

Eleven new species of crustose lichenized fungi from the Falkland Islands (Islas Malvinas)

Alan M. FRYDAY 

Abstract: Eleven new species of crustose, lichenized fungi are described from the Falkland Islands (Islas Malvinas). Nine species are saxicolous, whereas *Lecania vermisporea* occurs on the stems of *Hebe elliptica* and *Tephromela lignicola* is lignicolous on fence posts. The new species are: *Bacidia marina*, with a sordid blue-green K–, N+ violet epihymenium and acicular, multiseptate ascospores; *B. pruinata*, with pruinose apothecia and multiseptate ascospores; *Buellia gypsyensis*, with a thallus containing 5-O-methylhiassic acid and with *Amandinea*-type conidia; *Cliostomum albidum*, with pruinose apothecia lacking pigments; *C. longisporum*, with long narrow ascospores (c. 20 × 3 µm); *Coccotrema rubromarginatum*, with a placodioid thallus having a red-brown margin and lower surface; *Hymenelia microcarpa*, with minute, immersed apothecia (<0.1 mm diam.) and a trebouxoid photobiont; *Lecania vermisporea*, with vermiform, 3–6 septate ascospores; *Lepra argentea*, with papillate isidia with dark caps; *Rhizocarpon malvinae*, which is similar to *R. reductum* but with a grey thallus, generally sessile apothecia with a thick raised margin and often with the Cinereorufa-green pigment in the epithecium and upper exciple; and *Tephromela lignicola*, a sterile, sorellate species on fence posts. Most of these species are reported only from the Falkland Islands although *Coccotrema rubromarginatum* is also reported from Isla de los Estados and Isla Grande de Tierra del Fuego, Argentina. Ascoconidia are reported from *Lepra argentea* and cephalodia from *Pertusaria pachythallina*. Keys to the species reported from the Falkland Islands in the genera of the newly described species are also provided.

Key words: ascoconidia, cephalodia, South America, southern subpolar region, taxonomy

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Introduction

Recent fieldwork on the Falkland Islands, along with the continued investigation of previously collected material from the archipelago, has made possible the compilation of an annotated checklist of lichens reported from the islands (Fryday *et al.* 2019). However, despite several recent publications describing new taxa from the islands (Fryday & Common 2001; Coppins & Fryday 2006; McCarthy & Fryday 2009; Lumbsch *et al.* 2010; Fryday & Øvstedal 2012; Fryday & Hertel 2014; Søchting *et al.* 2016; Fryday *et al.* 2017a, b; Orange 2018; Øvstedal *et al.* 2018), many more remain to be fully investigated. In order to make the checklist from the

islands as comprehensive as possible, this contribution describes 11 new crustose, mainly saxicolous, species in nine genera.

Materials and Methods

This study is based upon specimens collected by Henry Imshaug and Richard Harris (1968) and housed in the herbarium of Michigan State University (MSC), supplemented by those of the author and Alan Orange (Cardiff) collected in January–February and November 2015 from various localities on the Falkland Islands (Fig. 1). The author's collections are also in MSC, whereas those of Orange are in the herbarium of the National Museum of Wales (NMW) with some duplicates in the Falkland Islands National Herbarium, Stanley (FINH).

Apothecial characteristics were examined by light microscopy on hand-cut sections mounted in water, 10% KOH (K), 50% HNO₃ (N), 10% HCl (H) or Lugol's reagent (0.15% aqueous IKI). Thallus sections were investigated in water, K and lactophenol cotton-blue. The ascus structure was studied in IKI, both without prior treatment and after pretreatment with K. Measurements of ascospores and paraphyses were made in K. Ascospore dimensions are given as (smallest

A. M. Fryday: Herbarium, Department of Plant Biology, Michigan State University, East Lansing, MI 48824-1312, USA. Email: fryday@msu.edu

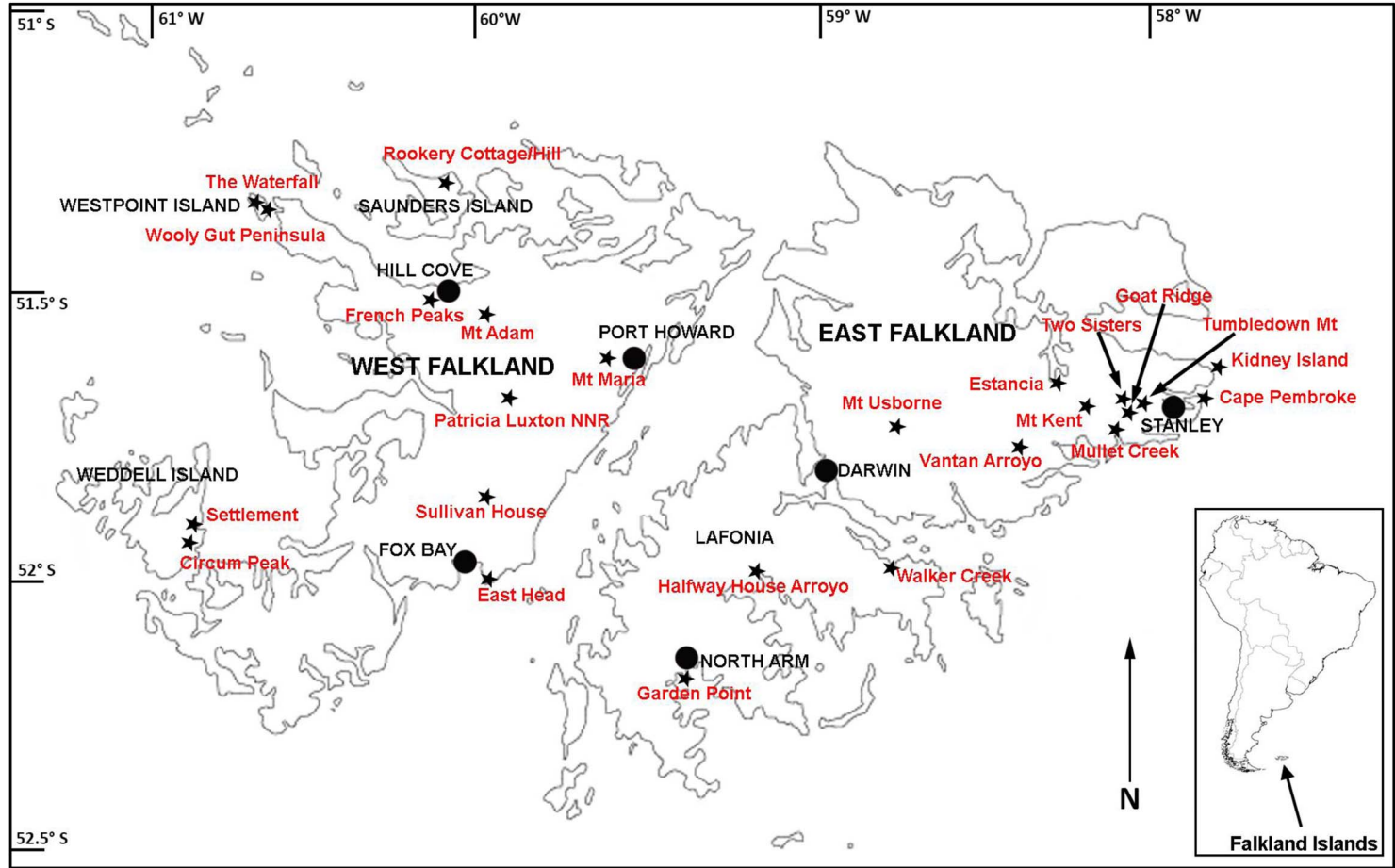


FIG. 1. Map of the Falkland Islands showing main settlements and islands (black text and black filled circles) and localities mentioned in the text (grey text (red online) and black stars). Inset showing the position of the Falkland Islands in relation to South America. In colour online.

measured—) *arithmetic mean* ± standard deviation (—largest measured). All hamathecial filaments are referred to as ‘paraphyses’, regardless of their origin. Thin-layer chromatography follows the methods of Orange *et al.* (2001). Nomenclature for apothecial pigments follows Meyer & Printzen (2000).

The Taxa

Bacidia marina Fryday *sp. nov.*

MycoBank No.: MB 829175

Characterized by its saxicolous habit, conglomerate apothecia, sordid blue-green K[−], N⁺ violet epihymenium, K⁺ purple exciple and acicular multiseptate ascospores, 32–48 × 2.5–3.5 µm.

Type: Falkland Islands, East Falkland, Cape Pembroke, 51°69′22.79″S, 57°76′39.77″W, 3 m, sloping rocks in upper splash zone, 21 January 2015, Fryday 10818 (MSC—holotype).

(Fig. 2)

Thallus mostly endolithic or between grains of the substratum, except near apothecia where a few areoles may be present, better developed in shaded situations (underside of rocks) where white to hyaline areoles are present; *areoles* angular, 0.2–0.4 mm across; *medulla* I[−]. *Photobiont* trebouxoid; cells 6–15 µm diam.

Apothecia lecideine, black, 0.4–0.6 mm diam., orbicular but larger apothecia becoming flexuose, usually in groups of 4–5, 0.8–1.0 mm across, rarely single; *disc* flat to slightly convex; *margin* thick, 0.05–0.07 mm wide, persistent, barely raised. *In section: proper exciple* red-brown, K⁺ purple, well developed, 70–85 µm wide, composed of radiating hyphae, 4–5 µm wide, cortical cells 8–10 µm diam. *Hymenium* 70–80 µm high; *paraphyses* simple, thin, 1.5 µm wide, widening slightly at apex to 4 µm, lax and readily separating in water; *epihymenium* 5–12 µm high, sordid blue-green K[−], N⁺ violet. *Hypothecium* pale brown above and composed of vertical hyphae, darker brown below and composed of inflated, randomly orientated hyphae, K[−]. *Asci* cylindrical 45–55 × 10–12 µm, *Bacidia*-type; *ascospores* acicular, 7-septate, (32–)40.67 ± 4.31(–48) × (2.5–)3.00 ± 0.21(–3.5) µm, l/w ratio (11.14–)

13.58 ± 1.36(–16.00), (*n* = 12), rounded at upper end tapering to narrow rounded lower end, loosely spirally arranged in the ascus.

Conidiomata not observed.

Chemistry. K[−], C[−], KC[−], Pd⁺(f) brownish; thallus too thin for TLC.

Etymology. Named after its habitat of maritime rocks.

Ecology and distribution. Known only from the Falkland Islands, where it is reported only from maritime rocks at the eastern tip of East Falkland. Associated species: *Tephromela lirellina* (Darb.) Fryday, *Buellia* sp., *Caloplaca* s. lat. sp., *Cliostomum* sp. and *Verrucaria* sp.

Remarks. Anatomically the new species closely resembles *Bacidia tuberculata* Darb., but the epihymenium of that species is dilute reddish brown and the hypothecium is more consistently red-brown, K⁺ purple. However, *B. tuberculata* differs most noticeably in gross morphology, having a thick, granular thallus in which the apothecia, which are only rarely conglomerated, are immersed. Also similar is the recently described *B. littoralis* Kantvilas from Tasmania. However, that species has a distinctly epilithic, grey-green to olive brownish thallus, and apothecia that are rarely conglomerated and become convex and immarginate. It also has narrower excipular hyphae, a more uniformly red-brown hypothecium, paraphyses that do not separate in water and ascospores that are sometimes spirally arranged in the ascus. It appears more similar to *B. tuberculata* than to *B. marina*. *Bacidia littoralis* is also not known from New Zealand and appears to be confined to Tasmania and adjacent mainland Australia (Kantvilas 2018).

Additional specimens examined. **Falkland Islands:** *East Falkland:* Kidney Island, on SE shore between landing bay and SE Pt., sea level, 1968, Imshaug 40551, 40568 & Harris; Port William, N side of Hell’s Kitchen, sea level, coastal rocks, 1968, Imshaug 41641 & Harris; *ibid.*, N side of Gypsy Cove, sea level, 1968, Imshaug 41664A & Harris.

