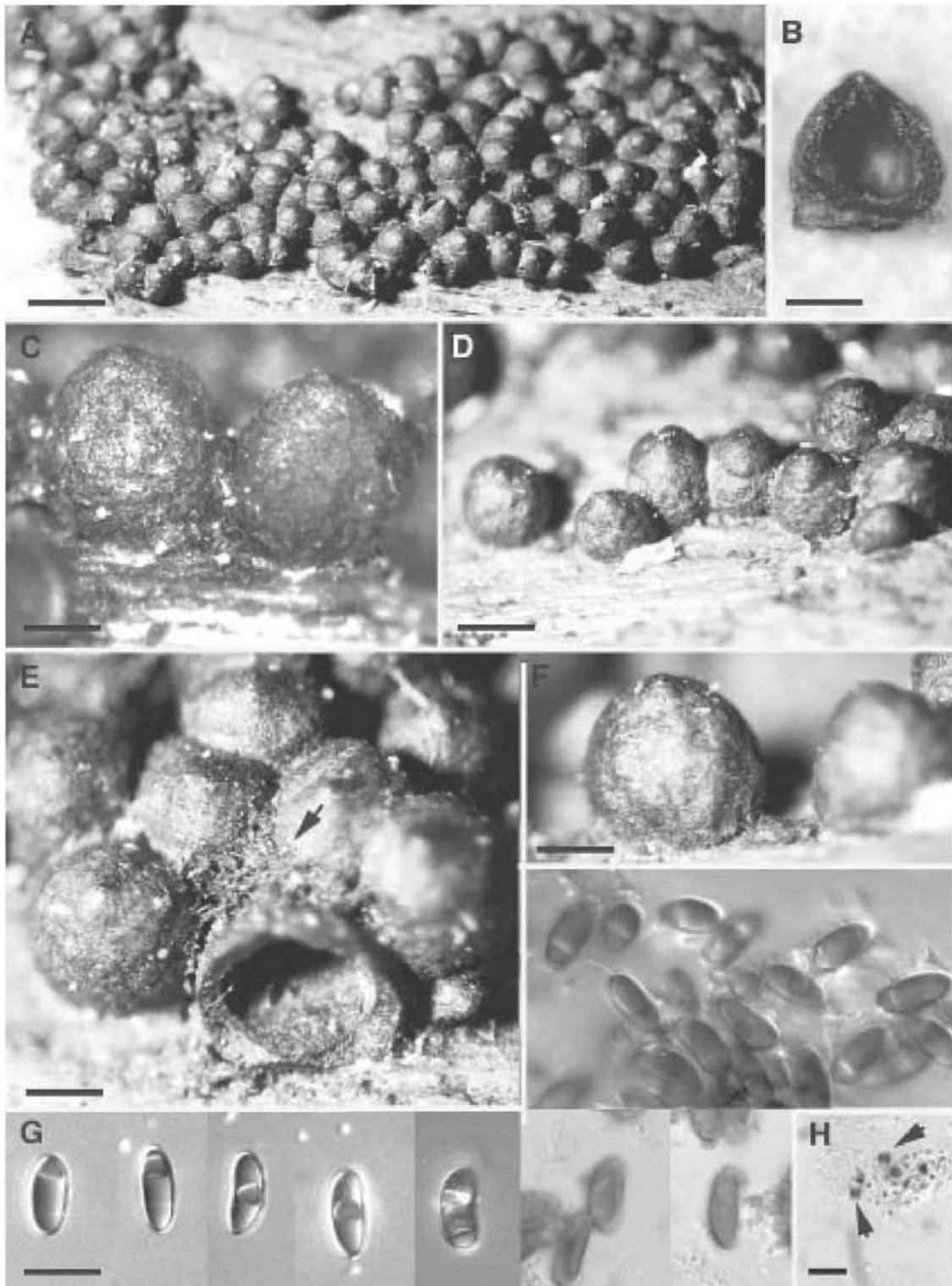
Subiculum perdurans, atrobrunneum, filo metallico simile, stromata orbum sed multis synnematis praeditum. Stromata (1050)1160 ± 125(1375) µm alta, (1125)1245 ± 99(1300) µm lata, globosa, basi lata brevicylindricaque, cupreobrunnea, ostiola circa nigra, superficie rugosa ad corrugata, solitaria ad gregaria lateraliter compressa. Ostiola grosse papillata. Annulus apicalis asci (6.7)7.3 ± 0.5(7.6) µm altus, parte superiore 4.5–5 µm et inferiore 3.5–4 µm latus, iodo valde coerulescenti. Ascospores (21.6)23.3 ± 1.4(26.9) µm longae, (6.7)7.7 ± 0.5(8.6) µm latae, asymmetricae ellipsoideae, brunneae ad atrobrunneae, fissura germinativa recta 10–13 µm longa in regione centrali partis planae ascosporae locata praeditae, apicibus parteque plana vagina mucosa 4.5 × 3–4 µm ad apices et 1 µm ad latus crassa circumdatis. Status anamorphosis *Dematophora*.

ANAMORPH: *Dematophora*.

HOLOTYPE (hic designatus): New Zealand, North Island, Auckland, Waitakere Ranges, Huia, Parau Tr., on decorticated wood, 23 Oct 1980, G. J. Samuels & P. R. Johnston, PDD 49690.

Subiculum persistent, dark brown, wiry, partially without stromata but with many synnemata. Stromata (1050)1160 ± 125(1375) µm high, (1125)1245 ± 99(1300) µm wide (*n* = 5), globose, with a short broad cylindrical base, copper brown, black around the ostioles, with rugose to wrinkled surfaces, solitary to crowded, becoming laterally compressed. Ostioles coarsely papillate. Ectostroma 75–100 µm thick, black, hard, splintering.

**Fig. 28** *Rosellinia stenasca*. **A**, **C–F**, Stromata, **E** showing subiculum (arrow); **B**, Vertical section of stroma with attached perithecium; **G**, Ascospores; **H**, Ascus apical rings in Melzer's reagent (arrows). PDD 46267. Scale bars: A = 1 mm; B, C, E, F = 0.25 mm; D = 0.5 mm; G = 10 µm; H = 5 µm. ▶



Entostroma cream, later dark brown, confined to base, absent in mature material. Perithecia detached and collapsed in mature material. Ascus apical rings  $(6.7)7.3 \pm 0.5(7.6)$   $\mu\text{m}$  long, upper width 4.5–5  $\mu\text{m}$ , lower width 3.5–4  $\mu\text{m}$  ( $n = 5$ ), J+, dark blue. Ascospores  $(21.6)23.3 \pm 1.4(26.9)$   $\mu\text{m}$  long,  $(6.7)7.7 \pm 0.5(8.6)$   $\mu\text{m}$  wide ( $n = 30$ ), inequilaterally ellipsoidal, brown to dark brown, with 10–13  $\mu\text{m}$  long straight germ slit centred on the flat side, both extremities and the flat side surrounded by a slimy sheath, up to  $4.5 \times 3\text{--}4$   $\mu\text{m}$  thick at the ends, 1  $\mu\text{m}$  thick at side. Synnemata up to 650  $\mu\text{m}$  high. Conidia  $6\text{--}10 \times 3\text{--}4$   $\mu\text{m}$ .

