The lichen genera *Cyclographina, Diplogramma, Glyphis, Gymnographa, Medusulina, Sarcographa* and *Sarcographina* (Graphidaceae) in Australia

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Abstract

Archer, Alan. W. (Botanic Gardens Trust Sydney, Mrs Macquaries Road, Sydney NSW 2000, Australia). 2004. *The lichen genera* Cyclographina, Diplogramma, Glyphis, Gymnographa, Medusulina, Sarcographa *and* Sarcographina *(Graphidaceae) in Australia.* Telopea *10(2): 589–605*. The following species are reported from Australia: *Glyphis cicatricosa* Ach., *Sarcographa intricans* (Nyl.) Müll. Arg., *S. labyrinthica* (Ach.) Müll. Arg., *S. oculata* Müll. Arg., *S. subtricosa* (Leight.) Müll. Arg., *S. verrucosa* (Mont. & Bosch) Zahlbr. and *Sarcographina cyclospora* Müll. Arg. The Australian species *Glyphis verruculosa* Zahlbr., *Sarcographa actinota* F. Wilson, *S. colliculosa* (C. Knight) Zahlbr. and *S. kirtoniana* (Müll. Arg.) Müll. Arg. are reduced to synonymy and *Cyclographina platyleuca* (Nyl.) Awasthi & Joshi is restored to *Graphina platyleuca* (Nyl.) Zahlbr. *Diplogramma australienses* is transferred to *Opegrapha* with the new combination **Opegrapha australiensis** and *Gymnographa medusulina* Müll. Arg. is reported as a later synonym of *Phaeographis eludens* (Stirt.) Shirley. The taxonomic position of *Medusulina egenella* (Müll. Arg.) Müll. Arg. remains unclear. A key to the species of *Glyphis*, *Sarcographa* and *Sarcographina* in Australia is given.

Introduction

The lichen family Graphidaceae includes 15 genera (Kirk et al. 2001) but includes *Gymnographa* as a synonym of *Sarcographa*; in this present account the two genera are retained, giving a total of 16 genera in the family Graphidaceae. The family in Australia is presently represented by 12 genera, viz: *Acanthothecis* Clem., *Cyclographina* Awasthi & Joshi, *Diplogramma* Müll. Arg., *Glyphis* Ach., *Graphina* Müll. Arg., *Graphis* Adans., *Gymnographa* Müll. Arg., *Medusulina* Müll. Arg., *Phaeographina* Müll. Arg., *Phaeographis* Müll. Arg., *Sarcographina* Müll. Arg. and *Sarcographa* Fée. Of the remaining genera in the family Graphidaceae listed by Kirk et al., *Anomalographis*, *Gymnographopsis* and *Helminthocarpon* are not recorded for Australia (Filson 1996; McCarthy 2003) and *Gyrostomum* is placed in the family Thelotremaceae (Filson 1996; McCarthy & Elix 1998). A recent, detailed account of the genus *Acanthothecis*, including a description of the single species reported from Australia viz: *A. gracilis* Staiger & Kalb, has been given by Staiger & Kalb (1999). The Australian species in the four major genera have been described elsewhere: *Graphina* (Archer 1999a, 2001a), *Graphis* (Archer 1999a, 2001b), *Phaeographina* (Archer 2000, 2001c) and *Phaeographis* (Archer 2000, 2001d). This leaves the species in the remaining genera found in Australia to be discussed here. *Diplogramma* and *Gymnographa* were previously considered to be monotypic genera, endemic to Australia.

Material and methods

This account is based on the examination of type and other specimens from BM, G, H, MEL, NSW and WELT and in particular the recent collections made by J.A. Elix and H. Streimann (CANB). The techniques used have been described previously (Archer 1999a, 2000a).

Key to species of *Glyphis*, *Sarcographa* & *Sarcographina* found in Australia

1 Ascospores hyaline; lichen compounds absent; ascospores 32–50 µm long, 8–12-locular; widely distributed ..... **Glyphis cicatricosa**

1* Ascospores brown 2

2 Ascospores muriform, 10–13 µm long, 2 × 2-locular; psoromic acid present; endemic ..... **Sarcographina cyclospora**

2* Ascospores septate, with rounded locules, 14–37 µm long, 4-10-locular 3

3 Lichen compounds absent; ascospores 14–18 µm long, 4-locular; Sri Lanka, Northern Territory ..... **Sarcographa subtricosa**

3* Lichen compounds present; ascospores 17–37 µm long 4

4 Norstictic acid present; ascospores 14–21 µm long, (4–)6-locular; South America, Sri Lanka, Borneo, New Zealand, Northern Territory, Queensland ..... **Sarcographa intricans**

4* Stictic acid present; ascospores 17-37 µm long, 4-10-locular 5

5 Ascospores 7–10-locular, 25–37 µm long; endemic ..... **Sarcographa oculata**

5* Ascospores ≤ 6-locular, 17-32 µm long 6

6 Ascospores 17–22 µm long, 4-locular; widely distributed, tropical to temperate ..... **Sarcographa labyrinthica**

6* Ascospores 23–32 µm long, 6-locular; Indonesia, the Philippines, Queensland ..... **Sarcographa verrucosa**

Graphina (Cyclographina) platyleuca

Graphina platyleuca (Nyl.) Zahlbr.

(Zahlbruckner 1921: 231).

Graphis platyleuca Nyl.

(Nylander 1868: 75).

Type: New Caledonia, Ins. Loyalty, Lifu, *D. Thiébaut s.n.*, 1865 (holo H-NYL 6980).

Cyclographina platyleuca (Nyl.) Awasthi & M. Joshi

(Awasthi & Joshi 1979: 174).

Helminthocarpon platyleucum (Nyl.) Müll. Arg.

(Müller 1887b: 423).

Platygrapha? [sic] *albovestita* C. Knight

(C. Knight 1882: 43).

Graphina albovestita (C. Knight) F. Wilson, *nom. nud. in sched.*

Schismatomma albovestitum (C. Knight) Zahlbr.

(Zahlbruckner 1923: 553).

Type: New South Wales [near Sydney], *C. Knight vol. 69A, p. 20, no. 26* (holo WELT; iso M).

Thallus greenish-white, corticolous, surface smooth and dull; apothecia lirelliform, white, conspicuous, open, immersed, becoming subsessile, irregular ellipsoid, straight or curved, 1–4 mm long, 0.4–1 mm wide, thalline margin inconspicuous at first, becoming conspicuous and prominent; surface of disc densely white pruinose, revealing the black epithecium when abraded; proper exciple thin or absent, complete, reddish brown to black; hymenium 150–200 µm tall; ascospores hyaline, densely muriform, 1 per ascus, (100–)125–150(–175) µm long, 20–30 µm wide. (Fig. 2b)

Chemistry: protocetraric acid.

