Plant and Fungal Systematics 71(2): 332–339, 2026
DOI: https://doi.org/10.35535/pfsyst-2026-0024

ISSN 2544-7459 (print)
ISSN 2657-5000 (online)

A new lignicolous species of *Micarea* (*Lecanoromycetes, Ectolechiaceae*) from Sweden

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Article info

Received: 30 Mar. 2026
Revision received: 8 Jun. 2026
Accepted: 9 Jun. 2026
Published: 8 Sept. 2026

Associate Editor

Martin Kukwa

Abstract. The new lignicolous species *Micarea latispora* is described from central Sweden based on morphological and molecular evidence. The species grows on decaying wood of deciduous trees, particularly *Populus tremula*, in open to semi-shaded conditions, and is characterized by Sedifolia-grey pigmentation in the epithecium and hymenium, unicellular, often ovoid ascospores, and by containing gyrophoric acid. It is similar to *M. misella*, from which it differs in having broader ascospores [(3–)3.5–4.5(–5) µm wide vs. 2–3(–3.5) µm in *M. misella*], a better developed thallus containing gyrophoric acid, and the absence of stipitate pycnidia. *Micarea denigrata*, which also contains gyrophoric acid and has similar apothecia, differs by having narrower ascospores [2–3.5(–4) µm] that are predominantly 1-septate rather than unicellular. *Micarea latispora* is currently known from three provinces in central Sweden, but is likely more widespread and may have been overlooked due to its superficial resemblance to related species.

Key words: *Ascomycota*, *Lecanorales*, lichens, molecular phylogenetics, secondary chemistry, taxonomy

Introduction

Micarea Fr. is a cosmopolitan genus of crustose lichenized ascomycetes currently comprising approximately 170 species, and new species continue to be described at a steady pace (Myllys et al. 2026). Members of the genus occur on a wide variety of substrates, including bark, dead wood, rock, soil and bryophytes, and are particularly characteristic of habitats with acidic pH (Coppins 1983; Czarnota 2007; Myllys et al. 2026). Several species preferentially grow on decaying wood in boreal and hemiboreal forests, where they form an ecologically distinctive and often species-rich assemblage together with other lignicolous crustose lichens.

Significant progress in understanding species boundaries within *Micarea* has been achieved through the application of molecular phylogenetic methods, which have revealed hidden diversity and clarified relationships among morphologically similar taxa (e.g., Czarnota & Guzow-Krzemińska 2010; Guzow-Krzemińska et al. 2019; Launis et al. 2019a; Kantelinen et al. 2024). At the same time, major contributions to the species-level taxonomy of *Micarea* continue to be made on a morphological basis (e.g., Brand et al. 2014; Kantvilas & Coppins 2019; Coppins et al. 2021).

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Despite increased interest in the taxonomy and phylogenetics of *Micarea*, many lineages remain incompletely sampled or studied, and new species are regularly uncovered even in comparatively well-investigated regions, such as Europe. Here, I describe a new lignicolous species of *Micarea* from what is probably among the more intensively studied areas (central Sweden), which may nonetheless have escaped attention previously because of its resemblance to common species such as *M. denigrata* (Fr.) Hedl. and *M. misella* (Nyl.) Hedl. The new species is characterized by broad ascospores, Sedifolia-grey pigmentation in the apothecium, the presence of gyrophoric acid and a preference for decaying wood of deciduous trees.

Material and methods

Morphological methods

Light microscopy was performed using a Zeiss Axio Imager A1 compound microscope. Measurements were made from hand-cut material mounted in water using an oil-immersion lens, with a precision to the nearest 0.5 µm for measurements of finer anatomical structures (e.g., ascospores or paraphyses). Only well-developed ascospores lying outside the asci were measured. Color reactions of pigments and solubility of crystals were tested using a 10% solution of KOH (abbreviated K),

and a 4–5% solution of NaClO (abbreviated C). I examined apical structures of asci in an aqueous solution of 0.33% w/v I2 and 0.67% w/v KI after pretreatment with K. The presence of light-refractive crystals was detected using polarized light (POL). Ascospore dimensions are presented in the format: (minimum value observed–) mean value ± standard deviation (–maximum value observed) with n being the number of measurements. I investigated secondary chemistry by high-performance thin-layer chromatography (HPTLC) following the methods of Orange et al. (2010), using solvent system C. Nomenclature of insoluble lichen pigments follows Meyer & Printzen (2000).

DNA extraction and amplification

I extracted DNA following the methods described in Svensson & Fryday (2022). To amplify and sequence the mitochondrial ribosomal small subunit (hereafter mtSSU), the nuclear ribosomal ITS1–5.8S–ITS2 region (hereafter ITS), the DNA-directed RNA polymerase II subunit *rpb2* (hereafter *rpb2*), I used the primers and PCR protocols described in Svensson & Fryday (2022). For the mini-chromosome maintenance protein 7 gene (*mcm7*), I used the following primers for nested PCR: first PCR, *mcm7*-709for and *mcm7*-1348rev (Schmitt et al. 2009); second PCR, *mcm7*-LecSphF (5′-GTS AAT GCI TAY ACI TGY GA-3′) and *mcm7*-LecSphR (5′-CAT ICC RTC ICC IAY YT-3′). For the first step, I used the following thermal profile: 94°C for 3 min; 2 cycles of 94°C for 40 s, 57°C for 45 s, and 72°C for 1 min 45 s; 3 cycles of 94°C for 40 s, 54°C for 40 s, and 72°C for 45 s; 3 cycles of 94°C for 40 s, 51°C for 40 s, and 72°C for 45 s; 36 cycles of 94°C for 30 s, 48°C for 30 s, and 72°C for 45 s; and a final extension at 72°C for 8 min. For the second step: 94°C for 3 min; 10 cycles of 94°C for 30 s, 65°C for 45 s (decreasing 1°C per cycle), and 72°C for 1 min 30 s; 22 cycles of 94°C for 30 s, 55°C for 45 s, and 72°C for 1 min; and a final extension at 72°C for 10 min.

