

Notes on lichenicolous *Micarea* species in Spain and Macaronesia, with the descriptions of two new species

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Abstract

Six species of *Micarea*, growing lichenicolous are treated. They are mainly collected in Macaronesia or Spain. Two species, *Micarea amplissima* and *M. parasitica* are described as new to science. Notes on the occurring of lichenicolous *Micarea*: *M. kemmleri*, *M. peliocarpa*, *M. synotheoides* and *M. usneae* are provided.

Keywords: new species; *Micarea amplissima*; *M. parasitica*; southern Europe; taxonomy.

Resumen

Se señalan seis especies de *Micarea* que encontramos sobre líquenes. Se localizan principalmente en Macaronesia o en España. Dos de ellas se describen como especies nuevas para la ciencia: *Micarea amplissima* y *M. parasitica*. De los otros cuatro taxones *Micarea kemmleri*, *M. peliocarpa*, *M. synotheoides* y *M. usneae* se indican nuevas citas y/o datos sobre su ecología.

Palabras clave: especies nuevas; *Micarea amplissima*; *M. parasitica*; sur de Europa; taxonomía.



INTRODUCTION

Recently, two lichenicolous species of *Micarea* have been collected in Galicia (Spain) by one of the authors (JE) of this paper: *Micarea usneae* van den Boom & Ertz and one unknown species growing on *Ricasolia amplissima*. A third species, *Micarea kemmleri* Brackel was collected in Extremadura (Spain), in the year 2001, growing on *Cladonia*, by the first author, but not yet published. *Micarea parasitica* is described from the Azores, growing on *Hypotrachyna*. During this study, some further *Micarea* species have been found growing facultatively as lichenicolous.

There are only a very few obligate lichenicolous *Micarea* species known (BRACKEL, 2016; COPPINS, 2009; VAN DEN BOOM & ERTZ, 2014 or ETAYO, 2017), but in further recent studies about *Micarea*, not any further lichenicolous species has been treated (BRAND *et al.* 2014; COPPINS, 1983; COPPINS *et al.* 2021; CZARNOŃA, 2007; GUZOW-KRZEMIŃSKA *et al.* 2019; KANTVILAS & COPPINS, 2019; KONOREVA *et al.* 2019; LAUNIS *et al.* 2019a; LAUNIS *et al.* 2019b; VAN DEN BOOM *et al.* 2017, 2018, 2020). In this paper we give references of six *Micarea* species, which are obligated or facultatively lichenicolous on lichens, collected in southern Europe, especially Spain and Azores.

MATERIALS AND METHODS

The morphology and anatomy of the studied species has been examined with a Nikon Eclipse 80i microscope (with DIC or Nomarski optics), Olympus BX2 as well as a MEIJI triocular and Optika zoom stereo microscope. The measurements of structures, visible to the magnifying glass, such as apothecia, have been carried out dry, the microscopic ones in distilled water with the 100X objective. Sections of the ascoma's have been made with a freehand razor blade and, in some, squash has also been used. We have used conventional reagents in lichenology: KOH, 10% (K), Lugol's iodine-iodide solution (I), isolated or after pretreatment with potassium hydroxide (KI), nitric acid (N) and dyes such as cresyl blue (BCr) or Congo red (CR). The photographs under the binocular stereo microscope have been taken with a Ricoh camera. For the nomenclature of fungi, we have generally followed DIEDERICH *et al.* (2018).

The specimens will remain in the authors' private herbarium (hb. v.d. Boom and hb. Etayo) and in MAF (University Complutense, Madrid), E (Royal Botanic Garden Edinburgh) and SANT (University of Santiago de Compostela).