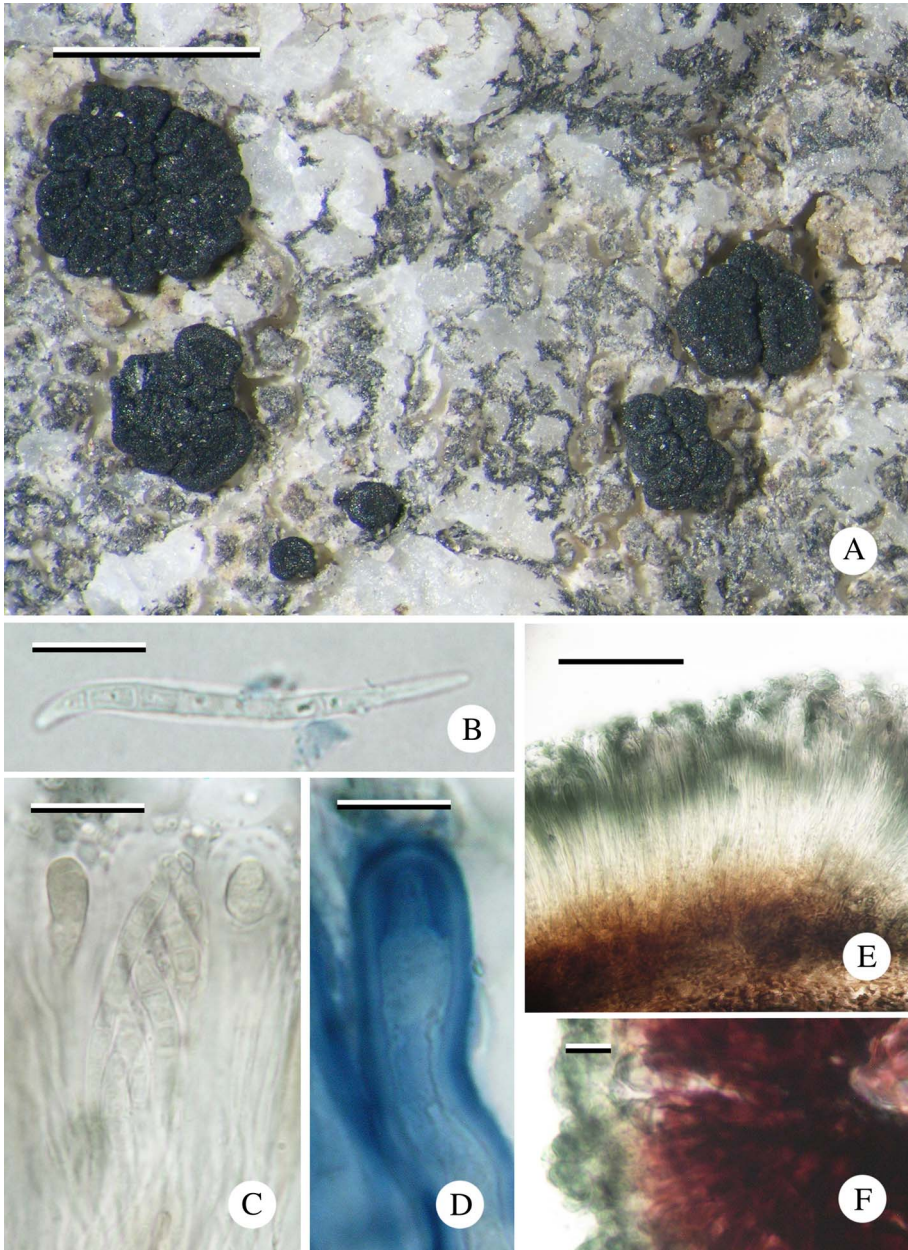


FIG. 2. *Bacidia marina*. A, thallus with apothecia (*Fryday* 10818, holotype); B, ascospore; C, ascospores in ascus (in 10% KOH); D, ascus in IKI; E, hymenium in 10% KOH; F, exciple in 10% KOH with cyanobacterial cells at the outer edge (B–F *Imshaug* 40551). Scales: A = 1 mm; B–D & F = 10 μ m; E = 50 μ m.
In colour online.

***Bacidia pruinata* Fryday sp. nov.**

MycoBank No.: MB 829176

Characterized by the thick thallus, orange-brown, pruinose apothecia and multiseptate, acicular ascospores, $33\text{--}45 \times 5\text{--}6 \mu\text{m}$. Further distinguished from other *Bacidia* species by the minute granules in the apothecia that dissolve in K to give a yellow solution.

Type: Falkland Islands, Saunders Island, Rookery Hill, 51°31'17"S, 60°10'49"W, 241 m, N-facing rock, 4 November 2015, Fryday 11314 (MSC—holotype).

(Fig. 3)

Thallus effuse, cream to grey, thick and warty, 0.5–2.0 mm thick, areolate; *areoles* 0.3–0.4 mm across with a rough, granular surface; *medulla* I–. *Photobiont* trebouxoid; cells 6–15 μm diam. with a thick hyaline wall.

Apothecia biatorine, pale orange-brown to grey, 1.0–1.2 mm diam., constricted below, orbicular becoming slightly flexuose, flat to slightly convex; *disc* heavily white, granular pruinose; *margin* thick (0.1–0.15 mm wide), not pruinose, slightly raised and persistent. *In section: proper exciple* well developed, c. 300 μm wide, cupular, pale yellow-brown laterally, hyaline below the hypothecium, interspersed with fine granules that dissolve in K to give a yellow solution but insoluble in N, composed of radiating branched and anastomosing hyphae, 2–3 μm wide, not enlarged at the outer edge. *Hymenium* 90–120 μm high; *paraphyses* \pm simple, sparingly branched and anastomosing, very thin, 1.0 μm wide, widening slightly at apices to 2 μm , lax and readily separating in water except at the apex; *epihymenium* hyaline but upper 10–20 μm interspersed with fine brown granules that dissolve in K to give a yellow solution but are insoluble in N. *Hypothecium* pale yellow brown, c. 100–120 μm high, interspersed with fine granules that dissolve in K to give a yellow solution but are insoluble in N, composed of vertical hyphae above and inflated, randomly orientated hyphae below. *Asci* cylindrical, slightly swollen towards upper end, $65\text{--}70 \times 18\text{--}20 \mu\text{m}$, *Biatora/Lecanora*-type with a prominent ocular chamber when immature; *ascospores* acicular, $7\text{--}9(12)\text{--}septate$, $(33\text{--})42.08 \pm 5.84(45) \times (5.0\text{--})5.375 \pm 0.380(6.0) \mu\text{m}$, l/w ratio (7.09–)

$7.86 \pm 1.19(10.00)$, ($n = 12$), not spirally arranged in the ascus.

Conidiomata not observed.

Chemistry. K+ yellow, C–, Pd–. TLC: atranorin, yellow spot at Rf 6.5 in solvent C, \pm norstictic acid (holotype).

Etymology. Named after the densely pruinose apothecia.

Distribution and ecology. Known only from the Falkland Islands. Reported from siliceous rocks on both main islands as well as two of the smaller ones, usually at relatively high altitude (180–240 m), although one collection is from <100 m. Associated species: *Ramboldia petraeoides* (Nyl. ex C. Bab. & Mitt.) Kantvilas & Elix, *Pertusaria cerebrinula* Zahlbr. and *Usnea* sp.

Remarks. The apical ascus structure of the new species appears to be intermediate between the *Biatora* and *Lecanora* types (Hafellner 1984). It has an amyloid tholus with a darker staining region immediately adjacent to the non-amyloid apical cushion, which penetrates to the upper wall of the ascus with sides that are either vertical or narrowing upwards (Fig. 3B)

The ascus type and other apothecial characters, especially the granular exciple composed of thin, branched and anastomosing hyphae, clearly exclude this species from *Bacidia* s. str. An ITS sequence was obtained from one collection (Orange 22970) but a BLAST search failed to reveal any close relatives, with no published sequence being more than 86% identical (*Bacidina* and *Biatora* spp.). Rather than erect a new monotypic genus, the species is retained in *Bacidia* pending further molecular investigation.

Additional specimens examined. **Falkland Islands:** *East Falkland:* Stanley, Goat Ridge, 600 ft, outcrops along ridge, 1968, Imshaug 41528 & Harris. *West Falkland:* Fox Bay, summit of East Head, 600 ft, 1968, Imshaug 42100 & Harris. *Saunders Island:* Rookery Mountain, 51°31'20"S, 60°10'18"W, 2015, A. Orange 22970 (NMW). *Westpoint Island:* settlement side of Woolly Gut Pt. peninsula, 300 ft, 1968, Imshaug 40830 & Harris.

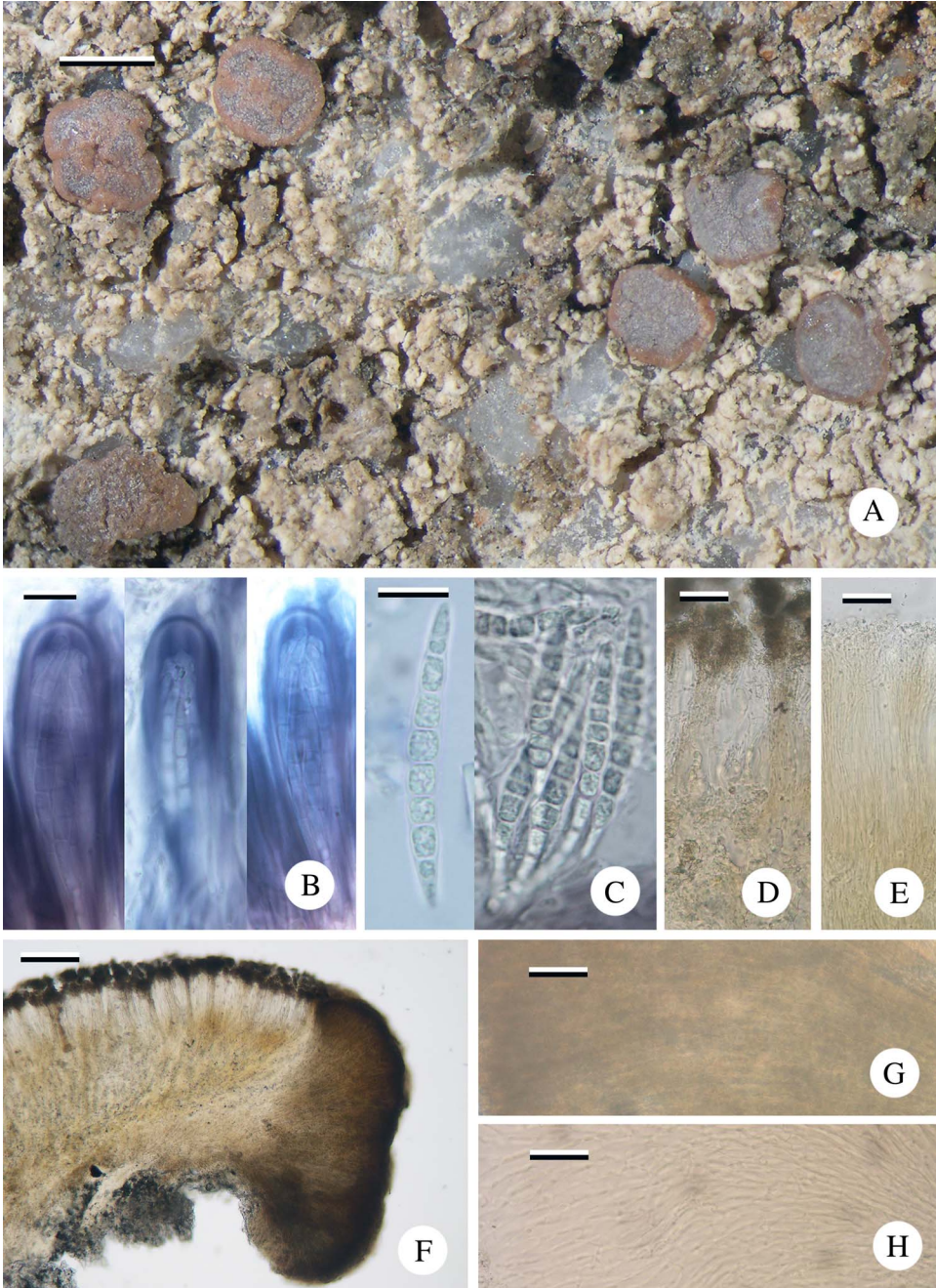


FIG. 3. *Bacidia pruinata* (A, G & H, *Imshaug* 42100; B–F, *Fryday* 11314, holotype). A, thallus with apothecia; B, asci in IKI; C, ascospores in IKI; D, hymenium in water; E, hymenium in 10% KOH; F, section in water; G, exciple in water, occluded by minute granules; H, exciple in 10% KOH showing fine, branched and anastomosing hyphae. Scales: A = 1 mm; B, C, G & H = 10 μ m; D & E = 25 μ m; F = 100 μ m. In colour online.

Provisional key to species of *Bacidia* occurring in the Falkland Islands

- 1 Corticolous, on *Empetrum nigrum* stems; apothecia pale to mid brown, often piebald, not pruinose; ascospores 50–65 µm long, 9–15-septate ***Bacidia* sp. ‘A’**
Saxicolous 2
- 2(1) Apothecia black 3
Apothecia yellow or pallid. 4
- 3(2) Thallus thick, granular; ascospores 35–40 µm long; hymenium 50–60 µm high; epihymenium brown ***B. tuberculata***
Thallus areolate or absent; ascospores 35–55 µm long; hymenium 80–90 µm high; epihymenium sordid blue-green ***B. marina***
- 4(2) Apothecia pallid, pruinose; exciple with minute crystals dissolving in K
. ***B. pruinata***
Apothecia yellow, not pruinose; exciple lacking minute crystals . . . ***Bacidia* sp. ‘B’**

***Buellia gypsensis* Fryday sp. nov.**

Mycobank No.: MB 829177

Distinguished from all other species of the genus by a combination of filiform conidia and the thallus containing 5-*O*-methylhiassic acid as the major substance.

Type: Falkland Islands, East Falkland, Stanley, Gypsy Cove, 51°67'39.20"S, 57°80'32.5"W, 10 m, shaded N-facing rock, 2 November 2015, *Fryday* 11286 (MSC—holotype).

(Figs 4 & 5)

Thallus areolate, cream or appearing pale yellow, occurring as a closed mosaic of thalli separated by black margins; individual thalli angular, mostly <5 mm across but up to 8 mm; *areoles* 0.2–0.4 mm across, angular, flat with vertical sides, 0.2–0.4 mm thick; *cortex* absent but a thin epinecral layer 5–10 µm high is patchily developed above an upper, 40–50 µm high, algal-free zone composed of vertically orientated hyphae (Fig. 4B) that are 3–4 µm wide and coated with extra-cellular crystals (Figs 4E & 5); *medulla* I+ pinkish. *Photobiont* trebouxoid; cells 6–12 µm diam. with a thick hyaline wall, distributed throughout the medulla, often in loose vertical columns.

Apothecia frequent, covering much of the thallus, black, lecideine, adnate to sessile with a broad base, 0.25–0.3(–0.4) mm diam.; *disc* flat, matt; *margin* thin, 0.02–0.03 mm wide, black, shiny, slightly raised. *In section: proper exciple* 15–25 µm wide, dark

brown-black, annular but extending part way under the hymenium. *Hymenium* 70–75 µm high; *paraphyses* c. 2 µm wide, unbranched except near the apices that are up to 5 µm wide and have a brown cap; *epihymenium* brown, c. 10 µm high. *Hypothecium* composed of vertically aligned hyphae, upper 25 µm dilute red-brown, becoming darker below and extending 100 µm into the thallus (Fig. 4C). *Asci* clavate, c. 30 × 15 µm; apical apparatus indistinct but apparently *Biatora*-type with a wide apical cushion (Fig 4F); *ascospores* pale grey when immature, becoming brown, 1-septate, with a slight median wall thickening (Fig. 4G), (10–)11.33 ± 1.56(–15) × (4.5–)5.0 ± 0.37(–6.0) µm, l/w ratio (2.00–)2.27 ± 0.31(–3.0) (*n* = 12).

