Description of *Abrothallus parmotrematis* sp. nov. (lichenicolous Ascomycota)

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Abstract. The new *Abrothallus parmotrematis* is formally described from *Parmotrema* species in Western Europe, Macaronesia and North America (Florida and Louisiana). Morphological study supported by statistical analyses of ascomata suggests that the species is distinguished from *A. parmeliarum* s. str. by more globose ascomata. It is distinguished from *A. microspermus* by larger and slightly darker ascospores. *Abrothallus parmeliarum* is often associated with *Nesolechia*-induced galls on diverse parmelioid genera, including *Parmotrema*, and it is suggested that most populations on these galls belong to *A. parmeliarum*. Three further specimens on *Parmotrema* with unusual hymenial and epihymenial pigmentation possibly represent distinct, yet undescribed species.

1. Introduction

The new name *Abrothallus parmotrematis* Diederich was informally introduced as a *nomen nudum* by Clauzade et al. (1989) for a species growing on *Parmotrema*. At the time, there were doubts about whether the species is really different from *A. parmeliarum* (Sommerf.) Arnold, a species mainly growing on *Parmelia* s. str., so it was never formally described. The name has nevertheless been frequently used in floristic papers and in checklists for *Abrothallus* material growing on *Parmotrema* (e. g., Berger & Aptroot 2002, Berger & Priemetzhofer 2008, Calatayud & Barreno 1995, Kalb & Hafellner 1992). Recent unpublished molecular analyses of *Abrothallus* species, based on ITS sequences, also questioned the strict host-specificity often believed to characterize *Abrothallus* species known from parmelioid lichens (Suija et al. 2008), and doubts of the distinctiveness of these species, including *A. parmotrematis*, persisted. Nonetheless, I am convinced that *A. parmotrematis* is a distinct species, not to be reunited with *A. parmeliarum*, mainly because of the different shape of the ascomata. Galloway (2007) and Hawksworth (1983) included material on *Parmotrema* in the concept of *A. microspermus* Tul., a species possibly confined to *Flavoparmelia caperata*, usually only represented by the anamorph. The aim of this paper is to show by morphological characters, supported by statistical analyses, that *A. parmotrematis* merits recognition as a species, and to formally describe it.

2. Material and Methods

Herbarium specimens are deposited in ANJUC, BR, E, LG, NY and SBBG, and in the private collections of F. Berger, P. Diederich and J. Etayo. Microscopical examination was carried out using thin hand-cut sections mounted in water, 5% KOH (K), Lugol's reagent without (I) or with (KI) pre-treatment with K, and concentrated nitric acid (N). Measurements of ascomata, ascospores and conidia are given as (min.–)$\overline{X}$-σ_x–$\overline{X}$+σ_x (–max.), followed by the number of measurements (N); the length/breadth ratio is indicated as l/b and given in the same way.

The following specimens of *Abrothallus parmeliarum* were used for the study of the ascomatal diameter: AUSTRIA: *Salzburg*: Lungau, Schladminger Tauern, on *Parmelia saxatilis*, 1981, *Hafellner*, Vězda *Lich. Sel. Exs.* 1825 (LG).—BULGARIA: Montes Pirin, distr. Melnik, Sugarevo, on *P. saxatilis*, 1983, *Pišut*, Vězda *Lich. Sel. Exs.* 1950 (LG).—FRANCE: *Pyrénées-Orientales*: Porté-Puymorens, on *P. saxatilis*, 1985, *Diederich* 6589. Unknown locality [France ?], on *P. saxatilis*, 1902, *L. Eneerf* [?] (ANGUC).—UNITED KINGDOM: *Somerset*: SW of Taunton, Mounty Fancy, on *P. saxatilis*, 1985, *Diederich* 6783. *North Ebudes*: Isle

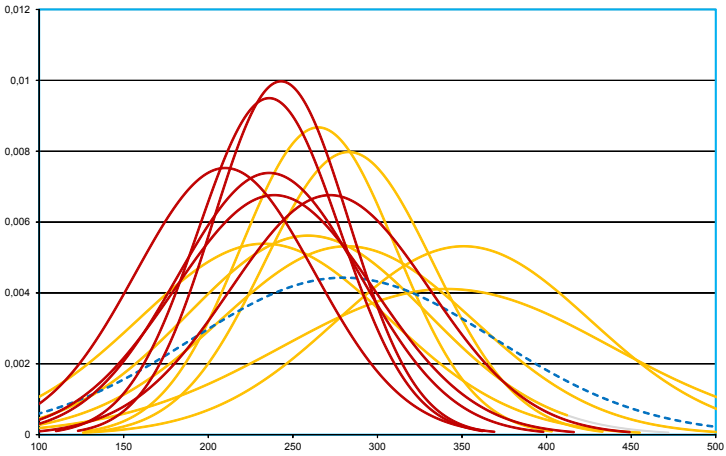

Fig. 1. Ascomatal diameter of selected *Abrothallus* specimens on *Parmotrema* (red lines) and on *Parmelia* s.str. (yellow lines). In addition, average ascomatal diameter of 18 specimens on *Parmelia* s.str., following Suija (2006) (in blue). Each curve corresponds to the normal distribution, based on statistical data from Table 1.