Distribution: occurs in Dominica, Puerto Rico, Florida (USA), New Caledonia and, in Australia, Queensland and New South Wales. It has not so far been reported from Lord Howe Island or Norfolk Island.

Notes: *Graphina platyleuca* is characterised by the greenish-white thallus, the conspicuous, open, densely white pruinose, immersed lirellae and the presence of protocetraric acid. The presence of this compound distinguishes the species from other Australian *Graphina* species with open lirellae and large ascospores.

Schismatomma albovestitium is listed as a synonym of *G. platyleuca* in the current Catalogue of Australian Lichens (McCarthy 2003).

During a study of the genus *Helminthocarpon* Fée, Awasthi and Joshi (1979) noted several species which lacked the branched, interwoven paraphyses characteristic of that genus. In these species paraphyses of this type were reported to be restricted to the upper part of the hymenium, as in the genus *Cyclographa* Vain., a morphological feature first noted in *Helminthocarpon pruinosa* (Eschw.) Müll. Arg. by Zahlbruckner (Awasthi & Joshi 1979). These *Helminthocarpon* species (which have muriform ascospores) were placed in the new genus *Cyclographina* Awasthi & Joshi (Awasthi & Joshi 1979) (cf. *Cyclographa* with septate ascospores).

Three species of *Cyclographina* were reported from Australia *viz*: *C. lojkana* (Müll. Arg.) Awasthi & M. Joshi, *C. pruinosa* (Eschw.) Awasthi and *C. platyleuca* (Nyl.) Awasthi & M. Joshi (Awasthi & Joshi 1979; Archer 1999b). *Cyclographina lojkana* and *C. pruinosa* are described in detail elsewhere (Awasthi & Joshi 1979) and these two species are currently undergoing detailed study (K. Kalb., *in litt.,* 2001).

Cyclographina platyleuca, previousl described as *H. platyleucum* (Nyl.) Müll. Arg.,, was based on *Graphis platyleuca* Nyl. (Nylander 1868). However, Zahlbruckner had indicated that the transfer of *Graphis platyleuca* to *Helminthocarpon* by Müller was incorrect ("mit Unrecht") as the paraphyses were not branched and interwoven, and he transferred this species to *Graphina* (Zahlbruckner 1921). A recent re-examination of several Australian specimens previously identified as *Cyclographina platyleuca* (Archer 1999b), together with additional recent collections, did not show the presence of the branched paraphyses characteristic of the genus *Cyclographina* and the specimens are redetermined as *Graphina platyleuca* (Nyl.) Zahlbr. Wirth and Hale (1978) reported *Graphina platyleuca* from Dominica and made no comment on the paraphyses and a recent account of the Graphidaceae of Florida also reported the taxon as *Graphina platyleuca* (Harris 1995).

The earliest name for this species may be *Graphina leprocarpa* (Nyl.) Zahlbr. Knight sent a specimen of *Platygrapha albovestitum* to Nylander in Paris where it was determined as *Graphis leprocarpa* Nyl. (Nylander 1886), later transferred to *Graphina* by Zahlbruckner (1923). *Graphis leprocarpa* [lectotype: FH] however, has smaller ascospores and does not contain protocetraric acid; it is not an earlier name for *G. platyleuca.*

Illustrations: Wirth & Hale, Plate 9e (1978); Awasthi & Joshi, figs. 35, 36 (1979) (as *Cyclographina platyleuca*).

Specimens examined (9 out of 18): Queensland: Southport, *F. Wilson s.n.*, no date (NSW); Christmas Pocket, 16 km NW of Kuranda, *J.A. Elix 17586*, Jul 1984 (CANB).

New South Wales: North Coast: Paterson River, *J. Boorman s.n.*, 1906 (NSW); Conglomerate State Forest, 24 km NNW of Coffs Harbour, *A.W. Archer G 205*, Apr 1998 (CANB, NSW 422708); Dorrigo National Park, Wonga Walk, *A.W. Archer G 240*, Apr 1998 (NSW 422707); Byron Bay, SW of Lighthouse, *A.W. Archer G 328*, Nov 1998 (WELT); Evans Head, S bank of Evans River, *A.W. Archer G 331*, Nov 1998 (NSW). Central Coast: Manly, *F. Wilson s.n.*, Sept 1897 (NSW 153559); Tomaga River Estuary, 15 km SE of Batemans Bay, on *Casuarina, J.A. Elix 22649*, Aug 1988, (CANB).

Opegrapha (Diplogramma)

Opegrapha australiensis *(Müll. Arg.) A.W. Archer*, **comb. nov**.

Basionym: *Diplogramma australiense* Müll. Arg.

(Müller 1891b: 400).

Type: Australia. Queensland: Brisbane, *F.M. Bailey 510*, 1889 (holo G).

Thallus dull olive-green, thin, cracked, surface smooth and dull; apothecia lirelline, numerous, scattered, straight, curved, or sinuous, sometimes branched, 0.5–2 mm long, 0.3–0.4 mm wide, thalline exciple lacking; proper exciple completely carbonised, sulcate; hymenium divided into two by the carbonised exciple, 40–50 µm tall, paraphyses branched; ascospores 8 per ascus, hyaline, fusiform, 15–18 µm long, 4–5 µm wide, 4-locular. (Fig. 1h, 2e)

Chemistry: not known; the type specimen is too small for chemical examination.

Distribution: endemic; so far known only from the type specimen.

Notes: Müller described the genus *Diplogramma* "as if formed from the longitudinal fusion of two *Opegrapha* lirellae, forming four parallel lips with two parallel hymenia"; in addition the paraphyses were reported to be branched (Müller 1891b). He compared *Diplogramma* with *Ptychographa* Nyl., a lirelline genus with multiple hymenia, but differentiated his species by the septate acospores, in contrast to the simple ascospores in *Ptychographa* (Coppins 1992). In the same paper he described *D. australiense* and compared the new species with *Opegrapha bonplandii* Fée but differentiated the two species by the sulcate lirellae in *Diplogramma*. Although *Diplogramma* is placed in the Graphidaceae (Rogers & Hafellner 1992; Kirk et al. 2001), the morphological features of the genus *Diplogramma*, viz: the sessile lirellae lacking a thalline margin, the ascospores with cylindrical locules characteristic of *Opegrapha* rather than the lenticular locules found in the Graphidaceae, and the branched paraphyses, place the species in the genus *Opegrapha*, as first suggested by Staiger (2000, *in sched*.) Accordingly, the new combination, *Opegrapha australiensis* (Müll. Arg.) A.W. Archer is made here. Multiple hymenia in *Opegrapha* are not unknown; for example, *O. prolificans* Redinger (Redinger 1940) has three hymenia (cf. Redinger. loc. cit. Taf. 1, Fig. 2).

