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Standard Paper

The genera *Brianaria* (*Psoraceae*) and *Micarea* (*Pilocarpaceae*) in Japan, with reports on other interesting species in Asia

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Abstract

An examination of collections from Japan has increased the number of *Brianaria* and *Micarea* species known from that country from eight to 19, including one new species, *M. rubioides* Coppins (also from Malaysia and the Philippines). Eleven species are reported as new to Japan (*M. botryoides* (Nyl.) Coppins, *M. denigrata* (Fr.) Hedl., *M. erratica* (Körb.) Hertel *et al.*, *M. hedlundii* Coppins, *M. lithinella* (Nyl.) Hedl., *M. micrococca* (Körb.) Gams ex Coppins and *M. misella* (Nyl.) Hedl.) or new to Asia: *M. byssacea* (Th. Fr.) Czarnota *et al.*, *M. deminuta* Coppins and *M. xanthonica* Coppins & Tønsberg (new to Asia; Japan); *M. nitschkeana* (J. Lahm ex Rabenh.) Harm. (new to Asia; South Korea). The presence of *Micarea prasina* s. str. from Japan needs to be confirmed; no collection was found in this study. Additional collections from South Korea and Sri Lanka are also reported, including the new species *M. ceylanica* Coppins from Sri Lanka. The identity of *M. synotheoides* (Nyl.) Coppins, originally described from Japan, has been resolved, resulting in the renaming of Western European material, previously under that name, as *M. longispora* Coppins. *Micarea coreana* Lőkös *et al.* is reported here as a synonym of *M. erratica*. The type of *Lecidea inopinula* Nyl. requires the new combination *Micarea inopinula* (Nyl.) Coppins & T. Sprib. to replace *Micarea prasinella* (Jatta) I. M. Lamb.

Key words: biogeography, Borneo, Chile, lichens, Philippines, Russian Far East, South Korea, Sri Lanka, taxonomy

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Introduction

This paper mainly presents the results of an examination of G. Thor's collections of *Brianaria* and *Micarea* species in Japan, made between 1994 and 2012, as well as a small number from South Korea in 2001 and 2006, and one from Sri Lanka in 1978. Additional collections housed in the Uppsala herbarium (UPS) were examined during the first author's visit there in January 2011. The latest checklist of Japanese lichens (Ohmura & Kashiwadani 2018) lists only seven species: *Brianaria sylvicola* (Flot. ex Körb.) S. Ekman & M. Svensson (as *Micarea sylvicola*), *Micarea globulosella* (Nyl.) Coppins, *M. inquinans* (Tul.) Coppins, *M. melaena* (Nyl.) Hedl., *M. peliocarpa* (Anzi) Coppins & R. Sant., *M. prasina* Fr. and *M. synotheoides* (Nyl.) Coppins, with a further species listed as *Catillaria inopinula* (Nyl.) Zahlbr. One additional species, *M. adnata* Coppins, was included in Kashiwadani *et al.* (2011) but is not included in the checklist (Ohmura & Kashiwadani 2018). Eighty-six species are currently known from Europe (including the four species referred to *Brianaria* by Ekman & Svensson (2014)). Of these, 63 occur in the British Isles (Coppins (2009), with four species added later). Therefore, more species could be expected to occur in Japan. Seven *Micarea* species are reported from South Korea; Joshi *et al.* (2011) reported *M. elachista* (Körb.) Coppins & R. Sant. as new to South Korea, Kondratyuk *et al.* (2013) described *M. coreana* Lőkös *et al.* and reported *M. denigrata* (Fr.) Hedl. and *M. peliocarpa* as new to South Korea, and Aptroot & Moon (2015) reported *M. lignaria* (Ach.) Hedl., *M. micrococca* (Körb.) Gams ex Coppins and *M. misella* (Nyl.) Hedl. as new to South Korea. *Micarea coreana* is discussed below under *M. erratica* (Körb.) Hertel *et al.* The species illustrated in Joshi *et al.* (2011; fig. 2A, p. 71) as *Micarea elachista* is not this species and probably not a *Micarea* at all. The specimen might represent a *Mycoblastus* sp., as a red pigment is visible in one apothecium where the hymenium is visible.

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Materials and Methods

Measurements of ascospores and asci were made in water mounts. For macroscopical investigation a Leica MZ6 stereo microscope with an eyepiece graticule was used. Ascospores, paraphyses, ascus walls, hyphae and conidia were measured with a 0.5 µm precision. For the newly described species, at least 50 ascospores were measured from the type collection. Secondary lichen compounds were identified with HPTLC (Arup *et al.* 1993), using the most stable solvent C (below as TLC). The colour reaction of the thallus was tested using common household bleach (C), 10% aqueous potassium hydroxide (K), 1,4-phenylendiamine in 95% ethanol (PD) and short-wave UV_{254} light. The material included in

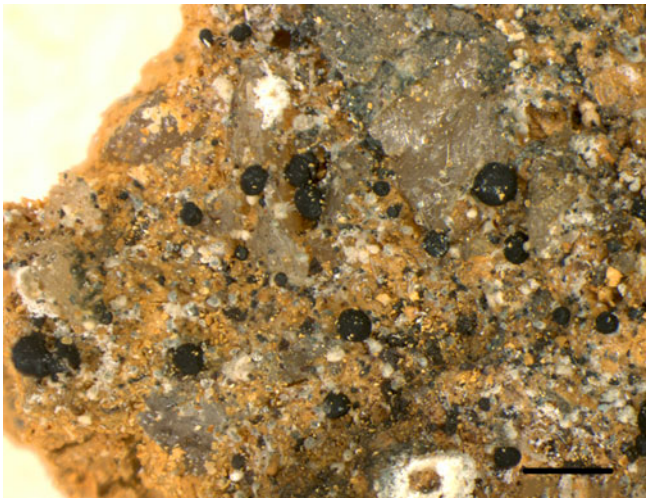

Fig. 1. *Micarea ceylanica* (holotype). Habit, thallus with dispersed apothecia. Scale = 1 mm. In colour online.

Joshi *et al.* (2011) and Kondratyuk *et al.* (2013) has not been seen by us. Additional material which might represent additional species will be studied further.

Taxonomy

New species from Asia

Micarea ceylanica Coppins sp. nov.

MycoBank No.: MB 836553

Similar to *Micarea lignaria* var. *lignaria* but with shorter, 1(–3)-septate ascospores; differs from *Micarea rubioides* in lacking soralia, having apothecia that do not form dense clusters, and in the longer ascospores, 10–18 vs (7.5–)9–11(–12) µm.

Type: Sri Lanka, Central Province, Kandy District, Dikoya, 6°52′N, 80°37′E, elev. 750 m, on the ground near the road, 13 February 1978, *G. Thor* 440 (S—holotype).

(Fig. 1)

Thallus episubstratal, of scattered to coherent ± globose areoles, 0.12–0.2 mm diam., white to pale blue-grey. *Soralia* absent. In section without a well-defined cortex, but with a hyaline covering layer *c.* 5 µm tall; external hyphae sometimes surrounded by bluish grey pigment, K–, N+ red. *Photobiont* cells 'micareoid', 4–7 µm diam. *Cephalodia* absent.

