

# Further interesting lichens and lichenicolous fungi from Fuerteventura, Canary Islands (Spain), with three new species and notes on *Mixtoconidium*

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**Abstract:** Fifty-two taxa of lichens and lichenicolous fungi from Fuerteventura (Canary Islands) are presented as a result of recent fieldwork. For each taxon, information about habitat and substrata is given. Forty-seven species are newly recorded from the island, including the rare lichenicolous fungi *Arthonia follmanniana* and *Stigmidium epistigmellum*, the latter previously only known from America, and three new species described here: *Lecania euphorbiae*, *Staurothele alboterrestris* and *Stigmidium seirophorae*. The new combination *Variospora fuerteventuriae* is proposed for *Caloplaca fuerteventuriae*. In a revision of the genus *Mixtoconidium* the new combinations *Mixtoconidium insidens* and *M. nashii* are proposed.

**Keywords:** biodiversity, Macaronesia, mycoflora, new records, taxonomy.

**Resumen:** Se señalan cincuenta y dos taxones de líquenes y hongos liquenícolas procedentes de Fuerteventura (islas Canarias). De cada taxón se aporta información sobre hábitat y sustrato. Cuarenta y siete especies se señalan por primera vez para la isla, incluyendo los hongos liquenícolas poco frecuentes *Arthonia follmanniana* y *Stigmidium epistigmellum*, este último previamente conocido sólo de América, así como tres nuevas especies descritas en este trabajo: *Lecania euphorbiae*, *Staurothele alboterrestris* y *Stigmidium seirophorae*. Se propone la nueva combinación *Variospora fuerteventuriae* para la anteriormente denominada *Caloplaca fuerteventuriae*. También se revisa el género *Mixtoconidium* y se proponen las combinaciones *Mixtoconidium insidens* y *M. nashii*.

**Palabras clave:** biodiversidad, Macaronesia, micoflora, nuevas citas, taxonomía.

## Introduction

Fuerteventura has like the other Canary Islands a high biodiversity in lichenized and lichenicolous fungi. VAN DEN BOOM & ETAYO (2006) presented a checklist with 189 taxa and reported another 98 taxa for the first time from the island. In addition, they described four species from the island as new for science. A more recent checklist, part of a survey of all Canary Islands, was published by HERNÁNDEZ-PADRÓN & PÉREZ-VARGAS (2010). Many further species are presented by VAN DEN BOOM & CLERC (2015) and VAN DEN BOOM *et al.* (2015), and *Amandinea oleicola* (Nyl.) Giralt & van den Boom by VAN DEN BOOM & GIRALT (2012).

In 2016 one of us (PB) visited the island again for a few days and collected several hundred specimens, especially in the south. This resulted in another 47 species new for the island, including some undescribed species. These and some further interesting taxa are presented here. *Lecania euphorbiae*, *Staurothele alboterrestris* and *Stigmidium seirophorae* are newly described. An opportunity to examine several *Mixtoconidium* specimens allowed us to clear the taxonomic confusion within this genus, so we present a taxonomic treatment with two new combinations.

## Material and methods

About 250 specimens of lichens and lichenicolous fungi were investigated using a stereomicroscope and a light microscope. Some specimens have been checked by specialists (see acknowledgements).

The indicated voucher specimens are placed in the private herbarium of P. van den Boom (herbarium numbers between 55700 and 55980), the type specimens are kept in TCF. The Canary Islands are abbreviated as: C (Gran Canaria), F (Fuerteventura), G (La Gomera), H (El Hierro), L (Lanzarote), P (La Palma) and T (Tenerife). References to the checklist by HERNÁNDEZ-PADRÓN & PÉREZ-VARGAS (2010) are abbreviated as H-P 2010. Species in bold are new to Fuerteventura. First records for the Canary Islands are marked by an asterisk.

Doubtful specimens or species already known, but in need of a remark, are mentioned in the same list in italics but not in bold. The locality numbers correspond with the list of localities (see following chapter).

## Collecting sites in Fuerteventura

- 1 = Parque Natural de Jandía, WNW of Morro del Jable, along unpaved road to Cofete, near mirador Montaña Aguda, W exposed volcanic rocks on slope. 28° 5.60' N, 14° 26.00' W, 230 m, 26 November 2016.
- 2 = Parque Natural de Jandía, NW of Morro del Jable, along trail in valley, Casas de Gran Valle, W exposed slope. 28° 5.01' N, 14° 22.81' W, 200 m, 26 November 2016.
- 3 = W of Tarajalejo, along small road (FV 56), from La Lajita to the north, in barranco de Tarajal de Caucho, W exposed slope with volcanic stones and outcrops. 28° 13.08' N, 14° 8.76' W, 70 m, 27 November 2016.
- 4 = La Pared, NW side of village, coastal area (near playa de la Pared), with low calcareous outcrops and dense shrubs of *Tamarix*. 28° 12.99' N, 14° 13.18' W, 15 m, 27 November 2016.
- 5 = W of road between La Pared and Costa Calma, Istmo de la Pared, trail in sandy dune area, with scattered group of stones. 28° 12.06' N, 14° 13.34' W, 115 m, 27 November 2016.
- 6 = W of road between La Pared and Costa Calma, Istmo de la Pared (south), near roundabout of Costa Calma, sandy dune area, with scattered stones. 28° 10.56' N, 14° 12.62' W, 45 m, 27 November 2016.
- 7 = Parque Natural de Jandía, N of Morro del Jable, top of mountain, Pico de la Zarza, many acidic boulders and outcrops with abundantly shrubs of *Asteriscus sericeus*. 28° 6.12' N, 14° 21.33' W, 800 m, 28 November 2016.
- 8 = Parque Natural de Jandía, N of Morro del Jable, just below the top of mountain Pico de la Zarza, along trail to the south, many acidic boulders and outcrops. 28° 5.92' N, 14° 21.09' W, 660 m, 28 November 2016.
- 9 = Road between Pájara and Betancuria, W exposed slope just N of Fenduca, many acidic boulders, outcrops and *Euphorbia* shrubs. 28° 22.39' N, 14° 6.06' W, 340 m, 29 November 2016.
- 10 = Road between Pájara and La Pared, SW of Cardón, near Chilegua, W exposed slightly sloping open field, with many small volcanic stones and outcrops. 28° 15.15' N, 14° 11.35' W, 130 m, 29 November 2016.
- 11 = Parque Natural de Jandía, NE of Morro del Jable, Casas de Mal Nombre, near mirador, mountain ridge with many acidic boulders and outcrops. 28° 7.55' N, 14° 19.76' W, 400 m, 30 November 2016.

## Notes on the genus *Mixtoconidium*

VOUAUX (in PITARD & HARMAND, 1911: 70) and subsequently VOUAUX (1914: 169) described *Celidium insidens*, a fungus growing on *Ramalina fraxinea* in the Canary Islands (Barranco del Río, Tenerife). He described sexual and asexual morphs of the fungus, including a surface mycelium forming a radiating disposed web that must belong to a different fungus (some samples of *Ramalina* in the Canary Islands are covered by a mycelium of this kind, probably belonging to *Lichenostigma* or *Lichenothelia*). Afterwards, *Celidium insidens* was proposed but not validly published as a species of *Arthonia*: *A. insidens* (Vouaux) in CLAUZADE *et al.* (1989). Unfortunately *C. insidens* disappeared from the herbarium Vouaux (RONDON, 1970), but the description is clearly complete.

The monotypic Coelomycete genus *Mixtoconidium*, with the species *M. canariense* Etayo was described for a lichenicolous fungus growing on *Ramalina* sp. with conidiomata forming small galls of 0.2–0.5 mm diam., with conidiogenous cells percurrently proliferating, with one to several annellations and dimorphic conidia; macroconidia hyaline, smooth, 1-septate, straight or slightly curved, 10–13 × 3.5–4(–5) µm and microconidia 4–6.5 × 0.8–1 µm (ETAYO, 1995). This paper was written in times when sexual and asexual morphs of the same fungus were allowed to be described separately and ETAYO (1995) commented that *M. canariense* might be identical with the asexual morph of *C. insidens*. ETAYO (1996b) described the sexual form of *Mixtoconidium* from samples found in the Balearic Islands. They differ from the description by Vouaux in the presence of a brown exciple and orange crystals, K+ purple, not pointed out by this author. However, some ascomata are without pruina and the description of the exciple could have been missed or mistaken for the hypothecium by Vouaux. The small ascospores size described by VOUAUX (*op. cit.*), 15–16 × 4–5 µm, was probably due to the study of immature specimens.

