

Arthonia protoparmeliopseos, a new lichenicolous fungus on *Protoparmeliopsis muralis* from Spain and Luxembourg

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Abstract. The new *Arthonia protoparmeliopseos* is described from the apothecia and thallus of *Protoparmeliopsis muralis* in Spain and Luxembourg. It has relatively large, blackish ascomata, and 2- or 3-septate ascospores, and is compared with the other known lichenicolous *Arthonia* species with pluriseptate ascospores.

1. Introduction

Species of the large genus *Lecanora* s.l. host several lichenicolous species of *Arthonia*, frequently developing in the apothecia of the host. E.g., Santesson et al. (2004) reported six species in Fennoscandia. The segregation of the *Lecanora muralis* group as the genus *Protoparmeliopsis* Choisy has recently been reinstated by Hafellner & Türk (2001). We report here the discovery of a first *Arthonia* species confined to *Protoparmeliopsis muralis*, and we compare it with the known *Arthonia* species developing over *Lecanora* and with similar taxa on other hosts.

2. Material and Methods

Specimens of the new species are kept in the private herbaria of the authors and in JACA. Ascomata have been studied using standard microscopical techniques and have been examined in water, 5% KOH (K) and Lugol's reagent, without (I) or with (K/I) pre-treatment with KOH. Microscopical measurements were done with hand-made sections examined in water.

3. Results and Discussion

Arthonia protoparmeliopseos Etayo & Diederich sp. nov.

Fungus lichenicola in apotheciis et thallo *Protoparmeliopsis muralis* vigens, insignis ascomatibus atris 0.1-1 mm diam., hymenio hyalino ad pallide brunneo, epihymenio brunneo ad

olivaceo-brunneo, in KOH olivaceo, hypothecio hyalino, paraphysibus apicaliter incrassatis, brunneis ad olivaceis, ascis clavatis ad elongate ellipsoideis, (5-)8-sporis, 22-42 × 10-15 µm, ascosporis ellipsoideis, hyalinis, (1-)2-3-septatis, 10-14.5(-15) × (3.5-)4-5.5(-6.5) µm.

Typus: Spain, Teruel, Rillo, c. 1 km to Pancrudo, on *Protoparmeliopsis muralis* on hard calcareous rocks, 4 April 2002, J. Etayo 19228 (JACA-holotypus, hb. Etayo-isotypus).

Ascomata grouped or more rarely single, blackish, applanate or slightly convex, roundish or rarely irregular in shape, immersed in the apothecial disc or sometimes the thallus of *Protoparmeliopsis muralis*, 0.1-1 mm diam., often filling the entire host apothecium. Exciple reduced. Hymenium colourless or pale brown, I+ red, K/I+ blue, 40-50 µm tall. Epihymenium brownish to olivaceous brown, intracellular pigment not granulose, K- or K+ more intense olivaceous green, N-, covered by a colourless gelatinous sheet 2-8 µm thick. Subhymenium and hypothecium well developed, sometimes appearing as up to more than 100 µm tall, although not easily separated from the hymenium of the host, colourless, I+ blue, K/I+ blue (reaction might be influenced by that of the hymenium of the host), composed of short, anastomosed hyphae abundantly filled with guttules, sometimes forming a subcartilaginous textura. Paraphyses branched-anastomosed, of short and wide cells, erect, septate, apically capitate (to 3-5 µm thick), brownish to olivaceous green in the upper 3-9(-15) µm. Asci broadly

claviform to elongate ellipsoid, (5–)8 spored, wall strongly thickened in the upper part, with a long ocular chamber, hemiamyloid ring present, but often poorly visible, $22\text{--}42 \times 10\text{--}15 \mu\text{m}$. Ascospores ellipsoid, colourless, thin-walled, (1–)2 or (1–)3-septate, not or slightly constricted at the septa, I–, KI–, uniseptate ascospores with central to excentric septum, perispore absent or very thin, $10\text{--}14.5\text{--}(15) \times (3.5\text{--})4\text{--}5.5\text{--}(6.5) \mu\text{m}$.

