Pulmosphaeria archontophoenicis gen. et sp. nov. associated with *Archontophoenix alexandrae* (Arecaceae) in northern Queensland

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The monotypic ascomycete genus *Pulmosphaeria* (Lasiosphaeriaceae) is described from *Archontophoenix alexandrae*. *P. archontophoenicis* is characterised by pairs of immersed ascomata with a common central ostiole, long cylindrical asci and filiform ascospores, obtuse at the apex and acute at the base and with an eccentric basal septum.

Keywords: Lasiosphaeriaceae, rachides, palm fungi, *Palmicola*.

Archontophoenix alexandrae Wendl. is endemic to northern Queensland, Australia. It occurs in the rainforests of tropical and warm temperate regions, ranging from the northern coast of Queensland to the southern coast of New South Wales and is found in damper areas along streams, gullies and adjacent to swamps (Uhl & Dransfield, 1987). Its endemic nature and the relative geographic isolation of its natural habitat makes it a suitable candidate for studies relating to host specificity of fungi and fungal biogeography. The mycobiota of this palm in its natural habitat is currently being investigated. A species that cannot be placed in any genus so far described was encountered and the monotypic genus *Pulmosphaeria* is introduced to accommodate it.

Material and methods

Dead rachides and leaves were collected from mature *A. alexandrae* palms at Dunk Island and Freshwater Creek State Forest, in Northern Queensland. The material was returned to the laboratory and examined for the presence of fungi. All microscopic measure-

ments of fungal structures were made in water. All attempts to isolate the fungus in pure culture failed.

Taxonomy

Pulmosphaeria J. E. Taylor, K. D. Hyde & E. B. G. Jones, gen. nov.

Ascomata immersa, bina, ostiolo communi aperientia. Asci 8-spori, cylindrici vel cylindrico-clavati, unitunicati, pedicellati, apparato apicali praediti. Ascosporae multiseriatae, hyalinae, filiformes ad apicem obtusae, ad basim angustatae, uniseptatae.

Etymology. – From the Latin '*ipulmoi*' meaning lungs and *sphaeria,* in reference to the morphology of the ascomata with the central ostiole, reminiscent of the morphology of lungs.

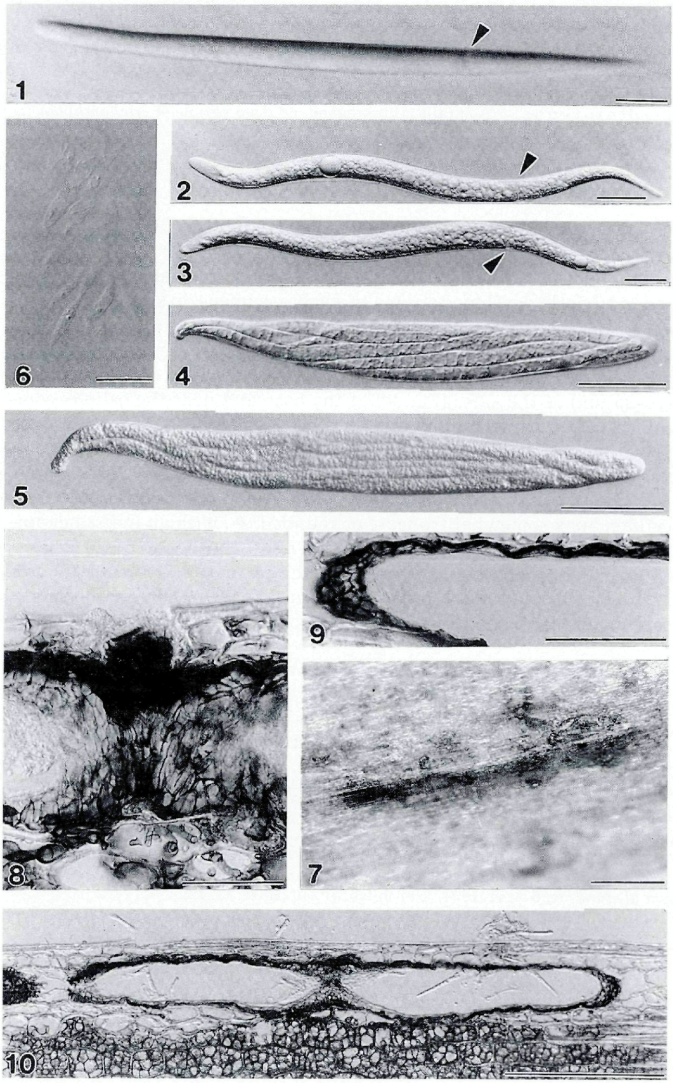
Ascomata beneath the host substrate, under the slightly raised cuticle and some epidermal cell layers, occurring in pairs, with a common central periphysate ostiole, immersed in poorly developed stromatic tissue in some specimens; in section individual ascomata are cylindrical with their long axis horizontal to that of the host surface. – Peridium at the sides comprising several layers of brown walled compressed cells, at the base and near the ostiole comprising dark brown, angular cells, which are hyaline inwardly. – Paraphyses deliquescent, with some remnants after maturation. – Asci 8-spored, cylindrical to cylindrical-clavate, unitunicate, pedicellate, apex somewhat truncate or rounded, J-, with an indistinct apical apparatus. – Ascospores multiseriate, hyaline, filiform, obtuse at the apex, tapering to the base, with one septum in basal region.

