

## Fungi from palms. VII<sup>1</sup>. The genus *Oxydothis* from rachides of palms in north Queensland, including five new species

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The genus *Oxydothis* is reported from decaying palm rachides in north Queensland. Five are new taxa and these are described and are compared with related species.

Keywords: *Oxydothis*, palm fungi.

*Oxydothis* Penzig & Saccardo was described by Penzig & Saccardo (1897) with *O. nigricans* Penzig & Saccardo as the type species. The genus is distinguished by having long-cylindrical asci, with a J+, sub-apical apparatus and hyaline, bicelled, long fusiform-filiform ascospores which taper from the centre to rounded, pointed or spine-like processes (Müller & von Arx, 1962; Samuels & Rossman, 1987; Hyde, 1993; Hyde & Nakagiri, 1989).

In a study of the fungi colonizing decayed palm fronds in north Queensland seven species of *Oxydothis* were collected. Five of these are new and are described and illustrated in this paper.








### Material and methods

Visits were made between January 1990 and March 1992 in north Queensland, to several rainforest habitats containing palm species, and parts of decaying fronds were collected. These were returned to the laboratory in plastic bags and incubated briefly before examination. Isolations were carried out when possible on to Potato Dextrose Agar plates supplemented with Streptomycin (PDA/S) and the plates were incubated at room temperature.

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<sup>1</sup> VI in *Sydowia* 45:204–225.

Tab. 1. – Synopsis of *Oxydothis* species on palm rachides in north Queensland.

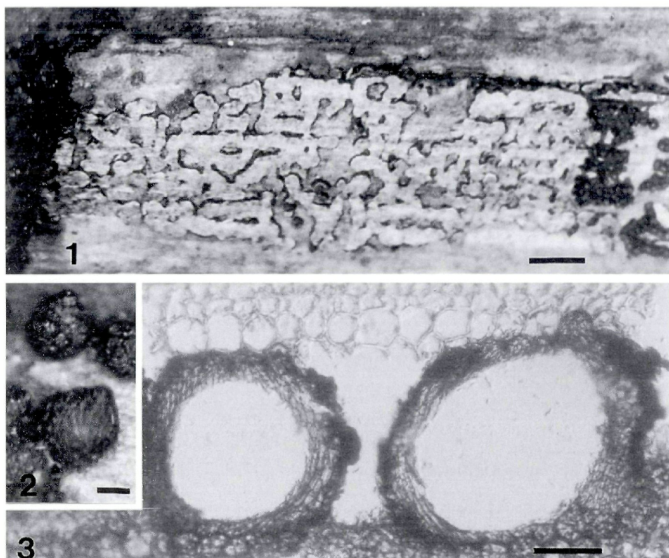
	<i>O. alexandrarum</i>	<i>O. australiensis</i>	<i>O. calami</i>	<i>O. frondicola</i>	<i>O. licaliae</i>	<i>O. futeaspora</i>	<i>O. rubella</i>
Orientation of ascospores							
Ascus apical ring size	2.0 µm diam 2.5 µm high	2–2.5 µm diam 2.5–3.0 µm high	3–4 µm diam 2–3 µm high	2–2.5 µm diam 1.75–2.25 µm high	2.5–3 µm diam 2–2.5 µm high	2.5–4 µm diam 2–4 µm high	4–5 µm diam 5–6.5 µm high
Ascospore size	80–92 x 3–4 µm	112–120 x 3–4 µm	66–92 x 5–7 µm	65–94 x 2.5–3.75 µm	56–82 x 5–6 µm	84–100 x 6.5–8.5 µm	94–102 x 7–8.5 µm

## Taxonomy

### 1. *Oxydothis alexandrarum* Hyde, sp. nov. – Figs. 1–11.

Ascomata 130–185 µm diam, globosa vel subglobosa, immersa, brunnea, ostiolata, papillata. Asci 120–144 x 8–10 µm, 8–spori, cylindrici, unitunicati, pedunculati, ad apicem rotundati et apparato subapicali, J+, 2.5 µm alto, 2.0 µm diam praediti. Ascosporae 80–92 x 3–4 µm, multiseriatae, filiformes, hyalinae, bicellulares, angustatae.