The species resembles the widely distributed *Opegrapha atra* Pers., which also occurs in Australia. This species has similar ascospores to those in *O. australiensis* but is distinguished from that species by the absence of the sulcate proper exciple and the dual hymenia.

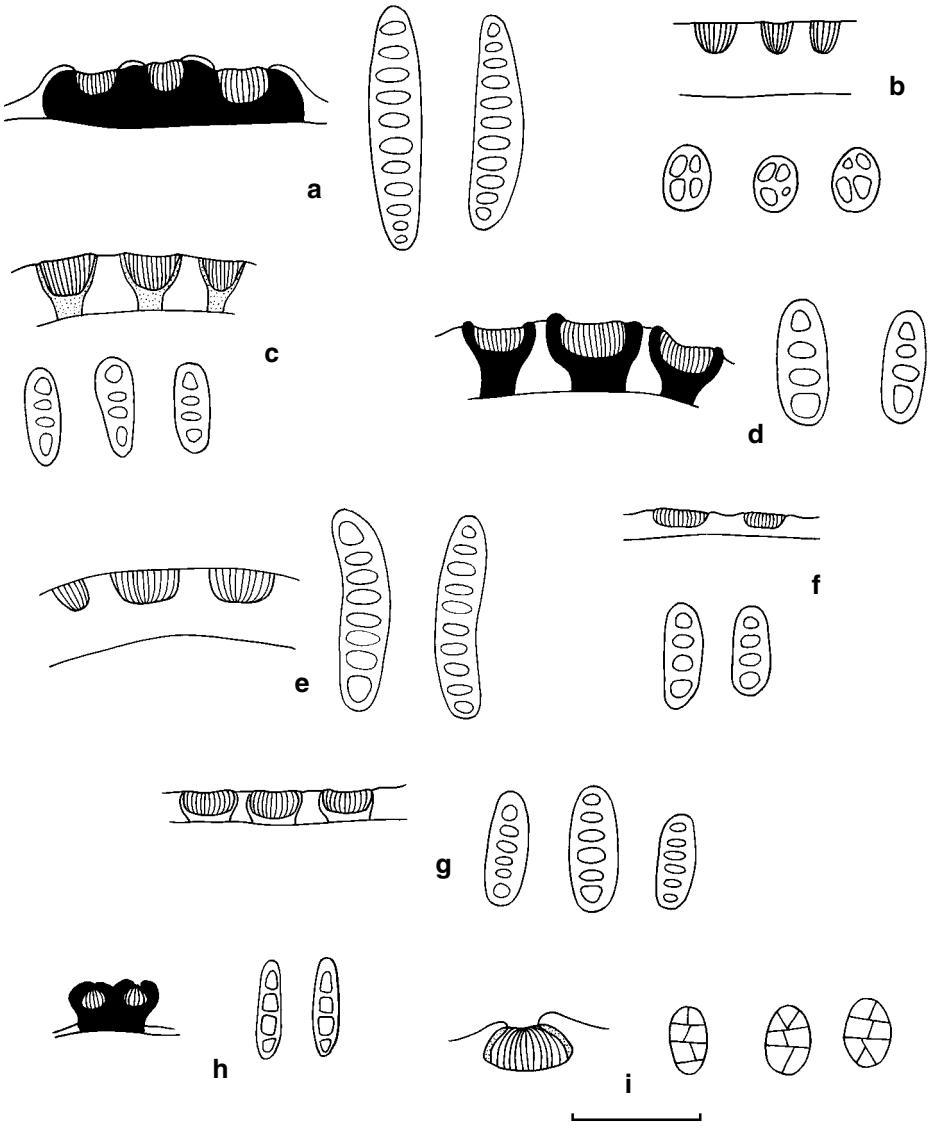

Fig. 1. Ascospores and cross-sections of lirellae. **a**, *Glyphis cicatricosa*; **b**, *Sarcographina cyclospora*; **c**, *Sarcographa intricans*; **d**, *S. labyrinthica*; **e**, *S. oculata*; **f**, *S. subtricosa*; **g**, *Sarcographa verrucosa*; **h**, *Opegrapha australiensis*; **i**, *Medusulina egenella* [from Müller (1894) *in sched*.]