Taxon sampling

To determine the infrageneric affinities of *Micarea latispora* and its relationship to morphologically similar species, I assembled a dataset of DNA sequences primarily based on Myllys et al. (2026), but the number of species per infrageneric clade was reduced, except for clades constituting just one species or, in some cases, clades containing species similar to *M. latispora*. To root the phylogenetic tree, I selected species of *Psilolechia* (*Psilolechiaceae*) as outgroup (cfr. Myllys et al. 2026). Newly generated sequences and those obtained from GenBank are listed in Table 1.

Sequence alignment and partitioning scheme

For the non-protein-coding markers (ITS, mtSSU), I estimated alignments using PASTA v. 1.8.5 (Mirarab et al. 2015), with the mask option enabled, MAFFT using the L-INS-i algorithm as the aligner, OPAL for pairwise merging, and FastTree as the tree estimator under the GTR+G model of molecular evolution. For the protein-coding markers *rpb2*, *rpb1* and *mcm7*, I estimated alignments in MAFFT using the E-INS-i algorithm (Katoh et al. 2019). To minimize potential problems arising from missing data, the ends of all alignments were trimmed.

To assess incongruence among markers, I conducted maximum-likelihood analyses on each of the five alignments in IQ-TREE v. 3.0.1 using 500 standard bootstrap replicates (Wong et al. 2026). Conflict among markers was defined as clades receiving more than 75% bootstrap support for incongruent relationships (Mason-Gamer & Kellogg 1996). As no significant conflict was detected, the five alignments were concatenated into a single dataset.

Phylogenetic analysis

Partitioning schemes and models of molecular evolution for the concatenated alignment were evaluated using ModelFinder, as implemented in IQ-TREE v. 3.0.1 (Kalyaanamoorthy et al. 2017; Wong et al. 2026). The concatenated dataset was initially divided into thirteen subsets: mtSSU, ITS1, 5.8S, ITS2, and the first, second, and third codon positions of *rpb2*, *rpb1* and *mcm7*, respectively. Model selection was based on the BIC, and merging of subsets was allowed. The best-fitting scheme merged these into five partitions: ITS1+ITS2 (GTR+I+G4), 5.8S+*rpb1* 2nd+*rpb2* 2nd+*mcm7* 2nd (TPM3u+F+I+G4), *rpb1* 1st+*rpb2* 1st+*mcm7* 1st (TIM+F+G4), *rpb1* 3rd+*rpb2* 3rd+*mcm7* 3rd (TIM2e+I+R2), and mtSSU (TVM+F+I+G4).

Results

The maximum-likelihood phylogeny was well resolved (Fig. 1) and broadly consistent with the phylogeny of Myllys et al. (2026). All eight sequenced specimens of *Micarea latispora* formed a strongly supported monophyletic group (BS = 100) resolved as sibling to *M. misella* (BS = 74 for their combined clade), placing the new species within Clade *M. misella* sensu Myllys et al. (2026). *Micarea perparvula* was also recovered within this clade as sibling to the *M. misella–M. latispora* pair (BS = 94), consistent with the mtSSU phylogeny of Myllys et al. (2026), in which *M. perparvula* and *M. misella* grouped with high support. Clade *M. misella* (comprising *M. latispora*, *M. misella* and *M. perparvula*) was resolved as sibling to Clade *M. prasina* (BS = 88).

Taxonomy

Micarea latispora M. Svenss., sp. nov. (Fig. 2)

MycoBank MB 63771

Diagnosis: Similar to *Micarea misella* and *M. denigrata*, but differing from the former in having broader ascospores, a better-developed thallus containing gyrophoric acid, and the absence of stipitate pycnidia, and from the latter by having broader ascospores that are unicellular rather than 1-septate.

Type: Sweden, Uppland: Östuna par., 200 m SE of Igelbäck, N of road 77, 59.746081, 17.832972, 30 m, on log of *Populus tremula* in partially cut mixed coniferous/deciduous forest, 13 Mar. 2023, M. Svensson 4606 [HPTLC: gyrophoric acid] (UPS L-1155960 – holotype!; E, H, PRA – isotypes!).

Table 1. Sequence data used for the phylogenetic analysis, with GenBank accession numbers and voucher information. Sequences newly generated for this study are in bold face.