HOST: Undetermined hardwood.

MATRIX: Decorticated wood.

ETYMOLOGY: In honour of the mycologist G. Samuels who collected and cultured many of the *Rosellinia* specimens deposited at PDD.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *R. paraguayensis*: TYPE, Paraguay, ad truncum dejectum putrescentem in silva, 3 Aug 1893, *Sasso Thomaso*, S. *R. petrakii*: TYPE, India, Mysore, Sagar, on *Syzygium cumini*, 29 Sep 1971, *D. V. Narendra*, AMH.

NOTES: *Rosellinia samuelsii* combines characters of massive stromata, flattened, ellipsoidal ascospores with a short germ slit and a *Dematophora* anamorph. Many fertile synnemata are present in parts of the subiculum devoid of stromata.

*Rosellinia samuelsii* differs from *R. hughesii* by its larger stromata and larger ascospores with a short germ slit, and from *R. buxi* by a thinner ectostroma, larger ascus apical rings, ascospores surrounded partially by a slimy sheath and shorter germ slits, as well as larger conidia (Petrini 1993). *Rosellinia paraguayensis* Starbäck and *R. petrakii* Narendra have similarly shaped but larger ascospores than *R. samuelsii*. *Rosellinia paraguayensis* has also a *Dematophora* anamorph, in contrast to *R. petrakii*. *Rosellinia britannica* has ascospores of similar size, but it differs from *R. samuelsii* by the smaller stromata of a different shape, an evanescent subiculum with a *Geniculosporium* anamorph, and ascospores with a longer germ slit (Petrini et al. 1989).

**17. *Rosellinia stenasca*** Rick, *Brotéria* 1, 190 (1932) Fig. 80,P, 28

ANAMORPH: Unknown.

ISOTYPI: Brazil, São Leopoldo, in ligno frondoso, Rick, PACA; São Leopoldo, Rio Grande do Sul, 1907, FH\*.

Subiculum evanescent, brown, felty, remnants between brown stromata, black stromata free of subiculum. Stromata  $(500)610 \pm 72(700)$   $\mu\text{m}$  high,  $(525)615 \pm 58(675)$   $\mu\text{m}$  wide ( $n = 5$ ), conical to columnar, with bluntly rounded top, dark brown to black, solitary, crowded, touching each other. Ostioles finely papillate or not differentiated. Ectostroma 50  $\mu\text{m}$  thick, black. Entostroma not seen. Perithecia remaining attached to the stromatal wall. Ascus apical rings 1.9–2.9  $\mu\text{m}$  high, upper width 2.4–2.8  $\mu\text{m}$ , lower width 1.9–2.8  $\mu\text{m}$  ( $n = 5$ ), J+, pale blue. Ascospores  $(9.6)11 \pm 0.6(11.5)$   $\mu\text{m}$  long,  $(4.3)4.8 \pm 0.3(5.3)$   $\mu\text{m}$  wide ( $n = 30$ ), ellipsoidal, broadly rounded, light brown, with unclear, straight germ slit running over the whole spore length, one  $0.5 \times 2$   $\mu\text{m}$  large semiglobose, cellular appendage on immature spores and occasionally on mature ones.

HOST: Undetermined.

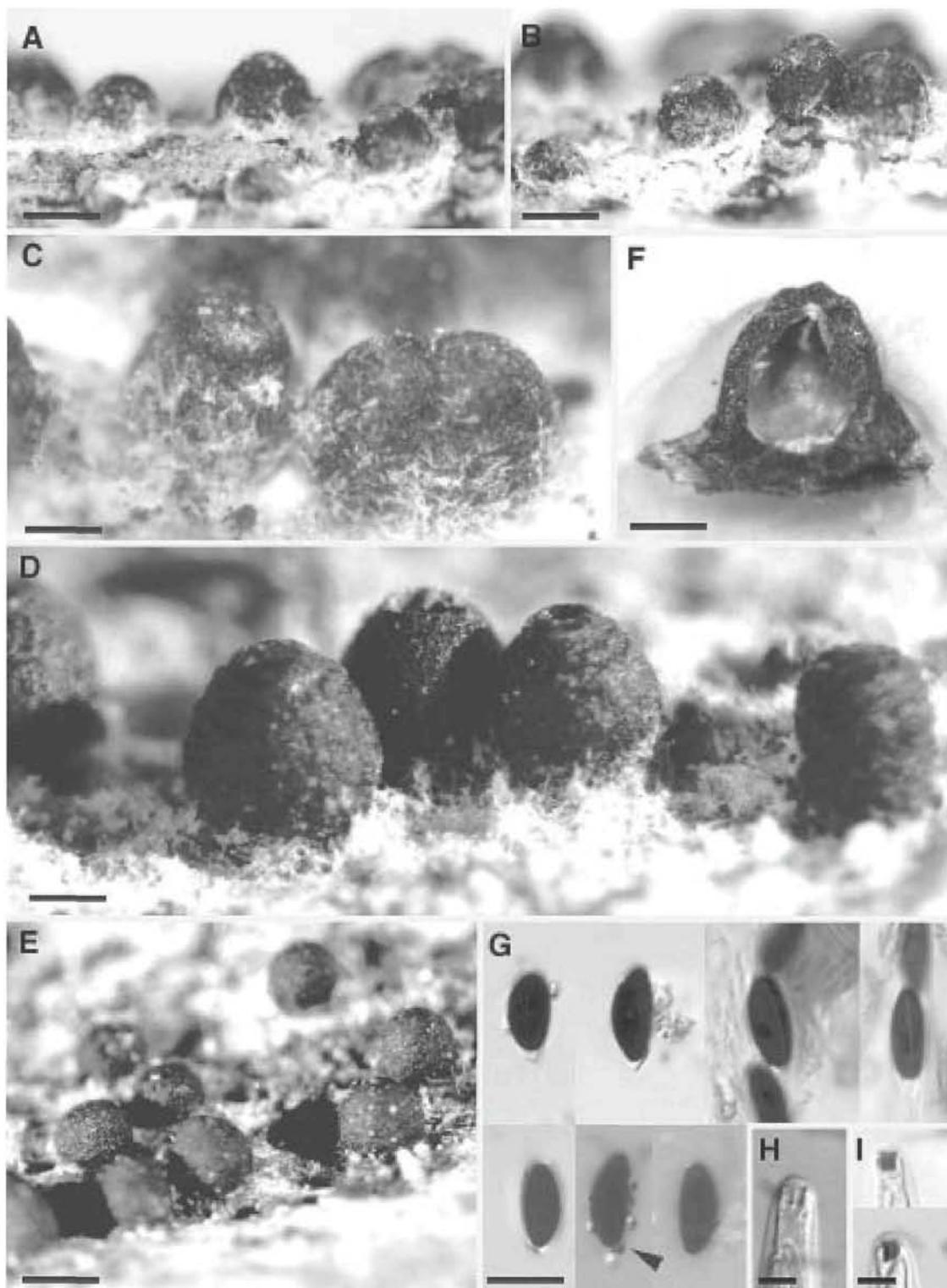
MATRIX: Decorticated, heavily decomposed hardwood.