of Skye, S of Carbost, on *P. saxatilis*, 1987, *Diederich* 8734; S of Broadford, Kilmore, on *P. saxatilis*, 1987, *Diederich* 8796; ibid., on *P. omphalodes*, 1987, *Diederich* 8816; Isle of Raasay, on *P. saxatilis*, 1987, *Diederich* 8762. The following specimens of *A. parmeliarum* were used for the study of the ascomatal shape: FRANCE: *Jura*: SE of St Claude, gorges du Flumen, on *P. sulcata*, 2007, *Diederich* 16669.—NORWAY: *Hordaland*: W of Odda, Sundal, on *P. saxatilis*, 2009, *Diederich* 16860.—SPAIN: *Navarra*: W of Pamplona, Sierra de Urbasa, on *P. saxatilis*, 1991, *Diederich* 9649. The following specimens of *A. parmotrematis* were used for the study of the ascomatal shape (detail of specimens below): *Becker* s.n., *Buck* 22364, *Diederich* 8301, *Diederich* 16588, *Etayo* s.n.

3. Results and Discussion

3.1. Morphological study

Ascomatal diameter of *A. parmotrematis* and *A. parmeliarum*

As the examination of many specimens gave me the impression that ascomata of *Abrothallus* on *Parmotrema* (i.e., *A. parmotrematis*) are smaller than those on *Parmelia* s.str. (i.e., *A. parmeliarum*), I measured the diameter of a large number of ascomata in a selection of specimens on both host genera (see Table 1). For each specimen I drew the

Table 1. Ascomatal diameter (in µm) of selected *Abrothallus* specimens on *Parmotrema* and on *Parmelia* s. str. In addition, average ascomatal diameter of 18 specimens on *Parmelia* s.str., following Suija (2006).

Specimen	Host	Average	Stand. dev.	N
Diederich 16588	*Parmotrema crinitum*	272	59	42
Diederich 15643	*Parmotrema perlatum*	243	40	19
Etayo: Guipuzcoa 1991 (hb Diederich)	*Parmotrema perlatum*	239	59	29
Berger 15710	*Parmotrema mellissii*	236	42	28
Becker: Tenerife 1990 (hb Diederich)	*Parmotrema crinitum*	236	54	31
Diederich 8301 (type)	*Parmotrema crinitum*	210	53	51
Eneerf (ANGUC)	*Parmelia saxatilis*	351	75	60
Vězda *Lich. Sel. Exs.* 1950 (LG)	*Parmelia saxatilis*	341	97	37
Diederich 8796	*Parmelia saxatilis*	283	50	17
Diederich 6589	*Parmelia saxatilis*	282	75	38
Vězda *Lich. Sel. Exs.* 1825 (LG)	*Parmelia saxatilis*	265	46	13
Diederich 8816	*Parmelia omphalodes*	259	71	17
Diederich 8734	*Parmelia saxatilis*	244	24	4
Diederich 8762	*Parmelia saxatilis*	233	74	6
Diederich 6783	*Parmelia saxatilis*	217	65	38
Suija (2006)	*Parmelia* s. str.	280	90	(18 spec.)

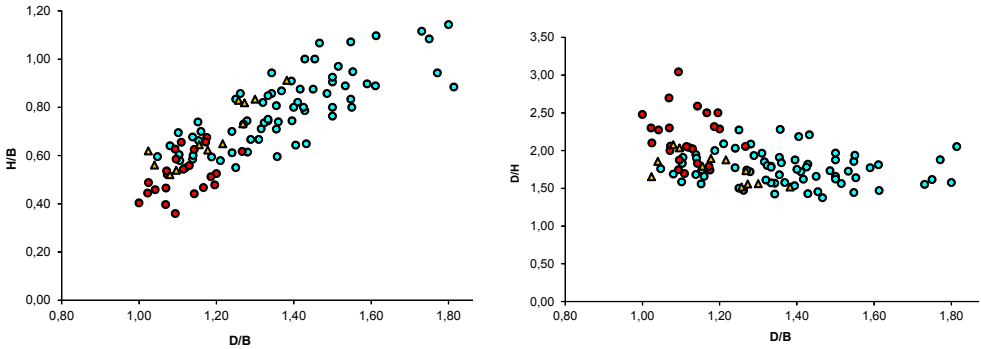

Fig. 2. Diameter of ascomata (D), diameter of the ascomatal base (B) and height of ascomata (H) of a selection of *Abrothallus* specimens growing on *Parmelia* s. str. (red circles), on thalli of European *Parmotrema* (blue circles) and on apothecia of American *Parmotrema* (orange triangles). Each symbol represents one ascoma, ascomata from different specimens being not distinguished. Left: ratio H/B versus D/B; right: ratio D/H versus D/B.

curve corresponding to the normal distribution, based on statistical data (Fig. 1). To this graph, I added the data from material growing on *Parmelia* s.str. obtained by Suija (2006). This graph shows that there is a tendency for the material on *Parmotrema* to have smaller ascomata. However, sufficient overlap exists with material on *Parmelia* s.str., so that ascomatal diameter alone does not allow the distinction of two species.