Ascomata immersed in the host tissue below raised blister-like, maze-like, non-blackened regions (Fig. 1), occasionally superficial (Fig. 2), solitary or mostly gregarious, each surrounded by stromatic tissue forming within the hypodermis; in section 130–185 µm diam, globose or subglobose, with long axis parallel, oblique or vertical to the host surface, dark-brown, with small papillae, seated on a cushion of host and fungal cells (Fig. 3). – Papilla usually appearing through the blistered sides of the raised maze-like epidermis, occasionally up to 150 µm long, ca 65 µm diam, black, with a hairy apex. – Stroma below and at the lower sides of the ascomata comprising rounded host cells and angular brown-walled fungal cells. – Peridium up to 25 µm thick, comprising 6–9 rows of brown angular cells, thinner and more elongate towards the centre. – Paraphyses embedded in a gelatinous matrix, hypha-like, filamentous, septate, thin-walled, up to 3 µm diam and persisting amongst asci. – Asci 120–144 x 8–10 µm, 8-spored, long-cylindrical, unitunicate, with a short knob-like peduncle, apically rounded, with a J+, wedge-shaped, subapical ring, 2.5 µm high, 2.0 µm diam, and faint canal leading to the tip (Figs 4–6). – Ascospores 80–92 x 3–4 µm, multiseriate, fili-

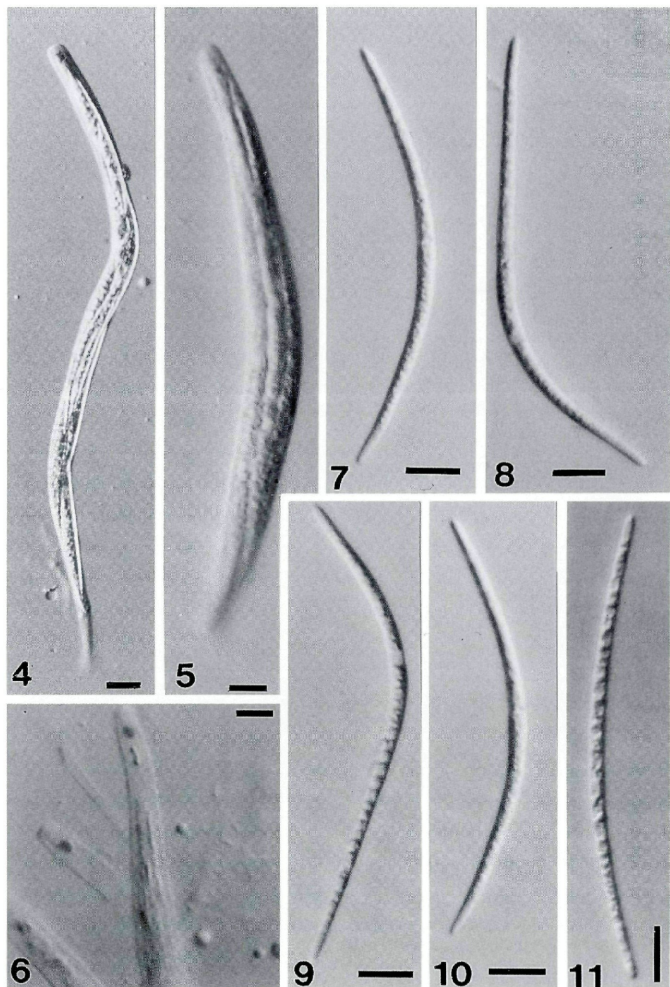


Figs. 1-3. - *Oxydothis alexandrarum*. - 1. Maze-like appearance on host surface. - 2. Superficial ascomata - 3. Vertical section through ascomata. - Bars: 1 = 1 mm; 2 = 100  $\mu$ m; 3 = 50  $\mu$ m.

form, hyaline, 2-celled, tapering gently from the central septum to terminal rounded processes which contain minute drops of mucilage (Figs 7-11).

*Holotypus*. - AUSTRALIA: north Queensland, Cairns, Freshwater Creek State Forest, on decaying rachis of *Archontophoenix alexandrae* (F. Mueller) H. A. Wendland & Drude, Feb. 1992, K. D. Hyde 1060 (BRIP 20846).

*Oxydothis alexandrarum* is different from most other *Oxydothis* species since ascomata are subglobose and form under raised, blister-like areas, while ascospores gently taper from the centre and are provided with rounded ends containing minute drops of mucilage (Figs 7-11). *Oxydothis alexandrarum* is closest to *Oxydothis poliothea* Syd., but has longer, thinner ascospores (80-92 x 3-4  $\mu$ m, vs. 62-86 x 5-6  $\mu$ m). It has shorter ascospores than *Oxydothis nypae* Hyde & Nakagiri (Sydow, 1930; Hyde & Nakagiri, 1989).



Figs. 4-11. - Interference light micrographs of *Oxydothis alexandrarum*. - 4, 5. Asci. - 6. J+, subapical apparatus. - 7-11. Ascospores. - Bars = 10  $\mu$ m.