Apothecia black, 0.25–0.5 mm diam., markedly convex to subglobose. *Hymenium* 40–55 µm tall, dilute aeruginose green, but with some vertically arranged lines of aeruginose pigment granules; dark aeruginose above (K–, N+ red), forming a distinct epithecium. *Paraphyses* numerous, monomorphic, sparingly branched, rather coherent in K, 1–1.5 µm wide, not or only slightly swollen at apices. *Asci* clavate, *c.* 40–50 × 12–15 µm, *Micarea*-type with a darker amyloid zone surrounding the apical cushion, 8-spored. *Ascospores* ovoid-ellipsoid to oblong and sometimes curved, 1(–3)-septate 10–18 × (3.5)–4(–5) µm. *Hypothecium c.* 100–120 µm tall, hyaline to dilute brownish. *Exciple* well developed but reflexed, dilute aeruginose, but with outwardly radiating streaks of aeruginose pigment granules; hyphae branched, outwardly radiating, *c.* 1 µm wide.

Conidiomata pycnidia, emergent to sessile, black, *c.* 50–70 µm diam.; wall green, K–, N+ red; *conidia* (*microconidia*) narrowly cylindrical, only faintly truncated at the proximal end, 6–7 × 0.8–1 µm.

Chemistry. Thallus C–, K–, PD+ red, apothecia in sections C–; argopsin detected by TLC.

Etymology. The specific epithet is an adjective derived from a Latinization of Ceylon, 'Ceylonia', the former name for Sri Lanka.

Notes. Similar in appearance, internal anatomy and pigmentation, and thallus chemistry to *Micarea lignaria* var. *lignaria*, but differing in the shorter (10–18 µm vs 16–36(–38) µm), mainly 1-septate ascospores which become noticeably curved with increasing length; those of *M. lignaria* are fusiform, not or only slightly curved, and 3–7-sepate. The new species differs from *M. rubioides* in lacking soralia, having apothecia that do not form dense clusters, and in the longer ascospores (10–18 µm vs (7.5–)9–11(–12) µm). *Micarea pseudolignaria* Brand *et al.* from Réunion (Brand *et al.* 2014) differs from *M. ceylanica* in its shorter, ellipsoid ascospores, shorter microconidia and the presence of an unknown, PD– substance instead of argopsin, which is PD+ red.

Habitat and distribution. Known only from the type collection from mineral soil on a road cutting in a tea plantation. *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway was also collected in the vicinity (hb. S).

Micarea rubioides Coppins sp. nov.

MycoBank No.: MB 836554

Similar to *Micarea lignaria* var. *lignaria* but thallus with soralia, apothecia markedly confluent or tuberculate forming composite structures, and ascospores 1-septate and shorter (7.5–)9–11(–12) × (3–)3.5–4.5 µm.

Type: Japan, Kyushu, Kagoshima Pref. (Ohsumi Prov.), Yakushima Island, 4 km S of Miyanoura, along the road from Miyanoura to Shirotani-Unshuikyo Gorge, Kami-Yakucho, 30°23.5′N, 130°34′E, elev. 300 m, on soil at roadside, 25 October 1994, *G. Thor* 12310 (UPS—holotype; TNS—isotype).

(Fig. 2)

Thallus episubstratal, comprising crowded, convex, pale grey, matt areoles, 0.1–0.3 mm diam., which are mostly constricted below. *Soralia* present, efflorescent, scattered to confluent, pale bluish grey, 0.25–0.38 mm diam., but often confluent to form rounded patches up to 1.8 mm diam.; *soredia* 15–25 µm diam., external hyphae hyaline or with greenish, K–, N+ red pigment. In section, areoles without a well-defined cortex or amorphous covering layer; medulla absent or present in larger areoles and visible as a white core. *Photobiont* cells 'micareoid', 4–7 µm diam. *Cephalodia* absent.

Apothecia black, greenish black when wet, 0.15–0.38 mm diam., immarginate, mostly markedly confluent or tuberculate forming composite structures to 0.75 mm diam. *Hymenium* 50–65 µm tall, mostly hyaline except for a *c.* 10 µm tall, aeruginose-green pigmented zone in upper part (epithecium);

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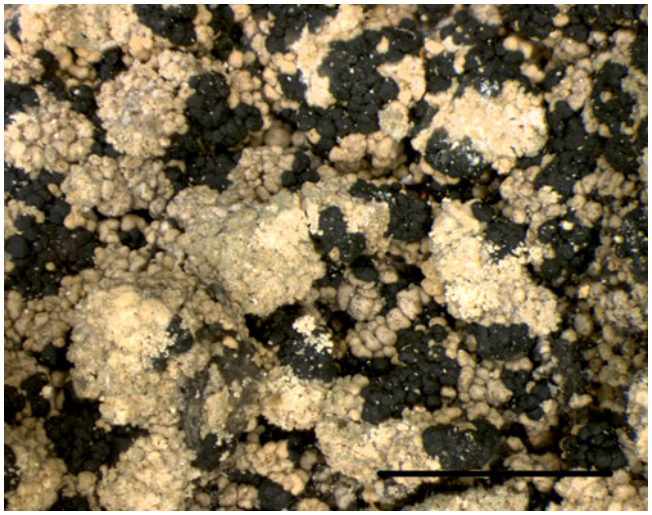

Fig. 2. *Micarea rubioides* (holotype). Habit, thallus with dispersed soralia and apothecia. Scale = 5 mm. In colour online.

pigment confined to the gel matrix, K−, N+ red. *Paraphyses* numerous, monomorphic, sparingly branched and anastomosing, rather coherent (even in K), 1.2–1.8 µm wide in mid-hymenium, not or only slightly swollen at apices to 2.5 µm. *Asci* clavate, *c.* 45–50 × 10–15 µm, *Micarea*-type with a darker amyloid zone surrounding the apical cushion, 8-spored. *Ascospores* ellipsoid to oblong-ellipsoid or ovoid-ellipsoid, 1-septate, (7.5–)9–11(–12) × (3–)3.5–4.5 µm. *Hypothecium c.* 150–180 µm tall, dilute olive-brownish, K−, N+ reddish, pigment confined to gel matrix; hyphae 1–1.8 µm wide, mostly vertically orientated; ascogenous hyphae with short cells swollen to 4 µm wide. *Exciple* indistinct, but visible in sections of young apothecia at the edge of the clusters, hyaline or tinged dilute greenish or olive-brownish; hyphae outwardly radiating, 1–1.5 µm wide, similar to paraphyses but more richly branched.

Conidiomata pycnidia, inconspicuous, immersed to emergent and sessile, black, 40–100 µm diam.; wall olive-brown or more strongly green in upper part, K−, N+ red; *conidia* (*microconidia*) narrowly cylindrical, only faintly truncated at the proximal end, 5–7 × 0.8–1 µm.

Chemistry. Thallus C−, K−, PD+ red, apothecia in sections C−; argopsin detected by TLC.

Etymology. The specific epithet refers to the resemblance of the clustered apothecia to the fruits of *Rubus caesius* L., as used in Acharius (1803: 324) for the basionym of *Psora rubiformis* (Ach.) Hook.