Ascomatal shape of *A. parmotrematis* and *A. parmeliarum*

The ascomata on *Parmotrema* usually appear to be more globose, i.e., with a larger ratio height/diam. and with a narrower base, whilst those on *Parmelia* s. str. are more applanate. To test this hypothesis, I measured three characters: the ascomatal diameter (D), the diameter of the ascomatal base (B), and the ascomatal height (H). As these characters, and especially the diameter of the ascomatal base, were often difficult to measure, I chose to use a different data set as in the study of the ascomatal diameter, considering only those ascomata that could easily be studied in lateral view without dissecting or removing the ascoma. For each ascoma, the following ratios were calculated: D/B (ascoma diameter/base diameter), H/B (ascoma height/base diameter) and D/H (ascoma diameter/ascoma height). Fig. 2 represents H/B versus D/B, and D/H versus D/B. In these graphs, I have

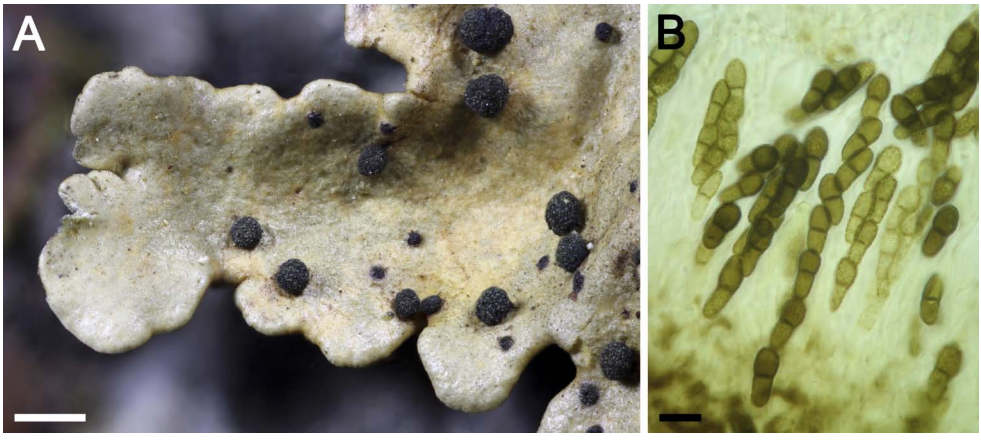

Fig. 3. *Abrothallus microspermus*. A, Ascomata on the thallus of *Flavoparmelia caperata*. B, Ascospores (*Diederich* 15255, Spain). Scale bars: A = 0.5 mm, B = 10 µm.

represented a selection of typical *Abrothallus* specimens on *Parmelia* s. str., typical specimens on European *Parmotrema* thalli, and an American specimen on *Parmotrema* apothecia. The results suggest that, although there is a minor overlap between populations on *Parmotrema* and *Parmelia* s. str., these are well separated using this combination of characters. Furthermore, an American specimen on *Parmotrema* apothecia (European material of *Abrothallus* on *Parmotrema* usually develops on the host thallus, which is not surprising, as these lichens rarely produce ascomata) shows a similar character distribution as the European material on *Parmotrema*, although overlap with material on *Parmelia* s. str. is greater. I conclude that *Abrothallus* material on *Parmotrema* included in this statistical study represents a distinct species, *A. parmotrematis*, distinguished from *Abrothallus parmeliarum* on *Parmelia* s. str. by more globose ascomata. Furthermore, American material on *Parmotrema* apothecia appears to belong to the same species, *A. parmotrematis*.

Differences between *A. parmotrematis* and *A. microspermus*

Abrothallus microspermus is a relatively common species on *Flavoparmelia caperata*, usually occurring as the anamorph, with only rarely one or a few scattered, often immature ascomata present. The anamorph has been carefully studied and described by Hawksworth (1981) under the name *Vouauxiomyces truncatus* (B. de Lesd.) Dyko & D. Hawksw. *Abrothallus parmotrematis*, on the contrary, normally presents numerous ascomata spread over the host thallus, with just a few pycnidia present. Some specimens on *Parmotrema*, however, mainly consist of pycnidia. As the pycnidial diameter and the conidial size on both hosts is comparable, and as the ascomatal shape is also similar, it is easy to understand that such specimens on *Parmotrema* have occasionally been named *A. microspermus* (Galloway 2007, Hawksworth 1983).