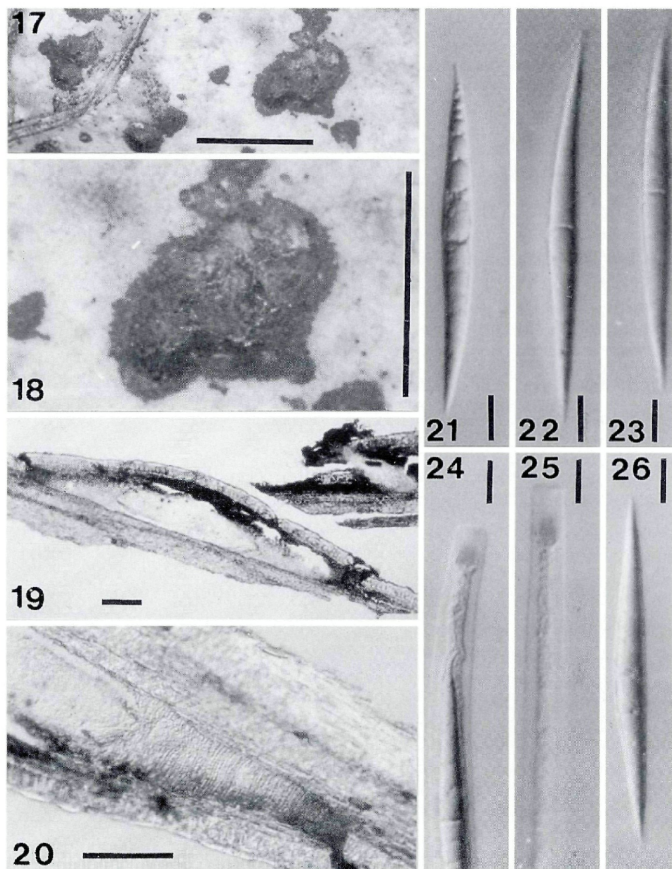


Figs. 12–16. – Interference light micrographs of *Oxydothis australiensis*. – 12. Vertical section through ascomata. – 13. Peridium. – 14, 15. Ascospores. – 16. Ascus. – Bars: 12 = 100  $\mu\text{m}$ ; 13–16 = 10  $\mu\text{m}$ .

## 2. *Oxydothis australiensis* Hyde, sp. nov. – Figs. 12–16.

Ascomata 130–240  $\mu\text{m}$  diam, globosa vel subglobosa, immersa, brunnea, ostiolata, papillata. Asci 120–180  $\times$  11–16  $\mu\text{m}$ , 8–spori, cylindrici, unitunicati, pedunculati, ad apicem rotundati et apparato subapicali, J+, 2. 5–3. 0  $\mu\text{m}$  alto, 2. 0–2. 5  $\mu\text{m}$  diam praediti. Ascosporae 112–120  $\times$  3–4  $\mu\text{m}$ , multiseriatae, filiformes, hyalinae, bicellulares, angustatae.

Ascomata immersed in the host tissue below raised blister-like regions covered with brown hair-like hyphae, hyphae 8  $\mu\text{m}$  wide at the base, 3  $\mu\text{m}$  wide at the apex and up to 74  $\mu\text{m}$  long, with only



Figs. 17-26. - *Oxydothis calami*. - 17, 18. Stromata on host surface. - 19-26. Interference light micrographs. - 19. Vertical section through ascoma. - 20. Wedge of palisade-like cells at periphery of ascoma. - 21-23, 26. Ascospores. - 24, 25. Asci with weakly staining subapical ring. - Bars: 17, 18 = 1 mm; 19 = 100  $\mu$ m; 20-26 = 10  $\mu$ m.