Conidiomata rare, red-brown, ±flat, 0.04 mm diam.; wall composed of vertically aligned hyphae c. 2–3 µm wide that gradually widen to 4–5 µm at the surface, upper 20–25 µm becoming increasingly brown-pigmented with dark brown caps (similar to the paraphyses); *conidiophores* not observed; *conidia* *Amandinea*-type, filiform, curved, 17–20 µm long (Fig. 5D).

Chemistry. K–, C+ pink, KC–, Pd–; 5-*O*-methylhiassic acid (major), gyrophoric acid (minor or trace) and lecanoric acid (minor or trace) by TLC.

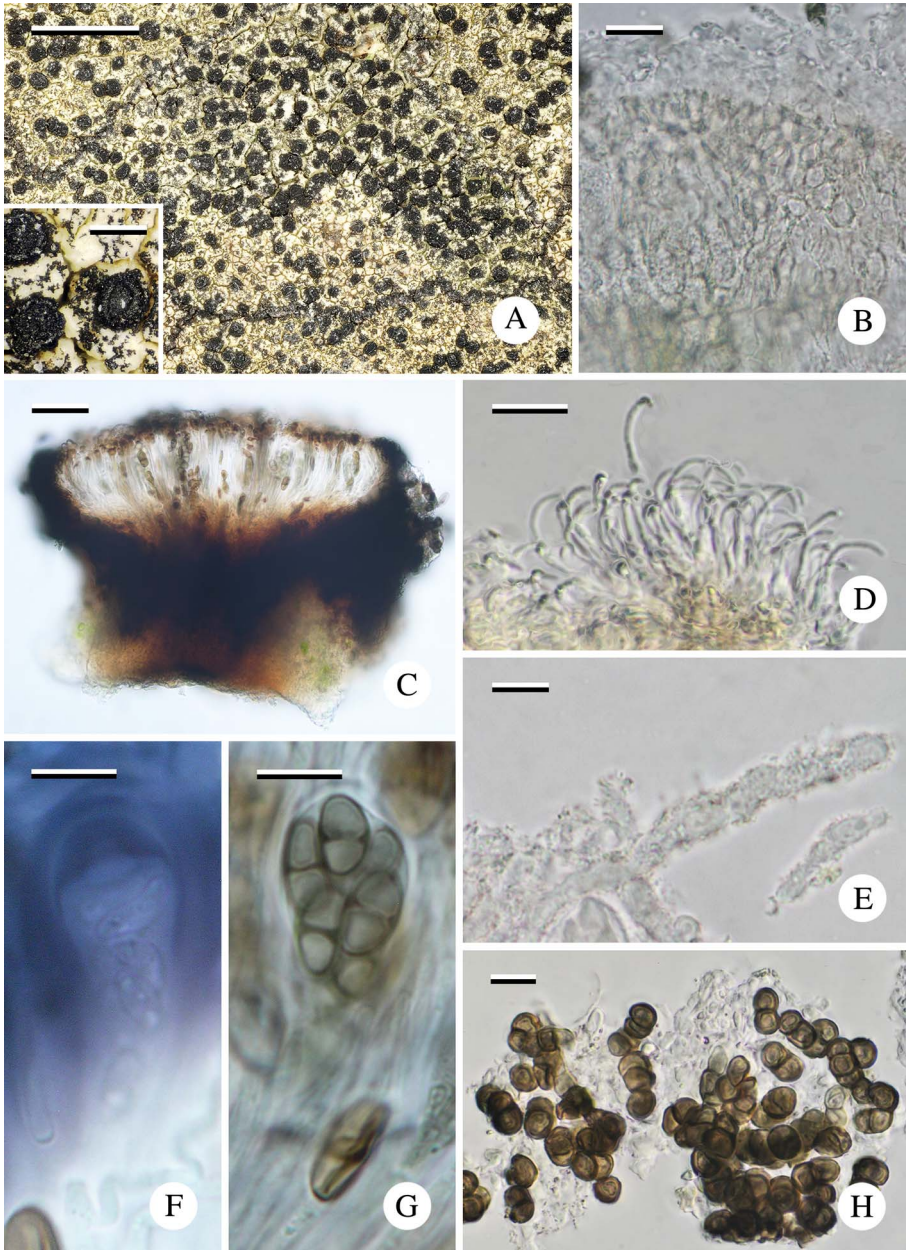


FIG. 4. *Buellia gypsyensis* (Fryday 11286, holotype). A, thallus with apothecia; B, section through thallus; C, section through apothecium; D, conidia; E, fungal hyphae from thallus; F, ascus in IKI; G, ascus and ascospores; H, parasitic hyphomycete cells. Scales: A = 2 mm (insert = 0.2 mm); B, F–H = 10 μ m; C = 50 μ m; D = 20 μ m; E = 5 μ m. In colour online.

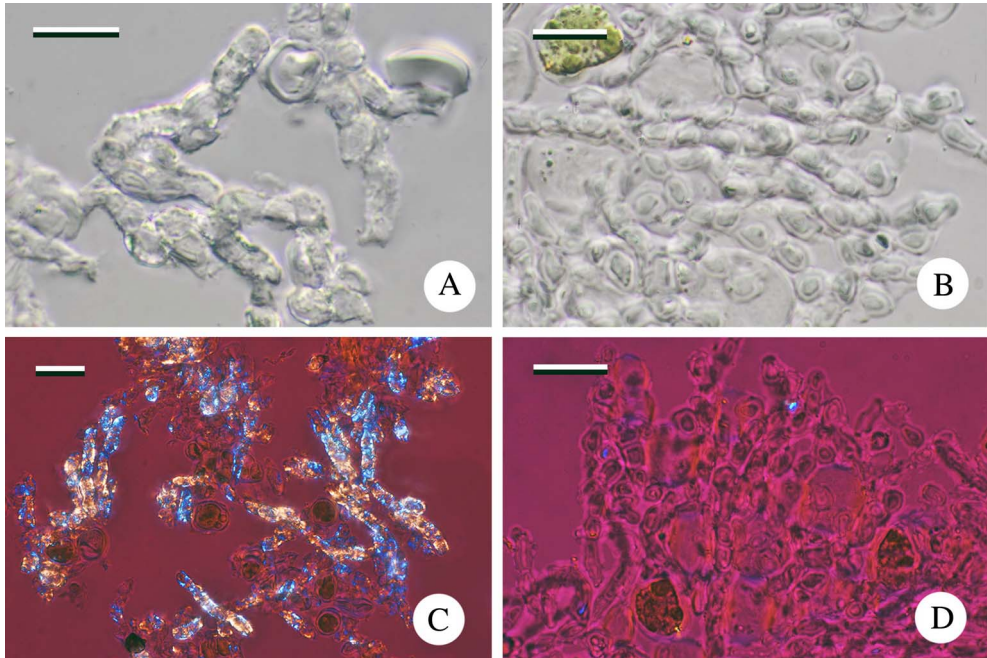


FIG. 5. *Buellia gypsyensis* (Fryday 11286, holotype). A & B, under DIC illumination; C & D, under polarized light with a red filter. A & C, hyphae in water, before treatment with 10% KOH; B & D, hyphae after treatment with 10% KOH. Scales = 10 µm.

Etymology. Named after Gypsy Cove, the type locality.

Ecology and distribution. Known only from the Falkland Islands, where it is reported from only a single collection from rocks near the coast at the eastern tip of East Falkland.

Remarks. The new species is known only from the type collection but is quite distinct as it is the only known buellioid lichen with *Amandinea*-type conidia and a thallus containing 5-*O*-methylhiascic acid as the only major substance. All other buellioid species containing 5-*O*-methylhiascic acid have short bacilliform conidia except *Buellia carballaliana* Paz-Berm. & Giralt, a lignicolous species known only from Portugal (Paz-Bermúdez *et al.* 2009), for which conidia were not observed. The most similar species would appear to be *B. eganii* Bungartz described from New Mexico, but that species has short, bacilliform conidia and immersed apothecia with a reduced, hyaline proper

exciple (*aethalea*-type; Bungartz & Nash 2004; Bungartz *et al.* 2007).

The filiform conidia would suggest a placement of this species in *Amandinea* M. Choisy ex Scheid. & H. Mayrhofer, but phylogenies have consistently shown intermixed species with filiform and bacilliform conidia (e.g. Wedin *et al.* 2002; Prieto & Wedin 2016), indicating that the species with filiform conidia do not form a monophyletic group. Sheard & May (1997) transferred four North American species from *Buellia* and *Rimodina* into *Amandinea* but acknowledged that other important morphological characters were variable and that even the length and type of conidia overlapped between species referred to *Buellia* and *Amandinea*. The indiscriminate transfer of buellioid species with filiform conidia to *Amandinea* should, therefore, be discouraged and a widely circumscribed *Buellia* is adopted here instead. Bungartz *et al.* (2007) provide an excellent discussion of this and other problems in the acceptance of segregate genera in buellioid lichens.

Under normal light microscopy the thalline hyphae appear to be papillate (Fig. 4E) but further investigation using DIC and polarized light revealed that the hyphae are covered with extra-cellular crystals (Fig. 5). Under DIC microscopy the hyphae have an irregular surface that becomes smooth after treatment with 10% KOH (Fig. 5A & B), whereas with

polarized light the birefringence caused by the crystals is completely eliminated by treatment with 10% KOH (Fig. 5C & D).

The thallus of the holotype is covered with the conidia of a hyphomycete similar to *Intra-lichen* or *Trimmatostroma*. The conidia are singular or in pairs, rarely in short chains, and measure 5–6 µm diam. (Fig. 4H).

Provisional key to species of *Buellia* and similar lichens occurring in the Falkland Islands

This key is very provisional. Buellioid lichens are common and diverse in the region and have yet to be comprehensively studied.

- | | | |
|--------|---|------------------------------|
| 1 | Ascospores 3-septate to submuriform; on bark | Diplotomma alboatrum |
| | Ascospores 1-septate; on various substrata | 2 |
| 2(1) | Lichenicolous or on organic material | 3 |
| | On rock | 6 |
| 3(2) | Lichenicolous on <i>Poeltidea</i> | Sclerococcum australe |
| | On organic material | 4 |
| 4(3) | On moribund <i>Bolax</i> , peat and bryophyte detritus | Buellia sp. 'A' |
| | On twigs; conidia <i>Amandinea</i> -type | 5 |
| 5(4) | Thallus well developed; ascospores with thickened septum | B. skottsbergii |
| | Thallus poorly developed; ascospores without thickened septum | B. punctata |
| 6(2) | Thallus yellow, C+ orange or C+ pink | 7 |
| | Thallus white, grey or brown; KC– and C– | 9 |
| 7(6) | Xanthones present, C+ orange, UV+ orange. | 8 |
| | Xanthones absent, C+ pink (fleeting), UV+ yellow. | B. gypsyensis |
| 8(7) | Thallus of convex areoles; medulla I+ violet; apothecia sessile | B. anisomera |
| | Thallus of flat areoles; medulla I–; apothecia innate | B. ocellata |
| 9(6) | Ascospores with thickened walls, polarilocular when immature; conidia <i>Amandinea</i> -type; thallus lacking lichen products | 10 |
| | Ascospores not polarilocular; conidia <i>Amandinea</i> - or <i>Buellia</i> -type; thallus with or without lichen products | 13 |
| 10(9) | Subhymenium inspersed | B. nitrophila |
| | Subhymenium not inspersed | 11 |
| 11(10) | Ascospores 12–16 × 6–10 µm | B. discreta |
| | Ascospores 18–24 × 6–12 µm | 12 |

- 12(11) Thallus yellowish grey; apothecia 0.5–1.0 mm diam. **B. falklandica**
Thallus pale grey; apothecia 0.3–0.4 mm diam. **B. decedens**
- 13(9) Epithemium brown (N–) 14
Epithemium aeruginose or olivaceous (N+ red) 15
- 14(13) Apothecia 0.25–0.50 mm diam., persistently plane and marginate, hymenium
c. 100 µm high; ascospores 15–18 × 9–11 µm **B. subcervina**
Apothecia 0.4–1.0 mm, becoming convex and immarginate, hymenium 70–75(–95)
µm high; ascospores 14–17 × 7–9 µm **B. coniops**
- 15(13) Thallus lacking lichen substances or with unidentified substances (K–) 16
Thallus with atranorin or norstictic acid (K+ yellow or red) 17
- 16(15) Thallus well developed, lacking lichen substances; apothecia with thin, indistinct
margin **B. cf. illaetabilis**
Thallus poorly developed, containing two unidentified substances (TLC); apothecia
with thick proper margin **Buellia** sp. 'B'
- 17(15) Thallus lacking norstictic acid, atranorin present (K+ yellow); apothecia adnate to
sessile with thin proper margin **B. stellulata**
Thallus containing norstictic acid (K+ red crystals in section), atranorin present or
absent 18
- 18(17) Apothecia innate, concave, with proper margin not apparent; thallus white, contain-
ing atranorin; medulla I+ violet **B. spuria**
Apothecia adnate to sessile, with well-developed proper margin; thallus creamy to
pale brown, lacking atranorin; medulla I– **B. russa**

***Cliostomum albidum* Fryday sp. nov.**

Mycobank No.: MB 829178

Characterized by the saxicolous habit and apothecia lack-
ing internal pigmentation.