No lichenicolous *Arthonia* has ever been described from *Protoparmeliopsis muralis* (= *Lecanora muralis*). However, according to Grube & Matzer (1997), several *Arthonia* species are known to grow on other *Lecanora* species, including some with 1–3-septate ascospores. *Arthonia lecanoricola* Alstrup & Olech (as '*lecanoriicola*'), known only from the type collection in the hymenium of the corticolous *Lecanora populiicola* in Poland (Alstrup & Olech 1996),

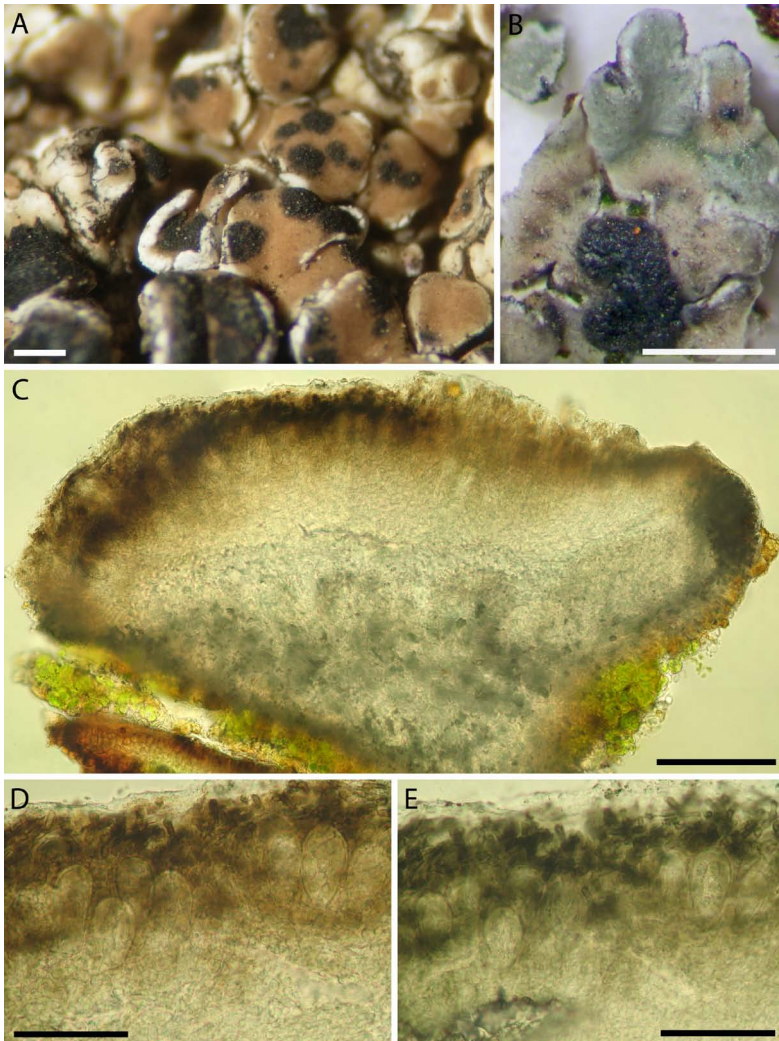


Fig. 1. *Arthonia protoparmeliopsis*. A, Ascumata growing in the apothecia of *Protoparmeliopsis muralis*. B, Ascumata growing on the thallus of *P. muralis*; note the brownish necrotic area surrounded by a darker line. C, Section through an apothecium of *P. muralis*, in which the hymenium in the left and middle is replaced by the hymenium of *A. protoparmeliopsis* (hymenium darker than that of the host), observed in water. D, Hymenium of *A. protoparmeliopsis*, observed in water. E, Idem, in 5% KOH. (A, J. Etayo 19224; B–E, P. Diederich 16852). Scale bars: A–B = 0.5 μm , C = 100 μm , D–E = 20 μm .