Some years later, HAFELLNER (in HAFELLNER *et al.*, 2002) described a species of *Plectocarpon*, placed with some hesitation in that genus: *P. nashii* Hafellner, with apparently very similar conidia but hidden within the hymenia and separated by plectenchyma in the apothecia. The host was *Niebla robusta*, a taxon closely related to *Ramalina*. The abundance and disposition of the conidiomata were different in *P. nashii*, the macroconidia are larger: (12–)15–17 × 4–5 µm and the microconidia slightly wider: 5–6 × 1–1.5 µm (HAFELLNER *et al.*, 2002). Exactly the same sizes were given by ERTZ *et al.* (2005) in their monographic treatment of *Plectocarpon*.

Recently, we were able to study some more samples of the apparently rare *Mixtoconidium* species from the Canary Islands and the Balearic Islands (Spain), mixed with ascomata, and definitely belonging to the same taxon. We realized that the species was rather similar to *P. nashii* but with clear differences. Apart from the indicated macroconidia and conidiomata differences, the ascomata in *M. canariense* are much smaller, 0.25–0.55(–1.5) mm in diam., in contrast with up to 2.5 mm in diam. in *P. nashii*. Also hymenium, asci and ascospores are smaller. *M. canariense*, especially its conidiomata, seems to frequently produce black dots in the host thallus while *P. nashii* does not form such dots.

HAFELLNER *et al.* (2002) realized that *P. nashii* does not belong to the core group of *Plectocarpon*. The same conclusion can be found in ERTZ *et al.* (2005) who included *Plectocarpon leuckertii* (S.Y. Kondr. & D.J. Galloway) Ertz & Diederich, also with orange, K+ purple pigment in the epithecium and excipular-like stroma, in the same group. Unfortunately, the genus *Plectocarpon* appears to be difficult to sequence (ERTZ *et al.*, 2005), thus phylogenetic information is still lacking. However, based on its very atypical conidiomata and conidia, excipulum-like stroma, orange pigment in the epithecium and atypical distribution of the locules in the stroma, we consider *P. nashii* and *M. canariense* to be different at genus level from *Plectocarpon*. Since the name *Mixtoconidium* is already available we propose the new combinations *Mixtoconidium insidens* and *M. nashii* for this two related species. We hesitate to include *P. leuckertii* in

spite of its similarities with *Mixtoconidium*, because only microconidia were described, the apothecial habitus is more similar to *Plectocarpon s. str.* and it is growing on *Pseudocyphellaria*, a genus with several parasitic *Plectocarpon* species.

The pruinose and apothecioid ascomata, branched-anastomosing paraphysoids, asci and ascospores remind us quit also of some genera of *Lecanactis s. lat.* studied by EGEA & TORRENTE (1994). The asci of *Mixtoconidium* are close to the *Grumulosa*-type, with hardly amyloid wall and ring. *Lecanographa* has this kind of asci and has three lichenicolous species (LAWREY & DIEDERICH, 2017). However, *Lecanographa* has white pruina on the apothecia and only microconidia (EGEA & TORRENTE, 1994). *Cresponea*, a genus with some species with yellow pruina on the apothecia differs by asci of the *Abietina*-type with strongly hemiamyloid endoascus and ring, and ascospores without a perispore (EGEA & TORRENTE, 1994). One species of this genus has recently been described as lichenicolous (CÁCERES *et al.*, 2014) on *Pyrenula*.

As the type of *Mixtoconidium canariense* is only based on the asexual morph, we have chosen a neotype with both morphs for Vouaux's name.

***Mixtoconidium insidens*** (Vouaux) Etayo & van den Boom, *comb. nov.* – Fig. 1 – Mycobank #820547

Basionym: *Celidium insidens* Vouaux, in Pitard & Harmand, *Bull. Soc. bot. France*, 58: 70 (1911).

**Neotypus hic designatus:** SPAIN. Canary Islands: Tenerife (NW), N of Santiago del Teide, 0.5–1 km WSW of Erjos, path to Las Portelas, along laurisilva with gardens and scattered trees, shrubs and outcrops, on *Ramalina* sp., on fruit-tree, 28° 19.77' N, 16° 48.62' W, 1000 m, 8 May 2007, leg. P. & B. van den Boom 37709 (TFC, neotype; hb. v.d. Boom, isoneotype).

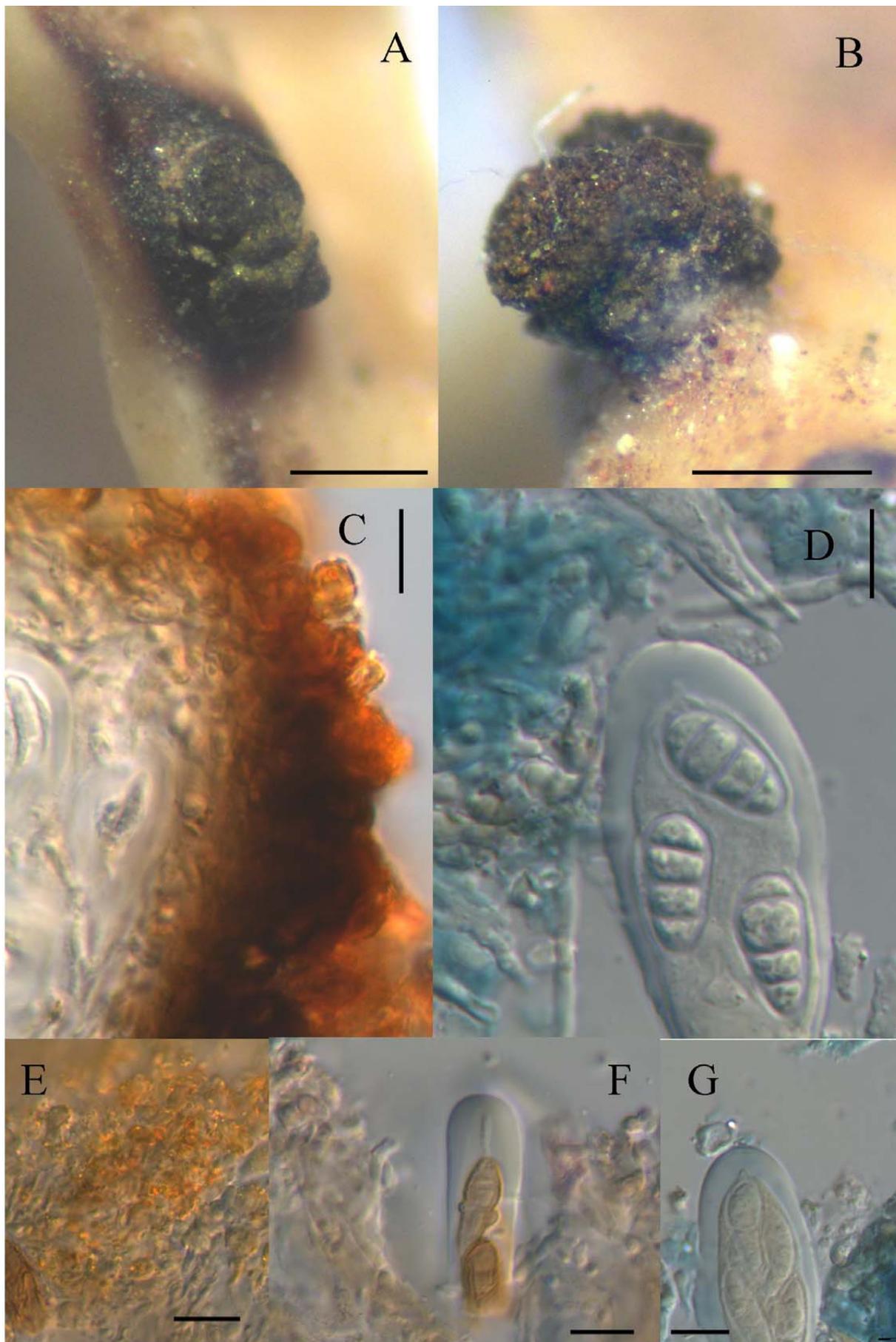
**Synonym:** *Mixtoconidium canariense* Etayo, *Mycotaxon*, 53: 426 (1985).