RESULTS

The new species

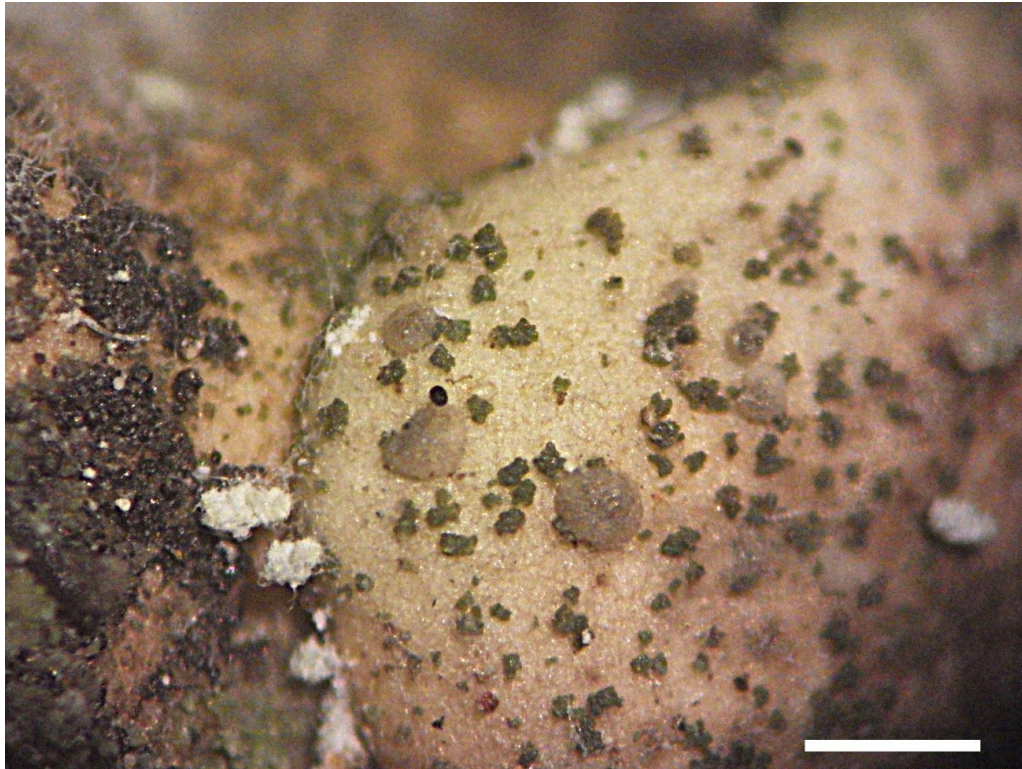
***Micarea amplissima* van den Boom & Etayo, sp. nov.**

MycoBank No.: MB846212

A *Micarea* species inconspicuous, with a very thin thallus made of small greenish to blackish, often scattered areoles, consisting of goniocysts. Apothecia abundant, medium to dark grey, grey to anthracite, 0.10–0.25(–0.3) mm in diam. Ascospores ellipsoid, 8–12 × 2.5–3 µm, (0–)1-septate. Micropycnidia not rare; microconidia bacillar, 5.5–6.5 × 0.7–0.9 µm. No chemical compound detected. Lichenicolous on *Ricasolia amplissima* (Scop.) De Not.

Typus: Spain, Galicia, Lugo, Courel, Devesa da Rogueira, abedular, hayedo, robledal, on *Quercus robur*, 42° 36'29.6"N, 7° 06'21.4"W, 1200 m, 5 July 2021, J. Etayo 33623 (SANT—holotypus, hb. Etayo—isotype).

Figure 1. *Micarea amplissima*, holotypus, habitus. Scale = 0.5 mm



Thallus very thin, of small scattered areoles, consisting of goniocysts of c. 25–30 μm wide, greenish, often darkened to black, without crystals, pigment lacking; cortex lacking. Photobiont micareoid, cells 3–6.5 μm diam., thin walled. Prothallus not present. Apothecia abundant, subglobose, without margin, 0.10 to 0.25(–0.30) mm in diam, whitish, medium to dark grey, brownish grey to violet grey to anthracite black, without crystals (C–); hymenium c. 30–40 μm high; epihymenium with pale olive brownish spots, K+violet when dark colored; paraphyses abundantly branched, c. 1.2–1.4 μm wide, tips widened, up to 3 μm , sometimes brownish pigmented. Asci *Micarea*-type, 25–30 \times 10–12 μm . Ascospores ellipsoid, (0–)1-septate, 8–12 \times 2.5–3(–4) μm .