ADDITIONAL SPECIMEN EXAMINED: NEW ZEALAND: NORTH ISLAND: COROMANDEL PENINSULA: Thames, Kauaeranga Valley, on decorticated wood, 1 May 1983, *G. J. Samuels* & *H. Petersen*, PDD 46267.

TYPE SPECIMENS EXAMINED OF RELATED SPECIES: *R. breensis*: ISOTYPE, Argentina, prov. Jujuy, Quinta prov. Laguna de la Brea, in trunco arbores sicco, 5 May 1901, *R. E. Fries*, S. *R. erianthi*: TYPE, India, New Dehli, on *Erianthus munja*, 29 Dec 1950, *B. L. Chona* & *Q. L. Munjal*, HClO. *R. pardalios*: TYPE, Pacific Ocean, Bonin Islands, *C. Wright*, K.

NOTES: *Rosellinia stenasca* has small ascospores for a *Rosellinia*. Its stromata are extremely crowded and therefore laterally compressed to form a uniform layer. In young material a subiculum is present and its remnants are still visible when mature, thus justifying the placement of this species in *Rosellinia*

**Fig. 29** *Rosellinia victoriae*. **A–E**, Stromata showing white subiculum; **F**, Vertical section of stroma; **G**, Ascospores, the two to the right in 1st row showing germ slit, others cellular appendages (arrow); **H**, Ascus apical ring shown by Nomarski contrast; **I**, Ascus apical rings in Melzer's reagent. PDD 21817. Scale bars: A, B, E = 0.5 mm; C, D, F = 0.25 mm; G = 10  $\mu\text{m}$ ; H, I = 5  $\mu\text{m}$ .



(Fig. 28E). Two original specimens collected by Rick held at FH and PACA (type) exhibit the same characteristics (L. E. Petrini unpubl. data). A discriminant analysis of ascospore size revealed no differences between the South American and the New Zealand collections (results not shown); the stroma size of the two species was also similar. The germ slit, faintly visible on the ascospores of the New Zealand material, could not be detected in either Rick collection. The age of the material and the very light coloured ascospores might have obscured the slit.

*Rosellinia breensis* Starbäck, *R. erianthi* Chona & Munjal, and *R. pardalios* (Berk. & M.A.Curtis) Cooke have ascospores of similar size as *R. stenascia*, but they are darker brown and their stromata differ in shape and size, especially in height.

**18. *Rosellinia victoriae*** Syd., *Ann. Mycol.* 6, 483 (1908) Fig. 8Q–S, 29  
= *Hypoxylon victoriae* (Syd.) Martin, *Jl. S. Afr. Bot.* 42, 74 (1976).

ANAMORPH: *Geniculosporium*.

HOLOTYPE: Australia, Victoria, County of Follett, on inner part of bark of tree, 16 Jun 1907, *F. M. Reader*, S\*.

Subiculum evanescent, white to cream, felty. Stromata (500)525 ± 35(575) µm high, (550)585 ± 22(600) µm wide (*n* = 5), conical, semiglobose to globose with broadly rounded top, black, crowded. Ostioles finely papillate or not differentiated. Ectostroma 50 µm thick, black. Entostroma not seen. Perithecia remaining attached to the stroma. Ascus apical ring 2.8–3.8 µm high, upper width 2.4–2.8 µm, lower width 1.9–2.8 µm (*n* = 5), J+, blue. Ascospores (11.5)12.9 ± 0.8(14.4) µm long, (5.3)5.7 ± 0.3(6.7) µm wide (*n* = 30), inequilaterally ellipsoidal, dark brown, with straight germ slit extending the whole spore length, occasionally one extremity with a 1 × 1 µm large, semiglobose, cellular appendage. Conidia 5–6 × 3 µm.

HOST: *Metrosideros robusta*.

MATRIX: Decorticated, heavily decomposed wood.

ADDITIONAL SPECIMEN EXAMINED: NEW

ZEALAND: NORTH ISLAND: COROMANDEL: Oamaru Bay, on *Metrosideros robusta*, 8 Aug 1963, *S. J. Hughes*, PDD 21817, anamorph on host.

NOTES: *Rosellinia victoriae* is characterised by a white to cream, evanescent subiculum, by small, almost globose stromata with poorly developed ostioles, and dark brown ascospores bearing a cellular appendage that is visible at maturity. Examination of the type material from S revealed no differences between the two specimens. Therefore, the name *R. victoriae* can be applied also to the New Zealand collection.

*Rosellinia victoriae* differs from *R. rhopalostilicicola* by the stroma shape, poorly expressed ostioles, ascospores with a cellular appendage and larger conidia.