Type species. – *Pulmosphaeria archontophoenicis* J. E. Taylor, K. D. Hyde & E. B. G. Jones.

Pulmosphaeria archontophoenicis J. E. Taylor, K. D. Hyde & E. B. G. Jones, sp. nov. – Figs. 1–13.

Ascomata 574-742 x 112-196 µm ($\bar{x}$ = 657 x 170 µm, n = 10), immersa, bina, ostiolo communi aperientia. Asci 218-331 x 23-35 µm ($\bar{x}$ = 282 x 28 µm, n = 25),

Figs. 1–10. – *Pulmosphaeria archontophoenicis*. – 1–3. Ascospores with single septum close to the tapering base (arrowed). – 4–5. Asci. – 6. Remnant of deliquescent paraphyses or young asci. – 7. Appearance of ascomata on host surface. – 8. Vertical section through ostiole showing single pore and arrangement of peridium cells. – 9. Vertical section through ascomata at end showing arrangement of peridium cells. – 10. Section through ascomata showing a pair of ascomata, centrally placed ostiole, and position of ascomata beneath host cuticle and epidermis. – Bars: 1–3, 6 = 10 µm; 4, 5, 7, 8 = 50 µm; 9, 10 = 200 µm.



8-spori, cylindrici vel cylindrico-clavati, unitunicati, pedicellati, apparato apicali 7–10 µm alto et 6–7 µm diam. x̄ = 8.5 x 6.5 µm, n = 10) praediti. Ascosporae 156-202 x 8-11.5 µm (x̄ = 117 x 9 µm, n = 50), multiseriatae, hyalinae, filiformes ad apicem obtusae, ad basim angustatae, uniseptatae.

Holotypus. – Australia, Dunk Island, on dead petiole of *Archontophoenix alexandrae*, 6 April 1994, J.Fröhlich, JP240 (BRIP 23234).

Etymology. – In reference to the host.

Ascomata developing beneath the slightly raised host cuticle and some epidermal cell layers, 574–742 x 112–196 µm (x̄ = 657 x 170 µm; n = 10) (Fig. 7), occurring in pairs with a common central ostiole, immersed in a poorly developed stroma in some specimens; in section individual ascomata 310-420 x 112-196 µm (x̄ = 408 x 170 µm; n = 10), cylindrical with their long axis horizontal to that of the host surface (Fig. 10). – Peridium comprising several layers of brown walled compressed cells (10-25 µm) at the sides (Fig. 9); at the base and near the ostiole, comprising dark brown walled angular cells, which are hyaline inwardly (30-40 µm) (Fig. 8). – Paraphyses deliquescent, with some remnants after maturation. – Asci 218-331 x 23-35 µm (x̄ = 282 x 28 µm, n = 25), 8-spored, cylindrical to cylindrical-clavate, unitunicate, pedicellate, apex somewhat truncate or rounded, J-, with an indistinct apical apparatus, 7-10 high x 6-7 diam. µm (x̄ = 8.5 x 6.5 µm, n=10) (Figs. 4, 5, 14). – Ascospores 156-202 x 8-11.5 µm (x̄ = 117 x 9 µm, n = 50), multiseriate, hyaline, filiform, apex obtuse, tapering to base, 1-septate, septum 45-62.5 µm (x̄ = 54 µm, n= 23) from the base (Figs. 1-3, 11-13).

Habitat. – Saprobic on dead petioles and rachides of *A. alexandrae*.