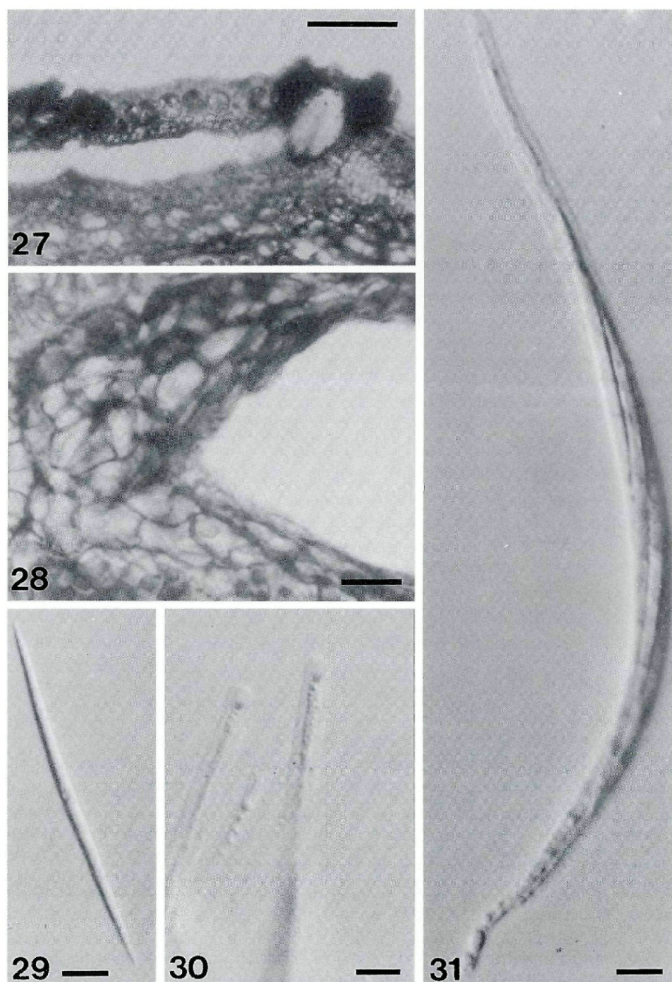
minute black dots indicating the ascomatal opening, gregarious; in section 130–240  $\mu\text{m}$  diam, globose or subglobose, with long axis oblique or vertical to the host surface, dark-brown, with a small periphysate ostiole (Fig. 12). – *P e r i d i u m* ca 20  $\mu\text{m}$  thick, coriaceous, brown to black, comprising 3–5 layers of angular cells with brown walls which are more elongate towards the centre (Fig. 13). – *P a r a p h y s e s* embedded in a gelatinous matrix, hypha-like, filamentous, septate and persisting between asci. – *A s c i* 120–180  $\times$  11–16  $\mu\text{m}$ , 8-spored, long-cylindrical, thin-walled, unitunicate, pedunculate, apically rounded, with a J+, wedge-shaped, subapical ring, 2.5–3.0  $\mu\text{m}$  high, 2.0–2.5  $\mu\text{m}$  diam and a faint canal leading to the tip (Fig. 16). – *A s c o s p o r e s* 112–120  $\times$  3–4  $\mu\text{m}$ , overlapping multiseriate, filiform, hyaline, equally 2-celled, gradually tapering towards the rounded poles, with polar mucilage (Figs 14, 15).

*H o l o t y p u s*. – AUSTRALIA: north Queensland, Bamaga, Lockerbie, “4 mile scrub”, on rachis of *Archontophoenix* sp. in forest litter, March 1991, K. D. Hyde 617 (BRIP 20847).

*Oxydothis australiensis* is closest to *Oxydothis nypae* (Hyde & Nakagiri, 1989), but has longer ascospores (112–120  $\mu\text{m}$ , vs. 82–113.6  $\mu\text{m}$ ).

3. *Oxydothis calami* (Hennings) Müller ex Müller & von Arx. – Figs. 17–26.

*A s c o m a t a* immersed in the host tissue, individually weakly raised and darkened, up to 1 mm diam, with eccentric ostioles, singly or in groups of 2–3 (Figs 17, 18); in section lenticular or hemispherical, axis horizontal to the host surface, immersed beneath a clypeus, with variable stromatic development surrounding the ascomata, at the sides is an area of palisade-like cells, ostiolar canal at one end curving upwards and piercing the host cuticle (Figs 19, 20); ostiolar opening appearing as small blackened dots on the host surface, periphysate. – *P e r i d i u m* thin, 3–4 layers of brown, flattened cells. – *P a r a p h y s e s* embedded in a gelatinous matrix, hypha-like, filamentous, septate, up to 3  $\mu\text{m}$  wide and persisting amongst asci. – *A s c i* and ascoma contents yellow and staining brown in Melzer’s reagent. *A s c i* 256–360  $\times$  8–11  $\mu\text{m}$ , 8-spored, long-cylindrical, thin-walled, unitunicate, pedunculate, apically truncate, with a wedge-shaped, J+, subapical apparatus, 2–3  $\mu\text{m}$  high, 3–4  $\mu\text{m}$  diam (Figs 24, 25). – *A s c o s p o r e s* 68–92  $\times$  5–7  $\mu\text{m}$ , 1–2-seriate, fusiform, hyaline, 2-celled, straight or curved, septate centrally, smooth-walled, tapering from the centre to pointed processes (Figs 21–23, 26). – *C o l o n i e s* on PDA quick



Figs. 27-31. - Interference light micrographs of *Oxydothis frondicola*. - 27. Vertical section through ascoma. - 28. Stromata. - 29. Ascospore. - 30. Asci tips with J+, subapical ring. - 31. Ascus. - Bars: 27 = 100  $\mu$ m; 28 - 31 = 10  $\mu$ m.



growing, 7 cm diam in one month, black, woolly, aerial mycelium grey, and no fruiting structures produced.

**Material examined.** – AUSTRALIA: north Queensland, Cairns, Freshwater Creek State Forest, on *Calamus* sp., Feb 1992, K. D. Hyde & J. Fröhlich 1009, (BRIP 20848).