In the original description of *Abrothallus microspermus* by Tulasne (1852), ascospores were described as 1-septate, very pale, 9.5–11 × 3.2–4.8 µm. Similar measurements given by Keissler (1930) and Hawksworth (1983) (9.5–11 × 3–5 µm) appear to be rounded values of Tulasne's data, probably not based on new data. Diederich (1989) studied a fertile Luxembourg specimen (with just one apothecium) and gave the ascospore size as 11.5–13.5(–14.3) × 3.8–5.5 µm. Cole & Hawksworth (2001) reported ascospores from an American specimen on *Flavoparmelia caperata* as 12–13.17–14.5 × 4–4.6–5.5 µm. Galloway (2007: 3) reported *A. microspermus* from *Parmotrema perlatum* in New Zealand and characterized it by the occurrence on *P. perlatum* and ascospores measuring 7.5–8.5 × 6–6.5 µm; these data are misleading, as the author inadvertently copied ascospore dimensions of *Abrothallus curreyi* Linds., a synonym of *Phacopsis thallicola* (A. Massal.) Triebel & Rambold; however, in the key to the species of *Abrothallus*, Galloway (2007: 2) gives the right ascospore measurements, 9–14 × 3–5.5 µm, the same measurements as previously published by Clauzade et al. (1989). Suija (2006) did not include *A. microspermus* in her study, possibly as not enough fertile specimens were available for a detailed statistical analysis of morphological characters. I have studied an additional fertile specimen (Spain, Catuluña, prov. Girona, Oïx, Riera d'Oïx, UTM 31 TDG 5880, alt. 500 m, on *Flavoparmelia caperata*, 1991, *Diederich* 15255) with many mature ascomata (Fig. 3A), and obtained ascospore measurements of (11.4–)11.7–13.9(–15.9) × (4.6–)4.8–5.5(–5.8) µm, ratio l/b (2.0–)2.2–2.8(–3.1) (N = 20); these ascospores are pale brown when young and medium brown when mature (Fig. 3B).

Keissler (1930) reported that epihymenium and hypothecium of *Abrothallus microspermus* do not react with K. Diederich (1989) described a K+ green reaction of the epihymenium in a Luxembourg specimen. Cole & Hawksworth (2001) mention a K+ bluish green reaction of the hymenium in an American specimen. The epihymenium in *Diederich* 15255 (see above) clearly reacts K+ green.

From these data, it appears that *Abrothallus microspermus* differs from *A. parmotrematis* by distinctly smaller ascospores (mainly 9.5–14.5 × 3.5–5.5 µm, versus 13.1–16.4 × 5.3–6.1), with a much larger length/breath

ratio (2.2–2.8 in *Diederich* 15255, 2.86 in Cole & Hawksworth 2001, versus 1.4–2.0 in *A. parmotrematis*), epruinose apothecia (apothecia of *A. parmotrematis* are often, but not always pruinose), the abundance of pycnidia and the rarity of ascomata, and the different host-selection. The absence of a positive K-reaction of the epihymenium reported by Keissler (1930) could not be confirmed. The much paler ascospores reported by several authors (e.g., Keissler 1930, Tulasne 1852) might be based on the examination of immature apothecia by earlier authors, mature ones being extremely rare; in *Diederich* 15255, ascospores are pale to medium brown, but distinctly paler than those of *A. parmotrematis* (see Figs 3 & 5).

3.2. Formal description of *Abrothallus parmotrematis*

Abrothallus parmotrematis Diederich sp. nov. Figs 4–5

Abrothallus in thallo *Parmotrematis* vigens, insignis ascomatibus superficialibus, pruinosis, subglobosis, 180–290 µm diam., basim 140–220 µm diam., 110–170 µm altis, hymenio hyalino ad pallide viridibrunneo, K–, N–, 50–85 µm, epihymenio atro-olivaceo, K+ viride, N+ purpureobrunneo, hypothecio atrorufo, K–, N–, ascis clavatis, 8-sporis, 55–65 × 12–15 µm, ascosporis brunneis, verruculosis, 1-septatis, 13.1–16.4 × 5.3–6.1 µm.

Type: United Kingdom, Isle of Skye, SSE of Broadford, Ardnameacan, on *Parmotrema crinitum*, 27 May 1987, *P. Diederich* 8301 (BR–holotype; hb Diederich–isotypes).

MycoBank: MB 563492.