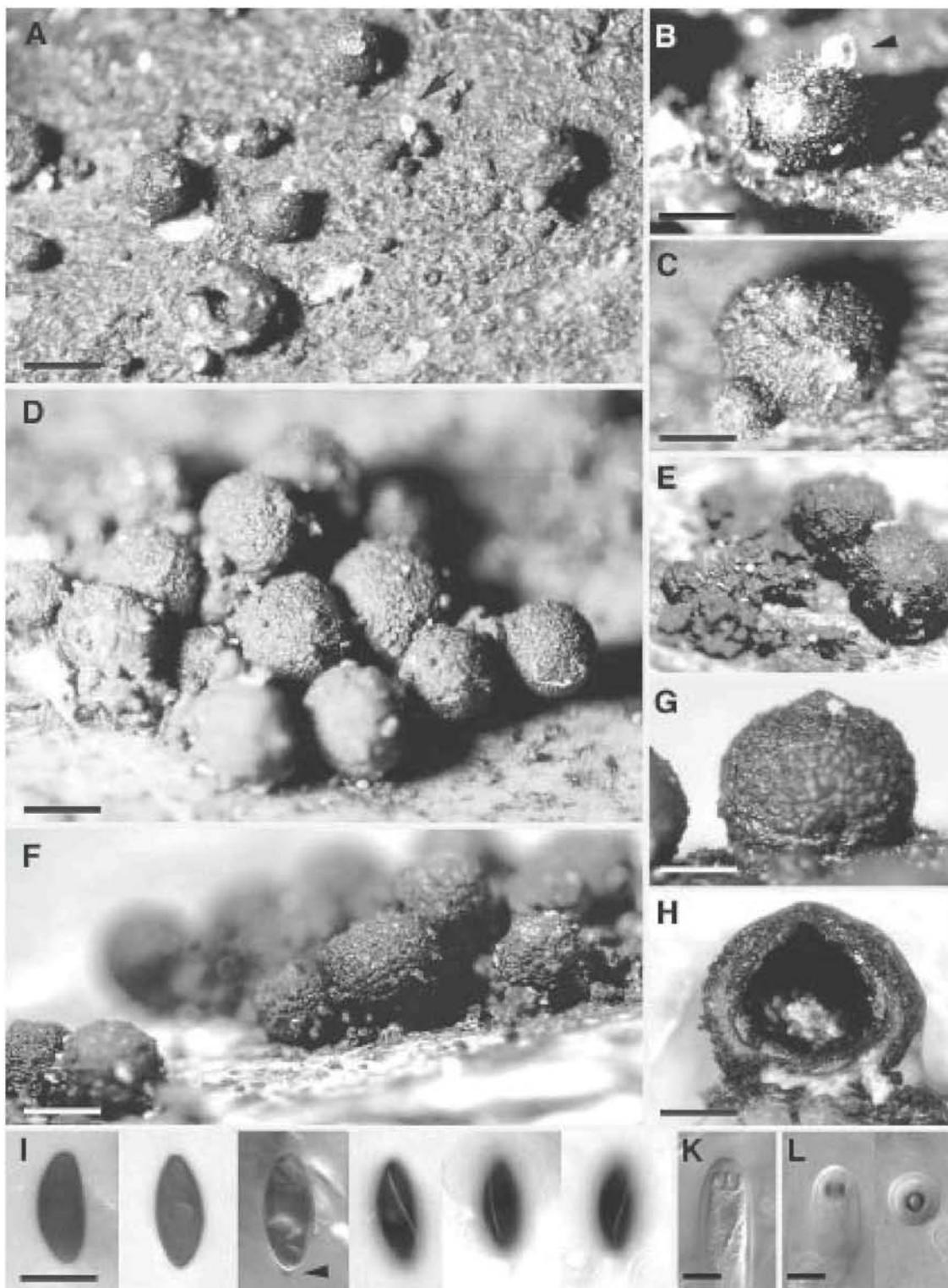
*Stilbohypoxyton* Henn., *Hedwigia* 41, 16 (1902)

Stromata globose to subglobose, surface rugose, with cracks, with pegs of conidial stromata attached, or warty, soft, leathery, or carbonaceous ectostroma tightly attached to entostroma. Entostroma white, perithecia adhering firmly to the entostroma, paraphyses and asci soon evanescent, ascus apical ring staining blue in Melzer's reagent. Ascospores unicellular, brown, with straight or sigmoid germ slit, sometimes with cellular appendages. Conidiophores developing on cylindrical stromata prior to teleomorphic stroma forming beneath and then being pushed up- or sideward, remaining as pegs on teleomorphic stromata or breaking away. Anamorph: unnamed coremium.

*Stilbohypoxyton novae-zelandiae* L.E.Petrini, sp. nov. Fig. 2L–O, 30

Stromata (350)485 ± 70(700) µm alta, (400)553 ± 82(775) µm lata, sub epidermide ut minuta strobila formantia, erumpentia dum crescentia, strobilis dein in stromate formato insidentibus citoque disruptentibus, globosa vel semiglobosa, cupulata, nigra, parte inferiori rugosa minutis fissuris in vetustis speciminibus distinctioribus praedita, mollia, coriacea, solitaria ad dense gregaria, greges parvos formantia. Ostiola minute ad grosse papillata, interdum ampulliformia, raro in disco ad 175 µm diametro insita. Ectostroma ad 25 µm crassum,

**Fig. 30** *Stilbohypoxyton novae-zelandiae*. **A–G**, Stromata, **A, B** showing anamorphic stroma (arrows); **H**, Vertical section of stroma, note thin ectostroma attached to white entostroma, black line inside perithecium; **I**, Ascospores, 3rd with cellular appendage (arrow), 4th to 6th showing sigmoid germ slit; **K**, Ascus apical ring shown by Nomarski contrast; **L**, Ascus apical rings in Melzer's reagent, the one on the right viewed from top. Paratype, PDD 49602: **A–F**; Type, PDD 39480: **G–I, K, L**. Scale bars: **A, D–F** = 0.5 mm; **B, C, G, H** = 0.25 mm; **I** = 10 µm; **K, L** = 5 µm.



nigrum, entostromati omnino adhaerens. Annulus apicalis asci (1.9)2.3 ± 0.4(3.3) µm altus, parte superiore 2.4–3.8 µm et inferiore 1.9–2.8 µm latus, margine superiori non protuberanti, iodo pallide coerulescenti. Ascospores (9.6)15.3 ± 1(18.2) µm longae, (5.8)6.7 ± 0.4(8.2) µm latae, ellipsoideae ad asymmetric ellipsoideae, brunneae ad atrobrunneae, fissura germinativa recta vel sigmoidea. Cellularis semiglobosa appendix 0.5–1 × 0.5–1 µm magna in nonnullis ascoporis adest.

ANAMORPH: Unnamed coremium.

HOLOTYPUS (hic designatus): New Zealand, North Island, Auckland, Waitemata City, Titirangi, Clarke's Bush, G. J. Samuels, W. Versluys, P. R. Johnston, & Y. Joe, 19 Apr 1979, PDD 39480; PARATYPUS (hic designatus): Waitakere Ranges, Cascades, on *Cyathea dealbata*, 9 Mar 1981, G. J. Samuel & P. R. Johnston, PDD 49602, cultures on OA, PDA.

Stromata (350)485 ± 70(700) µm high, (400)553 ± 82(775) µm wide ( $n = 95$ ), developing as small pegs below the epidermis, breaking through while growing, later seen as protuberances on the adult stroma, soon breaking off, globose to semiglobose, cupulate, black, lower part rugose with small cracks, more pronounced in older material, soft, leathery, solitary or densely crowded, forming small groups. Ostioles finely to coarsely papillate, sometimes ampulliform, rarely seating in a disk, up to 175 µm diam. Ectostroma less than 25 µm thick, black, completely adhering to the entostroma. Entostroma white, soft, absent in old material. Perithecia remaining tightly attached to the entostromata. Ascus apical rings (1.9)2.3 ± 0.4(3.3) µm high, upper width 2.4–3.8 µm, lower width 1.9–2.8 µm ( $n = 54$ ), without bulge at upper margin, J+, pale blue. Ascospores (9.6)15.3 ± 1(18.2) µm long, (5.8)6.7 ± 0.4(8.2) µm wide ( $n = 377$ ), ellipsoidal to inaequilateral ellipsoidal, brown to dark brown, with sigmoid or straight germ slit; one minute, 0.5–1 × 0.5–1 µm, semiglobose, cellular appendage present on some mature spores.