**Additional specimens** examined with asexual and sexual morph on *Ramalina*: SPAIN: Canary Islands: Tenerife (NW), N of Santiago del Teide, Barranco de Cuevas Negras o del Agua, path from Erjos to Los Silos, open place with *Erica arborea*, *Pinus* and outcrops, on *Ramalina* on *Erica*, 28° 19.99' N, 16° 48.41' W, 890 m, 15.V.2007, leg. P. & B. van den Boom 38044 (hb. v.d. Boom); La Palma, 3.5 km WSW of Los Sauces, Los Tilos, narrow cleft along volcanic outcrops, 28° 47.10' N, 17° 48.60' W 750 m, 27.X.2012, leg. P. & B. van den Boom 48346 (hb. v.d. Boom).

*Mixtoconidium canariense* Etayo; type: Canary Islands, Gran Canaria, Hacienda de Osorio, on *Ramalina canariensis*, on thin branches of *Quercus* sp., 4.XII.1992, leg. A. Pérez de Zabalza & A. Ariño (IMI, holotype!; hb. Etayo 3470, hb. Diederich, isotypes).

**Ascomata** first flat, soon convex, 0.25–0.55 µm diam., with margin, not forming a real stroma but finally grouped by two to six emerging from the same point and forming roundish structures to 1.5 mm diam., dark brown, covered by orange pruina, K+ purple. Exciple orange brown, K+ olivaceous brown, hyphal, 20–30 µm in lateral part and to 60 µm thick in basal part; hyphae covered by small brown granules. Epithecium brown with many orange crystals, K+ purple. Hypothecium brownish. Hymenium 60–90 µm thick, yellowish, I+ red, KI+ blue, with strongly branched-anastomosed paraphysoids. **Asci** clavate, KI-, 8-spored, 55–67 × 12–19 µm. **Ascospores** at first hyaline, soon brownish, 3-septate, with the second cell larger, with small guttules inside, halonate (halo 0.5–1 µm thick), 16–21 × 6–8 µm. **Asexual morph** see ETAYO (1995).

*Mixtoconidium canariense* was known from the Canary Islands (La Gomera, La Palma, Gran Canaria), Mallorca (ETAYO, 1995, 1996b, 2000) and recently it has been collected on Sicily (Italy) too (BRACKEL, 2008). This author found it very scarce amongst hundreds of samples of *Ramalina fraxinea*. So, it must have a Mediterranean Macaronesian distribution.



**Figure 1** – Sexual morph of *Mixtoconidium insidens* (typus, van den Boom 37709). A, B, ascoma groups emerging together from black dots, note that the habitus is not typical for *Plectocarpon* because the compound stromata are due to the aggregation of several simple apothecia. C, section of the exciple, thin orange brown. D, young ascus and hamathelial filaments. E, orange crystals in epithecium reacting K<sup>+</sup> purple. F, mature ascus (K). G, young ascus (KI). Scale bars: A & B = 0.5 mm; C, D, E, F & G = 10 μm.

**Mixtoconidium nashii** (Hafellner) Etayo & van den Boom, *comb. nov.* – Mycobank #820548

**Basionym:** *Plectocarpon nashii* Hafellner, *Mycotaxon*, 84: 312 (2002).

**Type:** U.S.A., California, Santa Barbara Co., W-end of West Anacapa Island, above Rat Rock, 34° 00' 50" N, 119° 26' 40" W, 60 m, on *Niebla robusta* on acidic rock, 9 November 1995, *leg.* Nash 37021a (ASU, holotype, *non vid.*; GZU, isotype, *non vid.*).

## Annotated species list and new species of lichens

**Agonimia opuntiella** (Buschardt & Poelt) Vezda

Specimen examined – Loc. 7 on dead branch of *Asteriscus sericeus*, 55814.

Notes: In H-P 2010 it is recorded from P and L, in VAN DEN BOOM *et al.* (2015) from G.

**Agonimia tristicula** (Nyl.) Zahlbr.

Specimen examined – Loc. 7 on dead branch of *Asteriscus sericeus*, 55813.

Notes: In H-P 2010 it is only recorded from G.

**Arthonia albopulverea** Nyl.

Specimen examined – Loc. 4 on *Tamarix*, 55772.

Notes: In H-P 2010 this species is published as *Arthothelium crozalsianum* (B. de Lesd.) B. de Lesd. and only reported from P.

**Coscinocladium gaditanum** (Clemente) A. Crespo, Llimona & D. Hawksw.

Specimen examined – Loc. 4 on calcareous outcrop, 55768.

Notes: This species was previously only known from L (H-P 2010).

**Dirina canariensis** Tehler & Ertz

Specimen examined – Loc. 5 on N side acidic outcrop, 55776.

Notes: This recently described species was previously known from C, G and T (TEHLER *et al.*, 2013).

**Endocarpon pusillum** Hedw.

Specimens examined – Loc. 9 terricolous, 55903, 55917.

Notes: This species was previously known from T (H-P 2010).

**Flavoparmelia caperata** (L.) Hale

Specimens examined – Loc. 7 on acidic outcrop, 55783, 55859.

Notes: This species was known from all of the Canary Islands, except F (H-P 2010).

**Flavoparmelia soledians** (Nyl.) Hale

Specimens examined – Loc. 7 on horizontal face of acidic outcrop, 55821, 55798; Loc. 8 on horizontal face of acidic outcrop, 55889.

Notes: This species was known from all of the Canary Islands, except F (H-P 2010).

**Heppia echinulata** Marton & Galun

Specimen examined – Loc. 9 terricolous, 55893.

Notes: This is the second record from the Canary Islands, the species was previously known only from C (SCHULTZ & VAN DEN BOOM, 2007).

**Heppia solorinoides** (Nyl.) Nyl.

Specimen examined – Loc. 9 terricolous, 55918.

Notes: In SCHULTZ & VAN DEN BOOM (2007) this species is only mentioned from T and L. On F we found a nice fertile population.

**Hyperphyscia adglutinata** (Flörke) H. Mayrhofer & Poelt

Specimen examined – Loc. 8 on *Lycium intricatum*, 55880.

**Lecania euphorbiae** van den Boom & Etayo, *sp. nov.* – Fig. 2 – MycoBank #820549

**Diagnosis:** Species similar to *Lecania juniperi* van den Boom, but differing by a granular, warted to small squamulose thallus; smaller apothecia, up to 0.5 mm, a paler disc, constricted at base or slightly stipitate, and smaller ascospores 8–10 × 2.7–4.0(–4.5) µm, ellipsoid to somewhat ovoid, (0)1-septate. Pycnidia not found.

**Holotype:** SPAIN, Canary Islands, Fuerteventura, road between Pájara and Betancuria, W exposed slope just N of Fenduca, many acidic boulders, outcrops and *Euphorbia* shrubs, 28° 22.39' N, 14° 6.06' W, 340 m, 29 November 2016, *leg.* P. & B. van den Boom 55926 (TFC, holotype; hb. van den Boom, isotype).

**Etymology:** The epithet refers to the host genus, *Euphorbia*.

**Thallus** corticolous, effuse, up to 1 dm wide, forming small areoles, which are granularly warted to small squamulose; areoles 0.3–1 mm wide; warts 50–100 µm wide; squamules 100–300 µm wide, up to 0.25 mm thick; upper surface of warts and squamules smooth, matt, pale grey to greyish green. Photobiont chlorococcoid, cells of 6 to 15 µm diam. Apothecia abundant, often crowded, up to 0.5 mm diam.; disc plane to convex, pale brown, grey-brown to medium brown; margin thin, becoming well developed (0.05 to 0.1 mm wide), sometimes crenulate, paler than the disc, persistent. Exciple lecanorine, not well developed, nearly completely filled with green algae, not cellular, hyaline, cortical zone absent. Parathecium hyaline, visible as a small rim, not well developed, c. 15 µm wide. Epithemium hyaline to reddish brown, paler in KOH. Hymenium c. 45–60 µm high, hyaline. **Paraphyses** conglutinated, clearly septate, cells in the middle of the hymenium 1.5–2 µm diam., simple to sometimes branched in the upper part, apices pale to often brown to dark brown-pigmented at the upper cell wall, widened up to 5 µm. **Asci** *Bacidia*-type, 8-spored, 30–40 × 10–15 µm. **Ascospores** ± biserial, ellipsoid to somewhat ovoid, (0)1-septate, 8–10 × 2.7–4.0(–4.5) µm. **Pycnidia** not found.

**Chemistry:** Thallus K–, C–, KC–, P–; no chemical compounds detected.

**Distribution and ecology:** This new species occurs on *Euphorbia* sp. where it has been found abundantly, covering at least 1 dm<sup>2</sup> on the trunk. It is only known from the type locality, on a north exposed sloping rather widening small valley. No other epiphytic lichen species have been found on the shrubs in that area. However populations of terricolous and saxicolous lichens are well developed.

