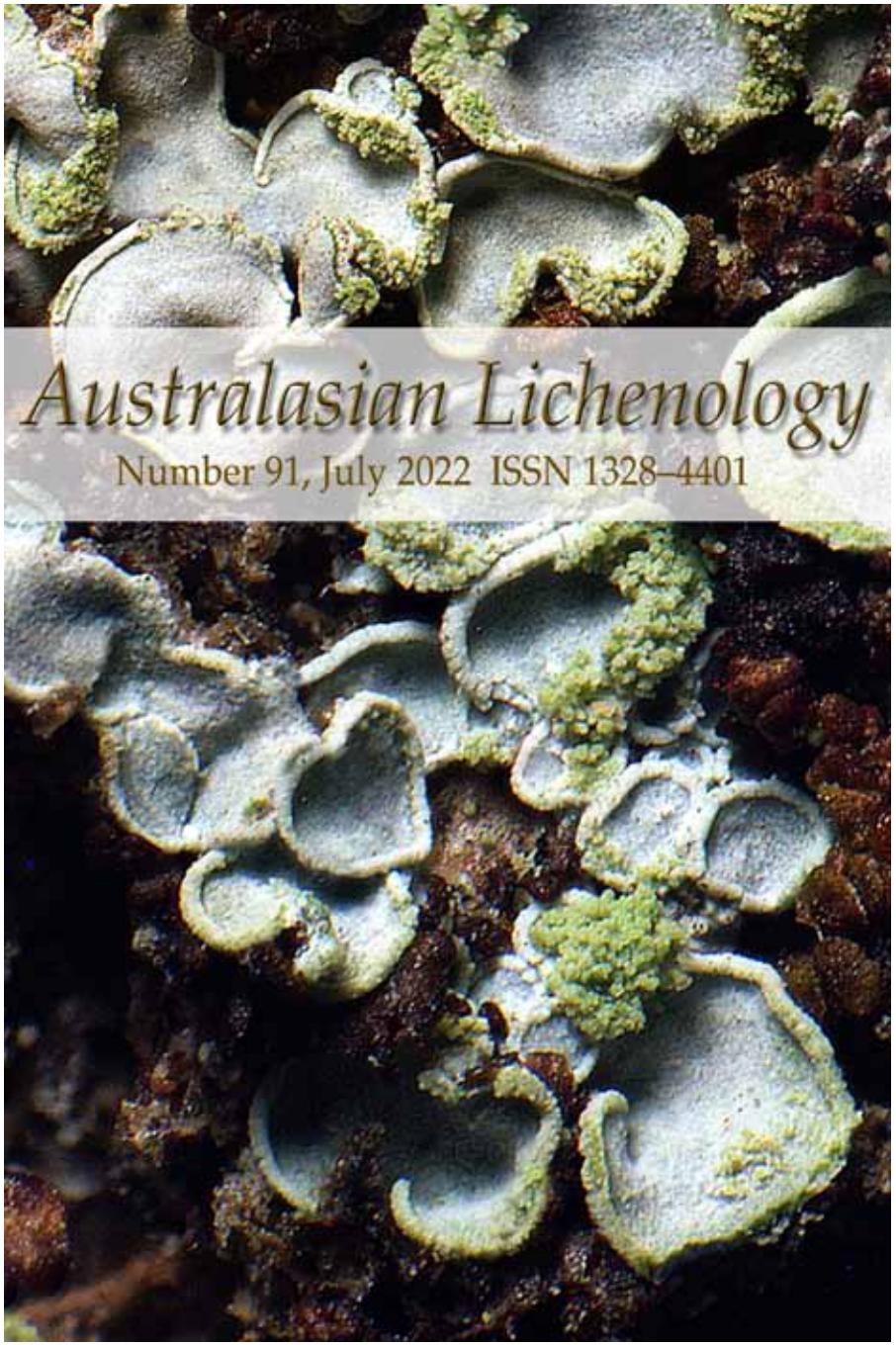

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Normandina pulchella is readily identified by its distinctive blue-green colour and its ear-like squamules, which have raised and strongly in-rolled margins. It colonizes a range of substrata, including rock, tree bark, moist humus, leaves, and even other lichens, and it's moderately tolerant of air pollution. It often produces dense patches of moss-green soredia on the surface and margins of its squamules, but ascomata and conidiomata are unknown. Occasional reports of perithecia have mostly been dismissed as fruiting bodies produced by *Lauderlindsaya borreri* or other lichenicolous Ascomycetes. Often overlooked because of its small size, it's nearly cosmopolitan in its distribution.

1 mm

CONTENTS

New and interesting saxicolous species of *Opegrapha* (Ascomycota, Opegraphaceae) from eastern Australia

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Abstract

Three species of *Opegrapha* Ach. are described as new. The sympatric *O. australis* and *O. oraria* occur on coastal siliceous rocks in eastern Victoria and southern New South Wales, both having thin, pale and inconspicuous thalli, with short, narrow, mostly sessile black lirellae with a basally closed, largely carbonized proper excipulum, a shallow, non-inspersed hymenium and *Varia*-type asci. However, the former has (3–)5-septate ascospores 12–18 × 2.5–4.5 µm, while those of *O. oraria* are mostly 3-septate and 12–18 × 3–6 µm. *Opegrapha howeana*, from sheltered basalt in lowland, subtropical forest in Lord Howe Island, has a thin, delicately rimose, greenish grey thallus, elongate and simple to sparingly branched, adnate to subsessile lirellae with rounded or truncate ends, a slit-like disc and a closed excipulum base, broad asci, mainly 7-septate ascospores, 24–36 × 5.5–9 µm, most with enlarged median cells and a distinct perispore. Two other species, *O. diaphoriza* Nyl. and *O. spodopolia* Nyl., are reported for the first time from rocky seashores in southern New South Wales, the latter also in eastern Victoria.

Introduction

The genus *Opegrapha* Ach. *sens. lat.*, with *c.* 300 species, is predominantly corticolous, but it also occurs on leaves and, frequently, as a parasite of other lichens, while a smaller minority occur directly on rock or soil. Most have a tropical or subtropical distribution, but there is also significant diversity at temperate latitudes in both hemispheres. Recent phylogenetic studies have seen the genus lose taxa to other families of Arthoniales and to genera including *Alyxoria*, *Arthonia*, *Fouragea*, *Gyrographa*, *Pseudoschismatomma* and *Zwackhia* (Ertz *et al.* 2009, 2014; Ertz & Tehler 2011; Frisch *et al.* 2014; Ertz 2020). These changes have yet to be incorporated into the Australian lichen checklist (McCarthy 2020).