has broader 2(-3)-septate ascospores, 11–12.5 × 6–6.5 μm, and the apical paraphyses cell has a brown cap (in *A. protoparmeliopseos*, paraphyses apices are entirely dark, see Fig. 2); asci are said to be I and K/I+ wine red, which certainly refers to the hymenium (asci do not react with Lugol's reagent, except an indistinct apical ring); this contrasts with *A. protoparmeliopseos*, which has a K/I+ blue hymenium; as all *Arthonia* species growing on *Lecanora* s. lat. seem to be confined to one or few phylogenetically related hosts, it is unlikely that the material on *Protoparmeliopsis muralis* represents the same species as that on *L. populicola*; the corticolous

L. populicola belongs to the *Lecanora dispersa* group, which was phylogenetically distinct from the saxicolous *L. muralis* group in the analyses by Arup & Grube (1998). *Arthonia subfuscicola* (Linds.) Triebel, growing on the thallus and the apothecia of the corticolous *L. albella*, *L. carpinea* and *L. chlarotera* (Grube 2007) has smaller ascomata, up to 0.25 mm diam., longer and broader ascospores, 15–17.5 × 5.5–7 μm, and also larger asci, 40–45 × 15–20 μm. *Arthonia varians* (Ach.) Nyl. [= *A. glaucomaria* (Nyl.) Nyl.], a species confined to the saxicolous *L. rupicola* and *L. bicincta* (Grube 2007), has larger ascospores, 13–18 × 4–7 μm.

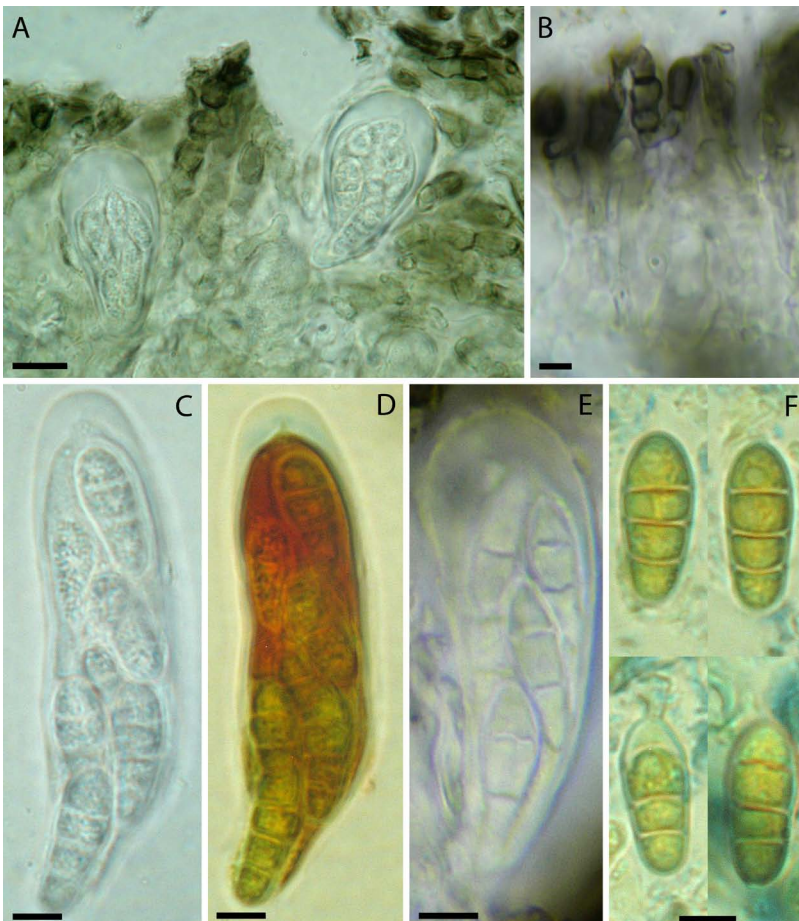


Fig. 2. *Arthonia protoparmeliopseos*. A, Asci and paraphyses, observed in 5% KOH. B, Paraphyses apices, in KOH. C, Ascus with mainly 2–3-septate ascospores, in KOH (ascus basally slightly damaged and therefore longer than healthy asci). D, Same ascus observed in Lugol's solution, after pre-treatment with KOH, showing a pale blue apical ring structure. E, Ascus with mainly (1)–2-septate ascospores, in KOH. F, Relatively broad, 3-septate ascospores from a 5-spored ascus, in Lugol's solution, after pre-treatment with KOH. (A, C–D, F, *P. Diederich* 16852; B, E, *J. Etayo* 19224). Scale bars: A = 10 μm, B–F = 5 μm.