**Notes:** The recently described *Lecania juniperi* (VAN DEN BOOM & GIRALT, 2012) is most related to the new species, but is sorediate, has much bigger apothecia (up to 0.8 mm), which are much darker, and the ascospores are 9–14(–15) × (3–)3.5–5(–5.5) µm. It is known from *Juniperus* in western Portugal. The new species looks like *Lecania cyrtella*, but the latter has a thalline excipulum that is often rather reduced, becoming excluded, its thallus is never warted-squamulose and the ascospores are usually longer (10–16 µm).

**Lecania rabenhorstii** (Hepp) Arnold

Specimen examined – Loc. 7 on a stone on soil, 55863.

*Mirolecis hagenii* (Ach.) Sliwa, Zhao Xin & Lumbsch

Specimen examined – Loc. 8 on *Lycium intricatum*, 55803.

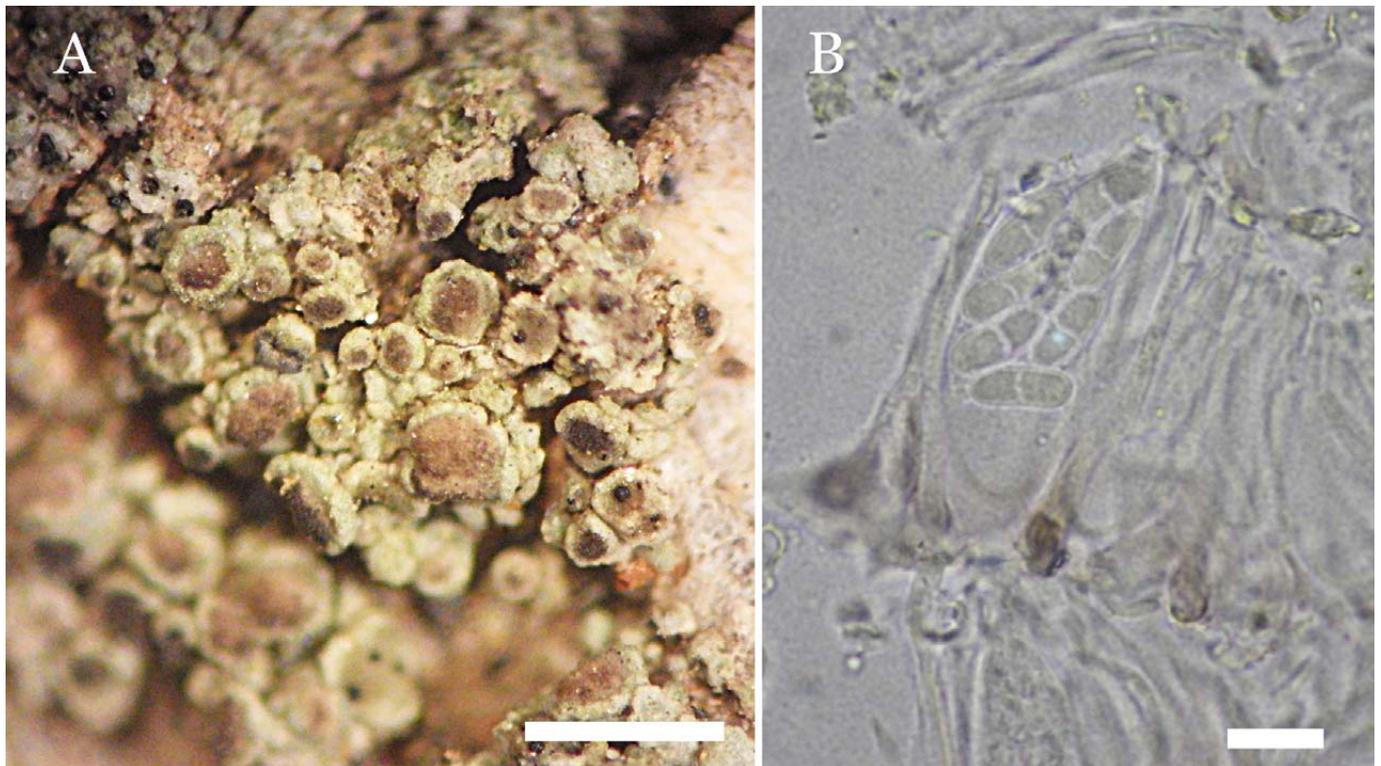
Notes: This species is not mentioned in the checklist of H-P 2010, not even as *Lecanora hagenii* (Ach.) Ach. However, VAN DEN BOOM & ETAYO (2006) reported it from an *Eucalyptus* tree as *Lecanora hagenii*.

**Normandina pulchella** (Borrer) Nyl.

Specimen examined – Loc. 7 among mosses on acidic outcrop, 55817.

**Parmotrema perlatum** (Hudson) M. Choisy

Specimen examined – Loc. 7 on acidic outcrops, 55824.



**Figure 2** – *Lecania euphorbiae* (typus, van den Boom 55926). A, habitus of the species with thallus and apothecia. B, ascus with ascospores. Scale bars: A = 1 mm; B = 10  $\mu$ m.

Notes: This species is known from all western Canary Islands but it was not recorded from L and F so far (H-P 2010).

***Physcia clementei*** (Turner) Lynge

Specimen examined – Loc. 7 on dead branch of *Asteriscus sericeus*, 55809.

***Physciella chloantha*** (Ach.) Essl.

Specimen examined – Loc. 8 on vertical shaded acidic outcrop, 55871.

Notes: This species is mentioned in VAN DEN BOOM & ETAYO (2006), but as a doubtful record. This time we have found a well-developed population.

***Placopyrenium bucekii*** (Nádv. & Servít) Breuss

Specimen examined – Loc. 7 on acidic outcrop, 55823.

***Ramalina siliquosa*** (Huds.) A.L. Sm.

Specimens examined – Loc. 11 on acidic outcrop, 55939, 55941.

***Staurothele alboterrestris*** van den Boom & Etayo, *sp. nov.* – Fig. 3 – MycoBank #820550

**Diagnosis:** Species similar to *Staurothele bacilligera* (Arnold) Arnold, but differing by a pale greyish to pale greenish grey thallus, terricolous on bare soil, continuous to weakly squamulose, rimose to areolate, areoles plane to slightly convex, up to 1 mm wide, up to 0.15 mm thick. Perithecia immersed in thallus (upper part) and sandy soil (lowest part), up to 0.35 mm diam., ostiole pale grey, hymenial algae oblong, up to 6  $\mu$ m long, 2.3–3  $\mu$ m wide; ascospores ellipsoid to ovoid, 25–45(–50)  $\times$  16–25  $\mu$ m, hyaline.

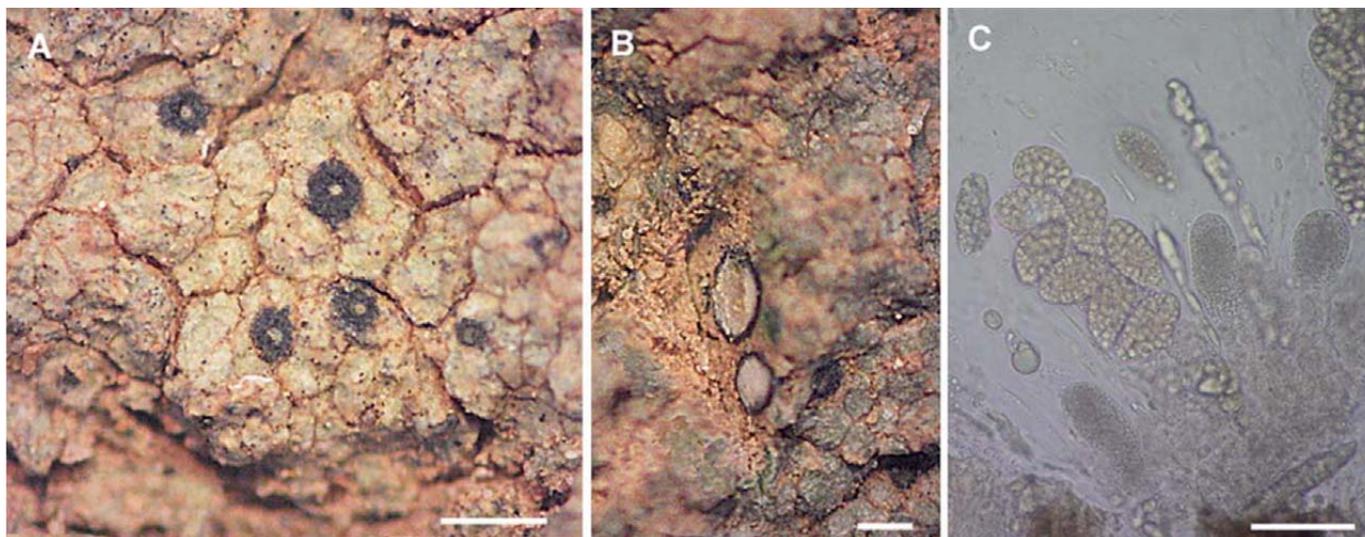
**Holotype:** SPAIN, Canary Islands, Fuerteventura, road between Pájara and Betancuria, W exposed slope just N of Fenduca, many acidic boulders, outcrops and *Euphorbia* shrubs, 28° 22.39' N, 14° 6.06' W, 340 m, 29 November 2016, leg. P. & B. van den Boom 55894 (TFC, holotype; hb. van den Boom, isotype).