Notes. Similar to *Micarea lignaria* var. *lignaria*, especially with regard to the internal anatomy and pigmentation of the apothecia, but with much smaller ((7.5–)9–11(–12) µm vs 16–36(–38) µm), 1-septate ascospores. Although similar in appearance, the thallus areoles lack the external, amorphous, hyaline covering-layer of *M. lignaria*, and sometimes break down to form efflorescent, bluish grey soralia. Sterile material of *M. rubioides* could be confused with the sorediate *M. leprosula* (Th. Fr.) Coppins & A. Fletcher, but the latter contains gyrophoric acid in addition to argopsin. When fertile, *M. leprosula* is distinguished by its 3-septate ascospores. *Micarea ceylanica* differs from *M. rubioides* in having an external, amorphous, hyaline covering-layer to the thallus areoles; longer, often curved ascospores; and lacking clustered apothecia. *Micarea pseudolignaria* Brand *et al.* from Réunion (Brand *et al.* 2014) also resembles *M. rubioides* and has 1-septate, ascospores which are shorter (8.0–9.2 µm). In addition, *M. pseudolignaria* lacks soralia, has shorter microconidia and contains an unknown, PD− substance instead of argopsin, which is PD+ red. The recently described *M. rubiformis* P. M. McCarthy & Elix (McCarthy & Elix 2020*a*), growing on soil in New Zealand, has blackberry-like apothecia but differs from *M. rubioides* in having a dark red-brown hypothecium, larger ascospores, an absence of soralia and in containing 2'-*O*-methylsuperperlatolic acid rather than argopsin.

Habitat and distribution. The type collection is from mineral soil on the side of a dirt road. Yakushima is the southernmost island where the conifer *Cryptomeria japonica* still occurs. It differs from the surrounding islands by the presence of high mountains, the highest peak reaching 1935 m. The annual precipitation is extremely high, with 3000–5000 mm in the lowlands and up to 10 000 mm in the montane area. The lichen flora is distinctive with, for example, the endemic *Calicium muriformis* Tibell (Tibell & Thor 2003) and *Gymnoderma* (e.g. Kashiwadani & Gradstein 1982; Yoshimura 1982). The lowland vegetation is subtropical. A section of the montane area belongs to a national park, partly covered with forests of very large and old trees of *Cryptomeria japonica*. *Micarea rubioides* has also been found amongst collections from Malaysia (Borneo, Sarawak) and the Philippines (Luzon). The Sarawak collection was from a montane ridge at 1525 m, on mineral soil and bryophytes in crevices between stones on a landslip, along with *Baeomyces heteromorphus* Nyl. ex C. Bab. & Mitt., and the collection from Luzon was found in an open area in the cloud forest zone.

Additional specimens examined. **Japan:** *Kyushu*: Kagoshima Pref. (Ohsumi Prov.), Yakushima Island, *c.* 14 km W of Anbo, along the path to the peak Miyanoura-dake, Hananoego marsh 2 km NW of Yodokawa lodge, 30°18.5′N, 130°31′E, 1650 m, on mossy stump, 1994, *G. Thor* 12500 (TNS, UPS; TLC, argopsin; no apothecia).—**Malaysia:** *Borneo*, *Sarawak*: Gunong Mulu National Park, ridge between top of Pantu Ridge and Gunong Tamacu, 1525 m, on soil and bryophytes in crevices between stones on landslip, 1978, *Coppins* 5712 (E).—**Philippines:** *Luzon*: Benguet Prov., Baguio, Mt Santa Tomas, 120°35′E, 16° 18′N, cloud forest, 2200 m, on soil, 1987, *Aptroot* 20305 (hb. Aptroot).

Additional reports of Micarea *species from Japan and South Korea*

The species of *Micarea* so far known from Japan are enumerated, with a small selection of cited specimens. The total number of collections for each species made during G. Thor's visits to Japan from 1994, 1995, 1996, 1997, 2006, 2010, and 2012 and South Korea in 2001 and 2006, are indicated after the name of the country. The examination of collections from Japan has increased the number of *Brianaria* and *Micarea* species known from that country from eight to 19. Eleven species are reported as new to Japan (*M. botryoides* (Nyl.) Coppins, *M. denigrata*, *M. erratica*, *M. hedlundii* Coppins, *M. lithinella* (Nyl.) Hedl., *M. micrococca* and *M. misella*) or new to Asia: *M. byssacea* (Th. Fr.) Czarnota *et al.*, *M. deminuta* Coppins and *M. xanthonica* Coppins &

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Tønsberg (new to Asia, Japan); *M. nitschkeana* (J. Lahm ex Rabenh.) Harm. (new to Asia, South Korea).

Brianaria sylvicola (Flot. ex Körb.) S. Ekman & M. Svensson

Syn.: *Micarea sylvicola* (Flot. ex Körb.) Vězda & Wirth.

Notes. This species has recently been transferred from *Micarea* to the new genus *Brianaria* S. Ekman & M. Svensson in the *Psoraceae* (Ekman & Svensson 2014).

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. Shaded siliceous rocks; 750–1220 m. A widely distributed species in Japan but few findings. First reported from Japan by Inoue & Moon (1998, as *Micarea sylvicola*). Also found in Asia from Turkey (Yildiz *et al.* 2002), eastern Russia (Andreev *et al.* 1996), Mongolia (Schubert & Klement 1977) and Taiwan (Aptroot & Sparrius 2003); elsewhere from Europe, North and South America, and Australia (Tasmania (Kantvilas & Coppins 2019)).

Specimens examined. **Japan** (3)**:** *Izu Islands*: Hachijo-Island, Mt Hachijo-Fuji, 33°08′N, 139°46′E, 840 m, under overhang of rock, 1994, *Thor* (12036) & *Kashiwadani* (TNS, UPS). *Kochi*: Ino-cho town, Teregawa, S slope of Mt Kamegamori, path along the stream Shirai-dani, humid old-growth, mixed deciduous/coniferous forest with e.g. *Abies firma*, *Cryptomeria japonica*, *Quercus* spp. and *Tsuga sieboldii*, 33°45.09–16′N, 133°11.48–54′E, 750–770 m, vertical shaded rock, 2006, *Thor* 21228 (UPS). *Honshu*: Toyama Pref. (Etchu Prov.), 30 km ESE of Toyama, Tateyama-cho, Nakashinkawa-gun, Syomyo-zaka, 600 m W of Shomyo Waterfall, just S of the river, path on the steep slope, mixed deciduous/*Cryptomeria* forest, 36°34′N, 137°31′E, 1160–1220 m, 1994, on shaded rock, *Thor* 12625 (TNS, UPS).

Micarea adnata Coppins

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species on lignum of stumps and logs, and bases of old trees in old-growth forest; 220–1480 m. Previously reported for Asia from Japan (Kashiwadani *et al.* 2011) and Taiwan (Aptroot & Sparrius 2003); elsewhere from Europe (Czarnota 2007), Macaronesia and North America (Fryday & Coppins 2007).