Following this realignment of species, based primarily on the results of molecular studies, the circumscription of *Opegrapha sens. str.* is now more problematic in terms of having diagnostic morphological characters that contrast with, for example, *Alyxoria*. Nevertheless, most species have a crustose, ecorticate thallus with *Trentepohlia* or *Phycopeltis* (foliicolous species only), usually without lichen substances. Ascomata are lirelliform and non-stromatic, with a partially or completely carbonized excipulum, anastomosing paraphysoids, mostly 8-spored, fissitunicate asci, elongate ascospores with three or more transverse septa, and conidia that are aseptate and ellipsoidal, bacilliform or arcuate (Hayward 1977; Clauzade & Roux 1985; Torrente & Egea 1989; Ertz & Egea 2007; Galloway 2007; Lücking 2008; Ertz 2009; Ertz *et al.* 2009; Pentecost & James 2009; Seavey *et al.* 2014; Wieczorek 2018; Cannon *et al.* 2021a; Nimis 2021).

Forty-eight species and infraspecific taxa of *Opegrapha sensu lato* have been reported from Australia (McCarthy 2020), but many identifications, including those of supposedly endemic taxa, require re-assessment. Recent additions to the flora have included several maritime, saxicolous taxa reported from South Australia and Tasmania (Elix & McCarthy 2017; Kantvilas 2019; Kantvilas *et al.* 2020). This contribution is based largely on specimens collected from rocky seashores in south-eastern mainland Australia during 2016–2018. These include two newly described taxa and additional new records, while another new saxicolous species is reported from subtropical forest on Lord Howe Island in the south-western Pacific Ocean.

Methods

Observations and measurements of photobiont cells, thalline and ascomatal anatomy, asci, ascospores, and conidia were made on hand-cut sections mounted in water. Calcium oxalate was detected by treatment of thallus sections with a 10% aqueous solution of sulfuric acid; it

forms colourless, needle-shaped crystals. Asci were observed in Lugol's Iodine (I), with and without pretreatment in K.

New species

Opegrapha australis P.M.McCarthy, sp. nov. Fig. 1
MycoBank No.: **MB 843517**

Characterized by the thin, pale and inconspicuous thallus with short, narrow, mostly sessile black lirellae, 0.15–0.8(–1) × (0.08–)0.12–0.2(–0.35) mm; proper excipulum basally closed and predominantly carbonized, enclosing a shallow, non-inspersed hymenium with *Varia*-type asci and (3–)5-septate ascospores, 12–18 × 2.5–4.5 µm.

Type: Australia. New South Wales, South Coast, Pooles Beach, 3 km S of Mystery Bay, 36°18'46"S, 150°07'57"E, *c.* 1 m alt., on exposed shale outcrops along foreshore, *P.M. McCarthy 4556B*, 18.xi.2016 (holotype – CANB).

Thallus crustose, epilithic, usually inconspicuous, often patchy and effuse, off-white to pale creamy grey or pale greyish green, forming poorly defined colonies to *c.* 30 mm wide, not cracked, to *c.* 50 µm thick on smooth surfaces, to *c.* 150(–250) µm thick in pits and minute fissures in the substratum, ecorticate, I–, not containing calcium oxalate (H_2SO_4–). *Algae Trentepohlia*, solitary or in short filaments; cells broadly ellipsoid to subglobose, 7–15(–21) × 6–13(–18) µm; interstitial hyphae long-celled, 2–3 µm thick. *Prothallus* not apparent. *Ascomata* sparse to numerous, lirelliform, adnate to subsessile or sessile and constricted at the base, scattered or contiguous, occasionally overlapping, usually elongate, straight or slightly to markedly bent, unbranched to very sparingly branched, 0.15–0.8(–1) × (0.08–)0.12–0.2(–0.35) mm [*n* = 75], with subacute or acute ends, jet-black, usually rather glossy; margin smooth or minutely to coarsely uneven, epruinose; disc slit-like or slightly to markedly gaping, dull black, smooth, usually epruinose, occasionally with minute scattered specks or clumps of white pruina to 50–80 µm wide. *Proper excipulum* closed below the hymenium, uniformly brown-black, K+ blackish, not or scarcely overgrown by the thallus, 30–55 µm thick laterally, the apices convergent (with slit-like discs) or erect (with open discs); excipulum base (70–) 120–160 µm thick, occasionally forming a broad 'root' that penetrates to 200 µm, paraplectenchymatous in thin section. *Hypothecium* 15–20 µm thick, brown-black, not inspersed, K–, KI–. *Hymenium* 50–70 µm thick, hyaline, not inspersed with granules or oil globules, weakly amyloid throughout, KI+ pale blue, I+ red-brown. *Epihymenium* (10–)15–20 µm thick, dark brown, K+ blackish brown. *Paraphysoids* conglutinate in water, separating in K, richly branched and anastomosing throughout, short-celled to moderately long-celled, 1–1.5(–1.8) µm thick; apical cell and a few subtending cells often dark brown, the apices usually not swollen but occasionally to 2.5(–3) µm wide. *Asci* ± *Varia*-type (*sensu* Torrente & Egea 1989), 8-spored, mostly cylindrical or cylindroclavate, laterally thin-walled, 34–53 × 10–16 µm [*n* = 56]; apex rounded, with a 2–3 µm thick tholus, this occasionally with a minute, conical to tuberculate ocular chamber 1–2 µm wide with a KI+ medium blue cap, the remainder of the tholus non-amyloid or very weakly amyloid; ascoplasm KI+ orange-brown. *Ascospores* ± *Calcarea*-type (*sensu* Torrente & Egea 1989), (3–)5-septate, irregularly biseriate or more massed in the ascus, persistently colourless, narrowly oblong to fusiform, with rounded or subacute apices, straight or somewhat curved, not or only slightly constricted at the septa, but occasionally markedly so at the middle septum, (12–)14.5(–18) × (2.5–)3.5 (–4.5) µm [*n* = 120]; perispore initially thin, usually not apparent at maturity; cells of ± equal size throughout spore ontogeny; contents clear. *Pycnidia* not seen.

Etymology: The epithet *australis* (L., southern) refers to the distribution of the new species in a global and Australian context.