Cultures on OA after 25 to 30 days at 20°C under 12 h dark and 12 h UV and fluorescent light 8–9 cm diam., white at the margin, composed of short hyphae, otherwise with dark olivaceous black stromatic areas bearing upright stromata up to 350 µm high and 300 µm, brown at base, white to pink towards top, sterile or with conidiophores on upper parts, sometimes concentric rings of growth. Conidiophores up to 100 µm long, 5 µm wide, compact, interwoven to form tight and uniform

40–50 µm high palisades arising from a small-celled pseudoparenchymatous base, irregularly dichotomously branched, ultimate cell conidiogenous, smooth, subhyaline, pale tan towards the base. Conidiogenous cells 9–15 × 3 µm ( $n = 16$ ), polyblastic, cylindrical, terminal, integrated, denticulate with a thin-walled separating cell, rupturing across the middle and leaving a minute circular refractive frill at each point of conidial dehiscence. Conidia 5–7.5 × 2–3 µm ( $n = 66$ ), clavate to elliptic with a broad tip and a truncate 0.5–1 µm wide base bearing a minute refractive frill, smooth, subhyaline. On CMD after 25 days under same conditions, 4–5 cm diam., white, transparent, without aerial mycelium, occasionally some immersed, discrete, brown stromal masses with conidial production or remaining sterile at all. Conidiophores formed on sporodochial structures, 50–70 µm long, poor, characters as on OA. On PDA after 30 days under same conditions, 8.5–9 cm diam., flat, cottony, white, with brown stromatic pustules breaking through the agar surface, becoming tubercular, discrete, sterile, composed of broad filaments arranged in palisades or bearing conidiophores and conidia, powdery, white, characters as on OA.

HOSTS: *Cyathea dealbata*, *Cyathea medullaris*, *Cyathea* sp., *Dicksonia squarrosa*.

MATRIX: Rachides.

ETYMOLOGY: Refers to the geographical origin, in New Zealand.

ADDITIONAL SPECIMENS EXAMINED: NORTH ISLAND: AUCKLAND: Henderson, Mountain Road, Walker Bush Track, on dead wood (monocotyledonous), 13 Dec 1973, W. B. Kendrick, PDD 40453; Te Morehu Scenic Reserve, between Kawakawa Bay and Orere Point, on *Cyathea medullaris*, 25 Jun 1980, G. J. Samuels, P. R. Johnston, & M. E. Lanigan, PDD 49657, culture on OA, PDA; vic. Kawakawa Bay, Te Morehu Scenic Reserve, on *Cyathea medullaris*, 4 Dec 1980, G. J. Samuels, M. E. Lanigan, P. R. Johnston, & M. Ratray, PDD 49707, culture on CMD; Waitakere Ranges, Marguerite Track, on *Cyathea medullaris*, 27 Sep 1997, G. J. Samuels, Y. Joe, & P. R. Johnston, PDD 40013; Waitakere Ranges, Cascades, on rachis of *Cyathea dealbata*, 12 Aug 1981, G. J. Samuels, P. R. Johnston, & J. W. Paden, PDD 41986; Waitakere Ranges, Piha Road, Cowan Trail, on *Dicksonia squarrosa*, 4 Jun 1983, G. J. Samuels & A. Y. Rossman, PDD 46320, cultures on OA, CMD; Waitakere Ranges, Huia, on *Cyathea medullaris*, 26

Mar 1981, *G. J. Samuels, P. R. Johnston, J. M. Dingley, & H. Thiers*, PDD 49615, culture on CMD; Waitemata City, Titirangi, Clarke's Bush, on *Cyathea medullaris*, 19 Apr 1979, *G. J. Samuels, W. Versluys, P. R. Johnston, & Y. Joe*, PDD 39481, culture on PDA; Waitemata City, Titirangi, Clarke's Bush, on *Cyathea dealbata*, 3 May 1979, *G. J. Samuels, E. H. C. McKenzie, P. R. Johnston, & Y. Joe*, PDD 39482; c. 15 km south of Wellsford, Waihiu Valley, on rachis of *Cyathea medullaris*, 6 Jun 1981, *G. J. Samuels, P. R. Johnston, & E. Horak*, PDD 41975. COROMANDEL: vic. Thames, Kauaeranga Valley, on *Cyathea dealbata*, Apr 1980, *G. J. Samuels & W. B. Kendrick*, PDD 49681, culture on OA. NORTHLAND: Hokianga Co., Puketi State Forest, Loop Track from Forest Headquarters, on *Dicksonia squarrosa*, 2 Jun 1982, *G. J. Samuels & P. R. Johnston*, PDD 44414; North Cape, Te Pahi Coastal Reserve, Pandora, on *Cyathea* sp., 7 Feb 1975, *J. C. Watt & G. J. Samuels*, PDD 37128; vic. Mangamuka Bridge, Omahuta State Forest, No. 3 Road, Waikoropupu R., on *Cyathea medullaris*, 15 May 1981, *G. J. Samuels & E. Horak*, PDD 49473, culture on OA; vic. Mangamuka Bridge, Omahuta State Forest, No. 3 Road, Waikoropupu River, on *Cyathea medullaris*, 15 May 1981, *G. J. Samuels & E. Horak*, PDD 49482. WAIKATO: Mt Pirongia, on *Cyathea dealbata*, 7 Jul 1977, *G. J. Samuels, C. E. Samuels, & R. Ferguson*, PDD 47529; Waitomo Caves, on *Dicksonia squarrosa*, 26 Apr 1983, *G. J. Samuels, P. R. Johnston, & R. H. Petersen*, PDD 45465.

NOTES: *Stilbohypoxyton novae-zelandiae* shows the typical stromatal features of the genus such as a thin, soft, leathery ectostroma with a persistent, white entostroma and an attached peridium (Fig. 30H). In young material the anamorph-bearing structures can be observed as white to pink pegs directly on the host or on the stroma (Fig. 30A,B). On OA, anamorphic structures were readily produced.

This species seems to be specific on pteridophytes, *Cyathea* spp. being the preferred hosts. Pteridophytes, especially tree ferns, as hosts are remarkable for this species, as they have not previously been recorded as substrates for xylariaceous fungi (Rogers 1979). Ju & Rogers (1999) reported this species previously as *Stilbohypoxyton* sp. In addition to material from New Zealand, this species is recorded from Taiwan and Venezuela on palm fronds.