Micropycnidia not rare, c. 50 μm diam., top dark brownish grey, K+violet, with microconidia 5.5–6.5 \times 0.7–0.9 μm . Mesoconidia or macroconidia not detected.

Chemistry: No chemical compounds found; pigment *Sedifolia*-grey, K+violet.

Etymology: The epithet chosen for this lichenicolous species refers to a quite unusual habitat, the rough cortex, especially on decaying parts of *Ricasolia amplissima* on which it has been found abundantly.

Habitat and distribution: On bark of *Quercus robur*, on standing trunks. Accompanying lichenicolous species on this *Ricasolia* are small thalli of *Micarea peliocarpa*. Thalli sometimes are also partly slightly coated by a thin gelatinous film of green algae. The new species is only known from North-Western Spain and South-Western France. The species is very inconspicuous, and it can be easily overlooked because of the rather dark habitus, including the small greyish to blackened apothecia. No doubt it will be detected more often if checking carefully populations of *Ricasolia amplissima*, especially thalli also infected by other fungi.

Notes: This new species has similarities with the recently described *Micarea fallax* Launis & Myllys, but that species has crystals in apothecia, in general their apothecia are brownish instead of greyish as in the new species, and bigger, up to 0.5 mm diam. (LAUNIS *et al.* 2019b). We have not seen *M. amplissima* on other substrata as the commented host, so we regard it as obligated lichenicolous.

Additional specimens examined all on *Ricasolia amplissima*:

France: Pyrénées-Atlantiques, Arette, La Pierre St. Martin le Braca, *Abies-Fagus*-wood along the way D-132, on *Fagus*, 42° 59'06"N, 0° 44'38"W, 1480 m, 1-VIII-2018, *J. Etayo* 31222 (hb. Etayo). **Spain:** Asturias, SW of Oviedo, Parque Natural de Somiedo (NW), 0.5 km S of Aguasmestas, mature *Castanea* trees and rotting trunks and stumps in forest, 43° 09.50' N, 6° 17.30' W, 500 m, 6-VII-2001, *P. & B. van den Boom* 26308 (hb. v.d. Boom). Galicia, Lugo, same locality as the type, *J. Etayo* 33626 (hb. Etayo-topotype, SANT 12459-A). Lugo, Courel, Devesa da Rogueira, lower zone after the stream, *Quercus* forest and limestone and siliceous slopes, 42° 37'23.6"N, 7° 06'52.5"W, 750-900 m, 5-VII-2021, *J. Etayo* 33668 (SANT 12457-A). Lugo, Ancares, Cabaniños, between Piornedo and Campa da Braña, old *Castanea sativa*, 42° 50'10.9"N, 6° 54'06.2"W, 960-970 m, 2-VII-2021, *J. Etayo* 33375 (hb. Etayo). Basque Country, Álava, Múrua, zona de los embalses subiendo a Gorbea, senda de Egillolarra, hayedo y *Quercus pyrenaica*, 1100 m, on *Fagus*, 23-VII-1996. *J. Etayo* 14448 (MAF-Lich.). Castilla y León, León, Ancares, Teso de Valiñas, *Quercus petraea* forest with granitic outcrops on the way LE-3203, on *Quercus petraea*, 3-VII-2021, *M.E. López de Silanes* (SANT 12458-A). Navarra, Ulzama valley, Lanz, mossy calcareous walls along the stream below *Fagus* forest, 14-X-1997, *J. Etayo* 17233 (MAF-Lich.).