Type: Falkland Islands, West Falkland, Port Howard,
Mt. Maria, Castle Rock, 51.621332°S, 59.591020°W,
370 m, shaded, S-facing crags (underhang), 26 January
2015, *Fryday* 10902 (MSC—holotype).

(Fig. 6)

Thallus effuse, white, thin, <50 µm thick,
with rock grains protruding through the sur-
face, rimose to cracked-areolate; *medulla* I–.
Photobiont trebouxoid; cells 9–15 µm diam.

Apothecia biatorine, white, pink to pale
orange, 0.6–0.8–1.0 mm diam.; *disc* flat
becoming convex, white pruinose; *margin*
prominent when young, 0.15 mm wide, per-
sistent but barely raised in older apothecia,
0.05 mm wide. *In section: proper exciple* well

developed, c. 120 µm wide, composed of nar-
row, 1.5 µm wide, richly branched and anas-
tomosing hyphae, interspersed with granular
crystals that form bands towards the outer
surface and dissolve in K to give a bright yel-
low solution; cortex absent; exciple extending
in a narrow band under the hypothecium and
forming a deep, conical 'root' 100–120 µm
into the thallus. *Hymenium* 50–65 µm high,
upper 10–20 µm with granular crystals that
mostly dissolve in K; *paraphyses* thin, 1.5 µm
wide, widening at the apex to 4 µm, sparingly
branched and anastomosing. *Hypothecium* hya-
line, 35–50 µm high, composed of randomly
orientated hyphae, well differentiated from
the hymenium. *Asci* *Biatora*-type, cylindrical,
35–40 × 15 µm, becoming clavate and 20 µm
wide; *ascospores* hyaline, 1-septate, (11–)12.33
± 0.89(–14) × (4.5–)4.96 ± 0.45(–5.5) µm, l/w
ratio (2.18–)2.50 ± 0.23(–2.89), (*n* = 12).

Conidiomata not observed.



FIG. 6. *Cliostomum albidum* (Fryday 10902, holotype). A, thallus with apothecia; B, Castle Rock on West Falkland. *Cliostomum albidum* was collected from a ledge below the overhang; C, ascus showing *Biatora*-type apical apparatus. Scales: A = 1 mm; C = 10 μ m. In colour online.

Chemistry. K⁺ yellow, C⁻, KC⁻, Pd⁺ orange-red; thallus too thin for TLC.

Etymology. Named after the white apothecia.

Distribution and ecology. Known only from the Falkland Islands. Reported from

siliceous rocks on both main islands, usually at relatively high altitudes (180–370 m). Associated species: *Cliostomum longisporum* Fryday, *Lecanora spegazzinii* Müll. Arg., *Lepra macloviana* (Müll. Arg.) I. Schmitt *et al.*, *Ramboldia petraeoides*, *Rhizocarpon malviniae* Fryday and *R. geographicum* (L.) DC. aggr.

Additional specimens examined. Falkland Islands: East Falkland: Stanley Common, Two Sisters, 51.685744°S, 58.016522°W, 289 m, slightly underhanging, E-facing rock face, 2015, Fryday 10732; ibid., 51.690161°S, 58.028866°W, 265 m, exposed rock near summit, 2015, Fryday 10740. West Falkland: Fox Bay, summit of East Head, 600 ft, 1968, Imshaug 42090 & Harris.

***Cliostomum longisporum* Fryday sp. nov.**

MycoBank No.: MB 829179

Distinguished from all other species of the genus by its long ascospores (15–23 × 2.5–3.0 μm).

Type: Falkland Islands, East Falkland, Stanley Common, outcrops along Goat Ridge, 600 ft, 30 January 1968, Imshaug 41510 & Harris (MSC—holotype).

(Fig. 7)

Thallus effuse, white, thin, <50 μm thick, with rock grains protruding through the surface, rimose to cracked-areolate; *medulla* I–. *Photobiont* trebouxiooid; cells 6–15 μm diam. with a thick hyaline wall.

Apothecia biatorine, pale orange to pink, 0.3–0.5 mm diam.; *disc* flat, sometimes becoming convex, white pruinose; *margin* paler than disc, barely raised, 0.03 mm wide, barely visible in convex apothecia. *In section: proper exciple* 30 μm wide, composed of narrow (1.5 μm wide), branched and anastomosing hyphae, interspersed with granular crystals that dissolve in K to give a bright yellow solution; cortex absent. *Hymenium* 40–50 μm high, upper 10–20 μm with granular crystals that mostly dissolve in K; *paraphyses* narrow, 1.5 μm wide, widening at the apex to 4 μm, sparingly branched and anastomosing. *Hypothecium* hyaline 80–100 μm, well differentiated from the hymenium, composed

of randomly orientated hyphae, interspersed with granular crystals that dissolve in K giving a bright yellow solution. *Asci* *Biatora*-type, initially cylindrical, becoming clavate, 25–30 × 10–12 μm; *ascospores* hyaline, acicular, 1(–)3-septate, tapering at lower end, usually straight, rarely curved, (15–)19.90 ± 2.02(–23) × (2.5–)2.80 ± 0.25(–3.0) μm, l/w ratio (5.00–)7.167 ± 0.99(–8.80), (n = 20).

Conidiomata not observed.

Chemistry. K–, C–, KC–, Pd–; thallus too thin for TLC.

Etymology. The name refers to the long ascospores, which are unique for the genus.

Distribution and ecology. Known only from the Falkland Islands. Reported from siliceous rocks on both main islands, usually at relatively high altitude (180 m), although one collection is from <100 m. Associated species: *Cliostomum albidum* Fryday and *Lithographa opegraphoides* Coppins & Fryday.

Remarks. The collection Imshaug 41510 also supports an isotype of *Lithographa opegraphoides* Coppins & Fryday (Coppins & Fryday 2006), which is known only from this collection. *Cliostomum pallens* (Kullh.) S. Ekman, a boreal corticolous species, also has 3-septate ascospores but these are only 9–18 μm long (Vainio 1922).

Additional specimens examined. Falkland Islands: East Falkland: Stanley Common, Tumbledown Mt., 51.690679°S, 57.937456°W, 100 m, underhang in low, N-facing crags, 2015, Fryday 11025. West Falkland: Fox Bay, summit of East Head, 600 ft, 1968, Imshaug 42090 & Harris.

Provisional key to species of *Cliostomum* occurring in the Falkland Islands

- 1 Thallus sorediate/leprose; corticolous 2
Thallus not sorediate or leprose; corticolous or saxicolous 3
- 2(1) Thallus and/or soralia Pd+ red (fumarprotocetraric acid); apothecia internally lacking pigmentation **C. flavidulum**
Thallus and soralia Pd– (fumarprotocetraric acid absent); purple pigment (Melaena-red; K+ aeruginose, H+ purple, N+ red) in exciple and epihymenium **C. violascens**



FIG. 7. *Cliostomum longisporum* (Imshaug 41510, holotype). A, thallus with apothecia; B, ascus showing *Biatora*-type apical apparatus; C, hymenium showing numerous minute granules. Scales: A = 0.5 mm; B = 5 µm; C = 25 µm. In colour online.

3(1)	Saxicolous	4
	Corticolous	6
4(3)	Apothecia dark, ±immersed in the thallus	C. falklandicum
	Apothecia pale, sessile	5
5(4)	Ascospores 15–23 × 2.5–3.0 µm	C. longisporum
	Ascospores 11–14 × 4.5–5.5 µm	C. albidum

- 6(3) Apothecia brownish, with grey pruina **C. griffithii**
 Apothecia black, pruina absent **C. aeruginascens**

Coccotrema rubromarginatum Fryday
sp. nov.

Mycobank No.: MB 829203

Distinguished from all other members of the genus by the placodioid thallus with a red-brown margin and lower surface.

Type: Falkland Islands, West Falkland, Port Howard, Mt. Maria, between Freezer Rocks and Castle Rock, 51°6'13.504"S, 59°57'65.15"W, 325 m, stone run, 26 January 2015, *Fryday* 10894 (MSC—holotype).

(Fig. 8)

Thallus crustose-placodioid to subfruticose, white to pale grey, 4–6(–8) mm thick, composed of contiguous convex areoles, 0.4–1.0 mm across that, in well-developed specimens, are supported on short pseudopodetia 2–4 mm high and 0.1 mm thick; *undersurface* of placodioid margin red-brown, this pigment often extending to the edge of the upper surface; *medulla* I–. *Soralia* orbicular, discrete, arising from an areole that often forms a rounded margin 0.1 mm wide, rarely two or more becoming confluent; *soredia* granular, *c.* 0.05 mm diam., greenish when fresh, becoming pinkish cream with age. *Primary photobiont* *Myrmecia*?; cells (12–)15–20(–22) µm diam. with thick hyaline wall. *Cephalodia* frequent, grey, ±orbicular with shallow marginal lobes, often radially fissured, 1–2 mm across; *secondary photobiont* *Chroococcus*?; cells pale brown/orange 10–15 µm diam., 3–4(–8) enclosed in a yellow sheath 20–25 µm across, groups of smaller yellow-brown cells 3–4 µm diam. also present but not definitely part of the symbiosis.

Apothecia poriform in thalline warts, 0.7–0.8 mm wide; ostiole pale, slightly depressed; internal cavity ±spherical, 140–160 µm diam. *Hymenium* I+ yellow, 120–130 µm high; *paraphyses* simple, thin, 1–1.5 µm wide, expanding at the apex to 5 µm. *Hypothecium* hyaline *c.* 30 µm high, composed of randomly orientated hyphae, well differentiated from the hymenium. *Asci* cylindrical, *c.* 150 × 25 µm; *ascospores* hyaline, simple, broadly ellipsoid,

8 per ascus (35–)40.75 ± 4.17(–48) × 18–21.4 ± 1.88(–27) µm, l/w ratio (1.68–)1.91 ± 0.18 (–2.25), (*n* = 20), cell wall *c.* 1–1.5 µm thick.

Conidiomata not observed.

Chemistry. Cortex K– or K+ dilute orange, medulla K+ bright yellow; stictic acid, constictic acid, ±norstictic acid and unknown pigment by TLC.

Etymology. The name refers to the red-brown margin of the thallus.

Distribution and ecology. Saxicolous on granitic rocks, usually in stone runs or fell-fields. Frequent on the Falkland Islands and also known from Tierra del Fuego (Isla de los Estados and Isle Grande). Associated species: *Ochrolechia antarctica* (Müll. Arg.) Darb., *Ramboldia petraeoides* and *Lepra macloviana*.

Remarks. The placodioid thalline morphology of *Coccotrema rubromarginatum* forms a link between the subfruticose thallus of *C. cocophorum* and the crustose thallus displayed by the rest of the genus.

Schmitt *et al.* (2001) showed that *Lepolichen cocophorus* (Mont.) Trevis. should be included within *Coccotrema* and made the new combination *Coccotrema cocophorum* (Mont.) I. Schmitt *et al.* However, they failed to realize that as *Lepolichen* Trevis. 1853 was an earlier name than *Coccotrema* Müll. Arg. 1889, this combination was invalid and that all species of *Coccotrema* should be transferred to *Lepolichen*. In the interests of nomenclatural stability, a formal proposal to conserve *Coccotrema* against *Lepolichen* is in preparation.

Additional specimens examined. **Argentina:** Tierra del Fuego: Isla de los Estados, Puerto Roco, summit of peak S of bay, 54°46'S, 64°15'W, 360 m, 1971, *Imshaug* 51117 & *Ohlsson*; Isla Grande (Tierra del Fuego), Sierra Alvear, W side of Paso Garibaldi, 54°42'S, 67°47'W, 460 m, 1971, *Imshaug* 54841 & *Ohlsson*.—**Falkland Islands:** East Falkland: Mt. Osborne, on ridge between Usbornes 1 & 2, 2250 ft, sheltered cliffs with seepage, 1968, *Imshaug* 39977 & *Harris*; *ibid.*, below The



FIG. 8. *Coccotrema rubromarginatum*. A, field photograph of a specimen in the stone run on Mt. Maria, West Falkland, from where the type was collected; B, thallus with soralia and cephalodia (*Imshaug* 40044); C, habitat in the stone run, *C. rubromarginatum* indicated by arrow. Scale = 1 mm. In colour online.

Gap, 300 ft, stone run, 1968, *Imshaug* 40044, 40046A, 40063 & *Harris*; *ibid.*, crags west of summit, 51°69'15.50"S, 58°85'09.76"W, 600 m, exposed NW

facing crags, 2015, *Fryday* 11428; Mt. Kent, summit, 1500 ft, cliffs on rock dome, 1968, *Imshaug* 40437 & *Harris*.

Provisional key to species of *Coccotrema* occurring in the Falkland Islands

- 1 Thallus subfruticose, with narrow, radiating marginal lobes; cephalodia absent . . .
 **C. coccophorum**
 Thallus crustose, placodioid in one species; cephalodia usually present 2
- 2(1) Thallus placodioid with red-brown margin; discrete soralia present
 **C. rubromarginatum**
 Thallus not placodioid; soralia absent 3
- 3(2) Thallus without isidia; apothecia abundant **C. curcubitula**
 Thallus with isidia; apothecia scarce 4
- 4(3) Isidia thick, 0.3–0.4 mm diam. **C. corallinum**
 Isidia fine, 0.10–0.15 mm diam. **C. magellanicum**

***Hymenelia microcarpa* Fryday sp. nov.**

Mycobank No.: MB 829204

Distinguished from all other species in the *Hymenelia-Ionaspis* complex by its minute apothecia (<0.1 mm diam.). Further characterized by the combination of a trebouxoid photobiont, apothecia with a granular epihymenium and lack of internal pigmentation or reaction with K or N.

Type: Falkland Islands, East Falkland, Estancia, SE side of inlet 6 km west of house, 51.657400°S, 58.262245°W, sea level, rocks at back of shore, 1 November 2015, Fryday 11254 (MSC—holotype).