lirellae: scale bar = 320 µm; ascospores: scale bar = 20 µm

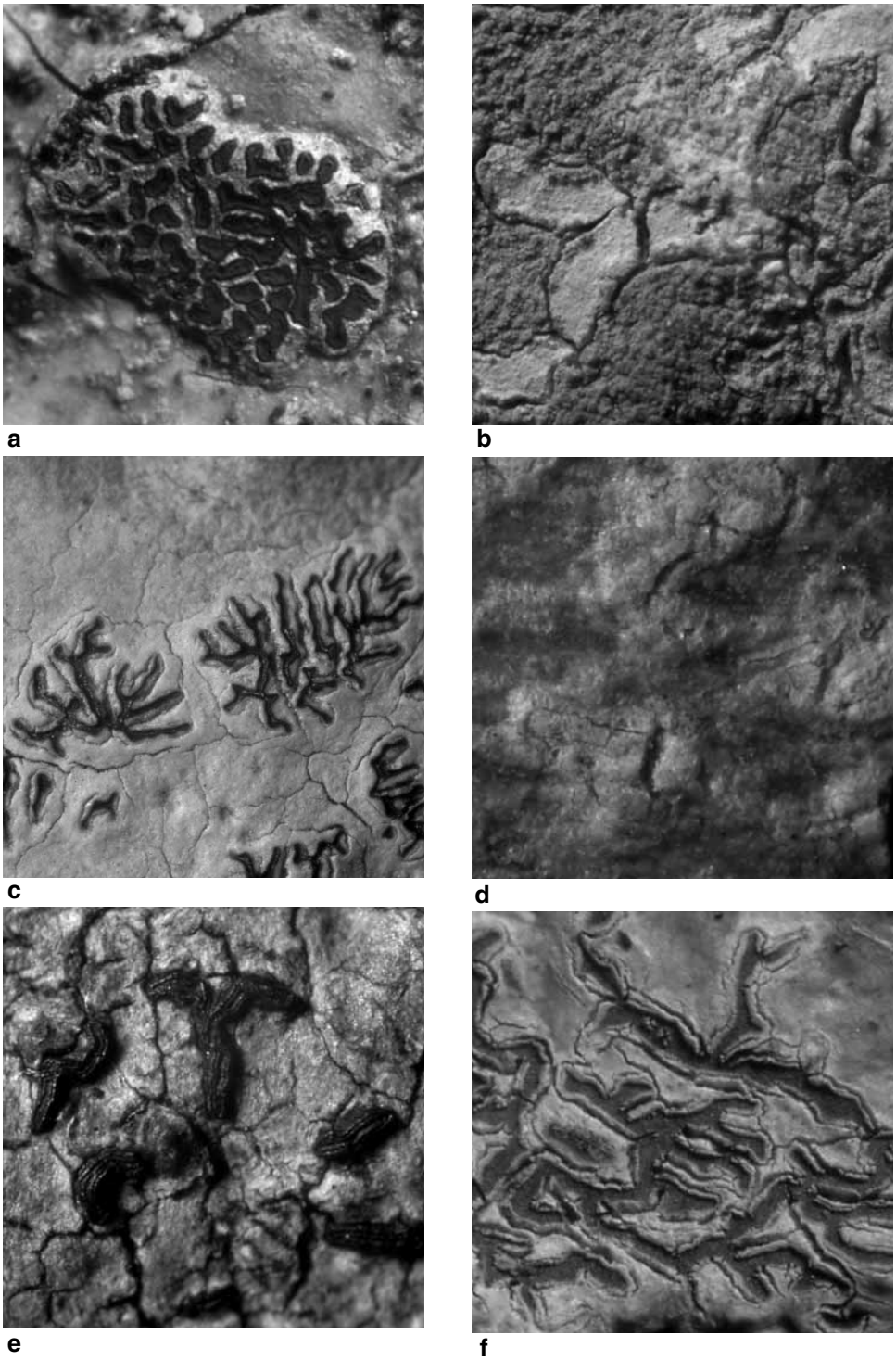

Fig. 2. a, *Glyphis cicatricosa* Ach. *Archer G 339*; **b**, *Graphina platyleuca* (Nyl.) Zahlbr. *Archer G 330*; **c**, *Gymnographa medusulina* Müll. Arg., holotype (G); **d**, *Medusulina egenella* (Müll. Arg.) Müll. Arg., holotype (G); **e**, *Opegrapha australiensis* (Müll. Arg.) A.W. Archer, holotype (G); **f**, *Sarcographa intricans* (Nyl.) Müll. Arg., *Elix 16272* (CANB).

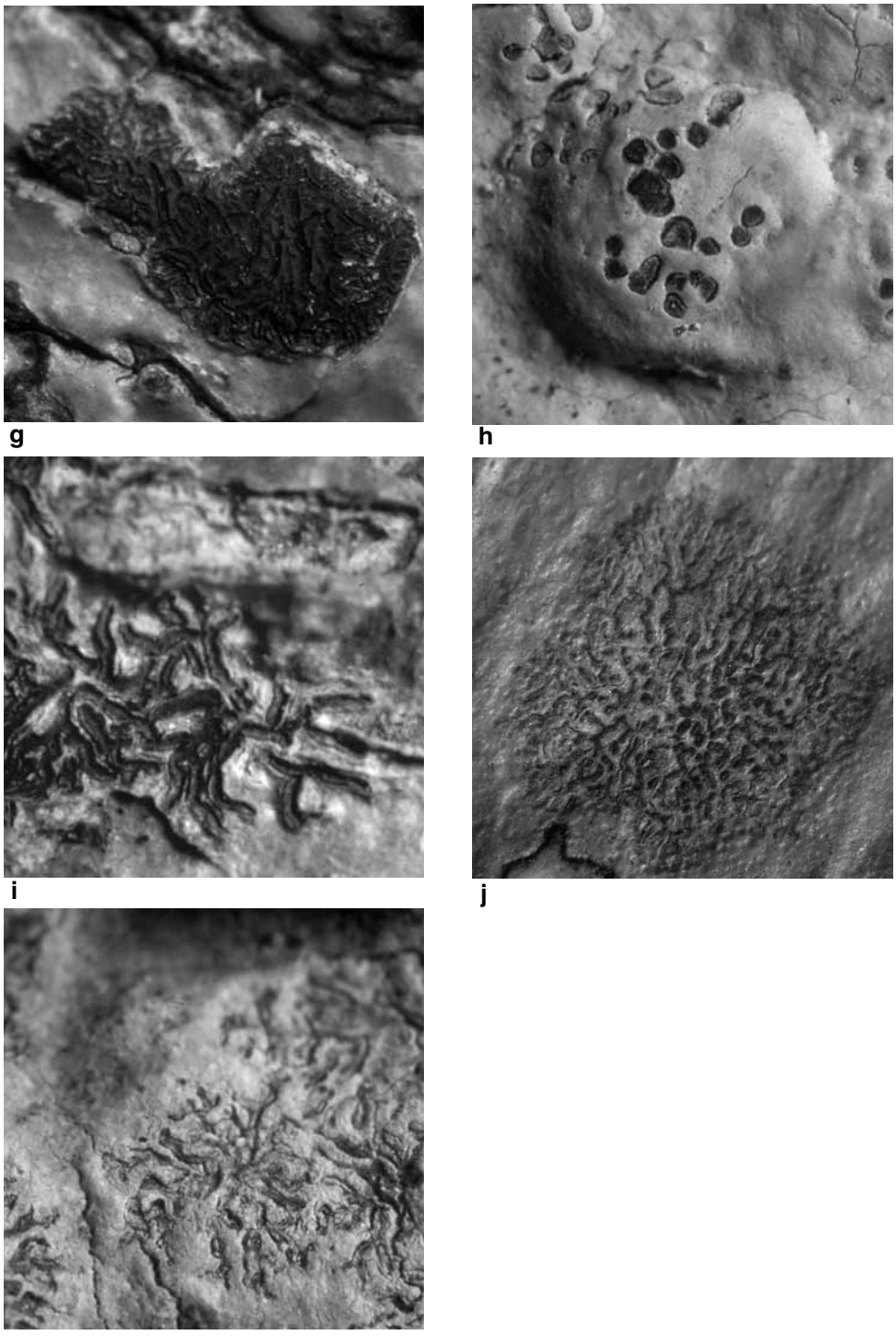

Fig. 2. g, *Sarcographa labyrinthica* (Ach.) Müll. Arg., *Archer G 338* (NSW 471723); **h**, *Sarcographa oculata* Müll. Arg., holotype (G); **i**, *Sarcographa subtricosa* (Leight.) Müll. Arg., holotype (BM); **j**, *Sarcographa verrucosa* (Mont. & Bosch) Zahlbr., *F.Wilson s.n.* (NSW 170581); **k**, *Sarcographina cyclospora* Müll. Arg., holotype (G). All ×17.