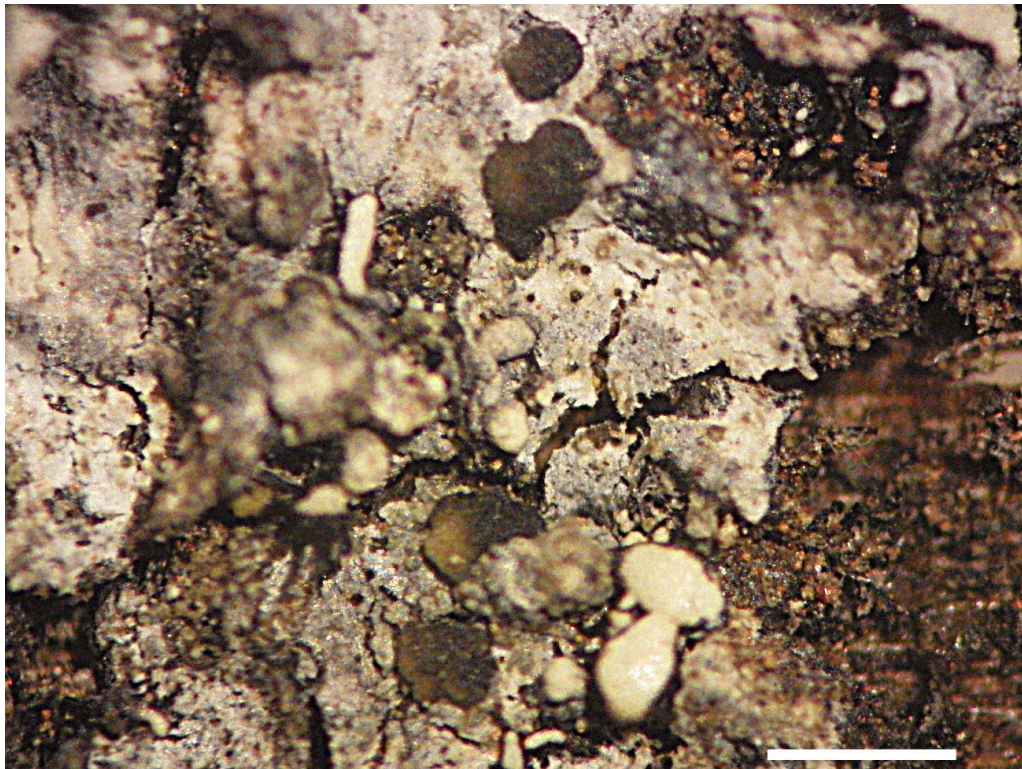
Micarea parasitica van den Boom & Etayo, **sp. nov.**

Mycobank No.: MB846213

A lichenicolous *Micarea* species very inconspicuous, thallus very thin, smooth, pale brownish, apothecia scattered to crowded, pale to medium cream orange, brownish to blackish, 0.15–0.35(–0.4) mm in diam., without margin, hymenium pigment lacking, K-, C+ reddish. Ascospores clavate, 10–18 × (2–)2.5–3.5(–4) μm, 0–3-septate. Micropycnidia immersed, microconidia bacillar, 4.5–5.5 × 0.7–0.9 μm. Lichenicolous on decaying *Hypotrachyna*.

Typus: Portugal, Azores, Terceira, NW of Angra do Heroísmo, Reserva Florestal Viveira da Falca, picnic area, with many mature *Cryptomeria* trees, some *Acer* and *Camellia* trees, on *Cryptomeria*, 38° 42.90' N, 27° 16.78' W, 460 m, 28-VI-2014, *P. & B. van den Boom* 51349 (BR—holotypus, SANT—isotype).