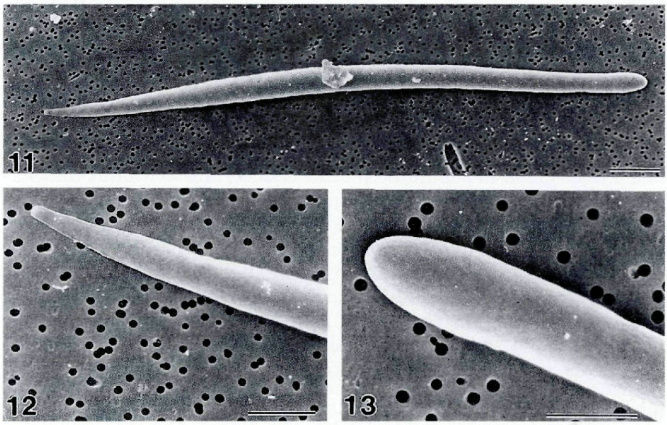
Known distribution. – Australia (northern Queensland).

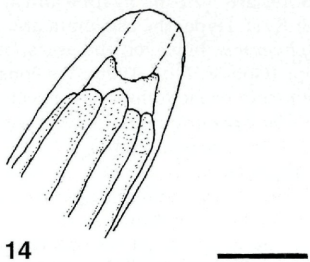
Host species. – *Archontophoenix alexandrae* Wendl.

Other material examined. – AUSTRALIA, Freshwater Creek State Forest, on dead rachis of *Archontophoenix alexandrae*, 17 April 1995, J. E. Taylor & K. D. Hyde, JP240 (BRIP 23243). – Dunk Island, on dead rachis of *Archontophoenix alexandrae*, 6 April 1994, J. Fröhlich, JP240 (BRIP 23242).

Discussion

Pulmosphaeria, a new monotypic genus, is introduced to accommodate fungi with immersed ascomata, which occur in adjacent pairs with a central common ostiole (Figs. 8, 10). The axis of the ascomata is parallel to that of the host surface and the paraphyses are deliques-





Figs. 11–13. – *Pulmosphaeria archontophoenicis*. SEM. – 11–13. Ascospore with an obtuse apex and tapering base. – Bars: 11–13 = 10 µm.
Fig. 14. – *Pulmosphaeria archontophoenicis*. Diagramatic representation of the apical apparatus of the ascus. – Bar: 10 µm.

cent. The asci are long and cylindrical, unitunicate, pedicellate and possess an indistinct apical apparatus (Figs. 4, 5, 14). Ascospores are hyaline, filiform, with an obtuse apex which tapers to the base. One septum occurs near the base (Figs. 1-3, 11-13).

The placement of *Pulmosphaeria* is troublesome, although it is closely related to *Palmicola*, presently disposed of in the Lasiosphaeriaceae (Hawksworth & al., 1995). Hyde (1993) placed *Palmicola* in this family because of its similarities with *Linocarpon* Syd. & P. Syd. and *Ophioceras* Sacc. In the Lasiosphaeriaceae ascomata are dark and usually superficial, while asci have a J- apical ring and ascospores of-

ten have one dark brown and one hyaline cell (Hawksworth & al., 1995). *Myelosperma* Syd. & P. Syd. (presently Lasiosphaeriaceae) has ascomata in a valsoid configuration and a single central pore as found in *Palmicola*. The Hyponectriaceae may also be a suitable family. In the Hyponectriaceae the stromatic tissues may be reduced, asci are cylindrical with a small J+ or J- apical ring and ascospores are variously shaped (Hawksworth & al., 1995). Exactly where *Palmicola* and *Pulmosphaeria* should be placed is uncertain and until the characteristics of these families are more clearly defined, we prefer to place *Pulmosphaeria* in the Lasiosphaeriaceae.

Pulmosphaeria archontophoenicis should be compared with *Palmicola,* to which it seems most closely related (Tab. 1). *Palmicola archontophoenicis* K.D. Hyde is also described from *A. alexandrae* in northern Queensland (Hyde, 1993). In *Palmicola archontophoenicis* groups of ca. 14 ascomata occur around a common central pore. The axes of the individual ascomata are parallel to the host surface, with their base towards the outside and their central ostioles joining in a common pore. Asci are cylindrical, unitunicate with a small J- refractive ring, and ascospores are filiform, hyaline and 5-septate. In *Palmicola filiformis* Goh & K. D. Hyde, the ascomata and asci are similar to *Palmicola archontophoenicis,* however, the ascospores lack septa and are swollen at the tips (Goh & Hyde, 1996). We consider that our species differs from *Palmicola* in the following respects:

1. The ascomata of *Pulmosphaeria* do not have a well developed upper or lower stroma and are nearly all in pairs.
2. Paraphyses are deliquescent.
3. Ascospores are filiform with an obtuse apex and an acute base and an eccentrically placed basal septum.