Mycelium immersed, I–. *Ascomata* superficial, blackish, often with a yellowish pruina, UV–, subglobose, with a strongly convex disc and a strongly constricted base, (110–)180–290(–400) µm diam. (N = 200), basally (100–)140–220(–280) µm diam. (N = 69), (80–)110–170(–220) µm tall (N = 69). *Hymenium* hyaline to pale greenish brown, K– (becoming green in upper part from epihymenial pigment), N–, I–, K/I–, 50–85 µm tall (incl. epihymenium); epihymenium dark greenish brown, K+ green and N+ purplish brown, 13–20 µm tall. *Hypothecium* dark brown, K–, N–. *Exciple* absent. *Paraphyses* branched, anastomosed, 2.5–3 µm thick. *Asci* clavate, thick-walled, 55–65 × 12–15 µm, 8-spored, I–, K/I–. *Ascospores* brown, verruculose, 1-septate, (12.0–)13.1–16.4 (–20.0) × (4.8–)5.3–6.1(–6.8) µm, l/b (2.1–) 2.2–3.0(–3.6) (N = 56), upper cell usually slightly shorter and broader than lower cell. *Conidiomata* pycnidial, 150–200 µm diam., wall brown, upper part greenish brown, K– or K+ green. *Conidiogenous cells* 7–14 × 4.5–5 µm. *Conidia* elongate ellipsoid, with a truncate base, hyaline, aseptate, verruculose, (6.0–)6.5–8.5(–10.3) × (3.5–)4.1–4.8(–6.0) µm, l/b (1.4–)1.4–2.0(–2.7) (N = 33).

Distribution and hosts: I have seen material of the new species from Western Europe (Spain, Scotland), Macaronesia (Azores, Canary Islands and Madeira) and North America (Florida and Louisiana). The species has also been reported in the literature from continental Portugal (Algarve) (van den Boom & Giralt 1996). It is known from the thallus of *Parmotrema crinitum*, *P. mellissii*, *P. perlatum* and *P. reticulatum* in Europe and Macaronesia, and from apothecia of *P. michauxianum* and *P. rigidum* in North America. Further literature reports of other *Abrothallus* species on *Parmotrema* might refer to *A. parmotrematis*: *A. microspermus* Tul. on *P. perlatum* in New Zealand (Galloway 2007), *A. microspermus* on *Parmotrema* spp. in the British Isles (Hawksworth 1983), and *A. smithii* Tul. on *P. perlatum* in Tasmania (Babington & Mitten 1860: 354).

Additional specimens examined (unless otherwise stated, all are kept in the private herbarium of the collector): PORTUGAL: *Azores*: Pico: N of Lajes do Pico, near Lagoa do Paúl, 38°25' N, 28°13' W, alt. 790 m, on *Juniperus brevifolia*, on *P. crinitum*, 2010, *Diederich* 17025; between Madalena and Ponta do Pico, along road near Furna de Frei Matias, 38°29'46" N, 28°26'50" W, alt. 660 m, on *P. perlatum*, 2010, *Diederich* 17029. Sao Jorge: 1 km E of Pico de la Esperanza, ericareiches Weidegebiet, 38°39' N, 28°05' W, alt. 650 m, on *P. mellissii*, 2001, *Berger* 15710. *Madeira*: Between Ponta do Sol and Porto Moniz, Rabaçal, alt. 1000 m, on *P. crinitum*, 1992, *Diederich* 4924.—SPAIN: *Navarra*: Guipuzcoa, Fuenterrabaía, Jaizkibel, barranco de Justiz-Ederra, alt. 50 m, on *P. perlatum*, 1991, *Etayo* s.n. (MA-lichen). *Canary Islands*: Tenerife: Monte Aguirre, on *Erica arborea*, on *P. crinitum*, 1990, *Becker* s.n. (hb Paul Diederich); Las Montanas de Anaga, Monte de las Mercedes, laurisilva along road and ridge W of Cruz del

Carmen, 28°32' N, 16°17' W, alt. 910 m, on *P. crinitum*, 2007, *Diederich* 16470 & *Ertz*; S of Los Silos, c. 1 km W of Erjos, Monte del Agua, 28°19' N, 16°48' W, alt. 1140 m, on *P. crinitum*, 2007, *Diederich* 16588 & *Ertz*; ibid., on *P. perlatum*, *Diederich* 16647 & *Ertz*.—UNITED KINGDOM: *Isle of Skye*: Tokavaig wood, on *P. crinitum*, 1987, *Diederich* 8071; ibid., on *P. perlatum*, *Diederich* 8072; SSE of Broadford, wood near the cost N of Isleornsay, on *P. perlatum*, 1987, *Diederich* 8791; 15 km WSW of Broadford, 0.5 km SSE of Kilmarie, graveyard, on *P. perlatum*, 2003, *Diederich* 15639; 2 km NNE of Ardvasar, park around castle, on *P. perlatum*, 2003, *Diederich* 15643; ibid., on *P. crinitum*, *Diederich* 15644.—U.S.A.: *Florida*: Citrus Co., Withlacoochee State Forest, along Florida