Species	Voucher/source	mtSSU	ITS	*rpb1*	*rpb2*	*mcm7*
Helocarpon assimilatum	Sweden, Svensson 3481 (UPS L-990152), Myllys et al. 2026	PX170272	PX170479	PX223171	PX171016	PX170821
Helocarpon crassipes	Sweden, Svensson 3483 (UPS L-990151), Myllys et al. 2026	PX170268	PX170481	PX223169	PX171013	PX170818
Micarea adnata 1	Japan, Thor 39643 (UPS), Myllys et al. 2026	PX170387	PX170563	PX223251	PX171085	–
Micarea adnata 2	Japan, Thor 40069 (UPS), Myllys et al. 2026	PX170386	–	PX223250	–	PX170927
Micarea botryoides	United Kingdom, Scotland, Kantelinen 4566 (H), Myllys et al. 2026	PX170297	PX170546	–	–	PX170901
Micarea byssacea	Russia, Himelbrant & Stepanchikova s.n. (H9220198), Myllys et al. 2026	PX170424	PX170573	PX223283	PX171132	PX170959
Micarea denigrata	USA, Björk 13019 (UBC), Miadlikowska et al. 2014, Myllys et al. 2026	KJ766437	PX170523	KJ766873	PX171047	PX170853
Micarea elachista	Finland, Launis 67113 (H), Launis et al. 2019b, Myllys et al. 2026	MG707745	MG521548	PX223239	PX171070	–
Micarea endocyanea	Japan, Thor 39742 (UPS), Myllys et al. 2026	PX170364	PX170555	PX223240	PX171071	PX170907
Micarea eximia	Finland, Kantelinen 3785 (H), Kantelinen et al. 2021	MT982133	MT981599	–	PX171068	MT981443
Micarea flagellispora	Australia, Tasmania, Kantvilas 40/20 (H), Myllys et al. 2026	PX170287	PX170496	–	–	PX170829
Micarea herbarum	Netherlands, van den Boom 61091 (herb. v.d.Boom), Myllys et al. 2026	PX170444	PX170599	PX223297	PX171146	PX170977
Micarea incrassata	Sweden, Svensson 3505 (UPS L-990149), Myllys et al. 2026	PX170306	PX170501	PX223197	PX171043	PX170840
Micarea lapillicola	Sweden, Svensson 3706 (UPS L-990150), Myllys et al. 2026	PX170275	PX170483	PX223174	PX171019	PX170823
Micarea latispora 1	Sweden, Svensson 4606 (UPS L-1155960)	**PZ412660**	–	–	–	–
Micarea latispora 2	Sweden, Svensson 4470 (UPS L-1155954)	**PZ412658**	–	–	**PZ418296**	–
Micarea latispora 3	Sweden, Svensson 4620 (UPS L-1155964)	**PZ412661**	–	–	–	–
Micarea latispora 4	Sweden, Svensson 4613 (UPS L-1155962)	**PZ412662**	–	–	–	–
Micarea latispora 5	Sweden, Svensson 5100 (UPS L-1155966)	**PZ412663**	**PZ412653**	–	–	–
Micarea latispora 6	Sweden, Svensson 4594 (UPS L-1155957)	**PZ412659**	–	–	**PZ418297**	–
Micarea latispora 7	Sweden, Svensson 4431 (UPS L-1155953)	**PZ412657**	–	–	**PZ418295**	**PZ418294**
Micarea latispora 8	Sweden, Svensson 4218 (UPS L-1155952)	**PZ412656**	–	–	–	–
Micarea lignaria	Finland, Kantelinen 64 (H), Myllys et al. 2026	PX170334	PX170504	PX223218	PX171062	PX170873
Micarea lithinella	Germany, Cezanne & Eichler 12086 (FR), Myllys et al. 2026	PX170278	PX170486	PX223177	PX171022	PX170824
Micarea misella	Finland, Launis 108111 (H), Launis et al. 2019b, Myllys et al. 2026	MG707742	MG521545	–	PX171089	MG692506
Micarea minuta	The Netherlands, van den Boom 57741 (UGDA), van den Boom et al. 2020	MN547360	–	–	–	–
Micarea myriocarpa	Sweden, Westberg VB083 (UPS L-947751), Myllys et al. 2026	PX170281	PX170489	–	PX171024	PX170826
Micarea nowakii	Finland, Weber MAL-080-3 (H), Myllys et al. 2026	PX170443	PX170594	–	PX171145	PX170976
Micarea peliocarpa	U.S.A., Launis 66123 (H), Launis et al. 2019b, Myllys et al. 2026	MG707741	MG521544	PX223211	PX171058	MG692505
Micarea perparvula	Czech Republic, Malicek 14643 (herb. Malicek), Malicek 2022	ON228402	–	–	–	–
Micarea prasina	U.S.A., Launis 1361212 (H), Myllys et al. 2026	PX170452	PX170593	PX223306	PX171153	PX170985
Micarea sp. I	Finland, Kantelinen 2656 (H), Myllys et al. 2026	PX170298	PX170495	PX223186	PX171034	–
Micarea sp. II	Madagascar, Serusiaux 4195 (LG), Myllys et al. 2026	PX170299	PX170498	–	–	PX170836
Micarea substipitata	Finland, Kantelinen 2700 (H), Myllys et al. 2026	PP811711	PX170494	PX223179	PX171027	–
Micarea tsugae	U.S.A., Tønsberg 45194b (H), Myllys et al. 2026	PX170286	–	PX223181	PX171028	–
Micarea turfosa	Sweden, Westberg JMT352 (UPS L-1033520), Myllys et al. 2026	PX170294	PX170548	–	PX171033	PX170834
Psilolechia leprosa	Sweden, Svensson 3408 (UPS L-1092596), Svensson & Fryday 2022	OP161957	–	–	OP198713	OP198696
Psilolechia lucida	Finland, Haikonen 24578 (H), Miadlikowska et al. 2014	KJ766472	–	KJ766884	–	–
Psilolechia clavulifera	Czech Republic, Vondrák 23846 (PRA), Vondrák et al. 2023	OQ646408	OQ718036	–	–	–