A synopsis of the characters of all the species known in these two genera is given in Tab. 1. The nature of the apical apparatus in the ascus of *Pulmosphaeria* requires further elaboration. It comprises a narrow subapical ring associated with an indentation of the cytoplasm and a faint canal leading to the tip of the ascus (Fig. 14).

In a collection of the fungus from the Fresh Water Creek State Forest, the ascomata were clustered in groups of ca. 20-25 individuals in raised areas. Horizontal sections through the material showed that there was little organisation to the ascomata, although ascomata were still in pairs. In a few cases the ascomata appear to be solitary. The consistency of the orientation in pairs in all collections, even the clustered ascomata lead us to believe this to be a stable character and we feel that it should be separated from *Palmicola* which have ascomata in a valsoid arrangement with a single central pore.

Of the 49 species of fungi that have been described from *Archontophoenix* sp. (Hyde & al., 1996), 46 have been described in the last decade. Several authors have examined *A. alexandrae* for saprobes

Tab. 1. – A comparison of the morphological features of *Pulmosphaeria* and *Palmicola* species.

Morphological features	*Pulmosphaeria archontophoenicis*	*Palmicola archontophoenicis*	*Palmicola filiformis*
Ascomata	310–420 µm long 112–196 µm diam.	200–300 µm long 140–170 µm diam.	350–500 µm long 100–200 µm diam.
Number of ascomata	1–2	14	10–15
Asci	220–330 x 23–35 µm	130–180 x 9–13 µm	155–195 x 10–13 µm
Ascospores	155–200 x 8–11.5 µm 1–septate, septum near the base Tapering at base	96–124 x 3.5–4 µm 5–septate Slightly swollen ends	110–135 x 3.5–4 µm Aseptate Tapering at base
Distribution	Australia	Australia	Ecuador
Host	*Archontophoenix alexandrae*	*Archontophoenix alexandrae*	*Jessenia bataua*

and pathogens and are repeatedly finding novel genera and species (Matsushima, 1989; Hyde, 1994). This is partly because of the previous lack of study of fungi in Australia. In addition it is possible that the biogeographic isolation of Australia may have contributed to the evolution of species. Malloch & Blackwell (1992) stated that fungi do not disperse well over long distances other than those which colonise cultivated plants or from those plants which occur in large monospecific stands. Consequently, the geographic isolation of some fungal species could be attributed to poor dispersal abilities. Obviously, fungi obligately associated with their host plant will have a restricted geographic distribution. Therefore, it is likely that endemic species which have evolved in Australia in geographic isolation, such as *A. alexandrae*, may be colonised by many novel fungi when studied in their natural environment.

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References

Goh, T. K. & K. D. Hyde (1996). A new species of *Palmicola* from Ecuador. – Mycol. Res. 100: 714–716.

Hawksworth, D. L., P. M. Kirk, B. C. Sutton & D. N. Pegler (1995). Ainsworth and Bisby's Dictionary of the Fungi. – CAB International, U. K.

Hyde, K. D. (1993). Fungi from palms. IV. *Palmicola archontophoenicis* gen. et sp. nov. – Sydowia 45: 15–20.

—— (1994). Fungi from palms. XIII. The genus *Oxydothis*, a revision. – Sydowia 46: 265–314.

——, J. Fröhlich & J. E. Taylor (1996). Biodiversity of fungi on palms. – In K. D. Hyde (ed.). Biodiversity of Tropical Microfungi. Hong Kong University Press, Hong Kong. In press.

Malloch, D. & M. Blackwell (1992). Dispersal of fungal diaspores. – In Carroll, G. C. & D. T. Wicklow (eds.). The Fungal Community: Its Role and Organisation in the Environment (Second Edition). Marcel Dekker, Inc. New York: 243–263.

Matsushima, T. (1989). Matsushima Mycological Memoirs 6, 1–100. – Matsushima Fungus Collection, Kobe, Japan.

Uhl, N. W. & Dransfield, J. (1987). Genera Palmarum – A classification of palms based on the work of Harold. E. Moore, Jr. – Allen Press, Inc., Lawerence, Kansas.

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