(Fig. 9)

Thallus effuse, areolate, rarely rimose, pale cream to orange-pink; areoles contiguous or dispersed, orbicular when dispersed, 0.15–0.3 mm diam., irregular and larger when contiguous, 0.3–0.5 mm across; *medulla* I–. *Photobiont* trebouxoid; cells 6–12 µm diam.

Apothecia frequent, arising singly from the centre of each areole, pale pink (rarely hyaline), 0.06–0.1 mm diam., concave to flat; *margin* not apparent. *In section: proper exciple* poorly developed, hyaline. *Hymenium* 85–100 µm high; *paraphyses* simple, thin, c. 1 µm wide, not swollen at the apices; *epihymenium* not pigmented but with numerous small brownish granules not dissolving in K or N. *Hypothecium* hyaline, 12–15 µm high, composed of randomly orientated hyphae. *Asci* cylindrical, c. 50 × 15 µm, *Hymenelia*-type (outer coat I+ blue but inner walls and apical dome K/I–); *ascospores* simple,

hyaline, simple, broadly ellipsoid, 8 per ascus (11–)12.50 ± 0.80(–14) × (6–)6.67 ± 0.78(–8) µm, l/w ratio (1.625–)1.89 ± 0.19 (–2.17) (*n* = 12).

Conidiomata not observed.

Chemistry. No lichen substances detected.

Etymology. The name refers to the minute size of the apothecia.

Distribution and ecology. Known only from the Falkland Islands. Apparently quite frequent but easily overlooked because of the small size of the immersed apothecia. Known from four localities on East Falkland, all close to the sea. Associated species: *Buellia* sp., *Lecidea* sp., *Porina austroatlantica* P. M. McCarthy & Fryday, *Porpidia* cf. *crustulata* (Ach.) Hertel & Knoph, *Porpidia* sp., *Rhizocarpon malvinae*, *R. infernum* (Nyl.) Lynge, *Rinodina* cf. *peloleuca* (Nyl.) Müll. Arg. and *Verrucaria* s. lat. sp.

Remarks. The genera *Hymenelia* Kremp. and *Ionaspis* Th. Fr. were traditionally separated by their different photobionts, *Trentepohlia* in *Ionaspis* and a green chlorococcoid alga in *Hymenelia* (Magnusson 1933; Jørgensen 1989), although it was generally accepted that this distinction was artificial (Clauzade & Roux 1985; Coppins & Purvis 1992). Lutzoni & Brodo (1995) performed a cladistic analysis of morphological-

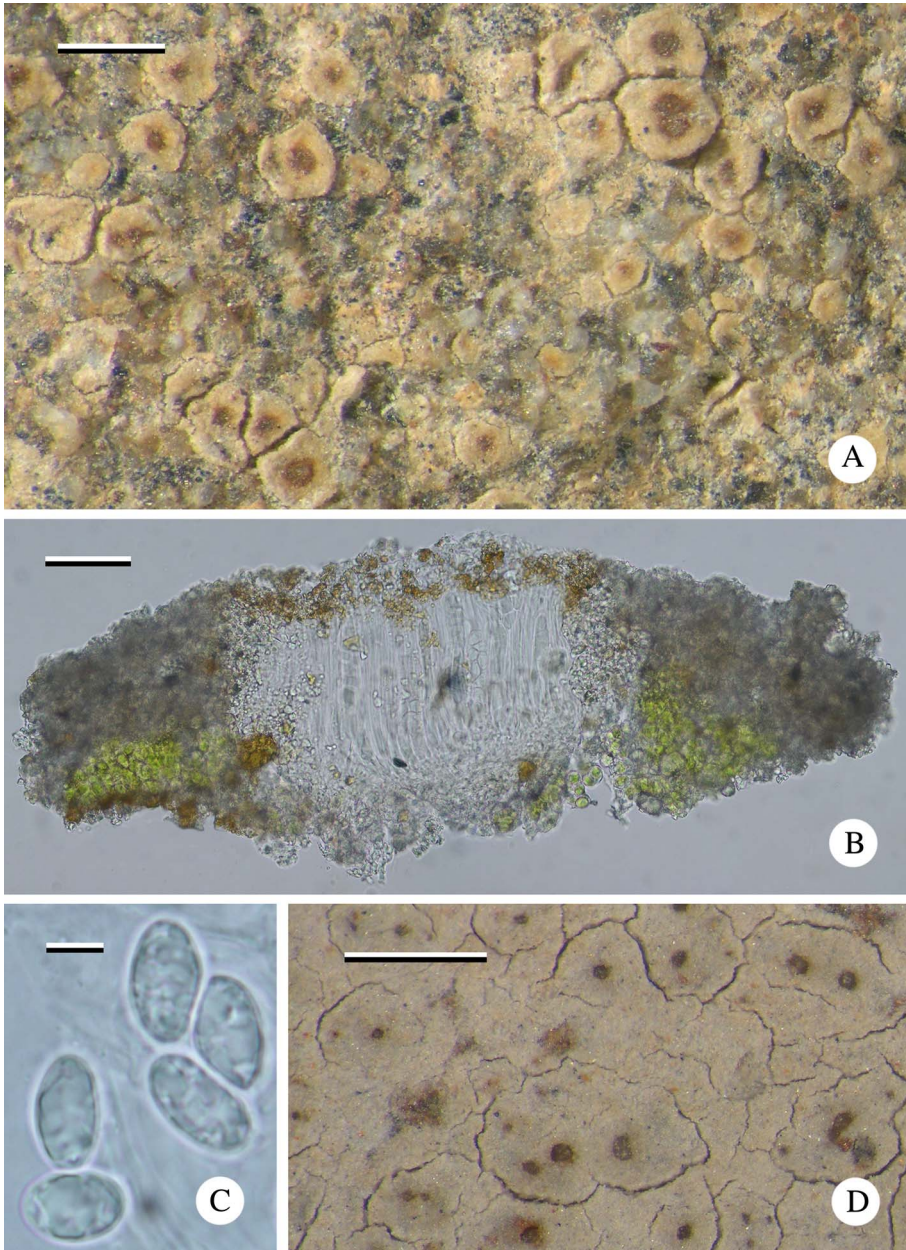


FIG. 9. *Hymenelia microcarpa* (Fryday 11254, holotype). A, continuous, rimose thallus with minute apothecia; B, section through apothecium showing granular epihymenium; C, ascospores; D, form with dispersed, areolate thallus (Fryday 11081). Scales: A & D = 0.5 mm; B = 50 μ m; C = 5 μ m. In colour online.

anatomical and enzyme electrophoresis data and showed that two genera could be recognized, but that a rearrangement of the species was required. This new arrangement was

generally accepted but the distinction between the two genera appeared to be just as artificial as the previous arrangement and was based on less distinctive or easily

observable characters. Kantvilas (2014) highlighted these issues and concluded that the best course of action, pending a full morphological-molecular revision, was to include all the species in a single genus. Under the system proposed by Lutzoni & Brodo (1995), the new species would be assigned to *Ionaspis* because of its granular epihymenium but I agree with Kantvilas (2014) and, consequently, describe the new species in *Hymenelia*, which is the older of the two names.

The thallus of the new species is often areolate but the thallus of one collection (Fryday 11081) is continuous, cracked-rimose. However, intermediates occur and in one case the two different thalline morphologies occur on the same specimen. All four collections also have an identical apothecial anatomy and it is considered therefore that only one species is involved.

The only species of *Hymenelia*/*Ionaspis* previously reported from southern South America is *Ionaspis fuegensis* P. M. Jørg. & R. Sant. (Jørgensen & Santesson 1989), but that species differs in having *Trentepohlia* as photobiont and apothecia with a dark disc and a pigmented epihymenium. Elsewhere in the region, *Hymenelia glacialis* Øvstedal was reported from Antarctica by Øvstedal & Lewis Smith (2001) but this also has *Trentepohlia* as photobiont and apothecia with a dark disc and a pigmented epihymenium. Although Øvstedal & Lewis Smith (2001) gave the author citation of this species as (C. W. Dodge) Øvstedal, the basionym, *Aspicilia glacialis* C. W. Dodge, is illegitimate because of *A. glacialis* (Arnold) Dalla Torre & Sarnth. and so Øvstedal's combination must be treated as a *nomen novum* (ICN Art. 58). The two species reported from Australasia, *Hymenelia gyalectoidea* Kantvilas and *H. lacustris* (With.) M. Choisy (Kantvilas 2014), both have larger apothecia, a rusty orange thallus and a different ecology: *H. gyalectoidea* is an alpine species whereas *H. lacustris* occurs on damp, usually semi-immersed rocks.

Among Northern Hemisphere species, the recently described *Hymenelia parva* Fryday & J. W. McCarthy (Fryday & McCarthy 2018) occurs in a similar habitat and has similarly

minute apothecia, but lacks a granular epihymenium which, according to Lutzoni & Brodo (1995), is an important character in this group.

Additional specimens examined. **Falkland Islands:** East Falkland: Lafonia, Halfway House Arroyo, N side, E of road, 51-990196°S, 59-278492°W, 3–5 m, low S-facing rocks among *Empetrum* above river, 2015, Fryday 11081; *ibid.*, inlet 3.5 km SW of Halfway House Arroyo, NW side of road, 52-012655°S, 59-319081°W, sea level, maritime rocks, 2015, Fryday 11448; Darwin, west side of cove at NE end of Darwin Harbour, 51-788657°S, 58-943417°W, sea level, pebbles in turf, 2015, Fryday 11416.

***Lecania vermisporea* Fryday sp. nov.**

MycoBank No.: MB 829205

Distinguished from all other members of the genus by the acicular, vermiform ascospores (23–36 × 2.0–2.5 µm).

Type: Falkland Islands, Westpoint Island, near the waterfall, 100 ft, *Hebe*-scrub, 20 January 1968, *Imshaug* 40692A & Harris (MSC—holotype).

(Fig. 10)

Thallus effuse, cream, leprose; individual granules <0.01 mm diam. but occasionally aggregating to up to 0.03 mm diam.; *medulla* I –. *Photobiont* trebouxiooid; cells 6–12 µm diam.

Apothecia frequent, biatorine, pale to dark brown, often piebald, initially flat, 0.15–0.2 mm diam. with a darker, slightly raised proper margin 0.02–0.04 mm wide, soon becoming convex, 0.2–0.3 mm diam. with an excluded margin. *Thalline margin* rarely apparent even in young apothecia. *In section:* *proper exciple* c. 50 µm thick, inner section pale brown becoming darker towards the cortex (K+ purple-brown; *Lecania*-brown); composed of narrow irregularly radiating hyphae c. 1 µm wide; cortex 10–20 µm wide, terminal cells 3–4 µm diam. *Hymenium* 35–40 µm high, upper 10–20 µm with patches of dilute brown (K+ purple-brown; *Lecania*-brown) pigment; *paraphyses* mostly simple, septate, c. 2 µm wide, gradually swelling towards the apices (to 5 µm) and becoming moniliform, sometimes with a brown (K+ purple-brown; *Lecania*-brown) cap. *Hypothecium* hyaline, c. 50 µm high, composed of randomly orientated hyphae. *Asci* *Biatora*-type, cylindrical, 25–30 × 10–12 µm, becoming clavate and up to 15 µm

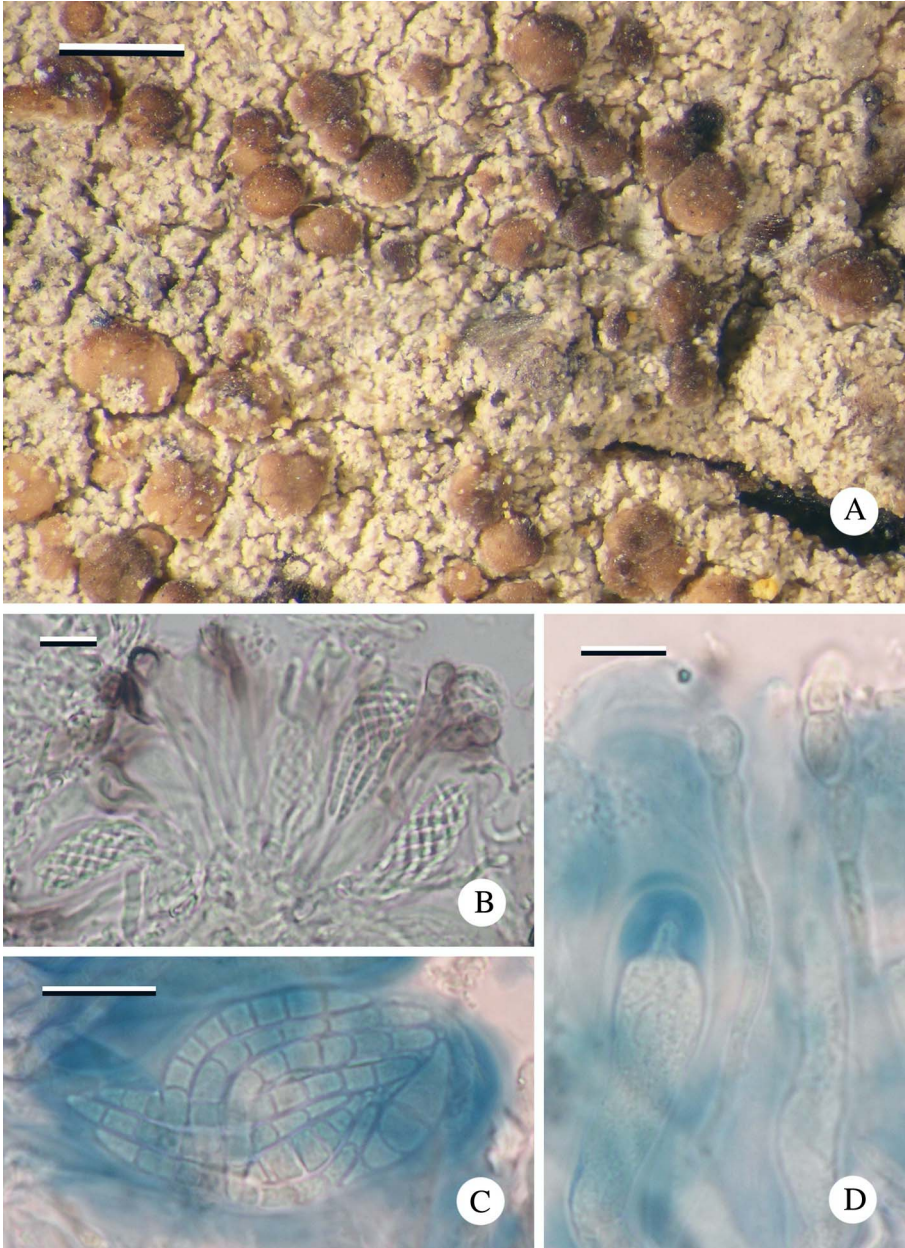


FIG. 10. *Lecania vermispora* (Imshaug 40692A, holotype). A, thallus with apothecia; B, section of hymenium showing ascospores in ascus and paraphyses with distinctive 'Lecania-brown' pigment in the epihymenium; C, mature ascospores in ascus; D, hymenium showing immature *Biotora*-type ascus and moniliform paraphyses. Scales: A = 0.5 mm; B–D = 10 μ m. In colour online.

wide; *ascospores* hyaline, (3–)5–7-septate, spirally arranged in ascus, vermiform with rounded ends, (23–)30.08 \pm 3.53(–36) \times

(2.0–)2.17 \pm 0.25(–2.5) μ m, l/w ratio (11.2–)13.96 \pm 1.70(–16.5), (n = 12). *Conidiomata* not observed.