Glyphis

Glyphis cicatricosa Ach.

(Acharius 1814: 107).

Type: Guinea. *s. loc*. no collector, on *Codaria acutifolia* [fide Acharius loc. cit.] (holo H-ACH 887).

Graphis cicatricosa (Ach.) Vain.

(Vainio 1921: 265).

Glyphis verruculosa Zahlbr.

(Zahlbruckner 1923: 457).

Glyphis verrucosa C. Knight

(C. Knight in Shirley 1889: 214).

[nom. inval., non *Glyphis verrucosa* Mont. & Bosch in Junghuhn, *Plant. Junghuhn*., fasc. 4: 489 (1855)].

Type: Queensland: Brisbane, Sankeys Scrub. *J. Shirley 494,* no date (holo WELT).

Glyphis cicatricosa Ach. v. *depauperata* (Müll. Arg.) Zahlbr.

(Zahlbruckner 1923: 456).

Glyphis favulosa Ach. v. *depauperata* Müll. Arg.

(Müller 1891a: 54).

Type: Australia. Queensland: Bellenden Ker, *F.M. Bailey 549 p.p*., 1889 (holo G).

Thallus pale greenish fawn, thin, corticolous, surface smooth and shiny; apothecia lirelline, the lirellae immersed in conspicuous, raised, white stromata; stromata rounded, oval or distorted ellipsoid, 1.5–4 mm wide, black with a thin white coating; lirellae numerous, open, initially rounded, becoming elongate and irregular in outline, finally much branched, crowded and covering the surface of the stromata, 0.1–0.2 mm wide; disc dark reddish brown, epruinose; proper exciple completely carbonised and continuous in the stromata; hymenium 120–160 µm tall, I-ve; ascospores narrow-ellipsoid, hyaline, irregularly 2-seriate, (32–)40–55 µm long, 8–12 µm wide, 8–12-locular, I+ blue. (Fig. 1a, 2a)

Chemistry: no lichen compounds found.

Illustrations: Acharius, Tab. 2, Fig. 3 (1818), in colour; Redinger, Fig. 1 & Taf. 1 (1933); Nakanishi, p.105, Fig 19A–D (1966); Yoshimura, Plate 44, Fig. 471, in colour (1974).

Distribution: a widely distributed tropical to temperate species reported from Brazil, Uruguay, Mexico, the United States (Florida), Japan, the Philippines, Singapore, Indonesia, New Caledonia, Fiji, New Zealand and, in Australia, Christmas Island (McCarthy & Elix 2002), Queensland and northern New South Wales; the species also occurs on Norfolk Island. Reported substrates in Australia include *Acacia*, *Alphitonia*, *Casuarina*, *Citrus, Cryptocarya, Euodia, Grevillea, Hibiscus*, *Melaleuca*, *Melia* and *Syzygium*.

Notes: *Glyphis cicatricosa* is characterised by the conspicuous stromata with crowded open lirellae, the hyaline *Graphis*-like ascospores and the absence of lichen compounds. The dark reddish brown discs distinguish the species from *Sarcographa labyrinthica*, which has black discs.

The species has several synonyms in addition to various varieties and forms. The varieties and forms were reduced to three forms, viz: f. *depauperata* (Müll. Arg.) Zahlbr. [based on an Australian type specimen, vide supra], f. *intermedia* (Müll. Arg.) Zahlbr. and f. *confluens* (Zenk.) Zahlbr., by Redinger (1933). The three forms, however, are merely stages in the development of the lirellae in the stromata and examples of each form may often be found on the same thallus. Thus the three forms accepted by Redinger, and their synonyms, are all considered to be synonyms of *Glyphis cicatricosa* Ach. The relevant references are reported in Redinger (1933).

Specimens examined (13 out of 47): Northern Territory: Channell Point, 23 km NNW of Daly River, *J.A. Elix 27728*, July 1991 (B, CANB).

Queensland: Sankeys Scrub [Brisbane], *F. Wilson s.n.*, Aug 1889 (NSW 170574); Killarney, *F. Wilson 94*, Aug 1890 (MEL 26213); Burleigh Heads National Park, *J.A. Elix 1316*, Aug 1975 (CANB); Yungaburra Road, 2 km SE of Atherton, *H. Streimann 16823*, Feb 1983 (CANB); Conway State Forest, 18 km E of Proserpine, *J.A. Elix 20212,* Dec 1986 (CANB); Stewart Ck, 17 km NNW of Mossman, *H. Streimann 45945*, Dec1990 (B, CANB, NY).

New South Wales: North Coast: Dangar Falls, 2 km N of Dorrigo, *A.W. Archer G 537*, Nov 2000 (NSW 471725); Byron Bay, Cape Byron, *A.W. Archer G 557*, Nov 2000 (NSW 471724); Lord Howe Island: track to Mutton Bird Point, *J.A. Elix 32782,* June 1992 (CANB); *ibid*., Neds Beach, *J.A. Elix 32883*, Jun 1992 (CANB).

Norfolk Island. Rocky Point Reserve, *J.A. Elix 18238*, Dec 1984 (CANB); Mt Pitt, Mt Pitt Reserve, *J.A. Elix 18814,* Dec 1984 (CANB).

Gymnographa

A saxicolous specimen of the usually corticolous species *Sarcographa medusula* (Spreng.) Fée was reported from Australia by Krempelhuber (1880). This specimen was later made the holotype (Fig.1h) of the new genus *Gymnographa* Müll. Arg. (Müller 1887a).

The only species in this endemic Australian genus, *G. medusulina* Müll. Arg., is based on an old specimen of the Australian taxon *Phaeographis eludens* (Stirt.) Shirley (Archer 2001d) which is described and illustrated elsewhere (Archer Fig. 2c, 2000a). Kirk et al. (2001) record *Gymnographa* as a synonym of *Sarcographa* but the lirellae in the holotype of *G. medusulina* are not immersed in stromatic tissue, as in other *Sarcographa* taxa. Shortly after the publication of *Gymnographa,* Müller reduced *Gymnographa* to section *Gymnographa* in the genus *Melaspilea*, (Müller 1892).