Remarks

Opegrapha australis is most similar to the sympatric *O. oraria* (see below), both having thin, often effuse, rather pale and inconspicuous thalli, as well as comparatively narrow and short, sessile, black lirellae with a proper excipulum that is closed at the base. Furthermore, they share a rather shallow, non-inspersed hymenium and cylindrical or cylindroclavate asci of the *Varia*-type (*sensu* Torrente & Egea 1989). They are distinguished, however, by their ascospores, these being (3–)5-septate and (12–)14.5(–18) × (2.5–)3.5(–4.5) µm in *O. australis*, broader and with fewer septa in *O. oraria* [3(–4)-septate and (12–)15(–18) × (3–)4.5(–6) µm]. Another comparable species is the silicolous and shade-loving *O. cesareensis* Nyl. from north-western and southern Europe. While that lichen has mostly 4–5(–7)-septate ascospores [(13–) 15–22(–26) × 4–5 µm], the disc is persistently slit-like, the hymenium is deeper (80–90 µm thick) and the smooth and often mosaic-forming thallus has a distinctly lilac tint (Clauzade & Roux 1985; Cannon *et al.* 2021a; Nimis 2021).

The new species is known from several siliceous rocky seashores in eastern Victoria and southern New South Wales. However, this rather nondescript and inconspicuous species is likely to be far more widely distributed and abundant in similar habitats in coastal southern Australia, including Tasmania. Associated lichens include *Amandinea decedens* (Nyl.) Blaha, H.Mayrhofer & Elix, *Angiactis banksiae* (Müll.Arg.) Kantvilas & Stajsic, *Buellia cranwelliae* Zahlbr., *Catillaria aff. austrolittoralis* Kantvilas & van den Boom, *Enterographa cretacea* P.M.McCarthy & Elix, *Opegrapha oraria*, *O. spodopolia*, *Porina corrugata* Müll.Arg., *P. guentheri* (Flot.) Zahlbr. *P. whinrayi* P.M.McCarthy, *Solenopsora vulturiensis* A.Massal. and *Thelenella tasmanica* H.Mayrhofer & P.M.McCarthy.

ADDITIONAL SPECIMENS EXAMINED
New South Wales: ● South Coast, Green Cape Peninsula, Haycock Point, 36°57'03"S, 149°56'10"E, *c.* 1.5 m alt., on hard, sheltered sandstone on the seashore, *P.M. McCarthy 4753*, 21.iii.2018 (CANB); ● type locality, *P.M. McCarthy 4531, 4557, 4558*, 18.xi.2016 (CANB).
Victoria: ● East Gippsland, Cape Conran Coastal Park, Banksia Bluff Camp, 37°48'03"S, 148°44'30"E, *c.* 1 m alt., on deeply sheltered mica schist on the seashore, *P.M. McCarthy 4516*, 30.x.2016 (CANB).

Opegrapha howeana P.M.McCarthy, sp. nov. Figs 2 & 4
MycoBank No.: **MB 843518**

Characterized by the thin, delicately rimose greenish grey thallus, elongate and simple to sparingly branched, adnate to subsessile lirellae with rounded or truncate ends, with a slit-like disc above and a closed excipulum at the base, with comparatively broad asci, mainly 7-septate ascospores, 24–36 × 5.5–9 µm, most with enlarged median cells and a distinct perispore.

Type: Australia, New South Wales, Lord Howe Island, Max Nicholls Track, 31°31'08"S, 159°03'01"E, 100 m alt., on sheltered basalt in lowland, subtropical forest on a broad ridge, *J.A. Elix 42400*, 9.ii.1995 (holotype – CANB).

Thallus crustose, epilithic, rather inconspicuous, forming small, well-delimited colonies, or patchy and effuse, pale to medium greenish grey, dull, *c.* 50–80 µm thick, sparingly to richly but delicately rimose, not areolate, ecorticate, I–, not containing calcium oxalate (H_2SO_4–). *Algae Trentepohlia*; cells broadly ellipsoid to subglobose, solitary or in short filaments, 7–15(–18) × 6–14(–16) µm; interstitial hyphae long-celled, 1.5–2.5 µm thick. *Prothallus* not apparent, or thin and dark grey to dull blackish. *Ascomata* moderately numerous, lirelliform, dull jet-black, adnate to subsessile and constricted at the base, scattered, elongate, 0.5–1.5(–4) mm long, 0.15–0.35 mm wide [*n* = 42], straight, slightly to markedly curved or serpentine, unbranched to very sparingly branched, with truncate or rounded ends, epruinose; margin smooth or minutely to coarsely uneven and fissured; disc slit-like. *Proper excipulum* closed below the hypothecium, uniformly brown-black, eventually carbonized and brittle, not overgrown by the thallus, 35–60(–70) µm thick laterally, the apices convergent; excipulum

base usually 70–110(–150) µm thick, usually tapering and often visible in section as a penetrating 'root', K–. *Hypothecium* 20–35(–45) µm thick, medium greenish brown, inspersed with minute granules, KI–, K–. *Hymenium* 75–100 µm thick, hyaline or with a pale greenish tint, not inspersed, weakly amyloid throughout, KI+ pale blue, I+ red-brown. *Epihymenium c.* 20 µm thick, dark greyish brown, K+ paler but more intensely brown. *Paraphysoids* moderately conglutinate in water, separating in K, richly branched and anastomosing throughout, short-celled to moderately long-celled, 0.8–1.2 µm thick; apices neither swollen nor pigmented. *Asci* intermediate between *Varia*- and *Vulgata*-types (*sensu* Torrente & Egea 1989), 8-spored, broadly ellipsoid or broadly clavate, laterally thin-walled, 42–58 × 21–25 µm [*n* = 22]; apex rounded, with a tholus 2–4 µm thick, lacking an ocular chamber throughout its development, but with a KI+ medium blue cap at maturity, the remainder of the tholus non-amyloid or very weakly amyloid; ascoplasm KI+ reddish or orange-brown. *Ascospores* ± *Varia*-type (*sensu* Torrente & Egea 1989), (5–)7-septate, irregularly massed in the ascus or in 2 overlapping fascicles of 4, colourless or, finally, collapsing slightly and pale to medium brown, narrowly oblong-cylindrical to fusiform, usually with subacute apices, straight or somewhat curved, not or very weakly constricted at the septa, (24–)29(–36) × (5.5–)7(–9) µm [*n* = 50]; some cylindrical spores with locules of ± equal size, fusiform spores with the median 1 or 2 locules markedly larger, the remainder diminishing in size towards the apices; wall to 1(–1.5) µm thick at maturity; perispore smooth, becoming 1–1.5(–2) µm thick; spore contents clear to coarsely granular. *Pycnidia* sparse, semi-immersed to almost superficial, hemispherical to subglobose, dull black, 80–100 µm wide. *Conidia* hyaline, simple, straight, bacilliform, 3–5 (–6) × *c.* 0.5 µm.
Chemistry: No substances detected by TLC (Elix 2022).

Etymology: The species is named after its type locality.