This third species from *Calamus* is conspecific with *Oxydothis calami* (Müller & von Arx, 1962).

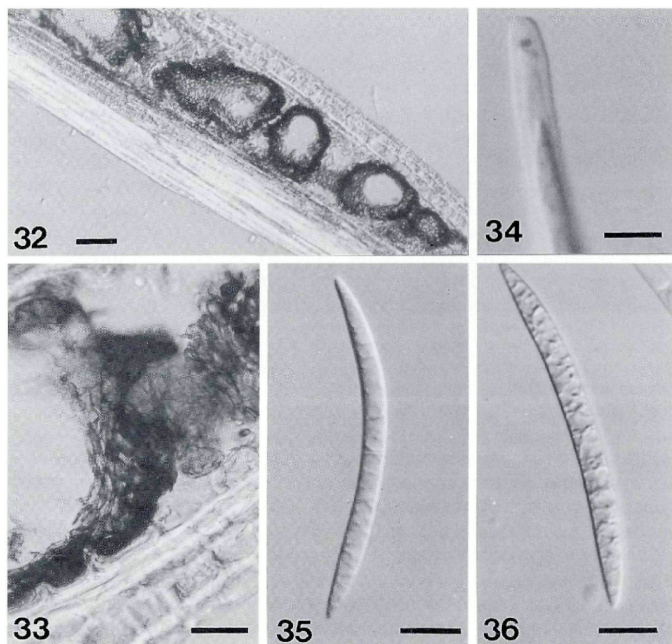
#### 4. *Oxydothis frondicola* Hyde, sp. nov. – Figs. 27–31.

Ascomata 60  $\mu\text{m}$  alta, 450  $\mu\text{m}$  diam, immersa, in sectione cylindrica, brunnea, papillata, solitaria vel gregaria. Asci 165–195  $\times$  8–9  $\mu\text{m}$ , 8–spori, cylindrici, pedunculati, unitunicati, ad apicem truncati, apparato apicali, J+, 1.75–2.25  $\mu\text{m}$  alto, 2.0–2.5  $\mu\text{m}$  diam praediti. Ascospores 65–94  $\times$  2.5–3.75  $\mu\text{m}$ , multiseriatae, bicellulae, hyalinae, angustatae.

Ascomata immersed beneath dull, black, dome-shaped areas, up to 550  $\mu\text{m}$  diam, with small eccentric ostiolar dots, solitary or clustered in small groups; in section up to 60  $\mu\text{m}$  high and 450  $\mu\text{m}$  diam, cylindrical to lenticular, immersed beneath a black clypeus, with variable stromatic development around the ascomata, axis horizontal to the host surface (Fig. 27). – Stromata surrounding ascomata and deep into the host tissue, comprising host cells filled with angular brown-walled fungal cells. – Peridium thin, comprising 3–4 layers of hyaline elongate cells, mostly indistinguishable from the stromata (Fig. 28). At the sides is an area of brown palisade-like cells. – Ostiole eccentric, periphysate, at one end curved upwards and piercing the host cuticle (Fig. 27). – Paraphyses embedded in a gelatinous matrix, up to 2  $\mu\text{m}$  wide, hypha-like, filamentous, septate, hyaline, filamentous and numerous. – Asci 165–195  $\times$  8–9  $\mu\text{m}$ , 8-spored, long-cylindrical, pedunculate, unitunicate, apically truncate, with a J+, wedge-shaped, subapical ring, 1.75–2.25  $\mu\text{m}$  high, 2.0–2.5  $\mu\text{m}$  diam, with a faint canal leading to the tip (Figs 30, 31). – Ascospores 65–94  $\times$  2.5–3.75  $\mu\text{m}$ , multiseriate, bicelled, with a central septum, hyaline, tapering from the centre to pointed processes (Fig. 29).

**Holotypus.** – AUSTRALIA: north Queensland, Bamaga, Lockerbie, '4 mile scrub', on palm frond, Feb 1992, K. D. Hyde 1015, BRIP 20849.

**Other material examined.** – AUSTRALIA: north Queensland, Bamaga, Lockerbie, '4 mile scrub', on palm frond, 12 March 1991, K. D. Hyde 532, BRIP 19324; Freshwater Creek State Forest, on rachis of *Licuala ramsayi*, Feb. 1992, K. D. Hyde 1061.



Figs. 32–36. – Interference light micrographs of *Oxydothis licualae*. – 32. Vertical section through ascomata. – 33. Peridium. – 34. Ascus tip. – 35, 36. Ascospores. – Bars: 32 = 100  $\mu$ m; 33–36 = 10  $\mu$ m.