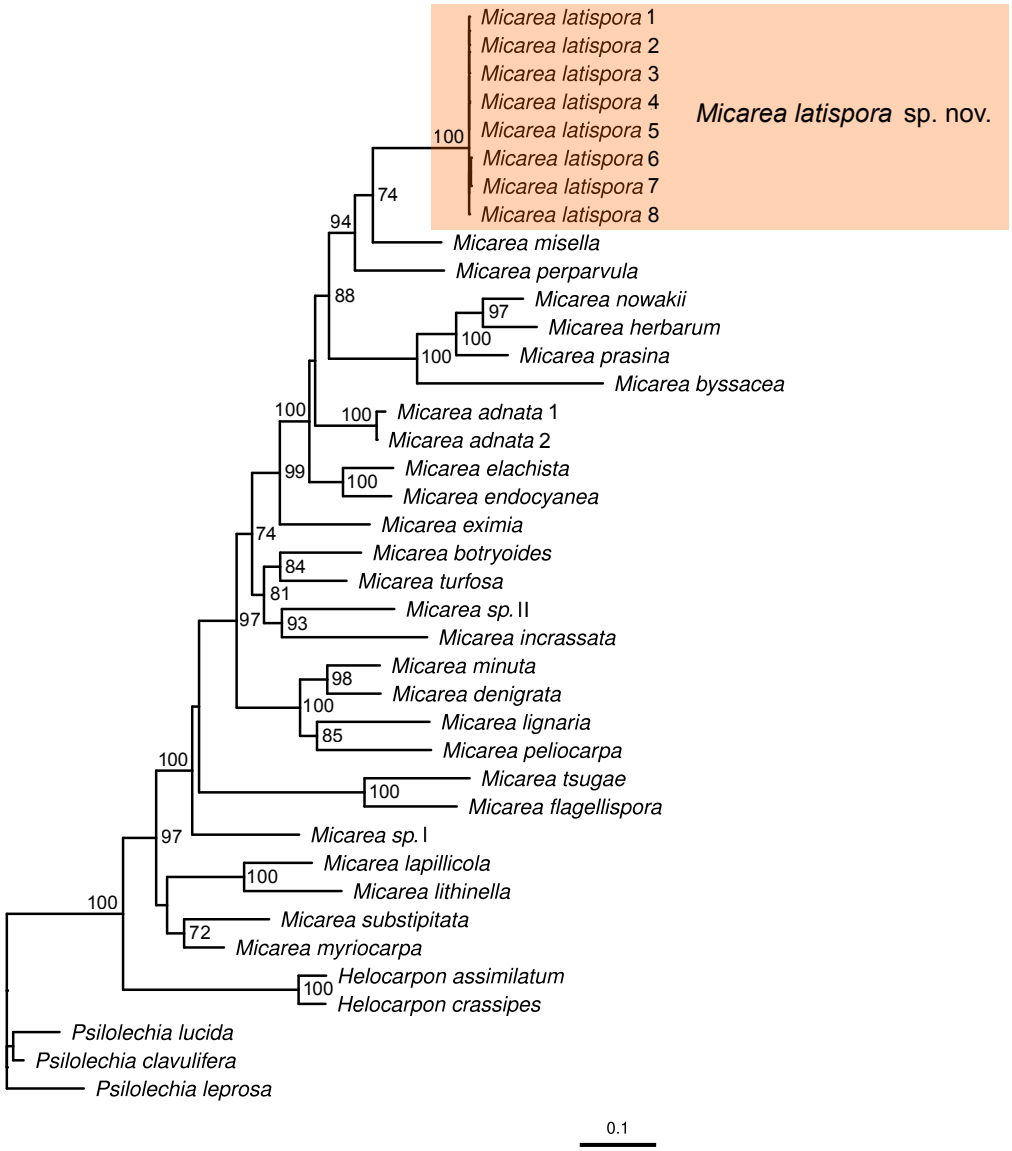

Figure 1. Maximum likelihood phylogeny inferred from five loci (ITS, mtSSU, *rpb1*, *rpb2*, *mcm7*), showing the position of *Micarea latispora* sp. nov. Bootstrap support values, based on non-parametric bootstrapping, are shown only when ≥70%.

Etymology. The epithet '*latispora*' is derived from 'latus' (broad, wide) and 'spora' (spores), and refers to the width of the ascospores, which is the most useful character to distinguish the new species from similar species.

Description. Thallus immersed and ± invisible, or composed of greenish grey to grey, non-corticate, scattered convex areoles, 0.05–0.12 mm diam., –0.08 mm high; K–, C– or C± reddish, in cross sections of areolae C+ red (reaction rapidly fading). Photobiont micareoid, 3–8 µm diam. Apothecia usually abundant, appearing slightly rough or uneven when viewed under a stereo microscope, single or sometimes 2–3 together, grey to greyish brown to greyish black, or black; disc initially ± plane with a thin, often paler margin, becoming convex and immarginate; 0.1–0.35 mm diam. Excipulum of radiating, paraphysis-like hyphae, ~1 µm diam., soon reflexed. Epithecium distinct, greenish, K+ violet, C+ violet (Sedifolia-grey). Hymenium colorless, C± red (reaction rapidly fading), or with greenish vertical streaks, K– or K± violet, C± violet, 50–60 µm high. Hypothecium colorless, –70 µm high. Paraphyses numerous, branched and anastomosing, not or only slightly thickened apically, 1–1.5 µm diam. Asci 8-spored, clavate, with a KI+ blue tholus penetrated by a paler channel flanked by darker-staining borders (*Micarea*-type), 25–52 × 8–14 µm. Ascospores broadly ellipsoid–ovoid, unicellular, when fresh often with a large oil drop, (6–)8.11 ± 1.07(–11) × (3–)4.00 ± 0.60(–5) µm; l/b ratio (1.4–)2.06 ± 0.39(–2.86) (n = 73). Pycnidia not seen. Crystalline granules (POL+) sparsely occurring, but often visible in thallus and hymenium, seemingly randomly distributed.

Chemistry. Gyrophoric acid detected by HPTLC in all specimens tested (n = 8). The compound is present in both the thallus and the apothecia. The C+ red reaction of the hymenium is often difficult to discern, as it may be masked by the C+ violet reaction of Sedifolia-grey; it is therefore best observed in pigment deficient apothecia.

Distribution and ecology. *M. latispora* has mostly been found in secondary deciduous forests on former arable