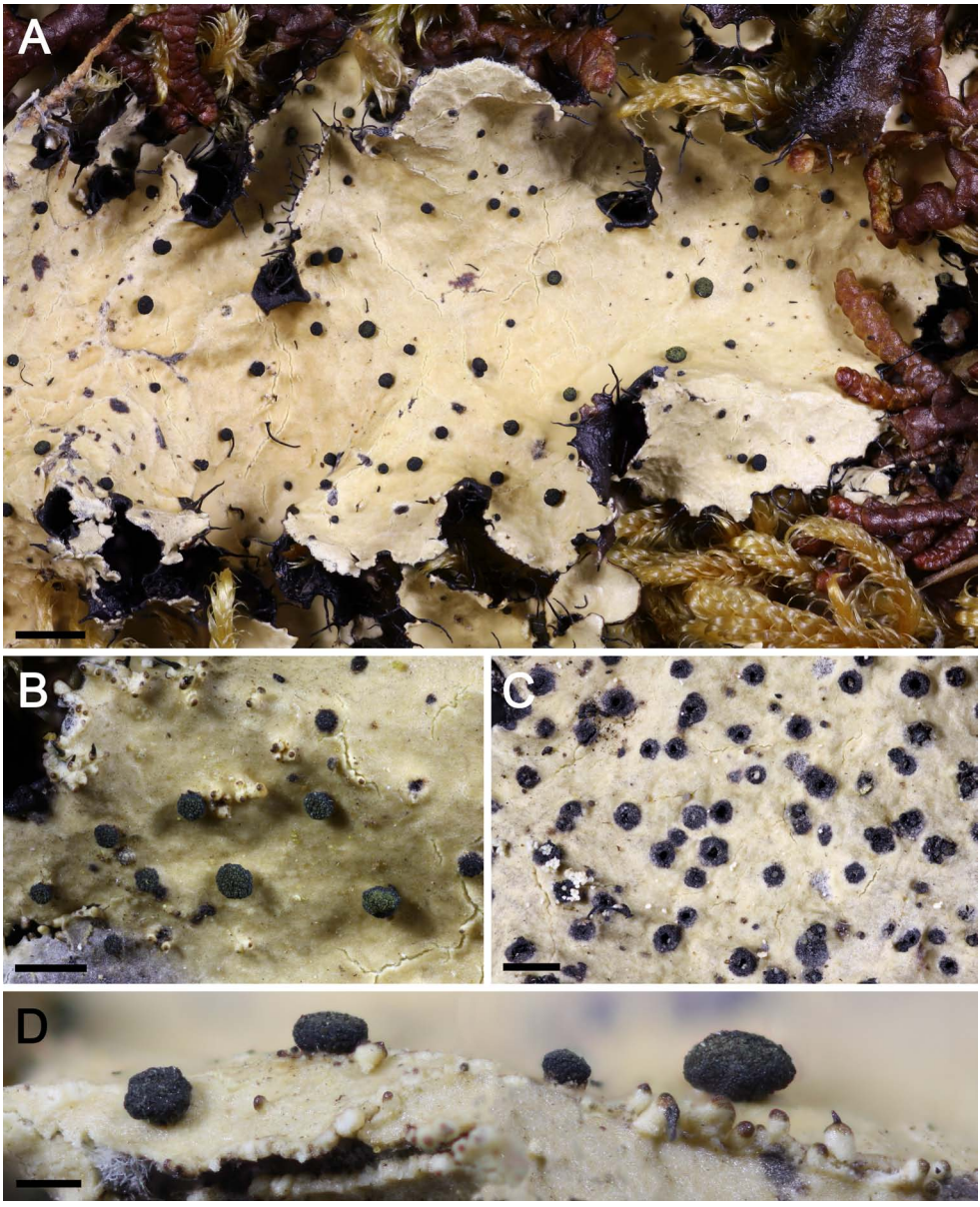

Fig. 4. *Abrothallus parmotrematis*. A–B, Ascomata on the thallus of *Parmotrema crinitum* (holotype). C, Pycnidia on the thallus of *P. perlatum* (*Diederich* 8791). D, Ascomata in lateral view, showing the relatively narrow base (holotype). Scale bars: A = 1 mm, B–C = 0.5 mm, D = 0,2 mm.