*Stilbohypoxyton novae-zelandiae* has ascospores of a similar size as those of *S. moelleri*, but the ascospores of the former species have a cellular

appendage and a sigmoid germ slit whereas those of the latter have slimy caps and a straight germ slit. Stromata of *S. mölleri* are larger and less aggregated. Other described species of *Stilbohypoxyton* (*S. quisquiliarum* and *S. samuelsii* J.D.Rogers & Y.M.Ju) have larger stromata and ascospores than *S. novae-zelandiae* (Rogers & Ju 1997). *S. novae-zelandiae* has a similar anamorph as described for *S. moelleri* and *S. quisquiliarum* (Rogers & Ju 1997).

## DISCUSSION

### *Astrocystis*

*Astrocystis cyatheae* was found in Auckland, exclusively on *Cyathea dealbata*, a tree fern which is native to New Zealand. It is the only *Astrocystis* species known from New Zealand. As *Astrocystis* spp. are exclusively reported from monocots elsewhere, it is somewhat surprising that no other species has been collected, e.g., on *Rhopalostylis* or *Freyinetia*, two monocotyledonous hosts regularly monitored by New Zealand mycologists.

### *Helicogermis*

*Helicogermis* in New Zealand accounts for four species. Three of them are described as new. The type specimen of *H. aucklandica* (= *Rosellinia aucklandica*) was collected in Auckland (Rabenhorst 1878), whereas the only collection examined here was from Canterbury, in the South Island. *Helicogermis gisbornia* (2 specimens) is at present geographically confined to Gisborne, North Island, whereas *H. mackenziei* (2 specimens) was collected on Stewart Island, south of, and Chatham Islands, at approximately the same latitude as, the South Island. One specimen of *H. johnstonii* was collected on the North Island (Taupo) and the other three on Campbell Island. Substrates known for *H. gisbornia* are the native *Beilschmiedia tawa* and *Weinmannia racemosa*; *Coprosma* sp. and (tentatively) *Dacrophyllum* are hosts for *H. johnstonii*.

### *Rosellinia*

Only three species of *Rosellinia*, viz *R. radiciperda*, *R. mammoidea*, and *R. aucklandica*, have been described previously from New Zealand. *Rosellinia radiciperda* is the most common species (35 collections). The 20 hosts identified were exclusively New Zealand native plants. Fourteen specimens were from *Beilschmiedia tawa*, two from *Coprosma* spp., and only one collection each from

*Beilschmiedia tarairi*, *Brachyglottis repanda*, *Olearia rani*, and *Weinmannia* sp. *Rosellinia radiciperda* was most frequently collected in the northern part of the North Island, especially Auckland, which accounts for about one third of the *R. radiciperda* collections. Only three specimens originated from the southern part of North Island (Wellington). Three specimens were from Chatham Islands.

Many specimens deposited in PDD were labelled as *R. mammoidea*, but, of these, only four can be assigned to that species. The remaining specimens are *R. communis*. The only known host for *R. mammoidea* is a native plant, *Metrosideros robusta*. Two collections in PDD and the type specimen were collected on the North Island, in Wellington Province, whereas the other two specimens were found on the Auckland Islands.

Specimens previously identified as *Rosellinia aucklandica* turned out to belong to *Helicogermis* (see above).

Some specimens could be assigned to five previously described *Rosellinia* species. Three of them, *R. chusqueae*, *R. longispora*, and *R. stenasca*, were first reported from southern (subtropical-temperate) South America, while *R. arcuata* was described from southern Sri Lanka. The origin of *R. victoriae* is Victoria (southern Australia), at approximately the same latitude as the North Island. With the exception of *R. arcuata*, each of the known species is represented by only one specimen from New Zealand, all collected on the North Island in the provinces of Auckland (*R. arcuata*), Coromandel (*R. stenasca*, *R. victoriae*), Gisborne (*R. arcuata*), and Northland (*R. arcuata*, *R. chusqueae*, *R. longispora*). Most of the hosts remained unidentified. Native host plants are recorded for one specimen of each of *R. arcuata* (*Freyinetia banksii*), *R. longispora* (*Rhopalostylis sapida*), *R. victoriae* (*Metrosideros robusta*).

Eleven species of *Rosellinia* are described here as new. *R. communis*, *R. johnstonii*, *R. novae-zelandiae*, and *R. rhopalostilicola* seem common, having been collected more frequently than the other species. The largest number of these specimens is from the North Island, Auckland hosting the most. Single collections originate from Bay of Plenty, Coromandel, and Northland. Only five specimens of *R. communis* and one of *R. rhopalostilicola* are from the South Island, and only a single record of *R. johnstonii* originates from Auckland Islands. *Rosellinia communis* is almost exclusively confined to New Zealand native plants, as are *R. johnstonii*

and *R. rhopalostilicola*, the former two occurring on a wide host range. *Rosellinia novae-zelandiae* fruits on native as well as on introduced plants. It is the only species being collected regularly on introduced plants.

The other new *Rosellinia* species are each represented by only 1–5 collections, mainly from the North Island, particularly from the Auckland area (*R. freycinetiae*, *R. samuelsii*). Single records are from Gisborne (*R. gisbornia*), Northland (*R. dingleyae*), and Taupo (*R. nothofagi*). From the South Island *R. hughesii*, one specimen of *R. gisbornia*, and two specimens of *R. nothofagi* are known. The only specimen of *R. palmae* is from the volcanic Raoul Island (Kermadec Islands) and has been collected on the endemic *Rhopalostylis bauerii* from an orchard. It is the only record from a tropical climate.

Of the sections described by Petrini (1993), only two are represented in New Zealand. *Rosellinia arcuata*, *R. freycinetiae*, *R. hughesii*, *R. nothofagi*, *R. novae-zelandiae*, *R. radiciperda*, and *R. samuelsii* belong to the section *Rosellinia*, whereas *R. chusqueae*, *R. communis*, *R. dingleyi*, *R. gisbornia*, *R. johnstonii*, *R. longispora*, *R. mammoidea*, *R. palmae*, *R. rhopalostilicola*, *R. stenasca*, and *R. victoriae* are typical representatives of the section *Calomastia*. No species of the section *Corrugata* has so far been recorded.

### *Stilbohypoxylon*

*Stilbohypoxylon novae-zelandiae* was collected on the North Island, mainly in Auckland; single records are from Northland, Coromandel, and Waikato. Most specimens were found on *Cyathea* spp., and only three on *Dicksonia squarrosa*, all pteridophytes being native to New Zealand.

### Host considerations

This study confirms the cosmopolitan distribution of Xylariaceae, especially *Rosellinia*, and their ability to develop fruiting structures on a wide host range (Rogers 1979). Xylariaceous fungi colonise a diverse range of substrates, such as tree ferns, screw pines, palms, and conifers. Some species are restricted to one substrate, others are able to colonise several hosts. Most species occur mainly on New Zealand native plants (Table 1). Only one species (*R. novae-zelandiae*) colonises a wide host range of native and introduced plants. As the substrate for over 60 specimens could not be identified, Table 1 is not exhaustive; conclusions on host specificity are therefore only indicative and refer to the known hosts.