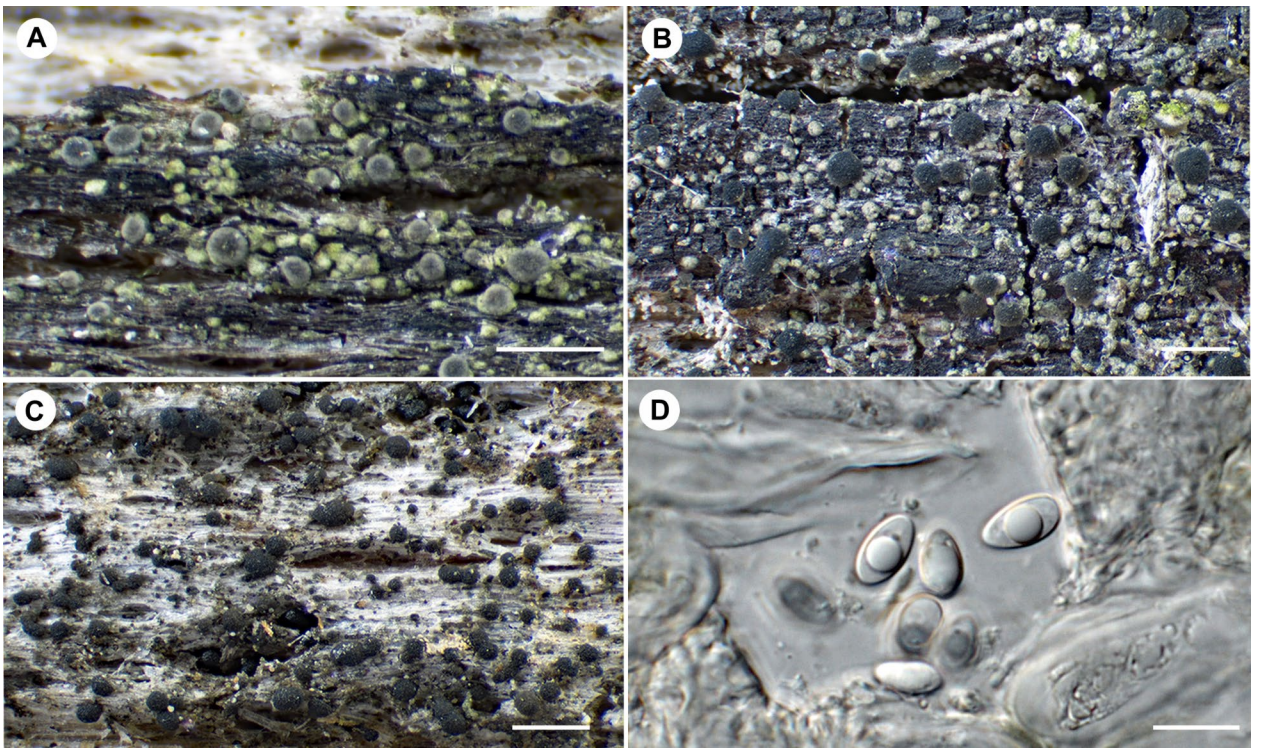

Figure 2. *Micarea latispora*. A – specimen growing in shaded conditions, with poorly pigmented apothecia (UPS L-1155953); B – mature specimen from more exposed wood (UPS L-1155960, holotype); C – specimen collected on sun-exposed wood, with ± immersed thallus (UPS L-1155964); D – ascospores (UPS L-1155967). Scales: A–C = 0.5 mm, D = 10 µm.

land or pastures, in rather open to semi-shaded conditions. Most collections have been made on wood of *Populus tremula*, but four collections were made on wood of other trees: one on *Acer platanoides*, one on *Sorbus aucuparia*, one on *Tilia cordata*, and one on an indeterminate broad-leaved tree (*Acer* or *Fraxinus*), respectively. The species has mostly been found on trunks, but sometimes also on coarse branches left on the ground after selective cutting. I have also searched for *M. latispora* on *Populus tremula* logs in closed, coniferous forest stands, but without success. In such more shaded settings, logs are often more rapidly colonized by bryophytes and the space available for lichens is smaller. In general, logs of deciduous trees decompose more rapidly than logs of conifers, and the window of opportunity for lichen colonization may be comparatively small, typically occurring between a first phase of rapid colonization by various pioneer fungi, e.g., on *Populus tremula* often *Eutypa sparsa* Romell and *Calycina citrina* (Hedw.) Gray, and a later, decayed stage dominated by bryophytes. Still, under brighter conditions in open stands as described above, such logs may be colonized by lichenized fungi; those occurring on the same logs as *M. latispora* include *Lecanoropsis saligna* (Schrad.) Ivanovich & Printzen, *L. subravida* (Nyl.) Ivanovich & Printzen, *Micarea misella*, *M. soralifera* Guzow-Krzem., Czarnota, Łubek & Kukwa, *Placynthiella icmalea* (Ach.) Coppins & P. James, *Steinia geophana* (Nyl.) Stein and *Trapeliopsis flexuosa* (Fr.) Coppins & P. James, less commonly *Absconditella celata* Döbbeler & Poelt and *Catillaria erysiboides* (Nyl.) Th. Fr. Among non-lichenized fungi, commonly co-occurring species include *Hysterographium elongatum* (Wahlenb.) Corda, *Patinellaria sanguinea* (Pers.) P. Karst. and *Psiloglonium lineare* (Fr.) Petr.; *Cryptodiscus pallidus* (Pers.) Corda, *Orbilia* sp., *Monodictys castaneae* (Wallr.) S. Hughes and *Natantiella ligneola* (Berk. & Broome) Réblová have been recorded occasionally. One *Populus* log with *M. latispora* also carried a fruitbody of *Artomyces pyxidatus* (Pers.) Jülich, indicating a relatively advanced stage of decay.

Micarea latispora is currently only known from three neighboring provinces in Central Sweden, but its distribution is likely much larger. It may prove to be a common, but overlooked, species.

Notes. *Micarea latispora* is characterized by the combination of relatively broad, often ovoid ascospores, the pigmentation with Sedifolia-grey in the epithecium and hymenium, the presence of gyrophoric acid, and the preference for growing on wood of deciduous trees. As is so often the case with *Micarea* species, thallus development and pigmentation are variable. In more shaded conditions, the thallus may be comparatively well developed and the apothecia often grey, sometimes with a characteristic paler rim when young (Fig. 2A, B). In more exposed situations, the thallus is often immersed and individual areoles hard to discern; when present, they are typically confined to cracks in the wood where more sheltered conditions occur (Fig. 2C).

One of the most similar species to *Micarea latispora* is its close relative *Micarea misella*, which may also grow on the same logs as *M. latispora*, sometimes occurring intermixed. The apothecial pigmentation of *M. misella* is very similar to that of *M. latispora*, and the ascospores are also predominantly unicellular. However, *M. misella* differs by having narrower ascospores, typically 2–3(–3.5) µm (Coppins 1983; Cannon et al. 2022), rarely reaching 4 µm

(Czarnota 2007). In addition, *M. misella* usually has a less well-developed thallus which does not contain secondary metabolites detectable by TLC (Czarnota 2007; Cannon et al. 2022). (Specimens of *M. misella* with an unusually well-developed thallus and detectable amounts of gyrophoric acid were discussed by Coppins (1983); they may be referable to *M. latispora*.) Further, a distinguishing feature of *M. misella* is its stipitate pycnidia, whereas pycnidia have not been observed in *M. latispora*. The occurrence of such pycnidia in the vicinity of *M. latispora* thalli in a couple of the studied collections raised the possibility that they could in fact belong to the latter species. However, separate DNA extractions made from stipitate pycnidia in two of the collections (UPS L-1155961 and L-1155963) resulted in mtSSU sequences (GenBank-ID PZ412654 and PZ412655) referable to *M. misella* and not *M. latispora*.