Specimens examined. **Japan** (4)**:** *Kochi*: Ino-cho town, Teregawa, NE slope of Mt Iwaguro-yama, along path from the road, tall, humid, old-growth, mixed deciduous/coniferous forest with e.g. *Abies homolepis*, *Fagus crenata* and *Quercus* spp., 33°45′10″N, 133°09′54″E, 1300 m, 2006, *Thor* 21326 (TNS, UPS). *Honshu*: Wakayama Pref. (Kii Prov.), Mt Koya, the walk from Ichinohashi bridge to the temple Okuno-in, old *Cryptomeria japonica* forest, 34°13′N, 135°35′E, 800 m, on stump in dense forest, 1994, *Thor* 12125 (TNS, UPS); Tochigi Pref. (Shimotsuke Prov.), Nikko National Park, 18.5 km WNW of Nikko, 1 km SSE of the village Yumoto, above Yutaki Falls, dense old-growth mixed coniferous/deciduous forest, 36°48′N, 139°26′E, on a log, 1997, *Thor* 15553b (UPS). *Hokkaido*: Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsular, *c.* 7 km NE of Utoro town, N of the small road to Iwaobetsu hot-spring hotel (Onsen), old-growth lowland forest dominated by *Abies sachalinensis* and *Quercus crispula*, 44.10947°N, 145.08242°E, 220 m, on a stump, 2010, *Thor* 24878 (UPS).

Micarea botryoides (Nyl.) Coppins

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species on bark of old trees (*Abies*, *Betula*, *Picea*) in old-growth humid forest; 600–1640 m. New to Japan, previously reported for Asia from Taiwan (Aptroot & Sparrius 2003); elsewhere from Europe, Macaronesia and North America (Czarnota 2007).

Specimens examined. **Japan** (3)**:** *Honshu*: Tochigi Pref. (Shimotsuke Prov.), Nikko National Park, 19.5 km WNW of Nikko, 2.2 km NNE of the village Yumoto, along trail from Yumoto, N slope just S of Lake Karigome-ko, 36°49′N, 139°26′E, 1640 m, dense old-growth forest dominated by coniferous trees, on *Betula* bark, 1997, *Thor* 15608 (TNS, UPS). *Hokkaido*: Ishikari Prov., Higashikawa-cho, 140 km NE of Sapporo city, W slope of Mt Asahidake, village of Asahidake Onsen, 200–600 m SW of the ropeway station, along the trail 'Kumagera course' from Lodge Nutapukaushipe to the ropeway station, old-growth montane forest, 43°39.0395′N, 142°47.4070′E, 1100 m, on *Picea* sp., 2010, *Thor* 25852 (UPS); Kushiro Prov., Kushiro-shi, 53 km NNW of Kushiro city, Mt O-Akan dake, along the trail from the road at the easternmost end of Lake Akan (elev. 420 m) to the top of the mountain (elev. *c.* 1350 m), old-growth montane forest with e.g. *Abies sachalinensis*, *Acer* spp., *Larix leptolepis*, *Magnolia* sp., *Picea* sp. and *Quercus crispula*, 43°27′N, 144°09′E, 600–1100 m, on *Abies sachalinensis*, 2010, *Thor* 26046 (UPS).

Micarea byssacea (Th. Fr.) Czarnota et al.

Description and illustrations. Czarnota & Guzow-Krzemińska (2009).

Habitat and distribution. Common and widely distributed on bark and lignum of trees, logs and stumps in old-growth or humid forest; 20–2000 m. New to Asia, but most records from Japan of *Micarea prasina* probably belong here (e.g. Thor *et al.* 2005); it might be the most common *Micarea* species in Japan, at least in forests. It was reported as *Micarea* sp. from the Imperial Palace grounds, Tokyo, by Ohmura *et al.* (2014). It is common in Europe and was recently reported as new to North America from coastal Maine (Launis & Myllys 2014) and is considered widespread and common in Tasmania (Kantvilas & Coppins 2019). All specimens examined have Sedifolia-grey pigment (greenish, K+ violet) in the thallus and apothecia, and methoxymicaraeic acid determined by TLC; thus, they do not represent the newly described *Micarea microareolata* Launis *et al.* or *M. laeta* Launis & Myllys in the *M. byssacea* complex (Launis *et al.* 2019*a*, *b*). Recent advances using molecular data for unravelling the complexities of *Micarea prasina* s. lat. (*sensu* Coppins 1983) have been based almost solely on European material. We strongly recommend that such studies should be expanded to other temperate regions of the world, where this group is well represented.

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Selected specimens examined. **Japan** (*c.* 25)**:** *Honshu*: Tokyo-to = Tokyo Metropolis (Musashi Prov.), Tokyo, Shiroganedai, Minato-ku, garden of the Institute for Nature Study, National Science Museum, old-growth evergreen forest, 35°38′N, 139° 43′E, 30 m, on log of deciduous tree, 1999, *Thor* 16609 (TNS, UPS); Aomori Pref. (Mutsu Prov.), Mt Hakkoda, S of Suiren-numa pond, open mixed coniferous/deciduous forest, 40° 37′N, 140°55′E, 900 m, on 2 m high stump, 1994, *Thor* 12000 (TNS, UPS). *Hokkaido*: Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsular, *c.* 7 km NE of Utoro town, N of the small road to Iwaobetsu hot-spring hotel (Onsen), old-growth lowland forest dominated by *Abies sachalinensis* and *Quercus crispula*, 44.1112°N, 145.0850° E, 249 m, on a stump, 2010, *Thor* 25021 (TNS, UPS).

Micarea cf. czarnotae

A collection from South Korea resembles *Micarea byssacea* in apothecial anatomy and pigmentation, and in thallus chemistry (methoxymicareic acid). However, it differs in the thallus being composed of small convex to subglobose areoles, 70–200 µm diam., rather than small, granule-like goniocysts, 12–40 µm diam. It is also similar to *M. meridionalis* van den Boom *et al.* (van den Boom *et al.* 2017) but that species contains micareic acid and has slightly smaller areoles, 40–70 µm diam. The recently described *M. pseudotsugae* van den Boom *et al.* (van den Boom *et al.* 2020) has an areolate thallus containing methoxymicareic acid, but Superba-brown replaces Sedifolia-grey as its apothecial pigment. This South Korean collection should be compared with another recently described species, *M. czarnotae* Launis *et al.* (Launis *et al.* 2019*a*), which has goniocysts that can coalesce to form a warted-areolate thallus and also an identical thallus chemistry. This species is now known to occur in North America (Spribille *et al.* 2020).

Specimen examined. **South Korea** (1)**:** *Pusan*: Songdo-gu, Songdo-Annam Park, path along the coast, open *Quercus dentata*/*Pinus densiflora* forest, 35°02′N, 129°03′E, 0–120 m, on *Pinus densiflora*, 2001, *Thor* 16905 (UPS).

Micarea deminuta Coppins

Descriptions and illustrations. Coppins (1995), Czarnota (2007).

Habitat and distribution. In Japan, mainly on bark, especially of *Cryptomeria japonica*, in old-growth but also managed forests; 750–*c.* 1500 m, widely distributed but scattered. Interestingly, most collections from Europe are on lignum. New to Asia; elsewhere from Europe, North America (California (Fryday & Coppins 2007)) and Australia (Tasmania (Czarnota 2007); New South Wales, on soil (McCarthy & Elix 2020*b*)). A widely distributed species with scattered findings.