**Table 1** Host list for species of *Rosellinia* and related genera in New Zealand. \*, indigenous to New Zealand.

Host	Fungal species
<b>Pteridophyta</b>	
Cyatheaceae	
* <i>Cyathea dealbata</i> (G.Forst.) Sw.	<i>A. cyatheae</i> , <i>S. novae-zelandiae</i>
* <i>Cyathea medullaris</i> (G.Forst.) Sw.	<i>S. novae-zelandiae</i>
<i>Cyathea</i> sp.	<i>S. novae-zelandiae</i>
Dicksoniaceae	
* <i>Dicksonia squarrosa</i> (G.Forst.) Sw.	<i>S. novae-zelandiae</i>
<b>Monocotyledons</b>	
Pandanaceae	
* <i>Freycinetia baueriana</i> subsp. <i>banksii</i> (A.Cunn.) B.C.Stone	<i>R. arcuata</i> , <i>R. communis</i> , <i>R. freycinetiae</i>
Arecaceae	
* <i>Rhopalostylis baueri</i> H.Wendl. & Drude var. <i>cheesemani</i> (Becc.) Sykes	<i>R. palmae</i>
* <i>Rhopalostylis sapida</i> H.Wendl. & Drude	<i>R. communis</i> , <i>R. longispora</i> , <i>R. rhopalostilicola</i>
<b>Conifera</b>	
Araucariaceae	
* <i>Agathis australis</i> (D.Don) Lindl.	<i>R. johnstonii</i>
<b>Dicotyledons</b>	
Actinidiaceae	
<i>Actinidia chinensis</i> Planch.	<i>R. novae-zelandiae</i>
Araliaceae	
* <i>Pseudopanax arboreum</i> (Murray) K.Koch (= <i>Neopanax arboreum</i> (Murray) Allan)	<i>R. communis</i>
<i>Pseudopanax</i> sp.	<i>R. novae-zelandiae</i>
* <i>Schefflera digitata</i> J.R. & G.Forst.	<i>R. communis</i>
Asteraceae	
* <i>Brachyglottis repanda</i> J.R. & G.Forst.	<i>R. communis</i> , <i>R. radiciperda</i>
* <i>Olearia rani</i> (A.Cunn.) Druce	<i>R. radiciperda</i>
Celastraceae	
<i>Euonymus japonicus</i> Thunb.	<i>R. novae-zelandiae</i>
Cunoniaceae	
*? <i>Weinmannia racemosa</i> L.f.	<i>H. gisborniae</i>
<i>Weinmannia</i> sp.	<i>R. radiciperda</i>
Elaeocarpaceae	
* <i>Elaeocarpus dentatus</i> (J.R. & G.Forst.) Vahl	<i>R. johnstonii</i>
Epacridaceae	
? <i>Dacrophyllum longifolium</i> (J.R. & G.Forst.) R.Br.	<i>H. johnstonii</i>
Fabaceae	
<i>Paraserianthes lophantha</i> (Willd.) Nielsen (= <i>Albizia lophantha</i> (Willd.) Benth.)	<i>R. novae-zelandiae</i>
Juglandaceae	
<i>Juglans regia</i> L.	<i>R. necatrix</i> (anamorph)
Lauraceae	
* <i>Beilschmiedia tarairi</i> (A.Cunn.) Benth. & Hook.f. ex Kirk	<i>R. radiciperda</i>
* <i>Beilschmiedia tawa</i> (A.Cunn.) Benth. & Hook.f. ex Kirk	<i>H. gisborniae</i> , <i>R. communis</i> , <i>R. novae-zelandiae</i> , <i>R. radiciperda</i>
Leguminosae	
* <i>Sophora microphylla</i> Aiton	<i>R. communis</i>
Malvaceae	
* <i>Hoheria populnea</i> A.Cunn.	<i>R. hughesii</i>
Meliaceae	
* <i>Dysoxylum spectabile</i> (G.Forst.) Hook.f.	<i>R. johnstonii</i>
Monimiaceae	

(continued over page)

Table 1 (continued)

Host	Fungal species
* <i>Hedycarya arborea</i> J.R. et G.Forst. Myrtaceae	<i>R. communis</i>
* <i>Metrosideros robusta</i> A.Cunn. Nothofagaceae	<i>R. mammoidea</i> , <i>R. victoriae</i>
* <i>Nothofagus solandri</i> (Hook.f.) Oerst. <i>Nothofagus</i> sp.	<i>R. communis</i> , <i>R. nothofagi</i> <i>R. nothofagi</i>
* <i>Nothofagus truncata</i> (Colenso) Cockayne Piperaceae	<i>R. johnstonii</i>
* <i>Macropiper excelsum</i> (G.Forst.) Miq. Pittosporaceae	<i>R. communis</i> , <i>R. dingleyae</i>
* <i>Pittosporum crassifolium</i> Banks & Sol. ex A.Cunn. * <i>Pittosporum umbellatum</i> Banks & Sol. ex Gaertn.	<i>R. novae-zelandiae</i> <i>R. johnstonii</i>
Rosaceae	
<i>Pirus malus</i> L.	? <i>R. radiciperda</i> (type description referable to <i>R. necatrix</i> )
<i>Prunus persica</i> (L.) Batsch	<i>R. novae-zelandiae</i>
<i>Rosa</i> sp. cult.	<i>R. novae-zelandiae</i>
Rubicaceae	
* <i>Coprosma arborea</i> Kirk	<i>R. johnstonii</i>
* <i>Coprosma grandifolia</i> Hook.f. (= <i>Coprosma australis</i> (A.Rich.) Rob.)	<i>R. radiciperda</i>
* <i>Coprosma lucida</i> J.R. & G.Forst. <i>Coprosma</i> sp.	<i>R. radiciperda</i> <i>H. johnstonii</i>
Salicaceae	
<i>Populus</i> sp.	<i>R. communis</i> , <i>R. novae-zelandiae</i>
<i>Salix caprea</i> L.	<i>R. novae-zelandiae</i>
<i>Salix</i> sp.	<i>R. novae-zelandiae</i>
Solanaceae	
<i>Solanum mauritianum</i> Scop. (= <i>Solanum auriculatum</i> Aiton)	<i>R. novae-zelandiae</i>
Violaceae	
* <i>Melicytus ramiflorus</i> J.R. & G.Forst.	<i>R. communis</i>

Rogers (1979) pointed out that Xylariaceae had never been reported to fruit on pteridophytes. Later work established their presence as endophytes of ferns (especially *Xylaria* spp.; Dreyfuss & Petrini 1984; Petrini & Petrini 1985; Petrini et al. 1992). That *Astrocystis cyathea* and *Sulbohypoxylon novae-zelandiae* have been recorded fruiting exclusively on *Cyathea* spp. and *Dicksonia squarrosa* clearly indicates that Xylariaceae are able not only to colonise but also to fruit on pteridophytes. The number of xylariaceous taxa, excluding endophytes, that occur regularly on pteridophytes, however, appears to be small.