**Etymology:** The epithet refers to the pale and inconspicuous thallus, growing on soil.

**Thallus** crustose, terricolous on soft bare soil, continuous, slightly rimose to areolate, sometimes weakly squamulose, closely appressed to the substrate; upper surface plane with slightly convex parts, margin sometimes somewhat imbricate, up to 0.5 mm wide, up to 0.1(–0.15) mm thick, pale greyish to pale greenish grey. Upper cortex weakly pseudoparenchymatous. Lower cortex not present. Thallus margin distinctly delimited, but no prothallus observed. Photobiont chlorococcoid, cells globose, 5–10  $\mu$ m diam. Ascomata perithecioid, globose, immersed in the thallus, up to 0.35 mm diam., scattered, black; ostiole pale grey, visible with a small dark ring up to 0.2 mm; perithecial wall pseudoparaplectenchymatous, in section up to 25  $\mu$ m wide, brown, with pale brown intracellular pigments at the inner part. No involucrellum observed. Hymenial algae stichococcoid, up to 6  $\mu$ m long and 2.3–3  $\mu$ m wide, narrowly oblong to oblong-ellipsoid, 1-celled, sometimes slightly curved. Interascal filaments not observed, periphyses numerous. Hymenium IKI + reddish. **Asci** cylindrical, thick-walled, 1 + reddish, 65–110  $\times$  25–55  $\mu$ m, 8-spored. **Ascospores** biseriate, cylindrical to ovoid, muriform, smooth, hyaline, becoming very pale brown when old, 25–45(–50)  $\times$  16–25  $\mu$ m, perispore not observed. **Conidiomata** not seen.

**Distribution and ecology:** The new species is only known from the type locality, growing abundantly in a wide open valley, exposed to north, sheltered, on sloping soft calcareous soil close to a vertical outcrop. A very interesting site, rich of species, where the following accompanying lichens were observed: *Heppia echinulata*, *H. solorioides*, *Verrucaria geophila*, *V. xyloxena*, and even surprisingly *Lecania spadicea* which has never been found on soil. An interesting and well developed flowering plant on this spot was *Caralluma burchardii*.

**Notes:** The new species is most related to the saxicolous *Staurothele bacilligera*. In the original description (ARNOLD, 1869) is mentioned a dark thallus, 8-spored asci with muriform ascospores of 30–36  $\times$  15–18  $\mu$ m and stichococcoid algae in the hymenium of 6–15  $\times$



**Figure 3** – *Staurothele alboterrestriis* (typus, van den Boom 55894). A, habitus of the species with thallus and immersed perithecia. B, section of perithecia. C, ascus with ascospores. Scale bars: A = 0.5 mm; B = 0.2 mm; C = 50  $\mu$ m.

2(–3)  $\mu$ m, bacilliform, growing on calcareous rock. The new species differs by the pale thallus, larger perithecia, up to 0.35 mm, larger ascospores 25–45(–50)  $\times$  16–25  $\mu$ m, the smaller hymenial stichococoid algae, oblong, up to 6  $\times$  2.2–3  $\mu$ m and the biology is different, as it grows on soft calcareous soil instead within pits on rock. CLAUZADE & ROUX (1985) describe *Staurothele bacilligera* as a saxicolous species with hymenial algae of 4–10  $\times$  2–3  $\mu$ m, and ascospores of 25–40  $\times$  12–20  $\mu$ m. SMITH *et al.* (2009) describe it as pale grey-brown endolithic thallus, perithecia immersed in well-defined pits in rock, hymenial algae 4–8  $\times$  1.5–2  $\mu$ m, ascospores hyaline, (30–)32–37.5  $\times$  (13–)14–16.5(–17)  $\mu$ m. Four further terricolous species of *Staurothele* have been described: *Staurothele epigaea* Breuss & Etayo from continental Spain has a brown thallus and smaller ascospores (22–30  $\times$  12–15  $\mu$ m); *S. geoica* Zschacke has a granular thallus and globose hymenial algae; *S. terricola* (Bagl.) Poelt & Nimis has cuboid and rectangular hymenial algae and ascospores of 36–43  $\times$  13–17  $\mu$ m and *S. argillacea* (Flagey) Zahlbr. is distinguished by 2-spored asci.

***Usnea* cf. *diplotypus*** Vain.

Specimens examined – Loc. 7 on acidic outcrop, on vertical surface, 55784, 55843.

Notes: In H-P 2010, this species is recorded from T. Our specimen deviates of *U. diplotypus* because despite having salazinic acid as main substance, accessories have not been found.

***Variospora flavescens*** (Hudson) Arup, Frödén & Søchting

Specimen examined – Loc. 7 horizontal and sloping volcanic outcrop, 55804.

Notes: In H-P 2010, this species is recorded from L, P and T, and in VAN DEN BOOM & CLERC (2015) from C, all as *Caloplaca flavescens* (Hudson) J.R. Laundon.

***Variospora fuerteventuræ*** (van den Boom & Etayo) van den Boom & Etayo, *comb. nov.* – MycoBank #820552

**Basionym:** *Caloplaca fuerteventuræ* van den Boom & Etayo, *Cryptogamie, Mycologie*, 27 (4): 347 (2006).

**Holotype:** SPAIN, Canary Islands: Fuerteventura, Parc Natural de Jandía, 5 km NW of Morro Jable, E of Casas de Gran Valle, Cuchillo del Ciervo, SW slope, volcanic rocks with shrubs, on horizontal, well lit surface of volcanic outcrops, 28° 5.1'N, 14° 22.7'W, 350 m, 28 February 2001, *leg.* P. & B. v.d. Boom 25889 (TFC-holotype; hb. v.d. Boom-isotype).

Specimen examined – Loc. 2 on exposed acidic outcrop, 55749.

Notes: The citriform ascospores place this species close to *C. flavescens*. Therefore it is combined here into the newly recognized genus *Variospora*. Despite of intensive search for this species in the

Jandía area, we have found it in only one locality where it is sparse, the second record after the type. It has been found not far from the type locality.

***Verrucaria geophila*** Zahlbr.

Specimen examined – Loc. 9 terricolous, 55913.

Notes: In H-P 2010, this species was only recorded from T.

***Verrucaria* aff. *squamulosa*** van den Boom & Brand

Specimen examined – Loc. 8 on acidic outcrop, 55872.

Notes: This collection fits well the holotype description, except that the perithecia are more immersed (c. ¾) and the squamules are sometimes slightly upturned (VAN DEN BOOM & BRAND, 2003).

**\**Verrucaria xyloxena*** Norman (syn. *Verrucaria terrestris* (Arnold) Vain., *illeg.*, non *V. terrestris* (Th. Fr.) Tuck.)

Specimen examined – Loc. 9 terricolous, 55905.

Notes: This species was collected in a species-rich locality, especially the terricolous lichen flora was well developed, including the newly described *Staurothele alboterrestriis*. It was growing close to the latter as well as together with *Verrucaria geophila*. Both *Verrucaria* species appeared rather different. We have found perithecia in *V. terrestris* of c. 250  $\mu$ m diam. and ascospores of c. 16  $\times$  8  $\mu$ m. The perithecia of *V. geophila* were c. 500  $\mu$ m diam. and the ascospores c. 30  $\times$  15  $\mu$ m.

***Xanthoparmelia subramigera*** (Gyeln.) Hale

Specimen examined – Loc. 7 on acidic outcrop, 55846.

Notes: In H-P 2010, this species is recorded from C, H, P and T.

## Annotated species list and new species of lichenicolous fungi

**\**Arthonia follmanniana*** Diederich

Specimen examined – Loc. 11 on *Rocella* sp. on sheltered acidic outcrop, 55934.