Selected specimens examined. **Japan** (10)**:** *Kyushu*: Kagoshima Pref. (Ohsumi Prov.), Yakushima Island, *c.* 14 km W of Anbo, along the path to the peak Miyanoura-dake, from *c.* 500 m E of Yodokawa lodge to Hananoego marsh 2 km NW of Yodokawa lodge, dense forest, 30°18′N, 130°31′E, 1400–1650 m, on bark of *Cryptomeria japonica*, 1994, *Thor* 12486 (TNS, UPS). *Kochi*: Ino-cho town, Teregawa, S slope of Mt Kamegamori, path along the stream Shirai-dani, humid old-growth, mixed deciduous/coniferous forest with e.g. *Abies firma*, *Cryptomeria japonica*, *Quercus* spp. and *Tsuga sieboldii*, 33°45.09–16′N, 133°11.48–54′E, 750–770 m, on coniferous tree, 2006, *Thor* 21250, 21274, 21275 (UPS). *Honshu*: Aomori Pref. (Mutsu Prov.), Mt Hakkoda, around Yachi Hot Spring, dense forest near small stream, 40°38′N, 140°56′E, 750 m, on *Cryptomeria japonica* [bark], 1994, *Thor* 11873a (TNS).

Micarea denigrata (Fr.) Hedl.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare but widespread species on lignum of tree stumps in old-growth forests; 600–*c.* 1640 m. New to Japan. Previously reported for Asia from South Korea (Kondratyuk *et al.* 2013), eastern Russia (Siberia (Konoreva *et al.* 2018)) and Taiwan (Aptroot & Sparrius 2003); elsewhere from Europe, North America and Australia (Czarnota 2007).

Specimens examined. **Japan** (2)**:** *Honshu*: Tochigi Pref. (Shimotsuke Prov.), 19.5 km WNW of Nikko, 2.2 km NNE of the village Yumoto, along trail from Yumoto, *c.* 100 m S of the small lake Karigomeko, north slope with old-growth, dense forest dominated by coniferous trees, 36°49′N, 139°26′E, 1640 m, on lignum of old, large *Tsuga diversifolia* stump, 1996, *Thor* 15062 (UPS; TLC, nil). *Hokkaido*: Kushiro Prov., Kushiro-shi, 53 km NNW of Kushiro city, Mt O-Akan dake, along the trail from the road at the easternmost end of Lake Akan to the top of the mountain, old-growth montane forest, 43°27′N, 144°09′E, 600–1100 m, on stump, 2010, *Thor* 26033 (TNS, UPS; TLC, nil).

Micarea erratica (Körb.) Hertel et al.

Syn.: *Leimonis erratica* (Körb.) R. C. Harris & Lendemer.

Syn. nov.: *Micarea coreana* L. Lőkös *et al.* Described and reported from South Korea (Kondratyuk *et al.* 2013). In the protologue it was compared only with *M. farinosa* Coppins, with which it bears no resemblance. In our opinion it is undoubtedly *M. erratica*.

Descriptions and illustrations. Czarnota (2007), Kondratyuk *et al.* (2013).

Habitat and distribution. A rare but widespread species on siliceous stones; 1080–2205 m. New to Japan. Previously reported for Asia from Indonesia (Java (Hertel 1977)) and South Korea (Kondratyuk *et al.* 2013, as *M. coreana*); elsewhere from Europe, North America, Australasia (Czarnota 2007; Kantvilas & Coppins 2019) and Réunion (Brand *et al.* 2014).

Specimens examined. **Japan** (2)**:** *Honshu*: Yamanashi Pref. (Kai Prov.), Yamanashi-city, Makioka-cho, at the road to Odarumi Pass, roadside with grass and scattered stones, 35°51.726′N, 138°39.624′E, 2205 m, on stone, 2012, *Thor* 28153 (TNS, UPS). *Hokkaido*: Ishikari Prov., Higashikawa-cho, 140 km NE of Sapporo, W slope of Mt Asahidake, village of Asahidake Onsen, 600 m SW of the ropeway station, at Lodge Nutapukaushipe, 43°38.5582′N, 142°47.3782′E, 1080 m, on stone in wall at the lodge, 2010, *Thor* 25831 (UPS).

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Micarea globulosella (Nyl.) Coppins

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. Not found during the recent field visits and known from Japan only from the type collection (Yokohama, on bark, 1879, *E. Almquist* (S, H-NYL)). It occurs elsewhere in Europe and North America but is rarely collected, except in old-growth coniferous forests in northern Sweden.

Micarea hedlundii Coppins

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species found once on the base of an old coniferous tree in old-growth forest; 750–770 m. New to Japan; elsewhere from shaded habitats in old-growth woodlands in wet forests or valley woodlands of Europe (including Russia, Komi Republic (Hermansson *et al.* 1998)), Macaronesia, Asia (eastern Siberia (Konoreva *et al.* 2018)), North America (New Brunswick (Gowan & Brodo 1988); California (Fryday & Coppins 2007); Maine, Michigan, Québec (Launis & Myllys 2014)), South America (Chile, specimens cited below), Central Africa (Rwanda (Czarnota 2007)) and Réunion (Brand *et al.* 2014). We also report a new locality in the near-coastal region of the Russian Far East.

Specimens examined. **Japan** (1)**:** *Kochi*: Ino-cho town, Teregawa, S slope of Mt Kamegamori, path along the stream Shirai-dani, 33° 45.09–16′N, 133°11.48–54′E, 750–770 m, humid old-growth, mixed deciduous/coniferous forest with e.g. *Abies firma*, *Cryptomeria japonica*, *Quercus* spp. and *Tsuga sieboldii*, in hollow at base of coniferous tree, 2006, *Thor* 21503 (UPS).—**Russia:** *Khabarovskiy Krai*: Komsomolsk-De Kastri route, Khomi Mountains, *c.* 20 air km E of Chernyy Mys, hills on N bank of the Salasu River, mixed coniferous/broad-leaved mature forest, 51°05.896′N, 138°46.303′E, 316 m, on rotten wood, 2009, *Spribille* (30498), *Yakovchenko, Printzen, Kanz* & *Malashkina* (GZU).—**Chile:** *Region X*: Rio Enco, between Choshuenco and Enco, 39°54′S, 72°9′W, 400 m, on underside of a fallen charred trunk, 1986, *B. J. Coppins, D. J. Galloway, G. Guzman* & *P. W. James* 6042 (E); *ibid*., in hollowed trunk of *Nothofagus dombeyi*, *B. J. Coppins* et al. 6043 (E).

Micarea inopinula (Nyl.) Coppins & T. Sprib. comb. nov.

MycoBank No.: MB 836556

Lecidea inopinula Nyl., *Lich. Jap.*, 71 (1890).—*Catillaria inopinula* (Nyl.) Zahlbr., *Cat. Lich. Univ.* **4**, 18 [as '*inopulina*'] (1926); type: Japan, Fuji, Itjigome [Itchigômé], 'super truncos putrescentes inter Jungermannias', 1879, *E. Almquist* (H-NYL 13003 = H9507484—lectotype, selected here, MBT 394864, material also in S).

Biatorina prasinella Jatta, *Bull. Soc. Bot. Ital.* **1911**, 257 (1911).—*Micarea prasinella* (Jatta) I. M. Lamb, *Lilloa* **26**, 413 (1953); type: Tasmania, [West Coast Range, near Macquarie Harbour], Dubbilbarril, Mt Lyell railway, on Jungermanniaceous hepatic on bark, 1899, *W. A. Weymouth* 977 (FI—holotype; BM—isotype!).