Figure 2. *Micarea parasitica*, holotypus, habitus. Scale = 0.5 mm



Thallus very thin, consisting of small areoles, often only visible around the apothecia, upper surface smooth to slightly uneven, with fine crystals, pigments lacking; cortex lacking. Photobiont micareoid, cells rather small, 3–5 μm diam., thin walled. Prothallus not present. Apothecia abundant, inconspicuous, slightly convex, without margin, irregularly in habitus, 0.15–0.35(–0.4) mm in diam., pale to medium cream orange, brownish to blackish, often piebald (C+ reddish); hymenium c. 30–40 μm high, hyaline, with fine crystals; epihymenium hyaline or with pale brownish spots (K+ violet), when dark colored; hypothecium hyaline; paraphyses occasionally present, branched, c. 1.0–1.5 μm wide, tips not widened. Asci *Micarea*-type, 30–40 \times 12–14 μm . Ascospores clavate to fusiform, often slightly curved, 10–18 \times (2–)2.5–3.5(–4) μm , 0–3-septate.

Micropycnidia immersed, c. 50 μm diam., top pale brownish grey. Microconidia bacillar, 4.5–5.5 \times 0.7–0.9 μm . Mesoconidia or macroconidia not detected.

Chemistry: Apothecia C+ reddish, gyrophoric acid. Pigment *Sedifolia*-grey, K+violet (not always clear).

Etymology: The epithet chosen for this lichenicolous species refers to a parasitical grow form on Parmeliaceae as habitat, the type is abundantly present on decaying parts of *Hypotrachyna* on which it has been found abundantly.

Habitat and distribution: *Micarea parasitica* is only known from the Azores, and it has been found on 3 islands, where it grows on decaying thallus of *Parmotrema*, or *Hypotrachyna*, on trunks of *Cryptomeria*, *Myrica*, and *Persea*.

Notes: *Micarea parasitica* grows clearly lichenicolous on decaying lobes of *Parmeliaceae*, but sometimes a few apothecia are growing on bark, close nearby, but in that case there is no thallus visible around the apothecia. The new species is similar to *Micarea peliocarpa*, a species which can also grow lichenicolous, but that species has longer ascospores, up to 23 μm , 3–5(–6) μm wide, a clearly granular to warted thallus and a greenish pigment (K-) in

apothecium; apothecia white coloured in *M. parasitica* are somewhat comparable with *Micarea pallida* Coppins & Kantvilas, but that species lacks gyrophoric acid, has a clearly areolate thallus and a prothallus, it has shorter ascospores (10–13.5 µm) and is corticolous instead of lichenicolous (KANTVILAS & COPPINS 2019). As sometimes apothecia of this species are growing on the bark close to the host thallus, we regard this species as facultative lichenicolous.

Additional specimens examined:

Portugal: Azores, São Miquel, ENE of Vila Franca, Furnas centre, botanical garden 'Terra Nostra', with mixed exotic and endemic trees and shrubs, on *Myrica*, on *Parmotrema*, 37° 46.40' N, 25° 18.80' W, 205 m, 27-X-2011, P. & B. van den Boom 46645 (hb. v.d. Boom). Terceira, S of Biscoitos, along road to the south (to Macieira), picnic area with mixed trees and shrubs, mainly *Myrica faya*, on *Persea*, on *Parmotrema*, 38° 46.25' N, 27° 15.74' W, 125 m, 3-VII-2014, P. & B. van den Boom 51815 (hb. v.d. Boom). Pico, ESE of São Roque, near Prainha de Cima, Reserva Florestal da Prainha, picnic area with mixed shrubs and trees, on *Myrica*, on *Hypotrachyna*, 38° 29.32' N, 28° 14.70' W, 230 m, 29-VIII-2017, P. & B. van den Boom 56598 (hb. v.d. Boom).

Further lichenicolous *Micarea* species or growing facultatively as lichenicolous

Micarea kemmleri Brackel

Material of this species was found abundantly on *Cladonia* cf. *subcervicornis*, several years before it was described by von BRACKEL (2016). At that time, it was not possible to identify our material. It must be a very rare species, because after the type collection (1863), described from Germany, there are not more reports of that species. Here we have a second world record.