The third member of the *misella*-clade is *Micarea perparvula* (Nyl.) Coppins & Printzen, which differs from both *M. latispora* and *M. misella* in the presence of the pigment Elachista-brown rather than Sedifolia-grey in its apothecia. Also, its ascospores are typically narrower than those of *M. latispora* (2.5–4 µm) and its thallus is immersed (Coppins 2008). Other species that are phylogenetically more distant, but which have similar morphology, could also present problems of determination. These include three lignicolous species with Sedifolia-grey in the epithecium: *Micarea denigrata*, *M. herbarum* M. Brand, Coppins, Sérus. & van den Boom and *M. nowakii* Czarnota & Coppins. In particular, *Micarea denigrata* has both similar apothecia and contains gyrophoric acid. It primarily differs by having narrower [2–3.5(–4) µm] ascospores that are predominantly 1-septate (Coppins 1983; Czarnota 2007; Cannon et al. 2022). At least in Fennoscandia, *Micarea denigrata* may also be more frequent on coniferous bark and wood rather than on deciduous wood, in contrast to *M. latispora*. *Micarea herbarum* differs from *M. latispora* by having narrower ascospores (2–2.6 µm) and by lacking secondary compounds detectable by TLC (van den Boom et al. 2017; Cannon et al. 2022). *Micarea nowakii* differs from *M. latispora* by having narrower ascospores (2–2.3 µm) and by containing micareic acid rather than gyrophoric acid (Czarnota 2007). A further, corticolous species with similar apothecial pigmentation is *M. minuta* van den Boom, Guzow-Krzemińska & Kukwa, which differs from *M. latispora* by having narrower ascospores [(2–)2.5–3 µm] and by lacking secondary compounds detectable by TLC (van den Boom et al. 2020). In addition, all these species are clearly separated from *M. latispora* in the phylogenetic analysis (Fig. 1), and they also commonly occur with pycnidia (Coppins 1983; Czarnota 2007; van den Boom et al. 2017; van den Boom et al. 2020; Kantelinen et al. 2022), which has not been observed in *M. latispora*.

An additional species with Sedifolia-grey pigment and gyrophoric acid is *Micarea confusa* Coppins & van den Boom, for which sequences are currently unavailable. This species differs from *M. latispora* by its narrower [1.8–2.7(–2.9) µm] ascospores, by the presence of numerous pycnidia, and by growing on soil or bryophytes on soil (Coppins & van den Boom 1995).

A further species somewhat similar to *M. latispora* is *M. peliocarpa* (Anzi) Coppins & R. Sant., which has a similar thallus containing gyrophoric acid and whose apothecia may also have a white rim when young. However, *M. peliocarpa* is typically larger in all aspects, has predominantly 3-septate ascospores, lacks Sedifolia-grey in the apothecia (and is hence K–), and the thallus areoles when well-developed typically form a more or less contiguous crust, unlike the more dispersed areolae of *M. latispora* (Czarnota 2007; Cannon et al. 2022).

All collections of *M. latispora* have been made on dead wood, and although it cannot be excluded that the species also occurs on bark or other substrates, it appears likely to be an obligate lignicole. If so, it is an exception to the pattern reported by Kantelinen et al. (2022), who showed that obligate lignicoles in *Micarea* are predominantly asexual, whereas facultative lignicoles reproduce predominantly sexually. They further noted that this pattern appears to extend beyond the *M. prasina* group (which was the focus of their analysis), citing *M. misella* as an example of a predominantly lignicolous *Micarea* species that mainly reproduces asexually. In contrast, its close relative *M. latispora* appears to reproduce exclusively sexually: apothecia are usually abundant, and I have not observed any pycnidia. The only comparable case in the dataset of Kantelinen et al. (2022) is *M. nowakii*, an obligate lignicole that is predominantly sexual, but even that species usually produces mesopycnidia alongside its apothecia (Kantelinen et al. 2022, tab. 3). Whether the exclusively sexual reproduction of *M. latispora* reflects a genuinely unusual life history strategy, or simply the difficulty of detecting pycnidia in a newly described and rarely collected species, remains to be clarified with additional material.

Additional specimens examined. SWEDEN. Södermanland, Länna par., 2 km SW of Länna church, just S of road 55, 59.26758°N, 16.96165°E, 30 m, on coarse log of *Populus tremula* in secondary deciduous forest next to agricultural field, 17 Jul. 2023, M. Svensson 4662 (UPS L-1155965); Strängnäs par., 500 m SE of Kärrholmen, Långkärr, 59.34192°N, 17.11643°E, 27 m, on log of *Populus tremula* at the edge of agricultural field, 19 Feb. 2023, M. Svensson 4594 [HPTLC: gyrophoric acid] (UPS L-1155957), 4602 [HPTLC: gyrophoric acid] (UPS L-1155958), 4603 (UPS L-1155959). Uppland, Danmark par., 730 m SSE of Danmark church, the NW edge of large field islet, 59.826603°N, 17.747924°E, 15 m, on log of *Sorbus aucuparia* in rather exposed situation close to arable field, 25 Apr. 2023, M. Svensson 4613 (UPS L-1155962); Edsbro par., 3.4 km SE of Edsbro church, Mellanlåren, by the W edge of the ancient hill fort ruin, 59.87240°N, 18.53695°E, 20 m, on small, cut log of *Tilia cordata* in partially cut, mixed coniferous forest, 31 Mar. 2026, M. Svensson 5424 (UPS L-1221569); Frösunda par., 150 m NW of Örsta, N of the arable field, 59.66513°N, 18.13093°E, 27 m, on log of *Populus tremula* in shaded situation in secondary mixed forest next to arable field, 30 Oct. 2021, M. Svensson 4218 (UPS L-1155952); Frösunda par., about 900 m S of Tarby, the S end of the large field islet E of Borgvreten, 59.655148°N, 18.120785°E, 22 m, on coarse branches of *Populus tremula* on the ground, left after cutting, 10 Sept. 2022, M. Svensson 4431 [HPTLC: gyrophoric acid]