Lecidea inopinula, described by Nylander (1890) from Mt Fuji, is an earlier name for the cephalodiate taxon widely known as *Micarea prasinella*, but it was overlooked in previous work on *Micarea* because the name has been maintained in *Catillaria* until now (Ohmura & Kashiwadani 2018). A locality for this species in Japan extends the range of this charismatic, temperate rainforest species from Australasia (Tasmania (Lamb 1953); New Zealand (Kantvilas & Coppins 2019)), North America (Alaska (Spribille *et al.* 2010, 2020); Oregon (Andersen & Ekman 2005), as 'U.S.A.', GenBank voucher AY567745)), South America (Chile (Kantvilas & Coppins 2019)) and Europe (Scotland (Coppins 2008)). It was not discovered during the recent visits to Japan by G. Thor, so a diligent search of the forested slopes of Mt Fuji is required to see if it is extant in Japan; likewise for *M. globulosella*, also described from there.

Micarea inquinans (Tul.) Coppins

This lichenicolous species was reported as new to Japan by Zhurbenko *et al.* (2015) from one single locality in Yamanashi Prefecture. One additional nearby locality from Nagano Prefecture is included here. Both findings are on the terricolous lichen *Dibaeis arcuata* (Stirt.) Kalb & Gierl in alpine regions.

Specimens examined. **Japan** (2)**:** *Honshu*: Nagano Pref. (Shinano Prov.), Ueda-city, along the trail from Sugadaira Pastureland to Mt Neko-dake, stone field below the top, 36°32.721′N, 138° 23.758′E, 2150 m, on exposed soil, 2012, *Thor* 28250 (TNS, UPS); Yamanashi Pref. (Kai Prov.), Kofu-city, along the trail between Odarumi Pass and Mt Kinpu, 35°52.194′N, 138° 37.885′E, 2570 m, on soil, 2012, *Thor* 27977 (UPS).

Micarea lignaria (Ach.) Hedl. var. lignaria

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species found only at one locality in South Korea. First reported from South Korea by Aptroot & Moon (2015). Widely distributed, in Asia, Europe, Macaronesia, North and South America (specimen from Chile cited below), Australasia (Papua New Guinea (Aptroot *et al.* 1997)), Réunion (Brand *et al.* 2014) and the Subantarctic (South Shetland Islands (Czarnota 2007)).

Specimens examined. **South Korea** (2)**:** *Cheju Island*: the rim surrounding the crater of Mt Halla, 33°22′N, 126°33′E, 1850–1950 m, on mossy rock, 2001, *Thor* 17070, 17129 (UPS); *ibid*., on soil/plant debris on dead *Abies koreana*, *Thor* 17038 (UPS).—**Chile:** *Region X*: Parque Nacional Vicente Pérez Rosales, Petrohue, Rio Petrohue near falls, 41°8′S, 72°27′W, 500 m, amongst mosses on wet rocks with *Toninia thiopsora*, 1986, *B. J. Coppins* et al. 6074 (E).

Micarea lithinella (Nyl.) Hedl.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species on siliceous stones, boulders and semi-exposed rocks found at three nearby localities on Hokkaido; 395–650 m. New to Japan; previously reported for Asia from China (Yunnan (Czarnota 2007)) and Taiwan (Aptroot & Sparrius 2003); elsewhere from Europe and North America (Czarnota 2007).

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Selected specimens examined. **Japan** (3)**:** *Hokkaido*: Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsular, *c.* 10 km NE of Utoro town, along the trail from Iwaobetsu hot-spring hotel (Onsen) to Mt Rausu-dake, old-growth montane forest, 44°10′N, 145°09′E, 395 m, on a boulder, 2010, *Thor* 23690 (TNS, UPS); *ibid*., 44°06.243′N, 145°05.716′E, 400 m, on stones, 2010, *Thor* 24536 (TNS, UPS); *ibid*., 44°10′N, 145°10′E, 650 m, on rock, 2010, *Thor* 24804 (UPS).

Micarea melaena (Nyl.) Hedl.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A common species on bark and lignum of trees and stumps, especially conifers, in old-growth and managed forests; 620–1280 m. Widely distributed, in Asia, Europe, Macaronesia, North America, South America (Falkland Islands (Calvelo & Fryday 2006)), Australasia (Tasmania (Kantvilas & Coppins 2019)) and the Subantarctic (South Shetland Islands (Czarnota 2007)).

Selected specimens examined. **Japan** (14)**:** *Kyushu*: Kagoshima Pref. (Ohsumi Prov.), Yakushima Island, 5 km S of Miyanoura, Shirotani-Unsuikyo Gorge, Kami-Yaku-cho, 30°22.5′N, 130° 34′E, 640–700 m, on old *Cryptomeria japonica* [bark], 1994, *Thor* 12335, 12464 (TNS, UPS). *Kochi*: Ino-cho town, Teregawa, S slope of Mt Kamegamori, path along the stream Shirai-dani, humid old-growth, mixed deciduous/coniferous forest, 33° 45.09–16′N, 133°11.48–54′E, 750–770 m, on moss on deciduous tree, 2006, *Thor* 21240 (UPS). *Honshu*: Yamanashi Pref. (Kai Prov.), Minamikoma-gun, Hayakawa-cho, 25 km W of Kofu town, along the small dirt road from the starting point 1 km S of the village Narada (and 100 m S of the dam) and *c.* 1.5 km towards SW until the road finish, deciduous forest with scattered, young, planted *Cryptomeria japonica* stands, on lignum of stump, 35°34′N, 138°18′E, 800–900 m, 1999, *Thor* 16493 (UPS). *Hokkaido*: Ishikari Prov., Kamikawa-gun, Kamikawa-cho, 200–400 m E of Obako Gorge tourist centre, at S shore of Niseicharomappu-gawa stream, mixed *Abies sachalinensis*/deciduous forest, 43°42′N, 143°01′E, on *Picea jezoensis* stump [lignum], 1994, *Thor* 14647 (TNS, UPS).

Micarea micrococca (Körb.) Gams ex Coppins

Description and illustrations. Czarnota & Guzow-Krzemińska (2009).

Habitat and distribution. A rare species on bark and lignum of trees, logs and stumps in old-growth or humid forest on Hokkaido; 220–1200 m. Reported as new to South Korea by Aptroot & Moon (2015). New to Japan. Its distribution outside Europe is uncertain following the recent revision of the *Micarea prasina* group (Czarnota & Guzow-Krzemińska 2009; Guzow-Krzemińska *et al.* 2019; Launis *et al.* 2019*a*, *b*), although it has since been reported from Alaska (Spribille *et al.* 2020). The *M. micrococca* complex is recognized by having apothecia up to 0.4 mm wide, rarely adnate, cream-white or greyish and by containing methoxymicareic acid. All Japanese collections have whitish, K− (lacking the Sedifolia-grey pigment) apothecia and spores 3–4.5 µm wide, and thus do not belong to the recently recognized *M. czarnotae* Launis *et al.* or *M. pseudomicrococca* Launis & Myllys (Launis *et al.* 2019*a*, *b*).