Remarks

Opegrapha howeana has a finely rimose but otherwise rather nondescript thallus, elongate lirellae [0.5–1.5(–4) × 0.15–0.35 mm] with rounded or truncate ends and a slit-like, epruinose disc, a basally closed proper excipulum, comparatively broad asci and narrowly oblong-cylindrical to fusiform, (5–)7-septate ascospores, 24–36 × 5.5–9 µm, mostly with 1 or 2 enlarged median cells.

Several species formerly included in *Opegrapha* but, following molecular investigations (e.g. Ertz *et al.* 2014) now referable to *Alyxoria* (Lecanographaceae), merit comparison with *O. howeana*. Thus, the mainly calcicolous, European and North American *A. mougeotii* (A.Massal.) Ertz, Frisch & G.Thor has similar ascospore dimensions, septation and enlarged median cells. However, like most of its congeners, its lirellae have acute ends and a widely exposed disc (Clauzade & Roux 1985, as *Opegrapha*; Wieczorek 2018; Cannon *et al.* 2021b). Interestingly, Clauzade & Roux (1985) included the Spanish endemic and basalt-inhabiting *Opegrapha cavernicola* Llimona & R.G.Werner in the synonymy of *O. mougeotina*. That species has a whitish thallus, a white-pruinose disc, mostly 7-septate ascospores less than 4 µm wide and filiform-arcuate conidia (Llimona & Werner 1975). *Alyxoria paraxanthodes* (Nyl.) Ertz & Coppins, endemic to Great Britain and Ireland, has a greenish yellow thallus, shorter lirellae, also with an exposed disc, and 4–5-septate ascospores (Cannon *et al.* 2021b). Furthermore, uncommon calcicolous thalli of the almost ubiquitous *A. varia* (Pers.) Ertz & Tehler have 4–6-septate ascospores that become red-brown with age (Ertz & Egea 2007; Wieczorek 2018; Cannon *et al.* 2021b). While the Australasian *O diaphoriza* (see below) has a superficially similar thallus and ascomata, the hymenium is granular-inspersed and the (3–)5-septate ascospores are only 17–27 µm long.

The type and only known locality of *O. howeana* is situated near the northern tip of Lord Howe Island on the Max Nicholls (Memorial) Track, which runs for approximately 2 km from Old Settlement Beach to Mount Eliza up through lowland forest and ending at an exposed cliff top *c.* 150 m above the sea. This suite of habitats is rich in bark- and rock-inhabiting lichens; it also includes the type localities of several saxicolous crusts, *viz. Dichoporis fractans* (P.M.McCarthy) S.H.Jiang, Lücking & Sérus., *Enterographa reticulata* P.M.McCarthy, *Fissurina howeana* (A.W.Archer) A.W.Archer, *Lepra miniatescens* (A.W.Archer & Elix) A.W.Archer & Elix, *Porina howeana* P.M.McCarthy and *Swinscowia rupestris* (P.M.McCarthy) S.H.Jiang, Lücking & Sérus.

Opegrapha oraria P.M.McCarthy, sp. nov. Figs 3 & 5
MycoBank No.: **MB 843519**

Similar to *Opegrapha australis*, but differs in ascospore septation and width, i.e. 3(–4)-septate and (3–)4.5(–6) µm wide, as opposed to (3–)5-septate and (2.5–)3.5(–4.5) µm wide.

Type: Australia. Victoria, East Gippsland, Cape Conran Coastal Park, Banksia Bluff Camp, 37°48'03"S, 148°44'30"E, *c.* 1 m alt., on deeply sheltered mica schist on the seashore, *P.M. McCarthy 4515*, 30.x.2016 (holotype – CANB).

Thallus crustose, epilithic, inconspicuous, patchy and often effuse, off-white or pale grey-green to pale yellowish brown, not or very sparingly rimose, rarely areolate, 60–150(–250) µm thick, the thallus most noticeable in minute pits and fissures in the rock, ecorticate, I–, not containing calcium oxalate (H_2SO_4–). *Algae Trentepohlia*, solitary or in short filaments, usually dominating the thallus but not occupying a discrete layer; cells broadly ellipsoid to subglobose, 6–16(–20) × 6–14(–17) µm; interstitial hyphae long-celled, 2–3.5 µm thick. *Prothallus* not apparent. *Ascomata* sparse to very numerous, lirelliform, adnate to subsessile or sessile and constricted at the base, scattered or contiguous in small clusters, not overlapping, initially ± rounded to oblong, 0.3–0.6 × 0.15–0.25 mm, later more elongate, straight or slightly to markedly bent, unbranched to very sparingly branched, alternatively ± isodiametric or more elongate and with a broader, open disc, 0.5–1(–1.4) × 0.2–0.45(–0.6) mm [*n* = 100], with truncate, rounded or subacute ends, jet-black, dull to distinctly glossy, epruinose throughout; margin smooth or minutely to coarsely uneven and fissured; disc slit-like or, later, gaping and dull black, smooth or with very faint, elongate fissures. *Proper excipulum* closed below the hymenium, uniformly brown-black, K+ blackish, not overgrown by the thallus, 35–60(–80) µm thick laterally, the apices convergent (when the disc is slit-like) or erect (when the disc is more open); excipulum base usually (40–)80–120 µm thick, occasionally taking the form of a 'root' that penetrates 150–250(–300) µm, paraplectenchymatous in thin section, the cells 3–5 µm wide. *Hypothecium* 15–25 µm thick, pale to medium greenish brown, K–, KI–. *Hymenium* 55–70(–80) µm thick, hyaline or with a pale greenish tint, not inspersed, weakly amyloid throughout, KI+ blue, I+ red-brown. *Epihymenium* 15–20(–25) µm thick, medium to dark brown, with or without green flecks, K+ crimson or K+ blackish. *Paraphysoids* slightly conglutinate in water, separating in K, richly branched and anastomosing, short-celled to moderately long-celled (distally), (0.5–)0.8–1.2(–1.8) µm thick; apical cell and a few subtending cells usually dark brown, the apices often slightly swollen, rounded and up to 2 µm thick. *Asci* ± *Varia*-type (*sensu* Torrente & Egea 1989), 8-spored, broadly ellipsoid, cylindrical or cylindroclavate, laterally thin-walled, 35–57 × 12–16 µm [*n* = 73]; apex rounded or appearing almost truncate, with a 2–3 µm thick tholus, this occasionally with a minute, conical to tuberculate ocular chamber 1–2 µm wide which has a KI+ medium blue cap, the remainder of the tholus non-amyloid; ascoplasm KI+ reddish or orange-brown. *Ascospores* ± *Calcarea*-type (*sensu* Torrente & Egea 1989), 3(–4)-septate, irregularly biseriate or more massed in the ascus, persistently colourless, narrowly oblong to fusiform, with rounded or subacute apices, straight or slightly curved, not or very weakly constricted at the septa, (12–)15(–18) × (3–)4.5(–6) µm [*n* = 244]; perispore occasionally visible on immature spores, 0.5–1 µm thick, inconspicuous and less than 0.5 µm thick at maturity; cells of ± equal size throughout spore ontogeny, their contents clear. *Pycnidia* usually sparse or absent, occasionally numerous, semi-immersed to superficial and hemispherical to subglobose, black, (60–)80–120 µm wide. *Conidia* hyaline, simple, straight, bacilliform, 3.5–5(–7) × *c.* 0.5 µm.