*Oxydothis frondicola* is closest to *O. aequalis* Syd. & P. Syd. (Sydow & Sydow, 1917), but has narrower ascospores (2.5–3.75  $\mu$ m vs. 4–6.5  $\mu$ m) and a shorter ascus ring (1.75–2.25  $\mu$ m, vs. 3.5–5  $\mu$ m high).

5. *Oxydothis licualae* (Syd. & P. Syd.) Hyde, comb. nov. – Figs. 32–36.  
= *Ophiobolus licualae* Syd. & P. Syd., Phil. J. Sc. C. Bot. 9: 165, 1914.

Ascomata immersed in the host tissue below raised blister-like, non-blackened regions of the host cuticle and epidermis, with only minute black dots indicating the ascumal opening, solitary or mostly gregarious, each surrounded by stromatic tissue forming within the hypodermis; in section ca 325  $\mu$ m high, 215  $\mu$ m diam,

subglobose or pyriform, with long axis parallel, oblique or vertical to the host surface, dark-brown, with small periphysate papillae (Fig. 32). – *Papilla* usually appearing through the cracks at the sides of the blisters. – *Peridium* up to 25 µm wide, comprising 4–5 rows of brown, angular cells, more elongate inwardly (Fig. 33). – *Paraphyses* embedded in a gelatinous matrix, hypha-like filamentous, septate, thin-walled and persisting amongst asci. – *Asci* 195–240 × 10–16 µm, 8-spored, long cylindrical, pedunculate, apically rounded, with a J+, wedge-shaped, subapical ring, 2–2.5 µm high, 2.5–3 µm diam, and faint canal leading to the tip (Fig. 34). – *Ascospores* 56–82 × 5–6 µm, 3–4-seriate, filiform, hyaline, 2-celled, tapering gradually from the central septum particularly toward the ends, to terminal acute, but rounded processes, which appear sticky (Figs 35–36).

Other material examined. – AUSTRALIA: north Queensland, Cairns, Freshwater Creek State Forest, on decaying rachis of *Licuala ramseyi*, Feb. 1992, K. D. Hyde 1072, BRIP 20850; on dead *Calamus* 'trunk', Feb. 1992, K. D. Hyde & J. Fröhlich, KDH 1008, BRIP 20851.

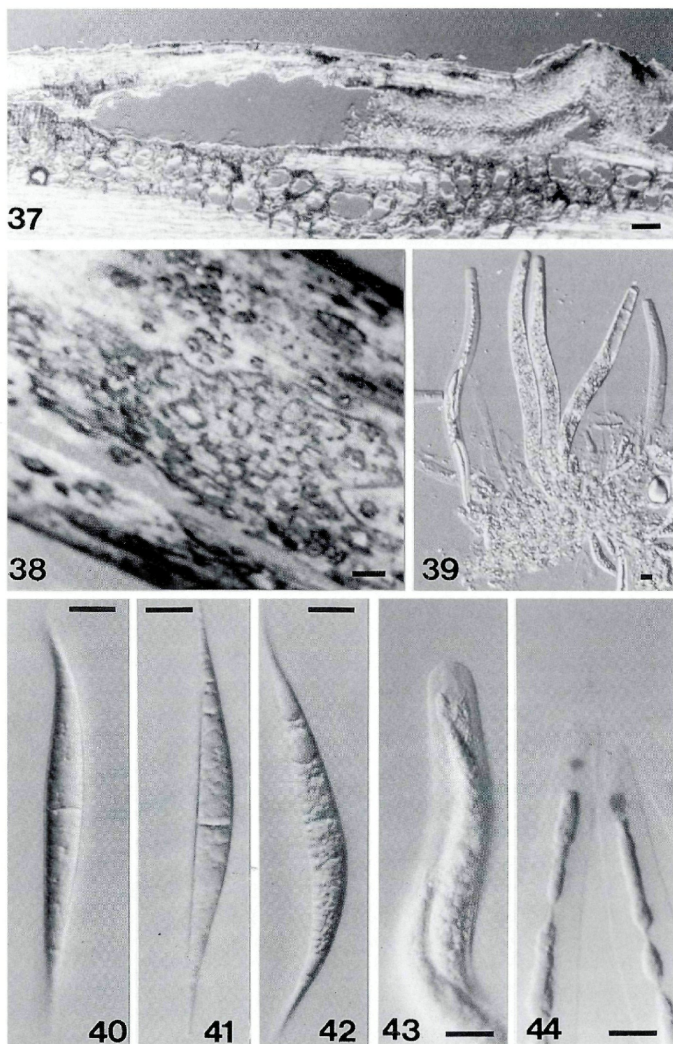
*Ophiobolus licualae* was described by Sydow & Sydow (1914) from dead rachides of *Licuala spinosa* Thunb., Lake Manguao, Palawan, Philippines. Type material borrowed from S comprised four pieces of palm frond, all with *Oxydothis*-like ascomata and two pieces with a small number of *Linocarpon*-like fruiting structures. This was probably *Linocarpon livistonae* Syd. & P. Syd. (Hyde, 1992), while no spores or asci could be found in the *Oxydothis*-like ascomata. In the original description Sydow & Sydow (1914) describe an *Oxydothis* species which is similar to the collection from Australia and is therefore considered conspecific.