Medusulina

Medusulina egenella (Müll. Arg.) Müll. Arg.

(Müller 1894: 93).

Graphina egenella Müll. Arg.

(Müller 1891a: 52).

Type: Australia. Queensland: Bellenden Ker, *F.M. Bailey 531 p.p.*, 1889 (holo G).

"Thallus pale yellowish brown, thin, corticolous, immersed, becoming evanescent; lirellae very small, thin, linear, rarely branched, immersed, with a thalline margin; disc 0.05–0.1 mm wide, pale pink and epruinose; perithecium pale brown above, otherwise indistinct; ascospores 8 per ascus, biseriate, hyaline, ellipsoid, 12–14 µm long, 6–8 µm wide, 4 × 2-locular. Similar to *Graphina nitida* (Eschw.) Müll. Arg. but with smaller ascospores with fewer locules." (Müller *loc. cit*. 1891a). (Fig. 1i, 2d)

Chemistry: not known; the holotype is too small for chemical examination.

Distribution: endemic; the species is so far known only from the type specimen.

Notes: *Graphina egenella* was described from a corticolous specimen collected by F.M. Bailey in Queensland. The holotype consists of two small fragments mounted on paper with Müller's annotations. The fragments have conspicuous swellings on the surface but these are part of the substrate. The lirellae are not crowded but are scattered on the surface of the thallus; they are inconspicuous, flattened and only slightly raised, with conspicuous thalline margins and show no stromata. The specimen is too small to permit examination of the ascospores, or chemical examination, but Muller's drawings (*in sched*.; reproduced as Fig. 2i) show small ascospores 12–14 µm long with muriform septation rather than the well-defined locules usually present in *Graphina* species, even those with small ascospores. The internal structure of the ascospores is similar to that of *M. texana*, described by Fink (1935) as transversely and longitudinally septate.

The absence of clustered lirellae or stromata (the distinguishing characteristics of *Medusulina*), the septate rather than locular ascospores and the absence of chemical data and additional specimens, renders the exact taxonomic position of *Medusulina egenella* unclear.

Müller published the genus *Medusulina* to describe the species *M. texana* (Müller 1894). Although *M. texana* was described in detail, the genus itself was briefly and inaccurately described as resembling *Sarcographa* but with hyaline ascospores (Müller, loc. cit.*)* which, as Redinger pointed out later, makes the genus *Medusulina* identical to the genus *Glyphis* (Redinger 1936: 119). In the same paper Müller transferred *Graphina nitida* (Eschw.) Müll. Arg. (Müller 1888) and *Graphina egenella* Müll. Arg. to the new genus as the corresponding *Medusulina* species. viz: *M. nitida*. and *M. egenella*.

Both *M. nitida* and *M. egenella* are reported to occur in Australia (Weber & Wetmore 1972; Filson 1996; McCarthy 2003). Weber & Wetmore recorded *M. nitida* from Victoria and cited a report by Müller (Müller 1893). However, in that paper Müller referred to *Graphis nitida* Mont. and cited a specimen collected by F. Wilson, no. *884*. A recent examination of this specimen [Victoria, Warburton, on tree, *F.R.M. Wilson* , Dec. 1885, no. *884* (NSW 427010)] revealed the asci to contain hyaline, 4-locular ascospores and confirmed its identity as a *Graphis* species. Apart from the erroneous report above, *Graphina nitida* (Eschw.) Müll. Arg. has not otherwise been reported from Australia and therefore *Medusulina nitida*, so far as is known, does not occur in Australia.

Redinger initially accepted the genus *Medusulina*, which he differentiated from *Graphina* by the presence of stromata in *Medusulina* (cf. *Glyphis* and *Sarcographa*) and described *Medusulina paraguayana* from South America (Redinger 1933). He later rejected the genus on the grounds that it was based on the weak characterisic of "lirellae in crowded clusters" and transferred Müller's *Medusulina* species back to *Graphina* and *Graphis* (Redinger 1936).

Sarcographa

Sarcographa intricans (Nyl.) Müll. Arg.

(Müller 1887a: 77).

Graphis intricans Nyl.

(Nylander 1863: 473).

Type: Nova Granata [Colombia], Fusagasuga, 1900 m, *A.Lindig 2579*, 1860; (lectotype, **here selected**, H-NYL 7026).

Thallus pale fawn, thin, corticolous, surface smooth and shiny; apothecia lirelliform, immersed in stromata; stromata raised, pale fawn, circular to ovoid, 1–3 mm wide; disc black, fine white pruinose; lirellae thin, intricately branched, 0.05–0.15 mm wide; proper exciple uncarbonised, pale yellow brown, complete, thickened below; hymenium 100–120 µm tall; ascospores 8 per ascus, irregularly 2-seriate, pale brown, 16–20 µm long, 5–7 µm wide, (4–)6-locular. (Fig. 1c, 2f)

Chemistry: norstictic acid.

Distribution: The species occurs in Brazil, Colombia, Sri Lanka, Borneo and New Zealand; in Australia it occurs in the Northern Territory and Queensland.

Notes: *Sarcographa intricans* is characterised by the absence of a carbonised proper exciple, the predominantly 6-locular ascospores and the presence of norstictic acid. The presence of this acid distinguishes *S. intricans* from other Australian *Sarcographa* species.

In the protologue Nylander (loc. cit.) referred to six specimens collected in Colombia (Nova Granata) by A. Lindig; one of these, Lindig 2579 (H-NYL 7026), was collected in 1860 at Fusagasuga (*ca*. 50 km SW of Bogota) and the others were collected in Bogota. Four of the five specimens from Bogota (Lindig 784, 2609, 2610, 2617) are small, unmounted fragments with no annotation and the fifth specimen (Lindig 2718), although mounted and annotated, is only ca. 5 × 10 mm. In contrast, the specimen from Fusagasuga consists of two larger, mounted fragments, (ca. 5 × 2.5 cm & 4.5 × 3.5 cm) with apothecia and is annotated by Nylander with ascospore dimensions and diagrams. This specimen (Lindig 2579, H-NYL 7026) is here selected as lectotype. This specimen has recently (Staiger 2002) been chosen as lectotype but is referred to as H-NYL 7021. However 7021 is the number on the outer packet and the inner sheet on which the specimens are mounted and which was annotated by Nylander bears the number 7026. Thus both numbers refer to the same specimen, Lindig 2579, but Nylander's herbarium number is 7026.