Etymology: The epithet *oraria* (L., of the coast), indicates the preferred habitat of this lichen.

Remarks
While the diagnostic ascospore characters that separate *O. oraria* from the otherwise similar and sympatric *O. australis* are outlined above, this is also one of very few species in or recently excluded from *Opegrapha* having a pale and comparatively inconspicuous, silicolous thallus, a basally closed excipulum and, most significantly, small 3-septate ascospores (less than 20 µm long). A rather similar lichen, at least in terms of habit and gross morphology, is the mainly Northern Hemisphere species *Arthonia calcarea* (Turner ex Sm.) Ertz & Diederich (syn. *O. calcarea* Turner ex Sm.). However, that species is almost exclusively calcicolous, and it is further separated from the Australian taxon by its broadly clavate to subglobose, *Arthonia*-type asci, a K+ greenish excipulum and epihymenium, clavate ascospores and broader conidia (Clauzade & Roux 1985; Torrente & Egea 1989; Wieczorek 2018; Cannon *et al.* 2020, 2021a; Nimis 2021). *Alyxoria culmigena* (Lib.) Ertz, with *Opegrapha herbarum* Mont. in its synonymy, is an even more ubiquitous species, its range including southern Australia (McCarthy 2020). This predominantly corticolous and lignicolous taxon occasionally grows on sandstone, and while it has some strong morphological and anatomical similarities with *O. ornaria*, the ascospores are larger, (16–)18–24(–26) × (4–)5–7(–8) µm, and they often turn reddish brown after maturity (Ertz & Egea 2007; Wieczorek 2018; Cannon *et al.* 2021b).

The new lichen, like *O. australis* (see above), is known from siliceous seashore rocks in southern New South Wales and eastern Victoria. *Opegrapha oraria* shares a similar range of habitat and associated lichens, and it is likely to be found in coastal communities elsewhere in southern Australia.

ADDITIONAL SPECIMENS EXAMINED
New South Wales: ● South Coast, Jervis Bay, *c.* 1 km S of Plantation Point, Vincentia, 35°04’22”S, 150°41’41”E, *c.* 2–3 m alt., on sheltered sandstone on the seashore, *P.M. McCarthy 4595*, 23.v.2017 (CANB); ● South Coast, Jervis Bay, Callala Bay, 0.5 km W of Callala Point, 35°00’22”S, 150°43’07”E, *c.* 1.5 m alt.**,** on unstable, vertical shale cliff receiving sea spray and soil runoff from above, *P.M. McCarthy 4948, 4949*, 19.iv.2017 (CANB); ● *loc. id.*, *J.A. Elix 46368*, 19.iv.2017 (CANB); ● *loc. id.*, *J.A. Elix 46384, 46387*, 23.v.2017 (CANB).
Victoria: ● East Gippsland, Quarry Beach, 6 km SW of Mallacoota, near airfield, 37°36’03”S, 149°43’41”E, *c.* 1.5 m alt., on deeply shaded sandstone on the seashore, *P.M. McCarthy 4504*, 30.x.2016 (CANB); ● type locality, on moderately sheltered mica schist on the seashore, *P.M. McCarthy 4510*, 30.x.2016 (CANB).

Other species

Opegrapha diaphoriza Nyl., *Lich. Nov. Zel.* 114 (1888) Figs 6 & 8D, E

This maritime, siliceous species is known from rocky seashores in New Zealand, and it also occurs in subantarctic Macquarie Island (Hayward 1977; Galloway 2007). Reported here for the first time from the Australian mainland, it has an effuse and very thin, greenish grey thallus. The dull black, sessile ascomata are 0.5–1.5(–2) mm long and 0.2–0.4 mm wide [*n* = 30], straight to slightly curved or flexuose and simple to once-branched, with a slit-like disc and a carbonized proper excipulum that is closed and thickened at the base. The hymenium is heavily inspersed with minute granules, the clavate-cylindrical asci are 65–72 × 17–24 µm [*n* = 15], and the (3–)5-septate ascospores are comparatively thick-walled, fusiform to oblong-fusiform and 17–27 × 5–8 µm [*n* = 63]. One or 2 cells in the middle of 5-septate spores are often markedly larger than those closer to the apices.

SPECIMENS EXAMINED
New South Wales: ● South Coast, Tomakin, Barlings Beach**,** 35°49’49”S, 150°12’20”E, alt. 1.5 m, on sheltered shale cliff on the foreshore, *P.M. McCarthy 4563, 4565A*, 19.xi.2016 (CANB).

Opegrapha spodopolia Nyl., *J. Linn. Soc. Bot.* **9**, 257 (1865) Figs 7 & 8A–C

The highly variable thallus of *O. spodopolia* can be thin and effuse to thick, well delimited and rimose to scurfy-areolate, off-white or pale to medium or darker grey, or yellowish brown to pale greenish brown, with or (usually) without a black prothallus. The black, lirelliform ascomata are semi-immersed and adnate to superficial and sessile, simple to sparingly branched, ± isodiametric or 0.4–1.2(–2) mm long and 0.2–0.5(–0.65) mm wide [*n* = 100], usually with blunt ends and a contorted and sometimes grossly uneven surface, with an irregular, slit-like apex or a narrow, gaping and epruinose disc. The proper excipulum is blackish in section, contiguous with or arching away from the hymenium (then with whitish tissue between the two layers) and 40–80(–110) um thick at the sides, but open at the base (in marked contrast to the other saxicolous species documented here). The epihymenium is 15–30 µm thick and mid-brown to dark brown, while the anastomosing paraphysoids are (0.7–)1–1.5(–2) µm thick, and the clavate, 8-spored asci are 58–80 × 14–21 µm [*n* = 51]; together they form a usually non-inspersed, amyloid hymenium that is 70–100(–130) µm deep, this layer being subtended by a pale brown to pale or medium olive hypothecium, (30–)50–80(–100) µm thick, inspersed or not by minute oil globules. The persistently colourless and narrowly fusiform ascospores are (3–)5–6(–7)-septate, with cells of ± equal size, straight or slightly curved, sometimes markedly constricted at the primary septum, and they measure (17–)24(–28) × (4–)5(–6.5) µm [*n* = 113], with a usually thin perispore at maturity (thickening in K). The sparse pycnidia contain bacilliform conidia 4.5–7.5 × *c.* 1 µm. No lichen substances were detected by TLC (Elix 2022).