#### 6. *Oxydothis luteaspora* Hyde, sp. nov. – Figs. 37–44.

Ascomata ca 100 µm alta, 400 µm diam, immersa, in sectione immersa, brunnea, papillata, solitaria vel gregaria. Asci 220–280 × 12–18 µm, 8-spore, cylindrici, pedunculati, unitunicati, ad apicem truncati, apparato subapicali, J+, 2–4 µm alto, 2.5–4 µm diam praediti. Ascosporae 84–100 × 6.5–8.5 µm, 2 (–3)-seriatae, bicellulares, hyalinae, angustatae.

*Etymology*. – in reference to the yellow (Latin *luteus*) spore mass oozed from mature ascomata.

*Ascomata* immersed beneath undarkened, raised, dome-shaped areas, up to 650 µm diam, with small eccentric ostiolar dots or short necks, clustered over large area of host (Fig. 38); in section up to 100 µm high, and 400 µm diam. cylindrical to lenticular in section, brown, axis horizontal to the host surface, immersed beneath a clype-



Figs. 37-44. - Interference light micrographs (except 38) of *Oxydothis luteaspora*. - 37. Vertical section of ascmata whose axis is horizontal to the host surface. - 38. Superficial view of stromata. - 39. Squash showing asci and paraphyses. - 40-42. Ascospores. - 43, 44. Apices of asci, unstained in 43, stained in 44. - Bars: 37 = 100  $\mu$ m; 38 = 1 mm; 39-44 = 10  $\mu$ m.

us with variable stromatic development around the ascomata (Fig. 37). – *Peridium* thin, comprising 3–4 layers of brown-walled elongate cells. At the sides is an area of brown palisade-like cells (Fig. 37). – *Ostirole* eccentric, at one end curved upwards and piercing the host cuticle, occasionally papillate and with periphyses. – *Paraphyses* embedded in a gelatinous matrix, comprising large oval cells at the base, up to 16  $\mu\text{m}$  wide, septate, hyaline, numerous, cells becoming more hypha-like (up to 4  $\mu\text{m}$  wide) distally and persistent between asci. – *Asci* 220–280  $\times$  12–18  $\mu\text{m}$ , 8-spored, long-cylindrical, pedunculate, unitunicate, apically truncate, with a J+, wedge-shaped, subapical ring and faint canal leading to the tip, 2–4  $\mu\text{m}$  high, 2.5–4  $\mu\text{m}$  diam (Figs 39, 43, 44). – *Ascospores* 84–100  $\times$  6.5–8.5  $\mu\text{m}$ , 2(–3)-seriate, filiform, bicelled with a central septum, hyaline, tapering from the centre to pointed processes, tips with minute mucilage drops, ascospores oozed as a bright yellow mass (Figs 40–42).

*Holotypus*. – AUSTRALIA: north Queensland, Cairns, Freshwater Creek State Forest, on rachis of *Calamus* sp., Feb. 1992, K. D. Hyde & J. Fröhlich, KDH 1055, BRIP 20852.

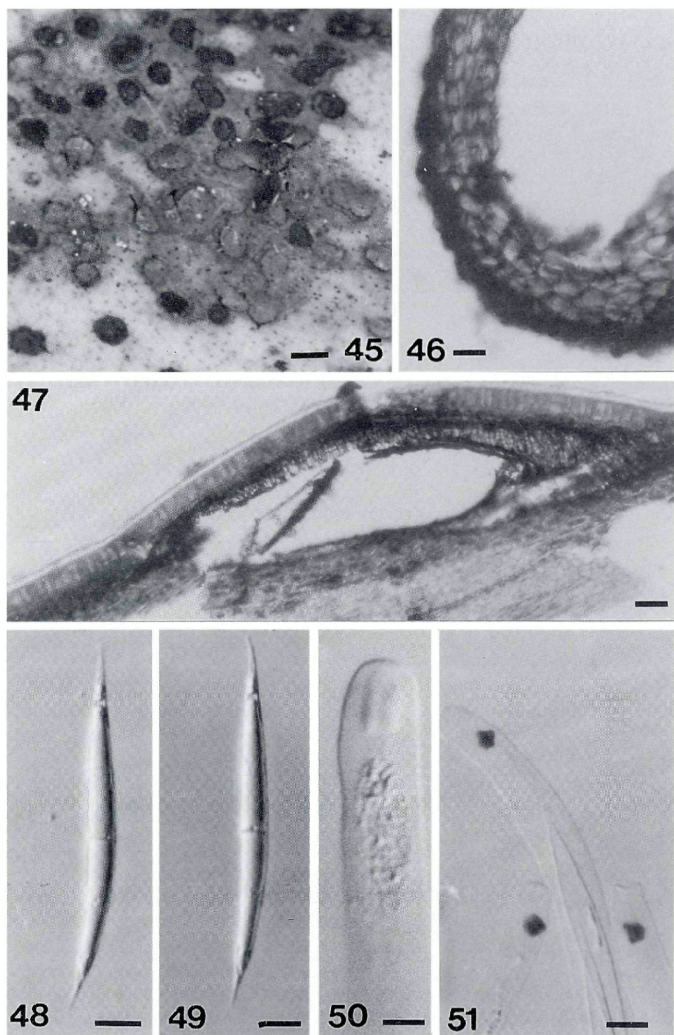
*Oxydothis luteaspora* differs from previously described species in ascospore size, morphology and the ascospores being released from the ascoma as a yellow cirrus.