Chemistry. K–, KC–, C–, Pd–; no substances detected by TLC.

Etymology. The name refers to the worm-like ascospores.

Distribution and ecology. Known only from *Hebe*-scrub on stems of *Hebe elliptica* on Westpoint Island. Associated species: *Buellia skottsbergii* Zahlbr., *Diplotomma alboatrum* (Hoffm.) Flot., *Enterographa* sp., *Gyalolechia xanthostigmoidea* (Räsänen) Söchting et al., *Myriolecis zosterae* (Ach.) Śliwa et al., *Opegrapha* sp. and *Ramalina laevigata* Fr.

Remarks. The thallus of several collections appears minutely isidiose due to a hyaline filamentous alga, presumably an artefact of the less than ideal conditions under which the specimens were collected and preserved; all the specimens are from an offshore island and were collected over 60 years ago.

Additional specimens examined. **Falkland Islands:** *Westpoint Island:* near the waterfall, 100 ft, *Hebe*-scrub, 1968, *Imshaug* 40705B & *Harris* (topotype); in steep-sided coves at S side of the Woolly Gut, 200 ft, *Hebe*-scrub, 1968, *Imshaug* 40737B, 40743C, 40745H, 40747A & *Harris*; on steep slope and cliffs facing the Woolly Gut, *Hebe*-scrub, 1968, *Imshaug* 40891D & *Harris*.

Provisional key to species of *Lecania* occurring in the Falkland Islands

- 1 Corticolous on *Hebe elliptica*; ascospores 3–6-septate, spirally arranged in the ascus **L. vermisporea**
 On bone; ascospores 1–3-septate, not spirally arranged in the ascus.
 **L. subfuscula**

Lepra argentea Fryday sp. nov.

Mycobank No.: MB 829206

Distinguished from all other species of the *Pertusariales* by its silver-grey thallus with isidia with dark pigmented caps and a distinctive thalline chemistry (?protolichesterinic acid).

Type: Falkland Islands, West Falkland, Mt. Adam, feldmark on summit ridge, 25 January 1968, *Imshaug* 41061 & *Harris* (MSC—holotype).

(Fig. 11)

Thallus effuse, silver-grey, thin, usually growing over terricolous bryophytes (one collection spreading onto rock) and following the contours of the substratum; *isidia* usually present, often in groups of 4–5 that probably arise through branching of the ‘stalk’; originating as dark green-grey pigmented warts emerging from the thallus, finally 0.4 mm high and with a short, unpigmented ‘stalk’ 0.2 mm wide, and a wider ‘cap’, 0.3 mm across that is usually dark pigmented and in section has a dark olivaceous brown cortex 25–30 µm thick (K+ brownish, H–, N+ blue-green); occasionally this pigment is absent and then the cap is creamy white throughout;

medulla I–. *Photobiont* trebouxioiid; cells 10–15(–17) µm diam.

Apothecia rare, lecanorine, 0.5–0.8 mm diam.; *disc* concave, black with grey pruina; *margin* raised, *c.* 0.05 mm wide and persistent. *In section: proper exciple* poorly developed, hyaline. *Hymenium* 140–170 µm high; paraphyses simple, *c.* 1 µm wide; *epihymenium* 25–30 µm, patchily olivaceous (K+ brownish, H–, N+ greenish). *Hypothecium* hyaline, 25–30 µm high, composed of randomly arranged hyphae. *Asci* clavate; *ascospores* poorly developed and dissolved into ascoconidia (see below) but notes and measurements on herbarium packets indicate they were hyaline, simple and one per ascus, $(127-151.00 \pm 18.20(-172) \times (58-66.167 \pm 5.63(-75) \mu\text{m}, \text{l/w ratio } (1.867-2.29 \pm 0.31(-2.57), (n = 6).$

Conidiomata not observed; ascoconidia bacilliform 4–5 × 1.0–1.5 µm, formed from old ascospores within the ascus.

Chemistry. All spot tests negative; two or three pale, creamy yellow-pink spots at R_f 6 in solvent C by TLC.

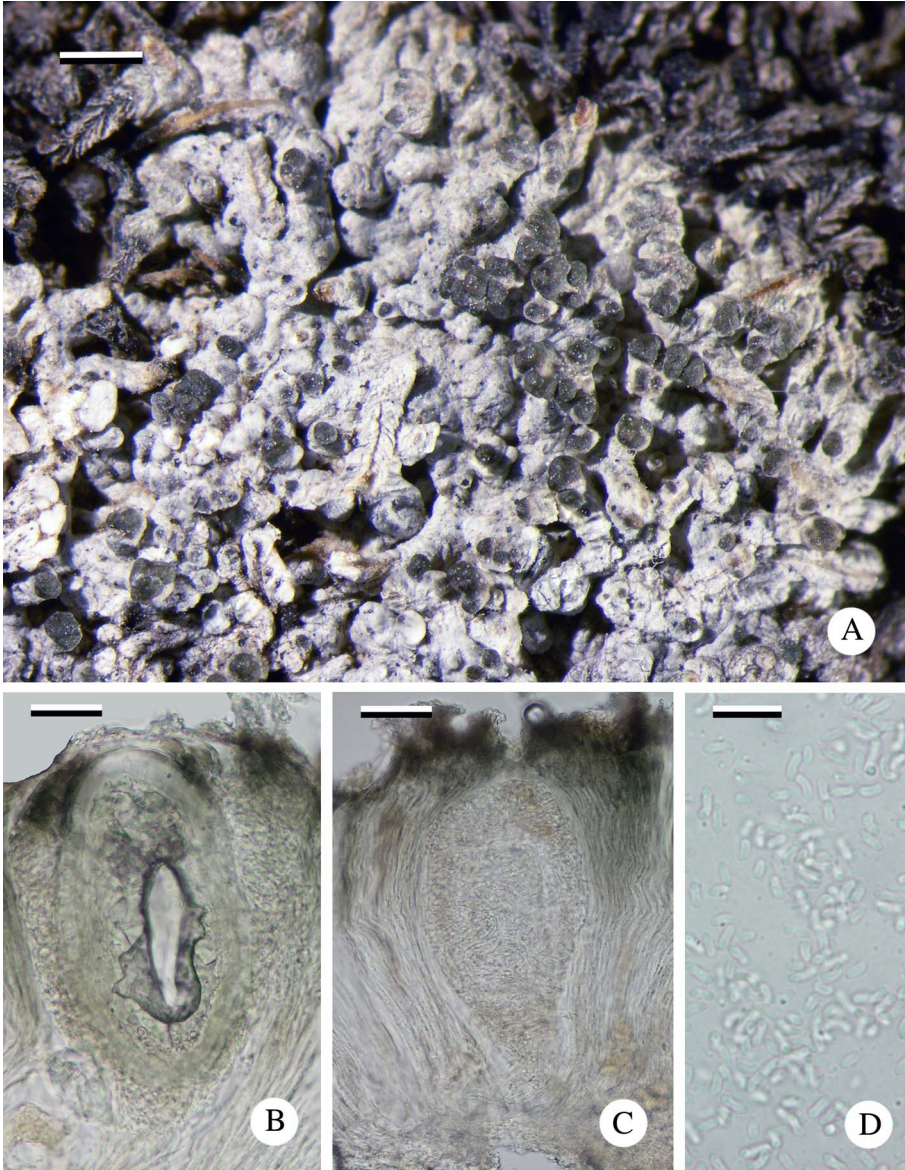


FIG. 11. *Lepra argentea*. A, thallus with isidia (Fryday 10915); B, ascus with single large ascospore; C, ascus with ascocidia; D, ascocidia (B–D Imshaug 41056). Scales: A = 1 mm; B & C = 25 µm; D = 10 µm. In colour online.

Etymology. Named for the silver-grey colour of the thallus

Distribution and ecology. Known only from the Falkland Islands. Reported from boulder fields on mountain summits on both main islands where it overgrows bryophytes, rarely

spreading onto siliceous rocks. Associated species: *Coccotrema corallinum* Messuti.

Remarks. The new species is similar to *Pertusaria pachythallina* (Räsänen) Messuti but that species usually occurs on rocks and has a much thicker thallus that contains

protocetraric and hypothamnolic acids (Mesuti 2005). *Pertusaria pachythallina* also regularly supports cephalodia with *Scytonema*, these being present on all 11 collections of this species (from Isla de los Estados (Argentina) and SW Chile) held at MSC. Within the *Pertusariales*, cephalodia are characteristic of the genus *Coccotrema* Müll. Arg. (*Coccotremataceae*), but species of that genus have closed, perithecia-like apothecia. However, cephalodia have also been reported from a single species of *Pertusaria*, namely *P. stellata* Fryday (Fryday 2008), which has single-spored asci and should probably be transferred to the genus *Lepra*. However, this will not be undertaken here pending the outcome of the proposal to reject the name *Lepra* in favour of *Variolaria* Pers. (Jørgensen 2018). Apothecia have not been reported for *P. pachythallina* and because molecular data is not available, its systematic position is unclear. However, its similarity to *L. argentea* and the presence of cephalodia suggests it should also be transferred to *Lepra*.

Imshaug reported the chemistry of all his collections as containing protolichesterinic acid. However, thin-layer chromatography (TLC) using solvent C (Orange *et al.* 2001) of one of his collections (Imshaug 41061) and one of the author's (Fryday 10915), along with a specimen known to contain this substance (*Tuckermannopsis chlorophylla* (Willd.) Hale; Imshaug 45060), revealed several pale, creamy yellow-pink spots at R_f 6 in all three collections. These were in almost the same position and it is possible that protolichesterinic acid is present in *L. argentea* but a more detailed investigation is required to fully elucidate the chemistry of this species. What is certain is that *L. argentea* does not contain protocetraric and hypothamnolic acids and so is chemically distinct from *P. pachythallina*.

Imshaug wrote ascospore dimensions on the packets of two of the collections of the new species; one bryicolous (Imshaug 41061) and the other saxicolous (Imshaug 41056). Unfortunately, the bryicolous collection was poorly curated and no longer has any apothecia whereas the saxicolous collection consists of a large piece of rock with a thallus with scattered apothecia spreading onto bryophytes and several small, richly fertile pieces removed

from their substratum that might have been bryicolous. The distinctive isidia of *L. argentea* are absent from this collection (Imshaug 41056) and, although the thalline chemistry reported by Imshaug (protolichesterinic acid) agrees with that of the other collections, it is possible that Imshaug 41056 represents a different species. However, even if this is the case, *L. argentea* is well characterized by its distinctive isidia and unusual chemistry and is certainly a new species.

The new species is unique in the *Pertusariales* in producing ascoconidia. Hawksworth *et al.* (1995) defined ascoconidia as “a conidium formed directly from the ascospore, esp. when still within the ascus”. Baral (1999) realized that two sharply distinct cases can occur and refined the term to refer only to the former case:

Case 1: conidia produced from ascospores within the living premature asci; each ascospore together with its ascoconidia is surrounded by a delicate membrane, forming more or less distinct “balls” when the ascus reaches maturity. These balls are violently ejected as single entities but they disintegrate if the asci die prior to discharge.

Case 2: conidia produced from ejected ascospores or rarely from ascospores within dead asci. They are never arranged as “balls”.

Baral (1999) further noted that these two types can only be distinguished within living asci. Because the asci of *L. argentea* are monosporous, it is not possible to distinguish between Baral's two cases.

Ascoconidia were first reported in lichenized fungi by Santesson (1952), who recognized them in five foliicolous and three corticolous species, all with muriform ascospores. They have subsequently been described in at least four other species (Hafellner & Bellemère 1983; Kantvilas & Vězda 1992; Ertz & Diederich 2004; Frisch & Kalb 2006), three of which also produce muriform ascospores and are mostly referable to Baral's Case 2. The exception is *Oevstedalia antarctica* Ertz & Diederich in which Ertz & Diederich (2004) observed the development of eight “conidial balls” within the asci of fresh material at a very early stage of development and referred them to Baral's Case 1 (true ascoconidia).