(UPS L-1155953); Frösunda par., about 750 m SW of Tarby, SW of Larsbacka, 59.65752°N, 18.11550°E, 25 m, on log of *Populus tremula* at the edge of agricultural field, 7 Oct. 2022, M. Svensson 4470 [HPTLC: gyrophoric acid] (UPS L-1155954); Frösunda par., 600 m WNW of Skrävsta, just N of the ruins of the croft Åttesta soldattorp, 59.653651°N, 18.123647°E, 21 m, on log of *Populus tremula* in exposed situation, 16 Oct. 2022, M. Svensson 4479 [HPTLC: gyrophoric acid] (UPS L-1155955); Frösunda par., about 900 m S of Tarby, the W edge of the large field islet E of Borgvreten, 59.655573°N, 18.120292°E, 22 m, on small log of *Populus tremula* close to arable field, 3 Mar. 2024, M. Svensson 4860 [HPTLC: gyrophoric acid] (UPS L-1155966); Frösunda par., about 300 m S of Vreta, E of Åttesta, 59.65519°N, 18.14139°E, 25 m, on log of *Acer platanoides* in open pasture, 22 Mar. 2026, M. Svensson 5405 (UPS L-1214485); Lagga par., about 150 m N of Moraborg, 59.78296°N, 17.77656°E, 45 m, on log of *Populus tremula* in small clear-cut, 2 May 2023, M. Svensson 4618 (UPS L-1155963); Lagga par., 450 m E of Träfallet, 59.76433°N, 17.78865°E, 30 m, on log of *Populus tremula* in open stand of deciduous trees next to former agricultural field, 2 May 2023, M. Svensson 4620 [HPTLC: gyrophoric acid] (UPS L-1155964). Västmanland, Arboga par., Arboga, 1.4 km ENE of S:t Nikolai church, Koberg, 59.402205°N, 15.867368°E, 14 m, on stump of deciduous tree (probably *Fraxinus* or *Acer*) in former manor house park, 23 Oct. 2024, M. Svensson 5100 (UPS L-1155967); Skultuna par., 3.9 km NNW of Skultuna, about 350 m NNW of Kampberget, 59.730559°N, 16.395375°E, 50 m, on log of *Populus tremula* in semi-open part of pasture in former agricultural field, 18 Apr. 2023, M. Svensson 4612 (UPS L-1155961).

Acknowledgements

This research was financially supported by the Swedish Taxonomy Initiative (2016-206 4.3 and 2023.4.3-30).

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References

Brand, A. M., van den Boom, P. P. G. & Sérusiaux, E. 2014. Unveiling a surprising diversity in the lichen genus *Micarea* (*Pilocarpaceae*) in Réunion (Mascarenes archipelago, Indian Ocean). *The Lichenologist* 46: 413–439. https://doi.org/10.1017/S0024282913000911

Cannon, P., Orange, A., Aptroot, A., Sanderson, N., Coppins, B. & Simkin, J. 2022. *Lecanorales*: *Pilocarpaceae*, including the genera *Aquacidia*, *Byssoloma*, *Fellhanera*, *Fellhaneropsis*, *Leimonis* and *Micarea*. *Revisions of British and Irish Lichens* 27: 1–48. https://britishlichensociety.org.uk/sites/default/files/Pilocarpaceae_0.pdf

Coppins, B. J. 1983. A taxonomic study of the lichen genus *Micarea* in Europe. *Bulletin of the British Museum (Natural History)*, *Botany* 11: 17–214.

Coppins, B. J. 2008. *Micarea perparvula* in North America. *Opuscula Philolichenum* 23: 23–24.

Coppins, B. J. & van den Boom, P. P. G. 1995. *Micarea confusa*: A new species from zinc- and cadmium-contaminated soils in Belgium and the Netherlands. *The Lichenologist* 27: 81–90. https://doi.org/10.1006/lich.1995.0007

Coppins, B. J., Kashiwadani, H., Moon, K. H., Spribille, T. & Thor, G. 2021. The genera *Brianaria* (*Psoraceae*) and *Micarea* (*Pilocarpaceae*) in Japan, with reports on other interesting species in Asia. *The Lichenologist* 53: 35–44. https://doi.org/10.1017/S0024282920000468

Czarnota, P. 2007. The lichen genus *Micarea* (*Lecanorales*, *Ascomycota*) in Poland. *Polish Botanical Studies* 23: 1–199.

Czarnota, P. & Guzow-Krzemińska, B. 2010. A phylogenetic study of the *Micarea prasina* group shows that *Micarea micrococca* includes three distinct lineages. *The Lichenologist* 42: 7–21. https://doi.org/10.1017/S0024282909990211

Guzow-Krzemińska, B., Sérusiaux, E., van den Boom, P. P. G., Brand, A. M., Launis, A., Łubek, A. & Kukwa, M. 2019. Understanding the evolution of phenotypical characters in the *Micarea prasina* group (*Pilocarpaceae*) and descriptions of six new species within the group. *MycoKeys* 57: 1–30. https://doi.org/10.3897/mycokeys.57.33267

Kalyaanamoorthy, S., Minh, B. Q., Wong, T. K. F., von Haeseler, A. & Jermiin, L. S. 2017. ModelFinder: Fast model selection for accurate phylogenetic estimates. *Nature Methods* 14: 587–589. https://doi.org/10.1038/nmeth.4285

Kantelinen, A., Hyvärinen, M., Kirika, P. & Myllys, L. 2021. Four new *Micarea* species from the montane cloud forests of Taita Hills, Kenya. *The Lichenologist* 53: 81–94. https://doi.org/10.1017/S0024282920000511

Kantelinen, A., Printzen, C., Poczai, P. & Myllys, L. 2022. Lichen speciation is sparked by a substrate requirement shift and reproduction mode differentiation. *Scientific Reports* 12: 11048. https://doi.org/10.1038/s41598-022-14970-9