Specimens examined. **Japan** (3)**:** *Hokkaido*: Kushiro Prov., Kushiro-shi, 53 km NNW of Kushiro city, Mt O-Akan dake, along the trail from the road at the easternmost end of Lake Akan to the top of the mountain, old-growth montane forest with e.g. *Abies sachalinensis*, *Acer* sp., *Larix leptolepis*, *Magnolia* sp., *Picea* sp. and *Quercus crispula*, 43°27′N, 144°09′E, 600–1100 m, on log, 2010, *Thor* 26038 (UPS); Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsular, *c.* 10 km NE of Utoro town, along the trail from Iwaobetsu hot-spring hotel (Onsen) to Mt Rausu-dake, old-growth subalpine forest dominated by *Betula ermannii*, 44.08942°N, 145.11675°E, 1021 m, on bark of *Betula ermannii*, 2010, *Thor* 24505 (UPS); *ibid*., *c.* 7 km NE of Utoro town, along the trail from Iwaobetsu hot-spring hotel (Onsen) to Mt Rausu-dake, old-growth lowland forest dominated by *Abies sachalinensis* and *Quercus crispula*, 44.10947°N, 145.08242°E, 220 m, on stump, 2010, *Thor* 24879 (UPS).

Micarea misella (Nyl.) Hedl.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. A rare species on lignum of logs and stumps, and also on bark of horizontal trunk of *Betula ermannii*; *c.* 900–1030 m. New to Japan. Previously reported in Asia from eastern Russia (Konoreva *et al.* 2018), Bhutan (Aptroot & Feijen 2002), Taiwan (Aptroot & Sparrius 2003) and South Korea (Aptroot & Moon 2015); elsewhere from Europe and North and South America (Czarnota 2007).

Specimens examined. **Japan** (3)**:** *Honshu*: Ibaraki Pref. (Hitachi Prov.), Hirosawa, 11.5 km N of Tsukuba-city, S slope of Mt Tsukuba, 36°11′N, 140°06′E, on log at roadside, 1994, *Thor* 11735 (UPS, apothecia and pycnidia); Aomori Pref. (Mutsu Prov.), S of Suiren-numa pond, Mt Hakkoda, 40°37′N, 140° 55′E, 900 m, on a *c.* 2 m high stump [lignum] in open mixed coniferous/deciduous forest, 1994, *Thor* 11999 (TNS, UPS, apothecia and pycnidia). *Hokkaido*: Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsular, *c.* 10 km NE of Utoro town, along the trail from Iwaobetsu hot-spring hotel (Onsen) to Mt Rausu-dake, old-growth subalpine forest dominated by *Betula ermannii*, 44.08905°N, 145.11694°E, 1032 m, on *Betula ermannii*, 2010, *Thor* 24678 (UPS, pycnidia only).—**South Korea** (1)**:** *Cheju Island*: Namceju-gun, Namwon-up, along the Songpanak trail on the E slope of Mt Halla, above the Azalea field shelter, *Abies koreana* forest with scattered deciduous trees, 33°31′N, 126°32′E, 1500–1700 m, on snag, 2001, *Thor* 17500 (UPS, pycnidia only).

Micarea nitschkeana (J. Lahm ex Rabenh.) Harm.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. Rare, only observed once on a snag. New to Asia; elsewhere from Europe and North America (California (Fryday & Coppins 2007)). The report from Australia (Tasmania (Czarnota 2007)) is based on a

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misidentification of *M. denigrata* (G. Kantvilas, personal communication). A recent report of the species as new to Asia was corrected in a subsequent publication (Konoreva *et al.* 2018).

Specimen examined. **South Korea** (1)**:** *Gangwon Prov.*: Yangyang-gun, Ser-myun, Osaeck-ri, the southern part of the massif Sorak Mts, Sorak-san National Park, S slope of Mt Dachong, along the trail from the shelter *c.* 500 m WNW of the top of Mt Dachong to the village at Hangyeryong Pass, *c.* 1–3 km SW of the shelter, open mixed coniferous/deciduous forest and siliceous rocky outcrops, 38°07.06–10′N, 128°27.25–26′E, 1400–1600 m, on snag of *Abies koreana*, 2006, *Thor* 20430 (UPS).

Micarea peliocarpa (Anzi) Coppins & R. Sant.

Descriptions and illustrations. Coppins (1983), Czarnota (2007).

Habitat and distribution. Widely occurring and common on bark and lignum of old trees, especially conifers and *Betula*, stumps and logs, and shaded siliceous rocks, also on plant remains in more open situations; 10–1650 m. Widely distributed, in South Korea and Japan (Kondratyuk *et al.* 2013; Ohmura & Kashiwadani 2018), though not yet found in eastern Siberia (Konoreva *et al.* 2018), Europe, Macaronesia, North, Central and South America, Africa (Madagascar (Aptroot 1990)), Réunion (Brand *et al.* 2014) and Australasia (Czarnota 2007; Kantvilas & Coppins 2019).

Selected specimens examined. **Japan** (27)**:** *Kyushu*: Kagoshima Pref. (Ohsumi Prov.), Yakushima Island, 7.5 km W of Anbo, Yakusugi-land, Yaku-cho, dense forest, 30°18′N, 130°34′E, 950–1100 m, on shaded mossy rock, 1994, *Thor* 12387 (TNS, UPS). *Kochi*: Ino-cho town, Teregawa, NE slope of Mt Iwaguro-yama, along path from the road, tall, humid, old-growth, mixed deciduous/coniferous forest with e.g. *Abies homolepis*, *Fagus crenata* and *Quercus* spp., 33°45.10′N, 133°09.54′E, 1300 m, on log, 1996, *Thor* 21308 (TNS, UPS); *ibid.*, on base of coniferous tree, *Thor* 21314 (TNS, UPS). *Honshu*: Okayama Pref. (Kii Prov.), Maniwa-gun, Kawakamimura, shrine 2 km SW of Gohara, 35°15′N, 133°38′E, 590 m, on *Pinus* bark, 1994, *Thor* 12230, 12232 (TNS, UPS). *Hokkaido*: Kitami Prov., Rishiri-to Island, Rishiri-gun, Rishirifuji-cho, along the trail from Rishiri-hokuroku campsite 2.5 km S of Sakae town to Himenuma Pond, old-growth lowland forest dominated by *Abies sachalinensis* and *Quercus crispula*, 45°13′N, 141°14′E, 140–360 m, on *Betula* bark, 1995, *Thor* 13819 (TNS, UPS).—**South Korea** (2)**:** *Cheju Island*: Namcheju-gun, Namwon-up, along the Songpanak Trail on the E slope of Mt Halla, above the Azalea field shelter, *Abies koreana* forest with scattered deciduous trees, 33°21′N, 126°32′E, 1500–1700 m, on lignum of living *Abies koreana*, 2001, *Thor* 17563 (UPS).

Micarea prasina Fr.

The presence of *Micarea prasina* s. str. from Japan needs to be confirmed. No collection was found in this study.

Micarea synotheoides (Nyl.) Coppins

Type citations, descriptions and illustrations. Coppins (1983: fig. 31D, ascospores from lectotype), Czarnota (2007).