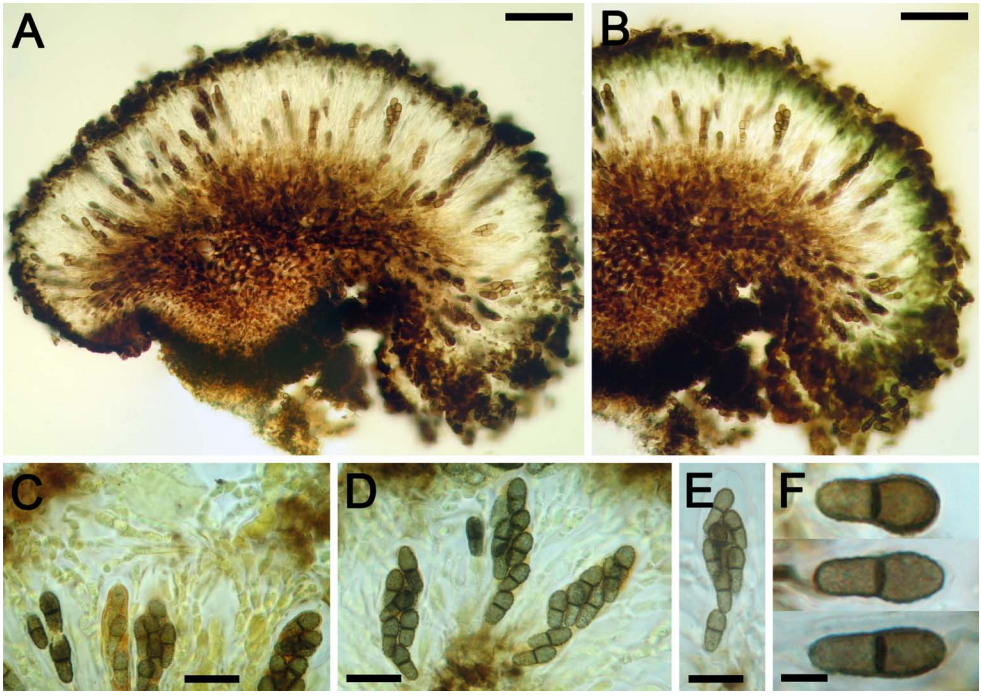

Fig. 5. *Abrothallus parmotrematis* (holotype). A, Section through ascoma, in water. B, Id., showing K+ green reaction of epihymenium. C, Hymenium, showing paraphyses and and asci (in K/I). D–E, Asci and ascospores (in K/I). F, Ascospores (in K). Scale bars: A–B = 50 µm, C–E = 20 µm, F = 5 µm.

trail N to Brush Sink from Co. Rd. 480, 1 mi E of Co. Rd. 491, c. 11 mi SW of Inverness, 28°42' N, 82°26' W, oak-pine woods, on *P. michauxianum* (apothecia), 1993, *Harris* 24487, 31834 p.p. (with *Gyalideopsis floridae*) (NY); Clay Co., Gold Head Branch State Park, along Florida Trail from cabins to clay pit in SW corner of park, 29°49' N, 81°58' W, pine-oak scrub, on *P. rigidum* (ap.), *Buck* 22364 (NY); Nassau Co., Fort Clinch State Park, coastal hammock along entrance road, on *P. rigidum* (ap.), 1987, *Harris* 21150 (NY). *Louisiana*: West Feliciana Parish, Standifer property, along La. Hwy 966, Sects. 71-72, pine-hardwood forest on bluffs and bottomlands between Thomson Creek and Hanmer Creek, 30°47'30" N, 91°15'30" W, on *Parmotrema* (ap.), 2004, *Tucker* 38215 (SBBG).

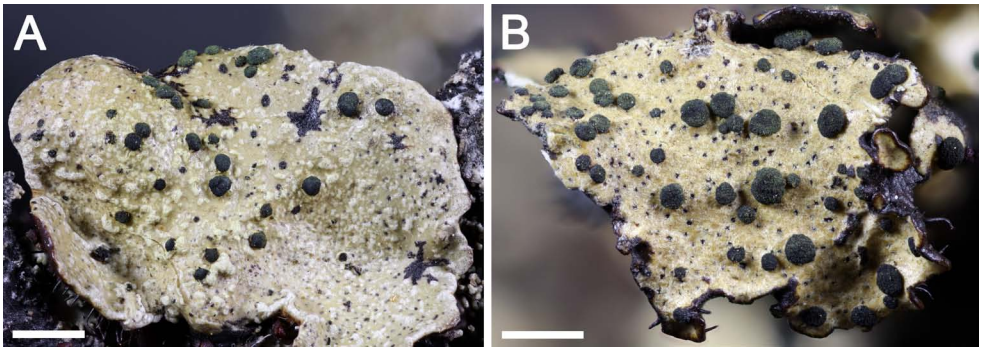

Fig. 6. *Abrothallus parmeliarum* on *Nesolechia*-induced galls. A, Over *Parmelia sulcata* (*Diederich* 9649, Spain). B, Over *Parmotrema reticulatum* (*Sérusiaux* s.n., Spain, Galicia). Scale bars: A–B = 1 mm.