Six *Rosellinia* species are reported from screw pines and palms (Pandanaeae and Arecaceae), although such hosts have not previously been conclusively confirmed for *Rosellinia* spp. (Læssøe & Spooner 1994; Fröhlich & Hyde 2000; Hyde et

al. 2000; Smith & Hyde 2001). *Rosellinia rhopalostilicola* is quite frequent (12 collections), whereas *R. arcuata*, *R. communis*, *R. freycinetiae*, *R. longispora*, and *R. palmae* are represented by single records only. The generic position of these species is clear: at least two species, *Rosellinia arcuata* and *R. freycinetiae*, are typical representatives of the genus, as they exhibit a persistent subiculum with a *Dematophora* anamorph.

The conifer *Agathis australis* (kauri) was substrate for a single specimen of *R. johnstonii*.

Among the broadleaved trees, three *Rosellinia* species (*R. communis*, *R. novae-zelandiae*, *R. radiciperda*) and one *Helicogermis* species (*H. gisbornia*) were collected on *Beilschmiedia* spp. *Nothofagus* spp. are inhabited by three species (*R. communis*, *R. johnstonii*, *R. nothofagi*); *Coprosma*

spp. host *R. johnstonii*, *R. radiciperda*, and *H. johnstonii*. On other hosts only 1 species was recorded (Table 1).

All newly described species, with one exception, have been collected exclusively on endemic New Zealand plants. Thus, it can be hypothesised that the various species of the xylariaceous genera studied here have evolved together with their host plants, favoured by the isolated position of New Zealand and its islands in the South Pacific Ocean.

### DISTRIBUTION

A surprisingly high number of species in *Rosellinia* and related genera can be found in New Zealand. They have been collected in all regions of New Zealand, although some geographic preferences are apparently seen.

Most specimens were collected on the North Island (c. 140), especially in Auckland (c. 100) and Northland (>15); fewer collections originate from the Bay of Plenty, Coromandel, Gisborne, Taupo, Waikato, and Wellington. Twelve specimens of six species were found on the South Island. Only one species (*R. hughesii*) is exclusively present there. Four collections are from Chatham Islands (*H. mackenziei*, *R. radiciperda*), one from Stewart Island (*H. mackenziei*), seven from the subantarctic Auckland Islands (*R. johnstonii*, *R. mammoidea*), three from Campbell Island (*H. johnstonii*), and one from Kermadec Islands (*R. palmae*).

These distribution data should be considered with some caution, because they are certainly biased. On the one hand, most of the collecting was done by DSIR/Landcare Research staff and their guests. Auckland and the northern part of the North Island are very close to Mt Albert Research Centre, where Landcare Research (formerly DSIR) mycologists are based and, thus, easily reached for collecting trips. In fact, the largest number of collections of the frequent species (*R. communis*, *R. johnstonii*, *R. novae-zelandiae*, *R. radiciperda*, *R. rhopalostilicola*, *S. novae-zelandiae*) and single records of rare species (*A. cyatheae*, *R. arcuata*, *R. dingleyae*, *R. freycinetiae*, *R. samuelsii*) are reported from this area. Only seven *Rosellinia* species (*R. chusqueae*, *R. gisbornia*, *R. longispora*, *R. mammoidea*, *R. nothofagi*, *R. stenasca*, and *R. victoriae*) known from one to five collections, as well as all *Helicogermis* spp. described here, are not reported from Auckland. For *Helicogermis* only one

literature record from Auckland can be found (Rabenhorst 1878).

On the other hand, the vegetation of the northern North Island (Waitakere Ranges, Coromandel, Waikato, Mangamuka Bridge, kauri reserves, Coromandel Peninsula) is characterised by podocarp-broadleaved forests of great plant species diversity, thus promising a good yield of fungi. In fact, most specimens of *Rosellinia* and related genera originate from these regions and were collected on endemic broadleaved plants of the podocarp-broadleaved forests such as *Beilschmiedia* spp., *Cyathea* spp., and *Dicksonia squarrosa*. The southern part of the North Island, including Taupo and the Urewera, and the South Island host mainly southern beech forests of *Nothofagus* spp., which are much less diverse than podocarp forests. From the collection data it is apparent that fungal species richness is correlated with host plant diversity, being greater in the podocarp forests of the northern North Island than in its central or southern parts or the South Island, and rather poor on the offshore islands.

How many *Rosellinia* and *Rosellinia*-like fungi are present in New Zealand compared with the rest of the world? New Zealand is a comparatively small and geographically isolated area. Landcare Research staff have been surveying the mycoflora for many years, so, in this respect, New Zealand fungi might be better known than those of other parts of the world. In any area, floristic diversity is more likely than climatic conditions to be crucial for species diversity of *Rosellinia* spp. and related genera. The structure and composition of the mixed podocarp-broadleaved forests are more stratified and diverse than those of the deciduous and conifer forests in the Northern Hemisphere due to the rich undergrowth, such as ferns and tree ferns, and, thus, resemble tropical rain forests. Therefore, it is not surprising that *Rosellinia* species reported from Europe (Petrini et al. 1989; Petrini 1993) are not present at all in New Zealand, and vice versa, although the climate is similar in both regions, being constantly moist and characterised by rainy, mild winters. Roughly, at least as many taxa are described from Europe as from New Zealand. Only the anamorphic state of the European *R. necatrix* has been reported from New Zealand on *Juglans regia* and on other cultivated introduced plants (Bösewinkel 1977; NZ Plant Disease Database).

Recent reports of *Rosellinia* and related fungi from other countries are scarce or absent and limited mainly to known root pathogens (Whalley 1996).

A few taxa have been reported from Taiwan and Mexico (San Martín & Rogers 1995; Ju & Rogers 1999), only one species from North Sulawesi rain forests (Rogers et al. 1987), and none from Papua New Guinea (Van der Gucht & Whalley 1996). The rare occurrence of these fungi in some areas may have three main causes: first, they may colonise several hosts as endophytes (see Petrini & Petrini 1985; Petrini et al. 1995; Whalley 1996; Rodrigues & Petrini 1997) but not produce fruiting structures on them; second, some collecting bias exists, as only a few mycologists specialised in small xylariaceous fungi have been collecting in these areas, and other collectors may have overlooked them; finally, it may also be assumed that many specimens collected in different areas are deposited in herbaria awaiting further identification, and are therefore still unknown to the public, as was the case with the PDD records.

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