Kantelinen, A., Svensson, M., Malíček, J., Vondrák, J., Thor, G., Palice, Z., Svoboda, S. & Myllys, L. 2024. A phylogenetic study of *Micarea melaeniza* and similar-looking species (*Pilocarpaceae*) unveils hidden diversity and clarifies species boundaries and reproduction modes. *MycoKeys* 106: 327–354. https://doi.org/10.3897/mycokeys.106.123484

Kantvilas, G. & Coppins, B. J. 2019. Studies on *Micarea* in Australasia II: A synopsis of the genus in Tasmania, with the description of ten new species. *The Lichenologist* 51: 431–481. https://doi.org/10.1017/S0024282919000343

Katoh, K., Rozewicki, J. & Yamada, K. D. 2019. MAFFT online service: multiple sequence alignment, interactive sequence choice and visualization. *Briefings in Bioinformatics* 20: 1160–1166. https://doi.org/10.1093/bib/bbx108

Launis, A., Malíček, J., Svensson, M., Tsurykau, A., Sérusiaux, E. & Myllys, L. 2019a. Sharpening species boundaries in the *Micarea prasina* group, with a new circumscription of the type species *M. prasina*. *Mycologia* 111: 574–592. https://doi.org/10.1080/00275514.2019.1603044

Launis, A., Pykälä, J., van den Boom, P., Sérusiaux, E. & Myllys, L. 2019b. Four new epiphytic species in the *Micarea prasina* group from Europe. *The Lichenologist* 51: 7–25. https://doi.org/10.1017/S0024282918000555

Malíček, J. 2022. Lišejníky přírodní rezervace Getsemanka v Brdech. [Lichens of the Getsemanka Nature Reserve in the Brdy Hills.] *Bryonora* 69: 19–29.

Mason-Gamer, R. J. & Kellogg, E. A. 1996. Testing for phylogenetic conflict among molecular data sets in the tribe *Triticeae* (*Gramineae*). *Systematic Biology* 45: 524–545. https://doi.org/10.1093/sysbio/45.4.524

Meyer, B. & Printzen, C. 2000. Proposal for a standardized nomenclature and characterization of insoluble lichen pigments. *The Lichenologist* 32: 571–583. https://doi.org/10.1006/lich.2000.0294

Miadlikowska, J., Kauff, F., Högnabba, F., Oliver, J. C., Molnár, K., Fraker, E., Gaya, E., Hafellner, J., Hofstetter, V., Gueidan, C., Otálora, M. A., Hodkinson, B., Kukwa, M., Lücking, R., Björk, C., Sipman, H. J., Burgaz, A. R., Thell, A., Passo, A., Myllys, L., Goward, T., Fernández-Brime, S., Hestmark, G., Lendemer, J., Lumbsch, H. T., Schmull, M., Schoch, C. L., Sérusiaux, E., Maddison, D. R., Arnold, A. E., Lutzoni, F. & Stenroos, S. 2014. A multigene phylogenetic synthesis for the class *Lecanoromycetes* (*Ascomycota*): 1307 fungi representing 1139 infrageneric taxa, 317 genera and 66 families. *Molecular Phylogenetics and Evolution* 79: 132–168. https://doi.org/10.1016/j.ympev.2014.04.003

Mirarab, S., Nguyen, N., Guo, S., Wang, L. S., Kim, J. & Warnow, T. 2015. PASTA: ultra-large multiple sequence alignment for nucleotide and amino-acid sequences. *Journal of Computational Biology* 22: 377–386. https://doi.org/10.1089/cmb.2014.0156

Myllys, L., Svensson, M., Kantvilas, G., Sérusiaux, E., van den Boom, P., Aptroot, A., Cezanne, R., Eichler, M., Pino-Bodas, R., Printzen, C., Pykälä, J., Thor, G., Westberg, M., Weber, L. & Kantelinen, A. 2026. The first comprehensive multilocus phylogeny of the lichenized genus *Micarea* (*Ectolechiaceae*, *Ascomycota*). *Taxon* 75: e70087. https://doi.org/10.1002/tax.70087

Orange, A., James, P. W. & White, F. J. 2010. *Microchemical methods for the identification of lichens*, 2nd ed. British Lichen Society.

Schmitt, I., Crespo, A., Divakar, P. K., Fankhauser, J. D., Herman-Sackett, E., Kalb, K., Nelsen, M. P., Nelson, N. A., Rivas-Plata, E., Shimp, A. D., Widhelm, T. & Lumbsch, H. T. 2009. New primers for promising single-copy genes in fungal phylogenetics and systematics. *Persoonia* 23: 35–40. https://doi.org/10.3767/003158509X470602

Svensson, M. & Fryday, A. 2022. *Gilbertaria*, a first crustose genus in the *Sphaerophoraceae* (*Lecanoromycetes*, *Ascomycota*) for *Catillaria contristans*, *Toninia squalescens* and related species. *Mycological Progress* 21: 90. https://doi.org/10.1007/s11557-022-01838-5

van den Boom, P. P. G., Brand, A. M., Coppins, B. J. & Sérusiaux, E. 2017. Two new species in the *Micarea prasina* group from Western Europe. *The Lichenologist* 49: 13–25. https://doi.org/10.1017/S0024282916000633

van den Boom, P. P. G., Guzow-Krzemińska, B. & Kukwa, M. 2020. Two new *Micarea* species (*Pilocarpaceae*) from Western Europe. *Plant and Fungal Systematics* 65: 189–199. https://doi.org/10.35535/pfsyst-2020-0014

Vondrák, J., Svoboda, S., Košnar, J., Malíček, J., Šoun, J., Frolov, J., Svensson, M., Novotný, P. & Palice, Z. 2023. Martin7: a reference database of DNA barcodes for European epiphytic lichens and its taxonomic implications. *Preslia* 95: 311–345. https://doi.org/10.23855/preslia.2023.311

Wong, T. K. F., Ly-Trong, N., Ren, H., Banos, H., Roger, A. J., Susko, E., Bielow, C., De Maio, N., Goldman, N., Hahn, M. W., Huttley, G., Lanfear, R. & Quang Minh, B. 2026. IQ-TREE 3: phylogenomic inference software using complex evolutionary models. *Molecular Biology and Evolution* 43: msag117. https://doi.org/10.1093/molbev/msag117