Imshaug annotated his temporary herbarium packets containing the two fertile collections with details of the ascospores and made no mention of conidia, whereas currently no ascospores are apparent and only spore-shaped groups of conidia can be seen. However, Imshaug's annotation included the detail that the spores were "thin-walled", which is unusual for species of *Lepra* that usually have thick-walled ascospores. It is possible that the thin-walled "spores"

observed by Imshaug were actually "balls" of ascoconidia.

Additional specimens examined. Falkland Islands: East Falkland: Mt. Osborne, on leeward side of Mt. Osborne 1 summit, 1968, *Imshaug* 39928, 39931, 39949 & *Harris*; *ibid.*, sheltered cliffs with seepage on ridge between Mt. Usbornes 1 & 2, 1968, *Imshaug* 39985 & *Harris*. *West Falkland:* Mt. Adam, feldmark on summit ridge, 1968, *Imshaug* 41056 & *Harris*; Port Howard, Mt. Maria, Lightning Rocks, 51°6'19.028"S, 59°60'18.49"W, 575 m, over bryophytes on S-facing rocks, 2015, *Fryday* 10915.

Provisional key to species of *Lepra* and *Pertusaria* on the Falkland Islands

- | | | |
|-------|---|-------------------------|
| 1 | Corticolous or bryophilous | 2 |
| | Saxicolous | 5 |
| 2(1) | Corticolous on twigs | P. microcarpa |
| | Overgrowing terricolous bryophytes | 3 |
| 3(2) | Apothecia abundant, with pruinose disc (K–, Pd–) | L. panyrga |
| | Apothecia usually absent; isidia with grey tips usually present | 4 |
| 4(3) | Thallus white, thick and areolate; protocetraric acid present (Pd+ orange-red) | P. pachythallina |
| | Thallus grey, thin and smooth; protocetraric acid absent (Pd–) | L. argentea |
| 5(1) | Thallus with isidia or soralia; apothecia usually absent. | 6 |
| | Thallus with neither isidia nor soredia; apothecia present | 10 |
| 6(5) | Thallus with isidia | 7 |
| | Thallus with soralia | 9 |
| 7(6) | Thallus dark grey with papillate isidia lacking a dark pigmented cap; containing protocetraric acid (Pd+ orange-red). | L. macloviana |
| | Thallus white or silver grey, isidia with a short colourless 'stalk' and a wider, pigmented 'cap'. | 8 |
| 8(7) | Thallus white, thick and areolate; protocetraric acid present (Pd+ orange-red) | P. pachythallina |
| | Thallus grey, thin and smooth; protocetraric acid absent (Pd–) | L. argentea |
| 9(6) | Thallus containing norstictic acid (K+ red crystals in section, Pd+ yellow); soralia convex, grey. | L. excludens |
| | Thallus containing fumarprotocetraric acid (K–, Pd+ red); soralia discrete, creamy coloured | L. aspergilla |
| 10(5) | Apothecia disciform | 11 |
| | Apothecia verruciform | 15 |

- 11(10) Ascospores 1 per ascus 12
 Ascospores 2 or 8 per ascus 13
- 12(11) Thallus with papillae; protocetraric acid present (Pd+ orange-red); on rocks **L. macloviana**
 Thallus without papillae or if present with grey tips; protocetraric acid absent (Pd-); usually overgrowing bryophytes and spreading onto rocks **L. argentea**
- 13(11) Ascospores 2 per ascus; thallus containing picrolichenic and norstictic acids (K+ red, KC+ violet, Pd+ yellow) **P. alterimosa**
 Ascospores 8 per ascus; thallus lacking picrolichenic acid (KC-) 14
- 14(13) Thallus containing norstictic acid (K+ acicular crystals in section); salazinic acid absent **P. erubescens**
 Thallus containing salazinic acid (K+ rhomboid crystals in exciple); norstictic acid absent **P. salacinifera**
- 15(10) Thallus containing norstictic acid (K+ red, Pd+ yellow) **P. perrimosa**
 Thallus lacking norstictic acid (K-, Pd-) 16
- 16(15) Apothecia ±innate, mostly single; ascospores 4 per ascus, 90–150 µm long; confluent acid present, 2'-O-methylperlatolic acid absent **P. malvinae**
 Apothecia sessile or in raised warts, in groups of 3–5; 2'-O-methylperlatolic acid present, confluent acid absent 17
- 17(16) Ascospores 8 per ascus, <100 µm long; thallus thin with raised fertile warts **P. cerebrinula**
 Ascospores 4 per ascus, >150 µm long; apothecia innate to sessile, rarely in raised warts **P. spegazzinii**

Rhizocarpon malvinae Fryday sp. nov.

Mycobank No.: MB 829207

Similar to *R. reductum* but with a grey thallus and ±sessile apothecia, often with blue-green pigment in the epihymenium and a ± hyaline exciple with a large, heavily pigmented, blue-green 'cap'.

Type: Falkland Islands, Weddell Island, Circum Peak, summit, 51°92'27.2"S, 60°92'52.63"W, 205 m, pebbles, 23 January 2015, Fryday 10845 (MSC—holotype).

(Fig. 12)

Thallus pale grey, effuse, thin, *c.* 120–150 µm thick, usually with a wide black, fimbriate hypothallus, rimose to cracked-areolate, usually continuous but sometimes reduced to scattered areoles on a black hypothallus; rarely with the thallus absent and apothecia occurring directly on the hypothallus; *cortical cells* pale brown, *c.*

5 µm diam. overlain by a thin epinecral layer *c.* 10 µm high; *medulla* poorly developed with the photobiont layer reaching almost to the substratum, I-. *Photobiont* trebouxoid; cells 8–12(–15) µm diam.

Apothecia frequent, black, lecidine, sessile, 0.4–0.6 mm diam.; *disc* concave, becoming flat or slightly convex when overmature; *margin* thick, up to 0.1 mm wide, raised and persistent. *In section: proper exciple* brown, composed of ±vertically aligned hyphae *c.* 5 µm wide, with a dark blue-black (N+ red; Cinereorufa-green) pigmented "cap"; this cap is often massively produced, 80–100 µm wide (Fig. 12B) with a much reduced or ±absent proper exciple below. *Hymenium* 85–100–150 µm high; *paraphyses* very thin, *c.* 1 µm wide, branched and anastomosing, swelling gradually to 3 µm at the apices, upper 10 µm olivaceous or blue pigmented

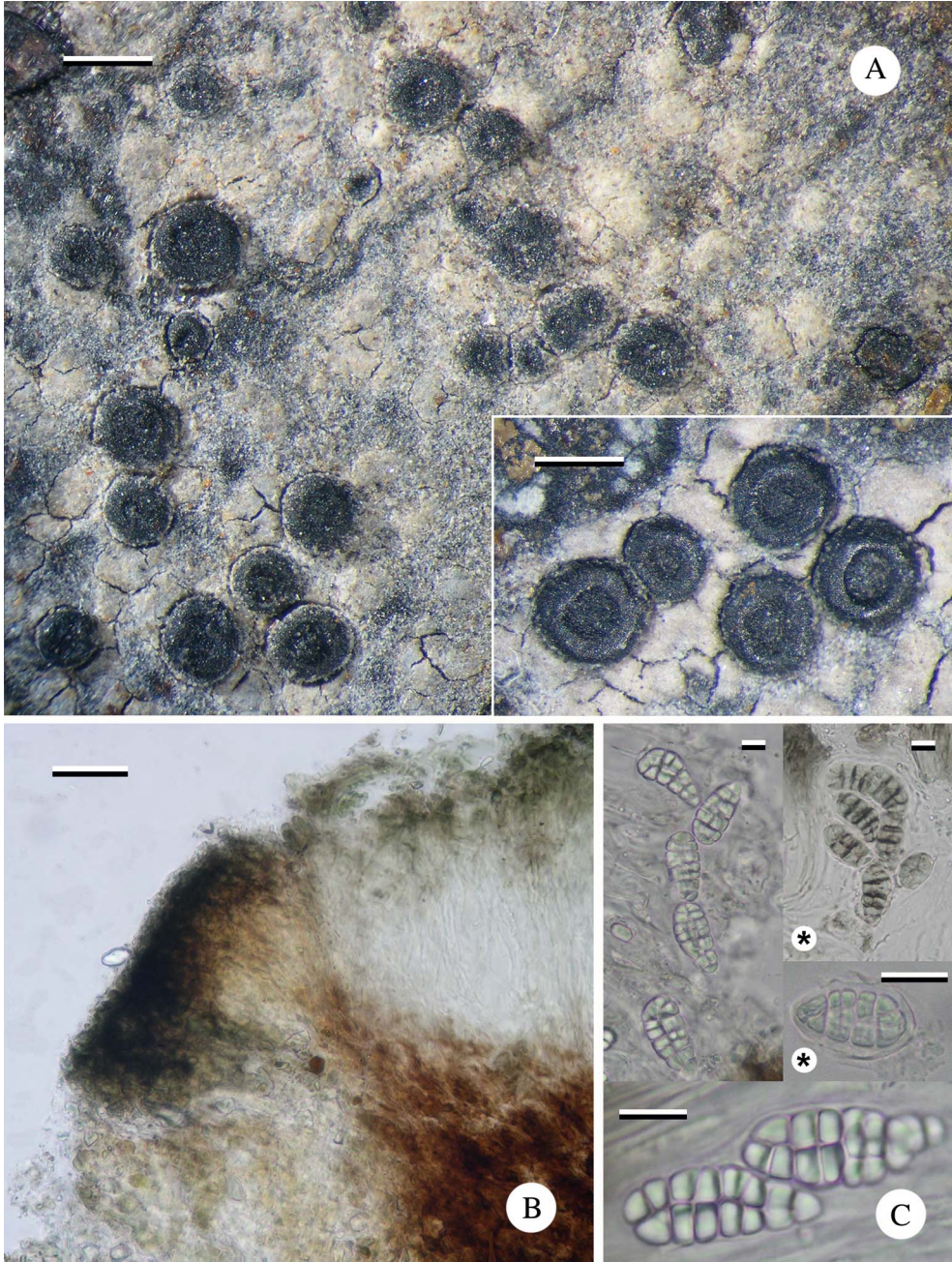


FIG. 12. *Rhizocarpon malvinae*. A, thallus and apothecia (Fryday 10845, holotype); B, exciple showing pale interior and pigmented 'cap' (Fryday 11255); C, ascospores (Fryday 11255, images marked with * from Imshaug 42369). Scales: A = 0.5 mm; B = 20 μ m; C = 10 μ m. In colour online.

(K+ intensifying blue, N+ red; Cinereorufa-green); *epihyemenium* diffuse, olivaceous to blue (K+ intensifying blue, N+ red; Cinereorufa-green). *Hypothecium* dark brown. *Asci* narrowly clavate, *Rhizocarpon*-type, 75–85 × 30–35 µm; *ascospores* submuriform (rarely more than one primary longitudinal septum but with 3–5(–6) longitudinal septa), becoming pigmented when overmature, (20–)22·80 ± 2·44(–35) × (9–)10·20 ± 0·83(–11) µm; l/w ratio (1·91–)2·24 ± 0·21(–2·64), (*n* = 20).

Conidiomata not observed.

Chemistry. K+ yellow, C–, Pd+ orange; stictic acid and norstictic acid (trace) detected by TLC.

Etymology. Derived from *Islas Malvinas*, the Spanish name for the Falkland Islands.

Ecology and distribution. Apparently endemic to the Falkland Islands where it is common on siliceous rocks, especially at mid to high elevations. It is not present among the c. 10000 collections in MSC made by Imshaug and co-workers from southern South America (Fryday & Prather 2001). Associated species: *Buellia anisomera* Vain., *B. russa* (Hue) Darb., *Fuscidea asbolodes* (Nyl.) Hertel & V. Wirth, *Lecanora capistrata* (Darb.) Zahlbr., *Lecidea* sp., *Myriospora smaragdula* (Wahlenb.) Nägeli, *Poeltidea perusta* (Nyl.) Hertel & Hafellner, *Porpidia crustulata* (Ach.) Hertel & Knoph, *P. tuberculosa* (Sm.) Hertel & Knoph, *Rhizocarpon distinctum* Th. Fr., *R. nidificum* (Hue) Darb. and *R. simillimum* (Anzi) Lettau.

Remarks. Imshaug annotated his collections of this taxon “*Rh. marginatum*”, emphasizing the thick proper margin. Although noting that the Imshaug & Harris collections from the Falkland Islands had somewhat larger ascospores than European collections, Fryday (2000) referred all their collections to *R. reductum* Th. Fr. However, having now seen specimens in the field it is apparent the Falkland Islands collections are morphologically and ecologically distinct. *Rhizocarpon malviniae* is frequent at higher altitudes, reaching 685 m on the summit of Mt. Adam, where

it is part of mature communities on siliceous rocks, unlike *R. reductum*, which is a lowland species of pioneer communities. Morphologically it differs in the presence of a blue-green pigment in the upper exciple and epihyemenium and the almost unpigmented lower exciple. Although lowland forms can be difficult to separate from *R. reductum*, the more typical upland form, with its grey thallus and sessile apothecia with a thick tumid margin, more closely resembles *R. laxatum* (Ach.) Hazsl. than *R. reductum*.