The Nylander Herbarium contains a second specimen labelled Lindig 2579. This specimen (H-NYL pm 6194), which is unmounted, not annotated and has few apothecia, was also collected at Fusagasuga but in 1861.

The lectotype has previously been examined by several lichenologists, including M. Nakanishi, who reported the specimen to contain norstictic acid (Nakanishi, *in sched.* 1973). Each examination, including that of Nylander, found the ascospores to be 6-locular, in contrast to Nylander's published figures of 6–8-locular, but in agreement with the ascospores found in the Australian specimens. A later specimen not cited by Nylander (Nova Granata, Monte del Morro, 2200 m, *A. Lindig s.n*., 1863, H-NYL 7024) was annotated by Nylander who reported the ascospores to be 5–6-locular. This specimen was also reported to contain norstictic acid (Nakanishi, *in sched*., 1973).

Specimens examined: Northern Territory: Wangi Road, Walker Ck, 68 km SSW of Darwin, *H. Streimann 8802*, Jan 1985 (CANB).

Queensland: Mt. Baldy, 4 km SW of Atherton, *J.A. Elix 16272*, Jun 1984 (CANB); ibid., *H. Streimann 29207* (CANB, US); Upper Coomera, *F. Wilson s.n*., Sep 1889 (MEL 26179); Killarney, *F.R.M. Wilson s.n.,* Jul 1890 (NSW 170613); Southport, *F. Wilson s.n*., Aug 1890 (NSW 170614).

Sarcographa labyrinthica (Ach.) Müll. Arg.

(Müller 1887c: 62).

Glyphis labyrinthica Ach.

(Acharius 1814: 107).

Graphis labyrinthica (Ach.) Vain.

(Vainio 1921: 230).

Type: Guinea, *s. loc.*, *Afzelius s.n.* fide Müll. Arg. (*loc. cit.* 1887: 63) (holo H-ACH 885).

Sarcographa colliculosa (C. Knight) Zahlbr.

(Zahlbruckner 1923: 459).

Glyphis colliculosa C. Knight in F.M. Bailey

(C.Knight in Bailey 1886: 75).

Type: type material not located (*fide* Filson 1986).

Sarcographa kirtoniana (Müll. Arg.) Müll. Arg.

(Müller 1887a: 77).

Glyphis kirtoniana Müll. Arg.

(Müller 1882b: 516).

Type: New South Wales: Illawarra, *W. Kirton 10 p.p.*, no date (holo G).

Sarcographa actinota F. Wilson

(F.Wilson in F.M. Bailey 1891: 33).

Type:Australia. Queensland: Upper Coomera, *F. Wilson s.n.*, 4.ix.1889 (syn NSW 170612).

Thallus pale olive-green, thin, corticolous, surface smooth and shiny; apothecia lirelline, immersed in conspicuous, raised, white stromata; stromata round, oval or distorted ellipsoid, 1–4 mm wide; lirellae numerous, much branched, open, 0.1–0.2 mm wide; disc matt black, epruinose or weakly white pruinose; proper exciple completely carbonised, thick at the base; hymenium 80–110 µm tall; ascospores 8 per ascus, irregularly 2-seriate, pale brown, 17–21(–23) µm long, 6–7 µm wide, 4-locular. (Fig.1d, 2g)

Chemistry: stictic acid, cryptostictic acid, hypostictic acid (trace) & constictic acid (trace) [*fide* Staiger *in sched*. 1998].

Distribution: a widely distributed, tropical to temperate species reported from South America, Mexico, Colombia, North America (Florida), the Philippines, Indonesia, New Zealand and, in Australia, it occurs in Queensland, New South Wales and Victoria, and on Norfolk Island.

Notes: *Sarcographa labyrinthica* is characterised by the highly branched lirellae immersed in conspicuous raised stromata, the 4-locular ascospores and the presence of stictic acid. The species was first reported from Australia by Shirley (Shirley 1889: 214), as *Glyphis labyrinthica*. The syntype of *S. actinota* F. Wilson has pale brown 4-locular ascospores and contains stictic acid, as does the holotype of *Sarcographa kirtoniana* and both species are here reported as synonyms of *S. labyrinthica*. The description of *S. colliculosa* suggests that the species may be based on an old specimen of *S. labyrinthica* and, in the absence of any type material, *S. colliculosa* is also tentatively included as a synonym of *S. labyrinthica*.

S. actinota was reported as a synonym of *S. subtricosa* by Shirley (1893) but the syntype material of *S. actinota* from NSW contains stictic acid, in contrast to *S. subtricosa* which lacks lichen compounds.

Illustrations: Acharius, Tab II, Fig. 1 (1818); Redinger Taf. VI, Fig. 81 (1936).

Specimens examined: Queensland: Darling Downs, Toowoomba, *C.H. Hartmann s.n.,* no date (MEL 26176); Russell River, *W.A. Sayer L 23*, 1886 (MEL 26177); Upper Coomera, *F. Wilson s.n.,* 1889 (NSW 170584); Conway State Forest, 18 km ENE of Proserpine, *H. Streimann 37338*, Jun 1986 (B, CANB); Cape Tribulation Beach, 40 km NE of Mossman, *L. Tibell 14347e*, Oct 1983 (CANB).

New South Wales: South Coast: "Emu Vale", *F. Wilson s.n.*, no date (NSW 170615); Budawang Range, 14 km SE of Nerriga, *D. Verdon 2569*, Aug 1976 (CANB); Clyde Mtn, 18.5 km SE of Braidwood, *D. Verdon 5003*, Sep.1981 (CANB, LSU). Northern Tablelands: New England National Park, Robinsons Knob Trail, 83 km E of Armidale, *A.W. Archer G 338*, Oct 1998 (NSW 471723); Dangar Falls, Dorrigo, *A.W. Archer G 593*, Nov 2000 (NSW 471719). North Coast: Duck Creek Road, 22 km WNW of Buladelah, *J.A. Elix 24421*, Apr 1990 (CANB); Broken Head, track to Seven Mile Beach, *A.W. Archer G 584*, Nov 2000 (NSW 471722). Central Coast: Cumberland State Forest, ca. 25 km NW of Sydney, *A.W. Archer G439*, Apr 2000 (NSW 440787);

Victoria: Woolston, *F. Wilson s.n.*, 1889 (NSW 170620); Cunningham, *F. Wilson s.n.,* Mar 1899 (NSW 170004).

Norfolk Island: Mt Pitt, Mt Pitt Reserve, *J.A. Elix 18806*, Dec 1984 (CANB).