First described from southern New Zealand (see Hayward 1977; Galloway 1985), *O. spodopolia* was recently reported from Kangaroo Island, South Australia (Kantvilas 2019). It is also rather common on sheltered, siliceous seashore rocks in Tasmania (Kantvilas *et al.* 2020), and it is recorded here for the first time from similar substrata and habitats in eastern Victoria and southern New South Wales.

SPECIMENS EXAMINED
New South Wales: ● South Coast, Callala Bay, 0.5 km W of Callala Point, 35°00’22”S, 150°43’07”E, 0.5**–**2 m alt., on unstable, vertical shale cliff receiving sea spray and soil runoff from above, *P.M. McCarthy 4577*, 19.iv.2017 (CANB); ● South Coast, Black Head, Gerroa, 34°46’36”S, 150°49’19”E, 2–3 m alt., on sandstone rocks of foreshore cliffs, *P.M. McCarthy 4586*, 24.v.2017 (CANB); • *loc. id.*, *J.A. Elix 46440* (CANB); ● South Coast, Pooles Beach, 3 km S of Mystery Bay, 36°18’46”S, 150°07’57”E, 1–3 m alt., on exposed shale outcrops along foreshore, *P.M. McCarthy 4533, 4534, 4535, 4556A*, 18.xi.2016 (CANB); ● *loc. id.*, *J.A. Elix 46298, 46303* (CANB); ● South Coast, Merimbula Point, 3 km SE of Merimbula, 36°54’S, 149°56’E, 8 m alt., on exposed siliceous rocks above the foreshore, *H.T. Lumbsch & H. Streimann 8614g*, 16.vi.1991 (CANB); ● South Coast, Tomakin, cliffs just N of Barlings Beach**,** 35°49’49”S, 150°12’20”E, 1–3 m alt., on sheltered shale cliff on the foreshore, *J.A. Elix 46329, 46340*, 18–19.xi.2016 (CANB); ● South Coast, Tomakin Cove, Melville Point, 35°49’48”S, 150°11’25”E, alt. *c.* 1.5 m, on sheltered shale cliff on the foreshore, *P.M. McCarthy 4947*, 6.xi.2021 (CANB); ● South Coast, Green Cape Peninsula, Haycock Point, 7.5 km ESE of Pambula, 36°57’03”S, 149°56’10”E, *c.* 1.5 m alt., on hard, sheltered sandstone on the seashore, *P.M. McCarthy 4752*, 21.iii.2018 (CANB); ● *loc. id.*, *J.A. Elix 46589, 46591* (CANB); ● South Coast, 5 km N of Bermagui, Camel Rock, 36°22’41”S, 150°04’37”E, alt. *c.* 3 m, on sheltered quartzitic sandstone on the seashore, above the splash zone, *P.M. McCarthy 4627, s.n.*, 10.ii.2016 (CANB); ● *loc. id.*, *J.A. Elix 46125, 46128* (CANB).
Victoria: ● East Gippsland, Quarry Beach, 6 km SW of Mallacoota, near airfield, 37°36’03”S, 149°43’41”E, 1–3 m alt., on deeply shaded sandstone on the seashore, *P.M. McCarthy 4498, 4500, 4501, 4502, 4506, 4512*, 30.x.2016 (CANB).

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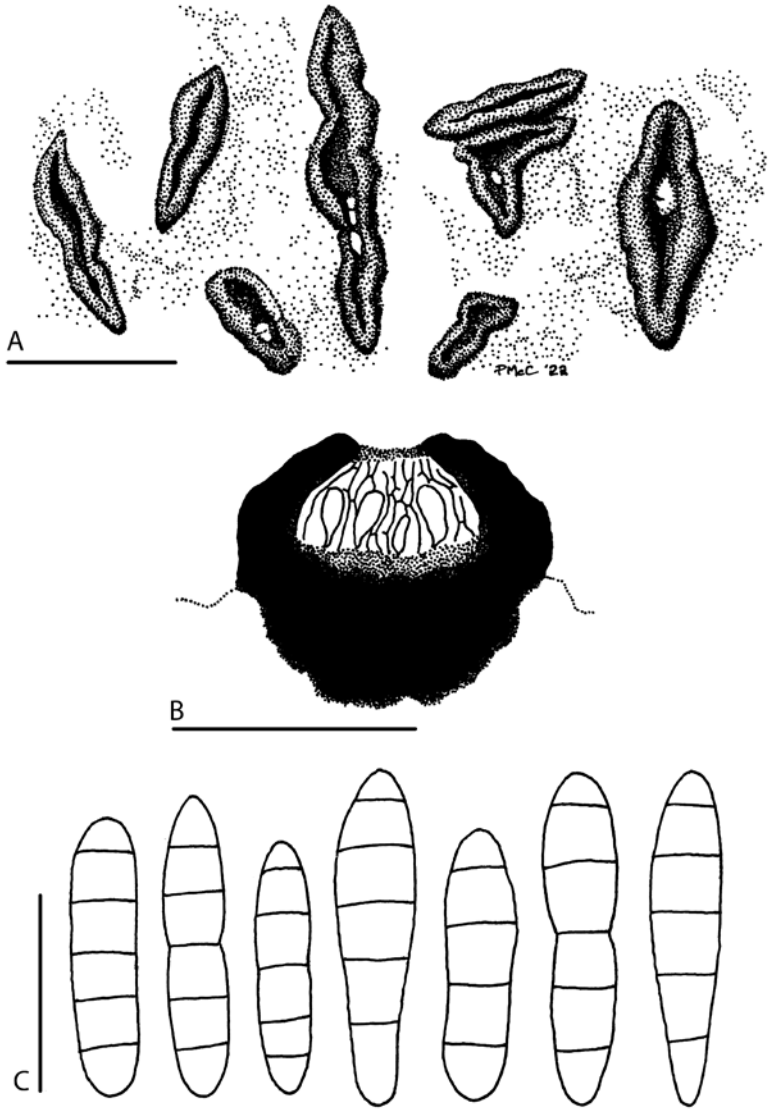

Figure 1. *Opegrapha australis* (A, holotype; B, *P.M. McCarthy 4516*; C, various specimens). A, Habit of thalli and ascomata; B, Vertical section of an ascoma (across the short axis, semi-schematic); C, Ascospores. Scales: A = 0.5 mm; B = 0.2 mm; C = 10 µm.