Notes: This species was known from Isla Bartolomé (Galápagos Islands) in Ecuador, on *Rocella galapagoensis* Follm. s. l. (DIEDERICH, 1995). It was also known from Turkey (HALICI & KAHRAMAN, 2016). This is the first record for the Canary Islands.

***Arthonia molendoi*** (Heufl. ex Frauenf.) R. Sant.

Specimen examined – Loc. 7 on horizontal and sloping outcrops, on *Variospora flavescens*, 55970.

Notes: The most recent record of this species for the Canary Island (Gran Canaria) is published by VAN DEN BOOM & CLERC (2015).

***Biatoropsis usnearum*** Räsänen *s. l.*

Specimen examined – Loc. 7 on sheltered and shaded outcrop, on *Usnea* sp., 55868.

Notes: The recent study of *Biatoropsis usnearum* (MILLANES *et al.*, 2016) proves by molecular methods that this taxon represents several species, including some still undescribed. We use the traditional name because in the sample collected in Fuerteventura, basidia and other structures are not easy to see.

***Bryostigma muscigenum*** (Th. Fr.) Frisch & G. Thor (syn. *Arthonia muscigena* Th. Fr.)

Specimens examined – Loc. 7 on *Parmotrema tinctorum* on vertical face of acidic outcrop, 55835; Loc. 8 on *Flavoparmelia soledians* on horizontal face of acidic outcrop, 55891.

Notes: We have found the same species growing on the soralia of *Flavoparmelia soledians* and the isidia of *Parmotrema tinctorum* in Canary Islands. Both samples are very similar, also to other small species with black apothecia growing on *Parmeliaceae* and other foliaceous hosts as they are recorded in ETAYO & SANCHO (2008). In Europe *B. muscigenum* has been recorded on several substrates (SMITH *et al.*, 2009; WIRTH *et al.*, 2013; ROUX *et al.*, 2017) but rarely on lichens (ETAYO & PÉREZ-ORTEGA, 2016). Probably more than one microspecies are involved, but should be studied with molecular methods.

***Catillaria mediterranea*** Hafellner

Specimen examined – Loc. 4 on acidic outcrop, on *Ramalina* sp., 55950.

Notes: This species grows on *Anaptychia*, *Physcia* and *Ramalina* species. This latter genus is the most common host for it in the Canary Islands (TRETIACH & HAFELLNER, 1998). In our sample conidiomata are very common, with small, bacillar conidia of about  $3 \times 1 \mu\text{m}$ .

***Cercidospora* aff. *epicarphinea*** (Nyl.) Grube & Hafellner

Specimen examined – Loc. 10 horizontal on stone, on *Seiophora scorigena*, 55932.

Notes: Our sample has cylindrical asci, 4.8 spored and caudate ascospores of  $18\text{--}22\text{--}(25) \times 5.5\text{--}7 \mu\text{m}$ , typical for most of species of *C. caudata* aggr. The most important differentiating feature are the small ascomata about  $100 \mu\text{m}$  diam., instead of  $150\text{--}200 \mu\text{m}$  in *C. caudata* aggr. (NAVARRO-ROSINÉS *et al.*, 2004). SANTESSON *et al.* (2004) placed all the species of this group as synonymous under *C. epicarphinea* (Nyl.) Grube & Hafellner.

***Didymocyrtis ramalinae*** (Roberge ex Desm.) Ertz, Diederich & Hafellner

Specimens examined – Loc. 7 on acidic outcrop, on *Ramalina*, 55795, 55847.

Notes: This species was previously only known from P and G, as *Leptosphaeria ramalinae* (Desm.) Sacc. (H-P 2010). ERTZ *et al.* (2015) record it from T.

***Endococcus* aff. *apiciicola*** (J. Steiner) R. Sant.

Specimen examined – Loc. 9 on *Euphorbia* 'tree', on *Lecania euphorbiae*, 55969.

**Ascomata** black, globose, semiimmersed to almost superficial, usually grouped on the disc of the host, very small,  $50\text{--}80 \mu\text{m}$  diam. Perithecial wall brown, thin, around  $7\text{--}10 \mu\text{m}$  thick, composed by a few rows (3–4) of cells, external cells long polyhedral in the base to isodiametric near the ostiole and with a thick wall,  $5\text{--}8 \mu\text{m}$  diam. Ostiole central, internally covered by periphyses, 1-celled, hyaline, slightly capitate,  $1.5\text{--}2 \mu\text{m}$  wide. Hymenium I-, without paraphyses. **Asci** clavate, widened in the middle,  $(26\text{--})30\text{--}43 \times 9\text{--}11 \mu\text{m}$ , with an apically distinctly thickened wall, 8-spored. **Ascospores** narrowly ellipsoid, or somewhat clavate, with obtuse ends, smooth, without

perispore, brown, 2-celled with one or two small guttules in each cell,  $8.5\text{--}10.5 \times 3.5\text{--}4.5 \mu\text{m}$ , with cells similar in size and shape, sometimes the lower one slightly smaller.

Notes: There are several similar *Endococcus* species with small spores. The recently described *E. xanthoparmeliae* Y. Joshi, S.Y. Kondr., L. Lököš & Hur (YOSHI *et al.*, 2015), growing on *Xanthoparmelia* in Korea, differs by its smaller asci ( $22\text{--}26 \times 10\text{--}12 \mu\text{m}$ ) and ascospores ( $(8\text{--})10\text{--}12 \times 4\text{--}5\text{--}(6) \mu\text{m}$ ). *E. parmeliarum* Etayo (ETAYO & SANCHO, 2008), growing on *Parmelia s. str.* agrees in its ascomatal size and asci but the ascospores are slightly smaller ( $6.5\text{--}9.5 \times 3\text{--}3.8 \mu\text{m}$ ). Another related species may be *E. tricolorans* Alstrup (ALSTRUP, 1993), with larger asci ( $45\text{--}50 \times 10\text{--}13 \mu\text{m}$ ) and ascospores ( $11\text{--}13\text{--}(15) \times 4\text{--}5 \mu\text{m}$ ). Very similar is also *Stigmatidium bellemerei*, with bitunicate asci and 1-septate ascospores of similar size growing on *Lecania*, but its wall is composed of polygonal, typical cells; its ascospores are hyaline and larger,  $(13.5\text{--})15\text{--}18\text{--}(19.5) \times (3.5\text{--})4\text{--}5.5 \mu\text{m}$  and it grows on the saxicolous *Lecania nylanderiana* (ROUX *et al.*, 1998). Another *Endococcus* species similar in ascospore size and shape, seems to be *E. apiciicola* (J. Steiner) R. Sant. [*E. alpestris* D. Hawksw.], with ascospores  $9\text{--}10.5\text{--}(11) \times 3.5\text{--}4 \mu\text{m}$ , but this species grows usually in groups on *Usnea*. However, as it is stated in ETAYO & SANCHO (2008) some samples collected on *Usnea* sp. have dispersed perithecia too, so perhaps the species is more variable than thought and maybe it can colonize other lichen hosts.

***Endococcus rugulosus*** Nyl. *s. l.*

Specimen examined – Loc. 11 on S exposed sloping, acidic outcrop, on *Rinodina etayoi*, 55954.

Notes: Our sample has perithecia of  $0.1\text{--}0.15 \text{ mm}$  diam., a brown wall, K+ olive brown and ascospores of  $11\text{--}15 \times 6.5\text{--}7.5 \mu\text{m}$ . It must belong in the *Endococcus rugulosus* complex. *Endococcus buelliae* (Dodge) Matzer (MATZER *et al.*, 1996), known from *Buellia* sp. and *Dimelaena radiata* is similar, but the ascomata are larger, up to  $200 \mu\text{m}$  diam. and the ascospores are wider,  $8\text{--}15 \times 6\text{--}9 \mu\text{m}$ , with more obtuse ends. More collections are needed to decide whether it is an undescribed species. It is mentioned in VAN DEN BOOM & CLERC (2015) from C.

***Endohyalina diderichii*** Giral, van den Boom & Elix

Specimens examined – Loc. 7 on *Ramalina* on outcrop, 55796, 55852, 55858, 55867.

Notes: This species is already known from four Canary Islands, F, H, L and T (H-P 2010) but now we encountered an extensive population in Fuerteventura.

**\**Intralichen lichenum*** (Diederich) Hawksworth & Cole

Specimen examined – Loc. 11 on S sloping outcrop, on *Ramalina* sp., 55950a.