Notes. This species was originally collected by Almquist in 1879 from Itjgome [on slopes of Mt Fuji] and described twice by Nylander, as *Lecidea synotheoides* Nyl. (Nylander 1890) and as *L. longella* Nyl. (Nylander 1900). None of Almquist's collections under either name have mesoconidia-containing pycnidia, but fortunately most of the 26 recent collections from Japan have such pycnidia in abundance, and indeed the species was often encountered as 'sterile' with numerous sessile to short-stalked pycnidia (Czarnota 2007: fig. 56A) and no apothecia. This answers the problem discussed by Czarnota (2007) regarding the possibility that two distinct species may be included in the concept of *M. synotheoides* as adopted by Coppins (1983). The result is that the material from westernmost Europe (and probably some from north-western America) requires a new name; it is introduced below as *M. longispora*. *Micarea synotheoides* has recently been recorded from Australia (New South Wales (McCarthy & Elix 2020*b*)). The specimen concerned lacked both mesoconidia and microconidia, although it did have macroconidia-containing pycnidia which have not been previously documented for either *M. longispora* or *M. synotheoides*.

Habitat and distribution. On bark of a variety of trees and shrubs, including *Abies*, *Alnus*, *Betula*, *Picea* and *Sorbus*, in old-growth and subalpine forest; *c.* 220–2000 m. A northern species mainly occurring on Hokkaido, rarely on Honshu and only at high altitudes.

Selected specimens examined. **Japan** (26)**:** [Cited specimens all with both apothecia and mesopycnidia] *Honshu*: Toyama Pref. (Etchu Prov.), 33 km ESE of Toyama, Tateyama-cho, Nakasinkawa-gun, Midagahara, along the path to Tateyama crater 500 m SSE of Midagahara bus stop, subalpine, open mixed deciduous/*Abies mariesii* forest, 36°34′N, 137°34′E, 1960–2000 m, on shaded *Abies mariesii*, 1994, *Thor* 12674 (TNS, UPS). *Hokkaido*: Ishikari Prov., Higashikawa-cho, 140 km NE of Sapporo, W slope of Mt Asahidake, village of Asahidake Onsen, 200–600 m SW of the ropeway station, along the trail 'Kumagera course' from Lodge Nutapukaushipe to the ropeway station, old-growth montane forest with e.g. *Abies sachalinensis*, *Acer* spp., *Alnus* sp. and *Picea* sp., 43°39.0395′N, 142°47.4070′E, 1100 m, on *Picea*, 2010, *Thor* 25863 (TNS, UPS); Kitami Prov., Shari-gun, Shari-cho, Shiretoko National Park, NW slope of Shiretoko Peninsula, *c.* 10 km NE of Utoro town, along the trail from Iwaobetsu hot-spring hotel (Onsen) to Mt Rausu-dake, old-growth subalpine forest dominated by *Betula ermannii*, 44.09406° N, 145.10672°E, 811 m, on *Sorbus commixta*, 2010, *Thor* 24324 (TNS, UPS); *ibid.*, 44.08376°N, 145.12332°E, 1220 m, on *Alnus maximowiczii*, 2010, *Thor* 25447 (TNS, UPS).

Micarea xanthonica Coppins & Tønsberg

Description and illustrations. Coppins & Tønsberg (2001).

Habitat and distribution. A rare species found once on bark in humid forest. New to Asia; elsewhere from oceanic Western Europe and western North America. When described, *Micarea xanthonica* was shown to belong to a list of species that apparently have a Western European (including Macaronesia for some species) and north-western North American disjunct distribution (Coppins & Tønsberg 2001). The lichen flora in many parts of NW Asia is still insufficiently studied and more species known

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currently to have a European and North American distribution are certain to be found in Asia (and maybe elsewhere as well).

Specimen examined. **Japan** (1)**:** *Kochi*: Tsuno-mura village, Mt Tongu-kogen, path along ridge, humid, open, mixed deciduous/coniferous forest with e.g. *Abies homolepis*, *Quercus* spp. and *Weigela decora*, 33°28.38–50′N, 133°00.20–55′E, 1360–1485 m, on tree, 2006, *Thor* 21467 (UPS, no apothecia).

Additional new species

Micarea longispora Coppins sp. nov.

MycoBank No.: MB 836555

Similar to *M. synotheoides* but with longer ascospores (14–35(–43) vs 14–26 µm), 1–7(–11)-septate, immersed pycnidia and longer mesoconidia (4.5–6 vs 3.5–5 µm).

Type: Scotland, Argyll (V.C. 98), Loch Fyne, 8 km E of Inverary, Ardkinglass, 27(NN)/17.10 [56°14′50.24″N, 4°57′13.95″W], elev. 30 m, on *Quercus* bole, 18 November 1977, *B. J. Coppins* 4035 (E—holotype; UPS—isotype).

Notes. *Micarea longispora* differs from *M. synotheoides* in having somewhat longer ascospores, often with more septa, immersed mesoconidia-containing pycnidia, and longer mesoconidia, 4.5–6 × 1.2–1.5 µm. For a full English description see Coppins (1983: 188–189, figs 31E, 43D & E) and for a habit photograph see Czarnota (2007: fig. 56B).

As previously discussed by Czarnota (2007), the material of *Micarea synotheoides* s. lat. from strongly oceanic areas (e.g. western Scotland and Norway) differs from the type and other material from Japan in having longer ascospores that are often more than 3-septate. Material from Central Europe (Czech Republic, Poland and Ukraine) has shorter ascospores, as in the Japanese collections, and additionally has sessile to short-stalked, mesoconidia-containing pycnidia, with shorter conidia. As the 19th century type material of *M. synotheoides* does not have any mesoconidia-containing pycnidia, it was not possible to assign either the Western or Eastern European material to *M. synotheoides* s. str. However, such pycnidia are amply present in the recently collected material from Japan, so it is now possible to identify the Central European material as *M. synotheoides* s. str.

Habitat and distribution. The species is usually corticolous though often overgrowing bryophytes, in mainly old-growth woodlands, on 'acid-barked' coniferous and deciduous trees and shrubs. It is very occasionally found on the lignum of rotting tree trunks. The species occurs in oceanic areas of Europe from Norway, the western British Isles, north Spain and Macaronesia, and probably equivalent areas along the Pacific coast from Washington to British Columbia, but material named as '*M. synotheoides*' from North America requires critical examination to confirm this.

Selected additional specimens examined. **Great Britain:** *England*: **V.C. 3,** South Devon, Dartmoor National Park, Cornwood, Dendles Wood NNR, 20(SX)/61.61, 1991, *Coppins* [13869] & *O'Dare* (E).—**Ireland: V.C. H35,** *West Donegal*: Glenveagh National Park, woodland on SE shore of Lough Veagh, C/00.19, *c.* 60 m, on *Betula*, 1991, *Coppins* [14694] & *H. Fox* (E); *ibid.*, on *Pinus*, *Coppins* 14709 (E).—**Spain:** *Tenerife*: Aquamansa, near Los Organos, 1100 m, on *Erica arborea*, 1978, *Topham* s. n. (E).

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We are delighted to be able to offer this paper in celebration of Peter Crittenden's 70th birthday and in recognition of his many contributions to lichenology, in particular his dedicated stewardship of *The Lichenologist*.

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