Figure 2. *Opegrapha howeana* (holotype). Scales: 2 mm.

Figure 3. *Opegrapha oraria* (*P.M. McCarthy 4948*). Scale: 1 mm.

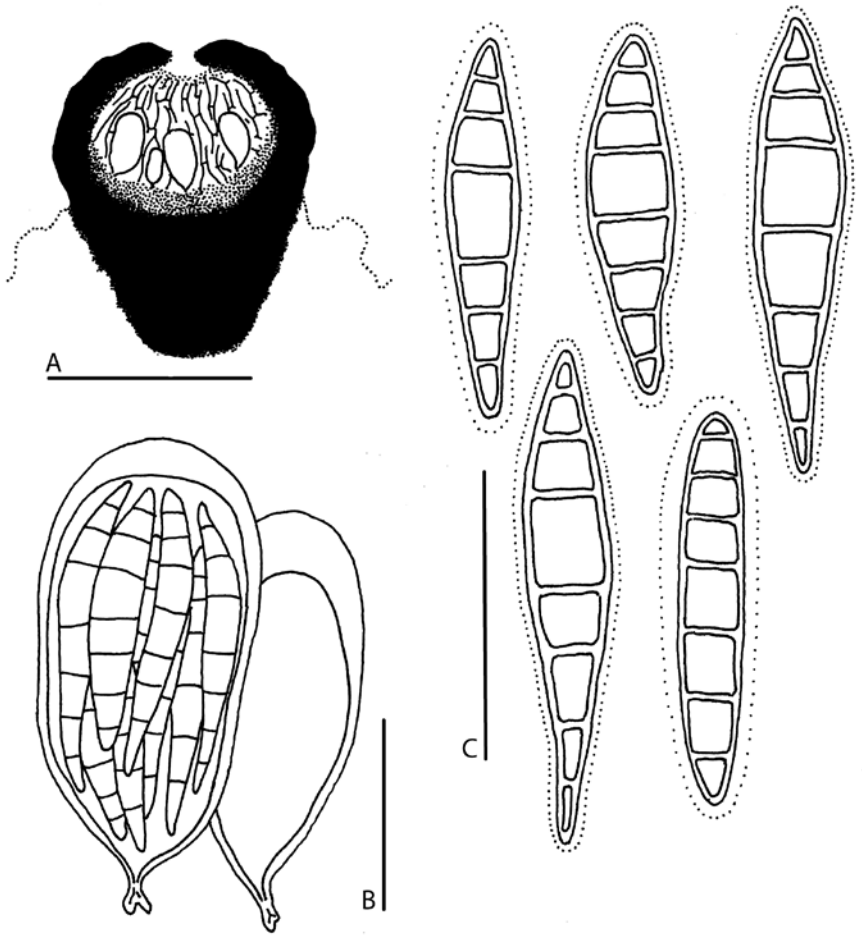

Figure 4. *Opegrapha howeana* (holotype). A, Vertical section of an ascoma (across the short axis, semi-schematic); B, Mature and immature asci; C, Ascospores. Scales: A = 0.2 mm; B, C = 20 µm.

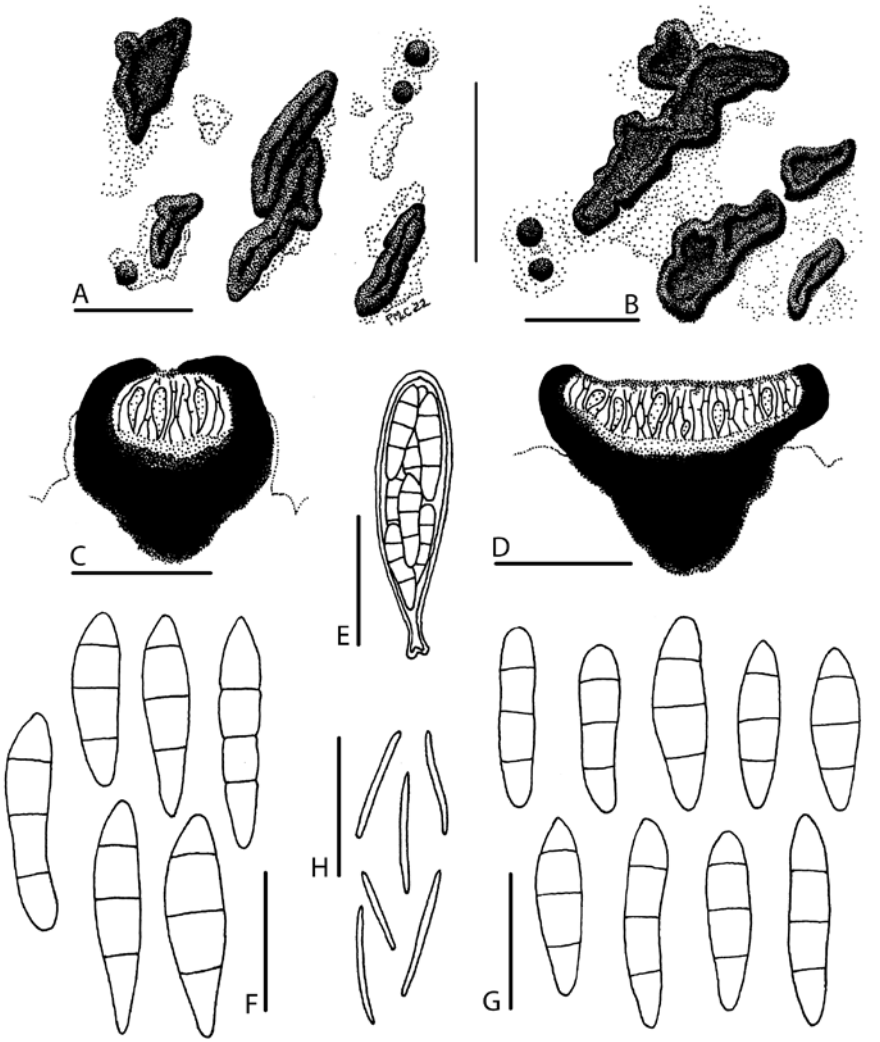

Figure 5. *Opegrapha oraria* (A, E, F, H, *P.M. McCarthy 4595*; B, D, G, *P.M. McCarthy 4948*; C, holotype). A, B, Habit of thalli, ascomata and pycnidia; C, D, Vertical sections of ascomata (across the short axis, semi-schematic); E, Mature ascus; F, G, Ascospores; H, Conidia. Scales: A, B = 0.5 mm; C, D = 0.2 mm; E = 20 µm; F, G = 10 µm; H = 5 µm.