Notes: This species has been collected in the hymenium of several lichen species as shown by HAWKSWORTH & COLE (2002). We found it on the apothecia of *Catillaria mediterranea*, growing on *Ramalina*.

***Lichenopeltella ramalinae*** Etayo & Diederich

Specimen examined – Loc. 7 on *Ramalina* sp. on acidic outcrop, 55844.

***Lichenostigma maureri*** Hafellner

Specimens examined – Loc. 7 on *Usnea* sp. on sheltered acidic outcrop, 55828, 55829.

***Marchandiomyces corallinus*** (Roberge) Diederich & D. Hawksw.

Specimens examined – Loc. 7 on acidic outcrop, on *Ramalina*, 55787, 55830.

***Muellerella lichenicola*** (Sommerf. ex Fr.) D. Hawksw.

Specimen examined – Loc. 9 on terricolous *Lecania*, 55911.

***Polycoccum microstictum*** (Leight.) Arnold s. l.

Specimen examined – Loc. 8 on vertical face of shaded outcrop, on *Buellia* sp., 55870.

Notes: In H-P 2010, this species is only recorded from P.

***Sclerococcum olivaceum*** Etayo & F. Berger

Specimens examined – Loc. 7 on acidic outcrop, 55800, 55802; Loc. 8 on acidic outcrop, 55892 (they all are growing on *Flavoparmelia soredians*).

Notes: This species was known only from the type locality in La Gomera (Canary Islands) on the same host: *Flavoparmelia soredians* (ETAYO & BERGER, 2004). This is the second world record and it is living together with *Sphaerellothecium reticulatum*.

***Scoliciosporum vouauxii*** (B. de Lesd.) Hafellner

Specimen examined – Loc. 7 on acidic outcrop, on *Ramalina* sp., 55796.

Notes: HAFELLNER (2002) studied and combined this species in *Scoliciosporum*. Basically, our description fits very well except that the ascospores in our sample are (0–)1(–)2-septate and strongly curved. As the host is also the same we consider this as a simple variation of the same species. It was growing together with *Endohyalina diderichii*. *Scoliciosporum vouauxii* was not mentioned in the checklist of the Canary Islands (H-P 2010), however, HAFELLNER (2002) mentioned it from H, C, G, H & L.

***Sphaerellothecium reticulatum*** (Zopf) Etayo

Specimens examined – Loc. 8 on boulder on *Flavoparmelia soredians*, 55890, 55888.

Notes: URBANAVICHENE *et al.* (2013) record this species on *Flavoparmelia caperata*. *Sphaerellothecium reticulatum* seems not to be host-specific of *Parmelia* s. l. ZHURBENKO *et al.* (2012) recorded it on *Physcia*.

**\**Stigmatidium epistigmellum*** (Nyl. ex Vouaux) Kocourk. & K. Knudsen

Specimen examined – Loc. 4 on horizontal outcrop, on *Caloplaca* sp., 55770.

Notes: It is known from maritime *Caloplaca* species and is characterized by its relatively long and narrow ascospores of (14.5–) 15.8–17.45–19.1(–21.5) × (3.5–)3.9–4.2–4.7(–5.0) μm and short pseudoparaphyses of type-b. So far, this species was known from USA and Mexico (KOCOURKOVÁ & KNUDSEN, 2009a). We found it on a saxicolous, maritime, undetermined *Caloplaca* (apothecia and thallus). This is a first record from Macaronesia.

***Stigmatidium ramalinae*** (Müll. Arg.) Etayo & Diederich

Specimens examined – Loc. 7 on *Ramalina* sp., 55785, 55854; Loc. 8 on *Ramalina* sp., 55878; Loc. 9 on *Ramalina bourgeana*, 55921, 55927; Loc. 11 on *Ramalina siliquosa*, 55945, 55946. All specimens are from acidic outcrops.

Notes: This taxon is discussed by ETAYO & OSORIO (2004) who considered *S. epiramalina* (Vouaux) Hafellner as a synonym of *S. ramalinae*. According to VOUAUX (*in* PITARD & HARMAND, 1911) *S. ramalinae* and *Pharcidia epiramalina* Vouaux differ in shape of perithecia and asci and size of spores, longer in *S. ramalinae*. *Stigmatidium epiramalina* was recombined by HAFELLNER (1994) but without any data about the Canary Island specimens. No doubt, our taxon is the same as the one described by Vouaux on *Ramalina decipiens* and *R. bourgeana* from Taganana (Tenerife). Fuerteventura material is really common, although it has not always ascospores. These are of an intermediate size, another reason to consider the two names as synonymous. The brown mycelium around the perithecia recorded by VOUAUX (*op. cit.*) in *S. epiramalina* should be another fungus, perhaps a species of *Lichenostigma* or *Lichenothelia*, also very common in our samples. *Stigmatidium ramalinae* was already recorded for Fuerteventura by VAN DEN BOOM & ETAYO (2006).

***Stigmatidium seirophorae*** Etayo & van den Boom, *sp. nov.* – Fig. 4 – MycoBank #820551

**Diagnosis:** Differs from *Stigmatidium microsporum* by its larger ascospores. Ascospores ellipsoid, straight, 1-septate, (10–)10.5–11.5(–12.5) × (3.5–)4–5(–5.5) μm, hyaline, only finally pale brown and with a verruculose surface, not or slightly constricted at the septum.

**Holotype:** Spain, Canary Islands, Fuerteventura, Corralejo, malpais de Corralejo, on *Seirophora scorigena* on volcanic rocks, 10 m, 18 July 2004, *leg.* J. Etayo 21993 & E. Ros (TFC, holotype; hb. Etayo, isotype).

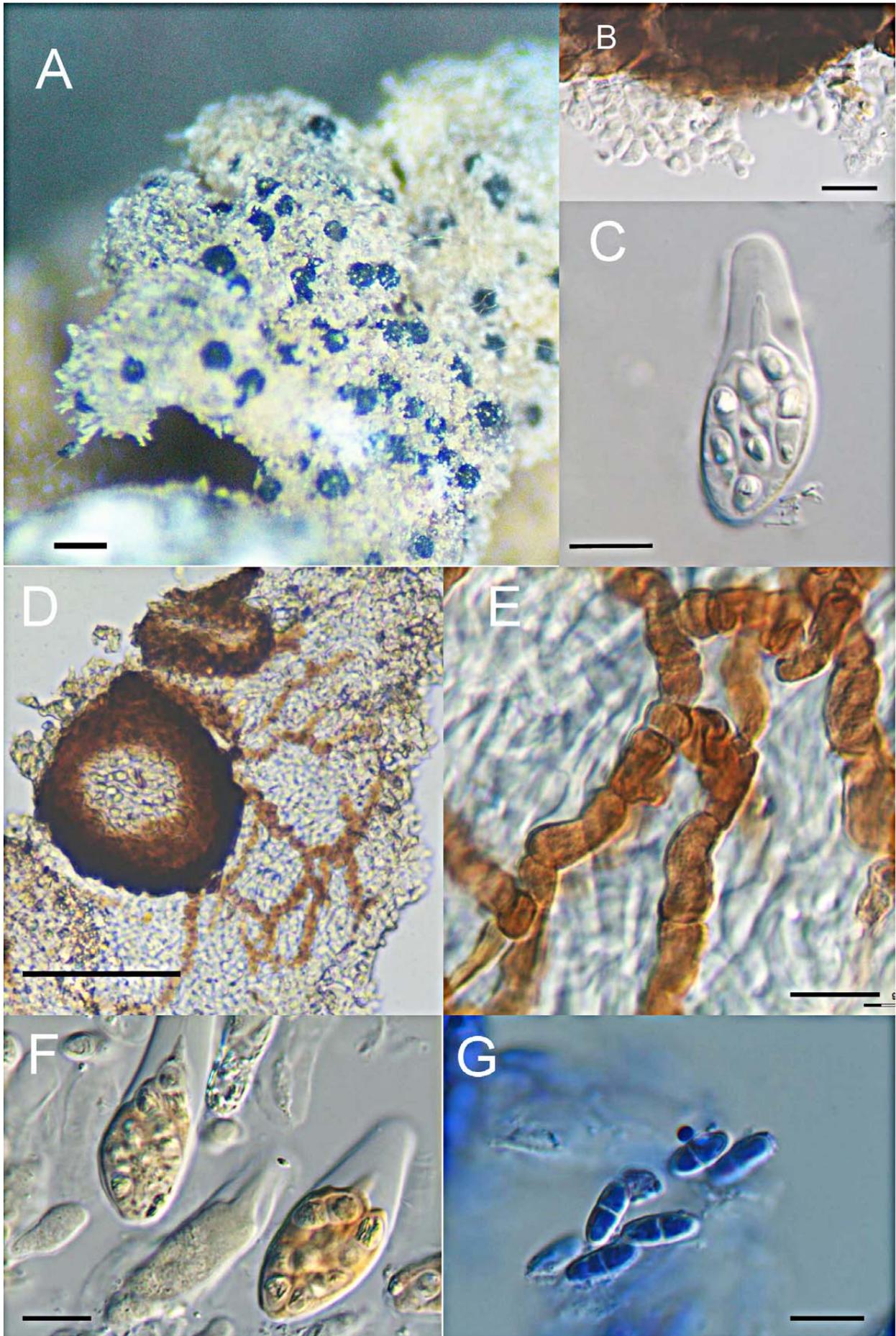
**Etymology:** The epithet refers to the host genus.