#### 7. *Oxydothis rubella* Hyde, sp. nov. – Figs. 45–51.

Ascomata ca 130  $\mu\text{m}$  alta, 390  $\mu\text{m}$  diam, immersa, in sectione ellipsoidea, brunnea, ostiolata, solitaria vel gregaria. Asci 256–320  $\times$  13–20  $\mu\text{m}$ , 8-sporei, cylindrici, unitunicati, pedunculati, ad apicem truncati, apparato subapicali, J+, 5–6.5  $\mu\text{m}$  alto, 4–5  $\mu\text{m}$  diam praediti. Ascosporae 94–102  $\times$  7–8.5  $\mu\text{m}$ , 1–3-seriatae, fusiformes, hyalinae, bicellulares, angustatae

*Etymology*. – from the Latin *rubellus* meaning 'red'.

*Ascomata* immersed in the host tissue below raised blister-like regions, ca 1 mm long  $\times$  0.7 mm wide, with eccentric, minute, black dots, indicating the ascomatal openings, solitary or in small groups or irregular rows (Fig. 45); in section up to 130  $\mu\text{m}$  high, 390  $\mu\text{m}$  diam, ellipsoidal, with long axis horizontal to the host surface, with variable stromatical development, ostiolar canal at one end, periphysate, curving upwards and appearing through tissue at the edge of the blisters (Fig. 47). – *Stromata* surrounding ascomata comprising palisade-like, thin-walled fungal cells, seated on a layer of rounded host cells, filled with brown-walled, angular fungal hyphae. – *Peridium* up to 40  $\mu\text{m}$  thick comprising several layers of brown-walled, angular



Figs. 45-51. - Interference light micrographs of *Oxydothis rubella*. - 45. Surface view of fruiting structures on host. - 46. Peridium. - 47. Vertical section through ascoma. - 48, 49. Ascospores. - 50, 51. Apices of asci showing apical rings (stained in 51). - Bars: 45 = 1 mm; 47 = 100  $\mu$ m; 46, 48-51 = 10  $\mu$ m.

cells (Fig. 46). Paraphyses embedded in a gelatinous matrix, hypha-like, filamentous, septate, up to 4  $\mu\text{m}$  wide, numerous and persisting amongst asci. – **Asci** 256–320  $\times$  13–20  $\mu\text{m}$ , 8-spored, long-cylindrical, thin-walled, unitunicate, pedunculate, apically truncate, with a J+, wedge-shaped, subapical ring, 5–6.5  $\mu\text{m}$  high, 4–5  $\mu\text{m}$  diam, and a faint canal leading to the tip (Figs 50, 51). – **Ascospores** 94–102  $\times$  7–8. 5  $\mu\text{m}$ , 1–3-seriate, fusiform, hyaline, 2-celled, septate centrally, smoothed-walled, tapering from the centre to pointed processes (Figs 48, 49). – **Colonies** on PDA quick growing, dark-grey, pellicular, with distinct circular blackened areas developing throughout, but no mature fruiting bodies produced.

**Holotypus**. – AUSTRALIA: north Queensland, Cairns, Freshwater Creek State Forest, on trunk of dead *Calamus* sp., Feb 1992, K. D. Hyde & J. Fröhlich, KDH 1006, BRIP 20853.

*Oxydothis rubella* differs in forming red raised blistering areas under which the ascomata develop, in having a large apical apparatus in the ascus and in ascus and ascospore dimensions. A synnematosous hyphomycete, possibly a *Tretophragmia* sp. was associated with the blistering red stroma of *O. rubella*.

### Acknowledgments

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