We need to compare the new taxon also with *Arthonia* species from other hosts, presenting 2–3-septate ascospores, roundish, epruinose ascomata >200 µm diam., without K+ reddish pigments, with a pale or indistinct hypothecium, and with isolocular, hyaline ascospores. *Arthonia intexta* Almq. has 2-septate, more fusiform ascospores, (11–)12.5–17(–20) × (3–)3.5–5(–6) µm, and grows intrahymenially on saxicolous *Lecidella* species (Triebel 1989); it is only weakly parasitic and does not cause any visible symptoms on the host, healthy asci of which are present intermixed with those of the *Arthonia*. *Arthonia santessonii* Matzer (on foliicolous *Porina* species) is distinguished by slightly narrower ascospores presenting an I+ blue gelatinous sheath, 9–13(–14) × 3–4(–5) µm (Matzer 1996).

The Luxembourg specimen slightly differs from the Spanish material: ascomata grow on the host apothecia and thallus, a majority of ascospores are 3-septate, intermixed with 1–2-septate ones, asci show an indistinct K/I+ blue apical ring, and the brownish epihymenium turns olivaceous in KOH. In the Spanish specimens, ascomata only grow in the host apothecia, c. 90% of the ascospores are 2-septate and 10% are 1-septate, no K/I+ blue apical ring has been observed in the asci, and the epihymenium is brownish olivaceous, not distinctly reacting with K. As it is not possible at this moment to decide if this represents infraspecific variability, or if two distinct species are involved, we provisionally consider the entire material as conspecific.

Distribution and host: The new species is known from Luxembourg and Spain, where it grows on apothecia and more rarely the thallus of *Protoparmeliopsis muralis*. Host apothecia completely occupied by the lichenicolous fungus do not produce any ascospores, asci or paraphyses, suggesting that the species is parasitic. Infected specimens mainly grow in mountain, non-polluted areas on calcareous to decalcified sandstone rocks.

Additional specimens examined (all on *P. muralis*): **Spain:** Burgos condado de Treviño, Dordóniz, subida al cerro del repetidor, 42°42'53" N, 2°41'34" W, 650 m, bloque calcáreo, 2009, *J. Etayo* 25081 (hb. Etayo). Huesca: Piedrafitas, Ibón de Piedrafitas, 30T 0716653, 4730720, 1625 m, en areniscas, 2004, *J. Etayo* 21650 (hb. Etayo); Candanchú, Tuca Blanca, 30T 0700304, 4738582, 2000–2080 m, en calizas decalcificadas, 2004, *J. & M. Etayo* 21773 (hb. Etayo); Astún, lago de

las Truchas, sobre esquistos venteados, 1986, *J. Etayo* 10981 (hb. Etayo); La Rioja, S^a de las Hormazas, cerca de Viniegras de Arriba, 1520 m, en afloramientos calcáreos, 1993, *O. Breuss & J. Etayo* 13906 (hb. Etayo). Soria: S^a de San Marcos, entre Carbonera de Frentes y Villabuena, páramo, 1200 m, en calizas decalcificadas, 1999, *J. Etayo* 17013 (hb. Etayo, MA). Teruel: Rillo, dirección a Pancrudo, en el cartel Son del Puerto, 1185 m, en calizas, 2002, *J. Etayo* 19224, 19225, 19227 (hb. Etayo); S^a Javalambre, Camarena de la Sierra, 1695 m, 2002, *J. Etayo* 19079 (hb. Etayo). – **Luxembourg:** N of Reckange (Mersch), W of Eenelter Kapelle, menhir (IFBL: L8.24.44), on vertical face of sandstone, 2009, *P. Diederich* 16852 (hb. Diederich).

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