**Additional specimens examined:** SPAIN, Canary Islands, Fuerteventura, 7 km NW of Pájara, 1 km W of Ajuy, coastal plane with volcanic boulders and stones, 28° 24.7' N, 14° 9.4' W, 50 m, 2 March 2001, *leg.* P. & B. van den Boom 26084 (hb. v.d. Boom); Parque Natural de Jandía, WNW of Morro del Jable, along unpaved road to Cofete, near mirador Montaña Aguda, W exposed volcanic rocks on slope, 28° 5.60' N, 14° 26.00' W, 230 m, 26 November 2016, on stone, *leg.* P. & B. van den Boom 55738 (hb. v.d. Boom); W of road between La Pared and Costa Calma, Istmo de la Pared (south), near roundabout of Costa Calma, sandy dune area, with scattered stones, 28° 10.56' N, 14° 12.62' W, 45 m, 27 November 2016, *leg.* P. & B. van den Boom 55779 (hb. v.d. Boom); *Ibid.*, Lanzarote, W of Tahiche, road to San Bartolomé, W of volcano Montaña de Maneje, small hill with volcanic outcrops, 29° 0.70' N, 13° 34.20' W, 205 m, 4 March 2003, *leg.* P. & B. van den Boom 30181, 30371 (hb. v.d. Boom). [All specimens on *Seirophora scorigena*]

**Mycelium** of long and branched hyphae below ascospores, hyphae brown, 3–7 μm wide with verruculose ornamentation. **Ascospores** perithecioid, superficial, abundant amongst the hairs of the host, sometimes hidden below the hairs, subglobose, 50–70 μm diam., black, not cupulate, not papillate, surface smooth. Ascospore surface formed by polygonal cells of 5–10 μm diam., but covered by some large, sinuose cells, of brown colour and with granulose pigmentation. Ascospore wall 10–15 μm thick, externally brown, at least formed by three rows of cells, black-brown in K, orange-brown in N. Hamathecium with only short pseudoparaphyses of type-b, best visible in old perithecia, pendent from the upper wall of the ascospore cavity, simple to branched, 3–3.5 μm wide. No external paraphyses around ostiole. Hymenial gel I-, KI-, BCr-. **Asci** fissitunicate, widely clavate, 30–46 × 12–16 μm, widened in subbasal part and with thickened wall up, 8-spored, with spores irregularly arranged, epiplasm KI, I+ orange, exoascus and endoascus BCr-. **Ascospores** ellipsoidal, straight, 1-septate, hyaline, only finally light brown and with a verruculose surface, not or slightly constricted at the septum, (10–)10.5–11.5(–12.5) × (3.5–)4.5(–5.5) μm, without perispore, but with a rather thick wall and lumina with some refractive structures, not really guttules, only with cytoplasm BCr+ blue, and wall BCr-. **Conidiomata** not seen.

**Distribution and ecology:** We found this species in several localities of Fuerteventura and Lanzarote on hard volcanic rocks on *Seirophora scorigena* mixed with species of *Caloplaca* and *Xanthoria*, in open places. It is very easily overlooked because the perithecia are often hidden among the hairs of the host thallus.

Notes: This species has several interesting features. The ascospores are covered, at least in some parts, by large and sinuose cells with an extracellular pigment. External paraphyses are poorly developed and the inner part of the ascospores has refractive structures which



**Figure 4** – *Stigmatidium seirophorae* (typus, J. Etayo 21993). A, habitus of the species with perithecia dispersed on thallus and amongst the hairs of the host. B, pseudoparaphyses of type-b branched and composed by several cells pendant from the upper wall. C, ascus with spores with refractive structures inside easily visible (KOH). D, section of a perithecium where there are several thallic hyphae penetrating into the substrate. E, thallic hyphae. F, asci (IKI). G, ascospores (BCr). Scale bars: A = 100  $\mu$ m, B, C, D, E, F & G = 10  $\mu$ m.

we do not know in any *Stigidium* species and the wall is rather thick, more than usual in the genus. It differs from *Sphaerellothecium subtile* Triebel & Rambold (TRIEBEL *et al.*, 1991), which lives on *Teloschistes chrysophthalmus*, in its larger perithecia surrounded by a net of brown hyphae, in its larger asci, in its finally light brown ascospores and in the presence of short pseudoparaphyses of type-b (in *S. subtile* perithecia 25–40 µm diam., asci 16–20 × 8–9 µm, spores 6.5–8.5 × 3–3.5 µm, and without hamathecium). It differs from *Stigidium microsporium* Etayo & Osorio (ETAYO & OSORIO, 2004) by its larger asci and, especially, ascospores (22–27 × 7–7.5 µm and 5.5–6 × 2–2.5 µm) and by the presence of pseudoparaphyses of type-b and its habitus, darkening the apothecia of the host (*Teloschistes exilis*) by the abundant perithecia. Pseudoparaphyses of type-b occur also in *Stigidium hesperium* Kocourk., K. Knudsen & Diederich (KOCOURKOVÁ & KNUDSEN, 2009a). This species differs in several respects: vegetative hyphae not distinct from hyphae of the host, ascomatal wall not covered by the verruculose pigment typical of *S. seirophorae*, ostiole with external periphyses (*sensu* ROUX & TRIEBEL, 1994), endoascus BCr+ dark blue and ascospores larger, 12.5–15.5 × 4–5.5 µm. This species is growing on saxicolous species of *Caloplaca* and is known from western USA and Mexico (KOCOURKOVÁ & KNUDSEN, 2009a). Another species with pseudoparaphyses type-b, growing on a related genus, is *S. epistigmellum* (Nyl. ex Vouaux) Kocourk. & K. Knudsen (KOCOURKOVÁ & KNUDSEN, 2009b), also recorded in this paper. However this species has much longer ascospores of 14.5–21.5 × 3.5–5 µm among other features. Other species with pseudoparaphyses type-a growing on *Caloplaca* are *S. cerinae* Cl. Roux & Triebel (ROUX & TRIEBEL, 1989) with periphyses, asci smaller, 27–34 × 10–11.5 µm and ascospores more narrowly ellipsoid, and *S. johnii* Halici & D. Hawksw. (HALICI & HAWKSWORTH, 2007) with ascospores measuring 12.5–16.5 × 5–6.5 µm, bigger than those of *S. seirophorae*.

#### *Stigidium triebeliae* Etayo

Specimens examined – Loc. 7 on vertical sheltered outcrop, on *Parmotrema tinctorum* 55835; on outcrop, on *Parmotrema reticulatum*, 55831. Tenerife (NW), N of Santiago del Teide, Bco. de Cuevas Negras o del Agua, path from Erjos to Los Silos, central part, near the houses of Las Cuevas Negras, laurisilva, with *Erica arborea*, *Laurus azorica* and *Apollonias barbujana*, outcrops and walls of stones, on *P. reticulatum* on sloping outcrop, 15 May 2007, leg. P. & B. v.d. Boom 38023 (hb. van den Boom).

Notes: This species was described from La Palma in the Canary Islands on *Parmotrema reticulatum* and is known also from continental Spain, Andalucía (ETAYO, 2000). It seems quite common in Fuerteventura on *P. reticulatum* and *P. tinctorum*. On this latter host it grows together with *Bryostigma muscigenum*.

#### *Tremella parmeliarum* Diederich

Specimen examined – Loc. 7 on acidic outcrop, on *Parmotrema reticulatum*, 55834.

Notes: In H-P 2010, this species is recorded from G and T, and in VAN DEN BOOM & CLERC (2015) from C.

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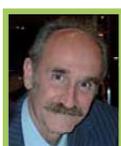
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