3.3. Other species of *Abrothallus* occurring on *Parmotrema*

Abrothallus parmeliarum (Sommerf.) Arnold

(Fig. 6)

A Spanish and a Brazilian specimen of *Abrothallus* on *Parmotrema* typically represent *A. parmeliarum*, with broad, applanate ascomata and a broad ascomatal base. Interestingly, in these specimens the *Abrothallus* ascomata are all confined to galls induced by the lichenicolous fungus *Nesolechia oxyspora* (Tul.) A. Massal., and do not grow on the healthy thallus of *Parmotrema*. In such situations, it has often been speculated that lichenicolous fungi prefer to establish on weakened portions of the host thallus, especially those already attacked by another lichenicolous fungus. However, in this case, the situation appears to be very different. *Nesolechia oxyspora* has recently been shown to be phylogenetically related to parmelioid lichens, being a member of the *Parmotrema* clade, the closest relatives being the genera *Punctelia* and *Flavopunctelia* (Crespo et al. 2010). As many parmelioid genera host *Abrothallus* species, I advance the hypothesis that species of *Nesolechia* can also act as a host of *Abrothallus*, the ascomata of which develop over galls induced by *Nesolechia*. Although more studies are required to support such a hypothesis, it is possible that most *Abrothallus* populations growing on *Nesolechia*-induced galls on any host genus belong to *A. parmeliarum* s.str., and that these are not necessarily conspecific with *Abrothallus* populations on the same host genera, but not associated with *Nesolechia*. The report by Suija (2006) of *Abrothallus* specimens on *Parmelia* s. str. with a mycelium reacting I+ blue might therefore at least partially be due to the presence of an I+ blue mycelium of *Nesolechia oxyspora* present in the same host thallus.

Sommerfelt (1826) interestingly stated that the host of the type specimen of *A. parmeliarum* is deformed by the parasite, and Hertel (1971) confirmed that a probable syntype in UPS on *Parmelia saxatilis* presents deformations on the host thallus, which suggests that the species is confined to *Nesolechia*-induced galls in the type collection.

The report by Kalb (1988) of *Abrothallus parmeliarum* and *Nesolechia oxyspora* on *Parmotrema* sp. in Kenya possibly also refers to *A. parmeliarum* s.str.

Specimens examined on Nesolechia-induced galls over Parmotrema: BRAZIL: *Bahia*: Municipality of Morro do Chapeu, BR 052, 4–6 km E of Morro do Chapeu, Campo Rupestre, alt. 1000 m, on corticolous *P. tinctorum*, 1981, *Boom* & *Mori* 1273 (NY).—SPAIN: *Galicia*: Côte W, au NW du Muros, entre Quilnas et Caldebarcos, Punta de Caldebarcos, rochers granitiques en bord de mer, on *P. reticulatum*, 1987, *Sérusiaux* s.n. (LG).

Abrothallus sp.1

A specimen on the thallus of *Parmotrema subtinctorum* from Haiti represents a new species, characterized by a brown epihymenium not reacting with K, and by relatively small ascospores, (10.0–)10.6–11.9 (–12.3) × (4.9–)5.0–5.6(–5.9) µm, l/b (1.9–) 2.0–2.3(–2.4) (N = 20). This species should be formally described during a revision of the *Abrothallus* species with ascomata not reacting with K.

Specimen examined: HAITI: Kenscoff, headquarters at M. Dereix, wooded ravine and open fields by side of paths, alt. 4600 and 4800 ft, on *Parmotrema subtinctorum*, 1935, *Thomas* 57 (NY).

Abrothallus sp. 2

A specimen on *Parmotrema reticulatum* thalli from the U.S.A. (North Carolina) might represent a distinct species, as the brown epihymenium does not react with K. The ascospores are c. 13–17 × 5–7 µm, much bigger than in *Abrothallus* sp. 1. The specimen mostly consists of pycnidia. The apothecia are relatively tall with a narrower base, but are rare and not well-developed. More similar specimens should be awaited for until the status of this material can be settled.

Specimen examined: U.S.A.: *North Carolina*: Jackson Co., Cedar Cliff Mountain, 3.5 mi E of Tuckasegee (NC 107) on NC 281, 35°15' N, 83°04' W, on *Parmotrema reticulatum*, 1994, *Buck* 25213 (NY).

Abrothallus sp. 3

A specimen on *Parmotrema* thalli from New Guinea might represent a distinct species, as ascomata possess a violet hymenium. Unfortunately, the specimen consists almost exclusively of pycnidia, and the rare apothecia are

not well-developed and therefore do not allow a more critical study. More similar specimens should be awaited for until the status of this material can be settled.

Specimen examined: PAPUA NEW GUINEA: *Eastern Highlands Province*: Mount Gahavisuka Provincial Park, 11 km N of Goroka, along trail to lookout, little disturbed mossy mountain forest, 6°01' S, 145°25' E, alt. 2400 m, on *Parmotrema*, 1992, *Diederich* 10511.

Excluded species

Abrothallus curreyi, described from New Zealand on *Parmotrema cetratum* (Lindsay 1867), is a synonym of *Phacopsis thallicola* (Triebel et al. 1995). I have examined the type specimen kept in E and confirm that no *Abrothallus* ascomata are present.

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