Specimen examined:

Spain: 44 km NNW of Trujillo, Parque Natural de Monfragüe, E of Villarreal de San Carlos, E of Portilla del Tiétar, E side of río Tiétar, W exposed slope, 30° 50.40' N, 5° 57.00' W, 500 m, 19-VII-2001, P. & B. van den Boom 27208 (E, hb. v.d. Boom).

Micarea peliocarpa (Anzi) Coppins & R. Sant.

In COPPINS (1983, 2009) this species is treated as a corticolous species only and it is not mentioned as a facultative lichenicolous species. However, in VAN DEN BOOM & ERTZ (2014) and BRACKEL (2016) there can be found remarks about several different hosts for this species. Among these it was not mentioned from *Pertusaria*. We have found it as lichenicolous on *Pertusaria* in France and Spain and record it here.

Specimens examined:

France: Cantal, SW of Murat, 0.3 km SW of Plomb du Cantal, path to Puy Brunet, NW facing steep acid rocks, on cf. *Pertusaria*, 45° 03.40' N, 2° 45.70' W, 1820 m, 31-VII-1998, P. & B. van den Boom 20927 (hb. v.d. Boom). **Portugal:** Alto Douro, NW of Villa Real, Parque Natural do Alvao, 8 km E of Ermelo, near crossing, 2 km from Pioledo, mature *Castanea* trees in sloping orchard, on *Ricasolia amplissima*, 41° 21.50' N, 7° 49.20' W, 1000 m, 18-VII-1999, P. & B. van den Boom 23606 (hb. v.d. Boom). **Spain:** Basque Country, Gipuzkoa, peñas de Aia, around Castillo del inglés, on *Hypotrachyna revoluta* on *Quercus robur* inside the forest, 21-IX-2008, J. Etayo 24837 (hb. Etayo). SW of Salamanca, Park Natural 'Sierra de la Peña de Francia', just below top (Peña de Francia), Los Lobos, acidic outcrops in open area, on *Pertusaria*, 40° 31.06' N, 6° 10.20' W, 1535 m, 14-VI-2011, P. & B. van den Boom 46089 (hb. v.d. Boom).

Boom). Galicia, Lugo, Courel, Devesa da Rogueira, on *Ricasolia amplissima* on *Quercus robur*, 42° 36'29.6"N, 7° 06'21.4"W, 1200 m, 5-VII-2021, *J. Etayo* 33623a (hb. Etayo).

Micarea synotheoides (Nyl.) Coppins

This species is not rare in Macaronesia, often found on trunks of different kind of trees.

We have two clearly lichenicolous specimens from Faial, both growing on *Hypotrachyna* and *Parmotrema* on *Cryptomeria*. This *Micarea* species has never been recorded as lichenicolous before.

Specimens examined:

Portugal: Azores, Faial, E side of the island, NW of Flamengos, SE slope of volcano, park Florestal da Falca, picnic locality with many *Cryptomeria* trees, small forests of young *Alnus* and *Acer* trees, on *Hypotrachyna*, 38° 33.72' N, 28° 40.95' W, 500 m, 1-VI-2016, *P. & B. van den Boom* 55182 (hb. v.d. Boom). NW of Flamengos, Largo Jaime de Melo, abandoned garden near small church S. João and *Cryptomeria* trees along road, on *Parmotrema*, 38° 33.72' N, 28° 39.73' W, 345 m, 3-VI-2016, *P. & B. van den Boom* 55420 (hb. v.d. Boom).

Micarea usneae van den Boom & Ertz

This species was described from Madeira (VAN DEN BOOM & ERTZ, 2014). This is the first record of mainland Europe.

Specimen examined:

Spain: Galicia, Lugo, Courel, Devesa da Rogueira, abedular, hayedo, robledal, on *Usnea florida*, 42° 36'29.6"N, 7° 06'21.4"W, 1200-1300 m, 5-VII-2021, *J. Etayo* 33643 (hb. Etayo).

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