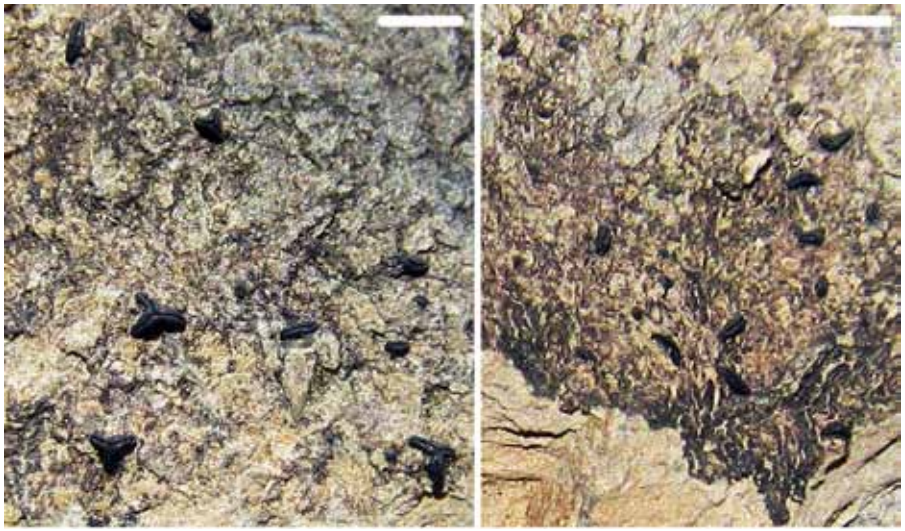

Figure 6. *Opegrapha diaphoriza* (*P.M. McCarthy 4563*). Scales: 2 mm.

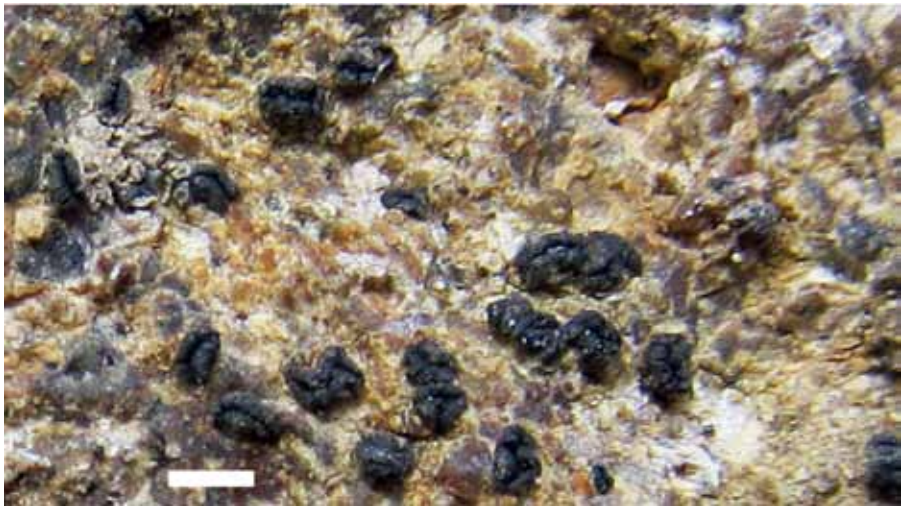

Figure 7. *Opegrapha spodopolia* (*P.M. McCarthy 4947*). Scale: 1 mm.

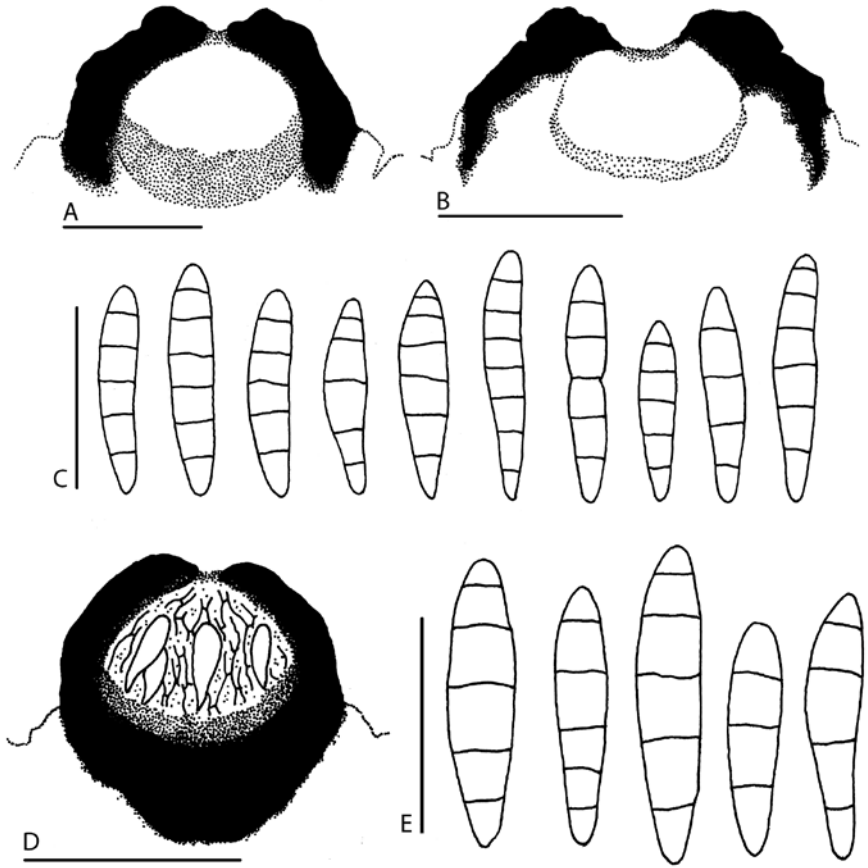

Figure 8. *Opegrapha spodopolia* (A–C) and *O. diaphoriza* (D, E). A, B, Vertical sections of ascomata (across the short axis, semi-schematic; A, *P.M. McCarthy 4503*; B, *P.M. McCarthy 4534*); C, Ascospores (various specimens); D, Vertical section of an ascoma (across the short axis, semi-schematic; *P.M. McCarthy 4563*); E, Ascospores (*P.M. McCarthy 4563*). Scales: A, B, D = 0.2 mm; C, E = 20 µm.