Additional specimens examined. Falkland Islands: *East Falkland:* Mt. Osborne, gap between Mt. Osborne 2 and Ceritos Rocks, 1550 ft, *Cortaderia* heath, 1968, *Imshaug* 40147 & *Harris*; Stanley Common, Goat Ridge, 600 ft, outcrops along ridge, 1968, *Imshaug* 41495 & *Harris*; *ibid.*, Two Sisters, 51·690161°S, 58·028866°W, 265 m, pebbles at summit, 2015, *Fryday* 10733; *ibid.*, exposed rock near summit, 2015, *Fryday* 10740; Mullet Creek, stream below fiord, 100 ft, 1968, *Imshaug* 41475, 41481, 41482, 41485 & *Harris*; Mt. Kent, summit, 1500 ft, cliffs on rock dome, 1968, *Imshaug* 40475 & *Harris*; *ibid.*, E of military base, N of cliff, 51·673213°S, 58·105353°W, 440 m, pebbles in alpine heath, 2015, *Fryday* 10797, 10803; Lafonia, North Arm, between settlement and Garden Point, 52·140000°S, 59·371650°W, 0 m, pebbles in depression in track, 2015, *Fryday* 11079; *ibid.*, 3·5 km west of Walker Creek, N of road, E of creek, 51·977064°S, 58·822842°W, 21 m, low outcrop in *Empetrum* heath above stream, 2015, *Fryday* 11436; Estancia, SE side of inlet 6 km west of house, 51·657400°S, 58·262245°W, sea level, rocks at back by shore, 2015, *Fryday* 11255; Darwin, west side of cove at NE end of Darwin Harbour, 51·788657°S, 58·943417°W, sea level, pebbles in turf, 2015, *Fryday* 11412. *West Falkland:* Hill Cove, NE base of French Peaks, 200 ft, stone run, 1968, *Imshaug* 41013 & *Harris*; Mt. Adam, E side of summit ridge, 2200–2297 ft, 1968, *Imshaug* 41089 & *Harris*; *ibid.*, summit of southernmost peak, 2250 ft, 1968, *Imshaug* 41093 & *Harris*; *ibid.*, ridge W of northern lake, 2000 ft, sheltered cliffs, 1968, *Imshaug* 41135 & *Harris*; Fox Bay, NE from Sullivan House, 500 ft, outcrops on ridge, 1968, *Imshaug* 42369 & *Harris*; Chartres, Patricia Luxton NNR, 51·725859°S, 59·984581°W, 15 m, low, exposed sandstone crags, 2015, *Fryday* 10987. *Saunders Island:* Rookery Cottage, 51·306687°S, 60·098780°W, 44 m, pebbles in *Empetrum* heath, 2015, *Fryday* 11354. *Weddell Island:* Circum Peak, NW slope, 51·925000°S, 60·928000°W, 140 m, pebbles, 2015, *Fryday* 10831; *ibid.*, summit, 51·927272°S, 60·925263°W, 205 m, pebbles, 2015, *Fryday* 10840, 10847 (topotypes).

Specimens of *Rhizocarpon reductum* examined. Falkland Islands: *East Falkland:* Vantan Arroyo, 51·743908°S, 58·280770°W, 15 m, pebble in *Leptinella scariosa* (button weed) heath, 2015, *Fryday* 10747, 10758.

Provisional key to species of *Rhizocarpon* occurring in the Falkland Islands

- 1 Thallus yellow-green (rhizocarpic acid present); ascospores pigmented 2
 Thallus white-grey or brown, not yellow-green (rhizocarpic acid absent); ascospores
 pigmented or hyaline 4
- 2(1) Ascospores 1-septate; apothecia sessile; thallus with norstictic acid (K+ red, needle-
 shaped crystals in section) **R. superficiale**
 Ascospores 1–3-septate or submuriform, usually with less distinct longitudinal and
 diagonal septa; apothecia innate; thallus with psoromic acid (K+ yellow, no
 crystals in section) 3
- 3(2) Ascospores 1–3-septate, usually with less distinct longitudinal and diagonal septa;
 thallus consisting of dispersed areoles on a black hypothallus **R. nidificum**
 Ascospores submuriform; thallus ±continuous **R. geographicum**
- 4(1) Ascospores pigmented dark blue-green (N+ red; Cinereorufa-green) 12–16 × 6–
 8 µm; medulla I+ violet **R. simillimum**
 Ascospores hyaline, although sometimes becoming brown when overmature 5
- 5(4) Ascospores with only transverse septa, 1–3-septate 6
 Ascospores with transverse and longitudinal septa 9
- 6(5) Ascospores 3-septate; medulla I– **R. submodestum**
 Ascospores 1-septate; medulla I– or I+ violet 7
- 7(6) Epihymenium red-brown, K+ purple-red (Atra-red); ascospores occasionally
 becoming pigmented or 3-septate; medulla I+ violet **R. polycarpum**
 Epihymenium brown, olivaceous or blue, K–; ascospores occasionally becoming
 pigmented but not 3-septate; medulla I– 8
- 8(7) Ascospores >24 µm long; paraphyses not distinctly capitate **R. hochstetteri**
 Ascospores <22 µm long; paraphyses distinctly capitate **R. infernum**
- 9(5) Medulla I+ violet; epihymenium K+ purple-red (Atra-red) **R. distinctum**
 Medulla I–; epihymenium K+ purple-red (Atra-red) or K– 10
- 10(9) Epihymenium K+ purple-red (Atra-red) **R. subpostumum**
 Epihymenium without K+ purple-red pigment 11
- 11(10) Epihymenium olivaceous; excipulum brown, N– **R. reductum**
 Epihymenium and excipulum blue-black, N+ crimson **R. malvinae**

***Tephromela lignicola* Orange & Fryday
 sp. nov.**

Mycobank No.: MB 829208

Separated from other sterile sorediate species by a combination of its yellow to blue-grey soralia, its unique

chemistry (atranorin and alectoronic acid) and lignicolous habit.

Type: Falkland Islands, Weddell Island, Weddell Settlement, behind Mountain View Cottage, 51°89'1525"S, 60°9'12416"W, 15 m, fence post, 24 January 2015, *Fryday* 10863 (MSC—holotype).

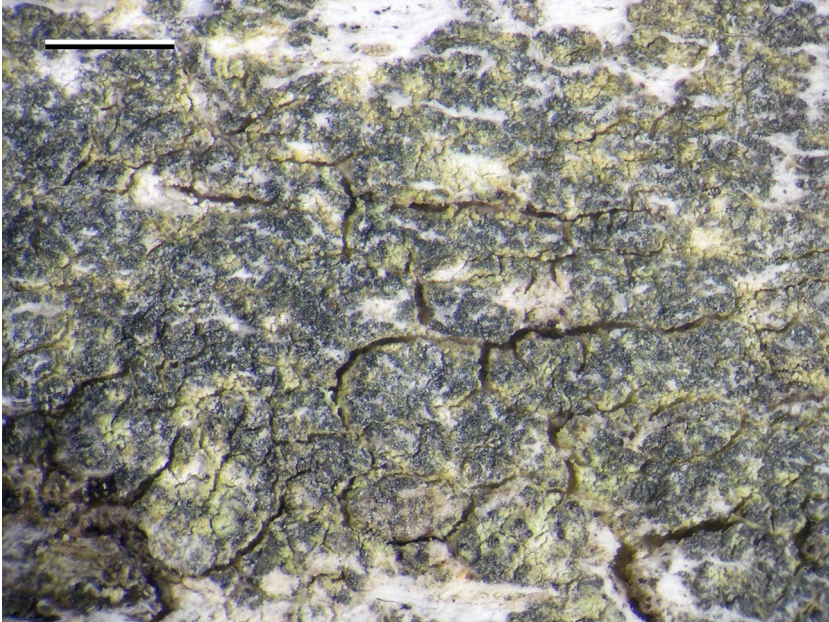


FIG. 13. *Tephromela lignicola* (Fryday 10863, holotype) thallus with soredia. Scale = 1 mm. In colour online.

(Fig. 13)

Thallus not apparent, endoxylic, completely within the substratum. *Soralia* erumpent, initially orbicular to 0.3 mm diam., becoming elongate to 0.6 × 0.3 mm, plane to concave, following the grain of the wood, but soon confluent and convex and forming a ±continuous crust; *soredia* farinose, pale green below becoming blue-grey at the surface (pigment K-, N+ purple-red), 20–25 µm diam., aggregating to 75–100 µm across. *Photobiont* trebouxoid; cells (6–)10–15 µm diam.

Apothecia unknown.

Conidiomata not observed.

Chemistry. K+ yellow, KC-, C-, Pd-; atranorin and alectoronic acid by TLC.

Etymology. The name reflects the substratum on which the species occurs.

Ecology and distribution. Known only from the Falkland Islands, where it occurs on fence posts and worked timber on both main islands and Weddell Island. It is possible that this species was imported with the fence

posts, which probably originated in Chile. Associated species: *Blastenia circumpolaris* Søchting *et al.*, *Buellia punctata* (Hoffm.) A. Massal., *Cliostomum griffithii* (Sm.) Coppins, *Lecanora expallens* Ach. and *Xylographa vitiligo* (Ach.) J. R. Laundon.

Remarks. *Tephromela lignicola* superficially resembles *Buellia griseovirens* (Turner & Borrer ex Sm.) Almb. but that species contains atranorin and norstictic acid, and reacts K+ red. The collections do not correspond with any of the known corticolous, sorediate species of *Tephromela* (e.g. *T. sorediata* Kalb & Elix from Australia has unpigmented soralia) but an ITS sequence from one collection (Orange 22552) is almost identical to that obtained from *Tephromela alectoronica* Kalb from Australia, which is a non-sorediate species also reported from South America (Elix 2009). It is possible that *T. lignicola* is the sorediate morphotype of *T. alectoronica*.

The lichenicolous fungus *Skyttea violacea* Etayo, previously reported only on a sorediate, corticolous morph of *Tephromela atra* (Huds.) Hafellner from Tierra del Fuego

(Etayo & Sancho 2008), was present on the thallus of the holotype.

Additional specimens examined. Falkland Islands: East Falkland: Darwin, Darwin House, 51°48·36'S, 58°57·49'W, 10 m, on wooden fence of garden by pasture, 2011, *A. Orange* 19679 (NMW C.2015.004.95); San Carlos Water, Bonners Bay, head of the Bay

Brook, 51°36·366'S, 59°00·845'W, on fence post, 2011, *A. Orange* 19831 (NMW); Goose Green Farm, Darwin, 51·80798°S, 58·95824°W, 2015, *A. Orange* 23157 (NMW). *West Falkland:* Port Howard, 51°37·74'S, 59°32·39'W, on old wood lying on ground, 2011, *A. Orange* 20142 (NMW C.2015.004.96); north-west of Fox Bay, Lake Sullivan, 51·91055°S, 60·16769°W, 10 m, on wood of fence post, 2015, *A. Orange* 22552 (NMW C.2015.004.75).

Provisional key to species of *Tephromela* occurring in the Falkland Islands

- 1 Thallus sorediate, soralia green-grey; apothecia unknown; on fence posts. **T. lignicola**
 Thallus not sorediate; apothecia present; on rocks. 2
- 2(1) Thallus in small patches (<1 cm diam.); containing stictic or norstictic acid only . . . **T. minor**
 Thallus more widespreading (>5 cm diam.); containing atranorin, α -collatolic acid
 and \pm alectoronic acid 3
- 3(2) Apothecia \pm lirellate; paraphyses apices blue-black. **T. lirellina**
 Apothecia consistently orbicular; paraphyses apices purple-brown 4
- 4(3) Hymenium interspersed **T. skottsbergii**
 Hymenium not interspersed 5
- 5(4) Apothecia innate **T. atroviolacea**
 Apothecia sessile 6
- 6(5) Thalline margin poorly developed, usually \pm excluded; apothecia large, up to 5 mm
 diam.; hypothecium with a wide hyaline band adjacent to the hymenium . . . **T. superba**
 Thalline margin well developed; apothecia <1·5 mm diam.; hypothecium with a
 narrow hyaline band adjacent to the hymenium 7
- 7(6) Thalline margin not corticate, not raised above the level of the disc **T. atrocaesia**
 Thalline margin corticate, raised above the level of the disc **T. atra**

Conclusion

Including this contribution, there have been 31 taxa described from the Falkland Islands since the year 2000 (Fryday & Common 2001; Coppins & Fryday 2006; McCarthy & Fryday 2009; Lumbsch *et al.* 2010; Fryday & Øvstedal 2012; Fryday & Hertel 2014; Fryday *et al.* 2017*a, b*; Orange 2018; Øvstedal *et al.* 2018) but, as can be seen from the number of 'Associated Species' identified only to

genus or included in the keys only as "sp.", many more remain to be fully investigated. Notes on many of these taxa can be found on the websites *Lichens of the Southern Subpolar Region* (Fryday 2018) or *Lichens of the Falkland Islands* (Fryday 2019). These additional taxa are often known from only a single collection, or material is otherwise insufficient to formulate an adequate description or to select a good type specimen. In particular, collections of crustose *Teloschistaceae*,

Lecideaceae and *Verrucariaceae* have been deliberately excluded from the present contribution because they are being investigated by specialists in these groups and more new species are confidently expected from their research. As an example of this underexplored biodiversity, the genus *Trapelia* consists of *c.* 20 species worldwide and none of these had previously been reported from the Falkland Islands. However, Orange (2018) reported seven species from the archipelago: two were previously described, two were newly described endemics, and three were species for which insufficient material was available for formal recognition.

The lichen biota of southern South America and many other austral regions is poorly understood and little researched genetically, so any conclusions concerning lichen distribution should be treated with extreme caution. Although all but one of the species described here are known only from the Falkland Islands, that number is certain to decrease as the lichen biota of other areas in the region (and beyond) becomes better known. However, as stated above under *Rhizocarpon malviniae*, Imshaug and co-workers made *c.* 10000 collections from southern South America, including *c.* 3550 from Isla de los Estados and *c.* 2200 from Isla Grande de Tierra del Fuego, the areas geographically closest to the Falkland Islands (Fryday & Prather 2001), and only one of the 11 species described here has been found among those collections. Conversely, several collections from the Falkland Islands have been identified as species with a predominately Northern Hemisphere distribution (e.g. *Lepra aspergilla* and *L. excludens*) and it is possible that, as has recently been demonstrated for *Ochrolechia antarctica* (Müll. Arg.) Darb. (Ertz *et al.* 2016), when these species are subjected to molecular investigation, they will be shown to be genetically distinct and represent different taxa.

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