Sarcographa oculata Mull. Arg.

(Müller 1895: 323).

Type: Queensland, *s. loc., F.M Bailey 783*, 1893 (holo G).

Thallus pale fawn, thin, corticolous, surface smooth and dull; apothecia lirelline, immersed in scattered, subhemispherical stromata; stromata 1–2 mm diam., the lirellae circular to irregular in outline, 0.2–0.4 mm wide, immersed; disc weakly white pruinose; proper exciple indistinct, uncarbonised; hymenium 100–130 µm tall; ascospores 8 per ascus, brown, (25–)30–36 µm long, 7–8 µm wide, (7–)8–10-locular. (Figs 1e, 2h)

Chemistry: stictic acid (*fide* Nakanishi, *in sched*., 1973).

Distribution: endemic; the species is so far known only from the type specimen.

Notes: *Sarcographa oculata* is characterised by the sunken rounded lirellae, the 7–10-locular ascospores and the presence of stictic acid. The 7–10-locular ascospores distinguish *S. oculata* from other Australian species of *Sarcographa* with stictic acid.

Sarcographa subtricosa (Leight.) Müll. Arg.

(Müller 1887a: 78).

Glyphis subtricosa Leight.

(Leighton 1869: 181).

Type: Ceylon [Sri Lanka]: Peradeniya, *G.H.K. Thwaites* (holo BM).

Thallus pale olive green, thin, corticolous, surface smooth and shiny; apothecia lirelline, immersed in ill-defined, flattened, off-white stromata; stromata irregular in outline, ca. 1 × 2 mm; lirellae narrow, immersed, much branched, 0.5–1.5 mm long, 0.15–0.2 mm wide, with slightly raised thalline margins; disc black, white pruinose; proper exciple uncarbonised, inconspicuous; hymenium 60–80 µm tall; ascospores 8 per ascus, brown, 14–18 µm long, 5–6 µm wide, 4-locular. (Figs 1f, 2i)

Chemistry: no lichen compounds found (in holotype, *fide* P. James, *in litt.,* 2000).

Distribution: the species occurs in Sri Lanka and is reported from Brazil. In Australia it is so far known only from the Northern Territory.

Notes: *Sarcographa subtricosa* is characterised by the open lirellae, the absence of a carbonised proper exciple, the 4-locular ascospores and, in particular, the absence of

lichen compounds. This last characteristic distinguishes *S. subtricosa* from other Australian *Sarcographa* species, which contain stictic or norstictic acid.

Specimen examined: Northern Territory**:** Litchfield park, 39 km WSW of Batchelor, on fallen palm, *J.A. Elix 27570*, Jul 1991 (CANB).

Sarcographa verrucosa (Mont. & Bosch) Zahlbr.

(Zahlbruckner 1923: 467).

Glyphis verrucosa Mont. & Bosch,

(Montagne & v.d. Bosch 1855: 489).

Graphis verrucosa (Mont. & Bosch) Vain.

(Vainio 1921: 231).

Type: Indonesia. (Java). *s.loc*. (holo: L? n.v.).

Sarcographa javanica (Müll. Arg.) Müll. Arg.

(Müller 1887a: 77).

Glyphis javanica Müll. Arg.

(Müller 1882a: 333).

Type: Indonesia. (Java). *s.loc.*, no collector (holo G).

Thallus pale fawn, thin, corticolous, surface subtuberculate and slightly shiny; apothecia lirelliform, immersed in white stromata; stromata irregularly ovoid, 4–5(–6) mm long, 2–3.5 mm wide, flattened; lirellae black, crowded, open, not confluent or branched, sub-circular, 0.1–0.15 mm diam.; disc black, fine white pruinose, the pruina often lost due to abrasion; proper exciple complete, thin, dark brown to black; hymenium 120–140 µm tall; ascospores 8 per ascus, irregularly 2-seriate, pale brown, 24–28(–32) µm long, 7–8 µm wide, 6–(–8)-locular. (Fig. 1g, 2j)

Chemistry: stictic acid

Distribution: the species is reported from Indonesia and the Philippines, and, in Australia, it occurs in Queensland.

Notes: *Sarcographa verrucosa* is characterised by the flattened stromata, the discrete lirellae, the 6–8-locular ascospores and the presence of stictic acid. The species is distinguished from other Australian *Sarcographa* species with stictic acid by the 6–8-locular ascospores and the nonconfluent lirellae. The Australian specimen cited below is chemically and morphologically identical to the holotype of *S. javanica* in G. This taxon was reported as a synonym of *S. verrucosa* by Redinger (1936).

Specimen examined: Queensland: Korunda [Kuranda], *F. Wilson s.n*., no date (NSW 170581).

Sarcographina

Sarcographina cyclospora Müll. Arg.

(Müller 1887b: 425).

Glyphis cyclospora (Müll. Arg.) Shirley

(Shirley 1889: 215).

Type: Queensland, Trinity Bay [Cairns], *W.A. Sayer s.n.* (holo G; iso MEL 26180).

Thallus pale fawn, thin, corticolous, surface smooth and shiny; apothecia lirelline, immersed in stromata; stromata white, immersed, irregularly circular, 2–5 mm wide; lirellae thin, black, open, immersed, in irregular stellate clusters, 0.05–0.1 mm wide; disc black, weakly white pruinose; proper exciple uncarbonised, pale yellow brown; hymenium 80–100 µm tall; ascospores rounded ellipsoid, initially pale brown, uniseptate, 1-seriate, becoming dark brown, 10–13 µm long, 6–8 µm wide, irregularly 2 × 2-locular. (Fig. 1b, 2k)

Chemistry: (hplc): psoromic acid (major), 2′-*O*-demethylpsoromic acid (trace) & subpsoromic acid (trace).

Distribution: endemic; the species is so far known only from the type specimen from Queensland.

Notes: *Sarcographina cyclospora* is characterised by the immersed stromata, with immersed, branched lirellae, the dark brown muriform ascospores and the presence of psoromic acid. Shirley (1889) transfered the species to *Glyphis*, but this is both unnecessary and incorrect.

Acknowledgments

The author is grateful to the Herbaria cited above for the loan of type and other specimens, to Prof. J.A. Elix for the liquid chromatography results and to the National Herbarium of New South Wales for funding provided through the New South Wales Diversity Strategy, for permission to use the facilities of the Herbarium and for arranging the loan of type and other specimens, and to Ms.Catherine Wardrop for the drawings.

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Manuscript received 14 January 2002
Manuscript accepted 24 November 2003