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The genus *Fuscidea* (*Fuscideaceae*, lichenized Ascomycota) in North America

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Abstract: The species of the genus *Fuscidea* occurring in North America are revised. Two new species, *Fuscidea appalachensis* Fryday and *F. texana* Fryday, are described from eastern North America and southern Texas, respectively. Three new combinations are also made in *Fuscidea*: *Lecidea aleutica* Degel. is shown to be a distinct species and not a synonym of *Fuscidea lowensis* (H. Magn.) R. Anderson & Hertel as previously suggested and is here recognized as *F. aleutica* (Degel.) Fryday; non-sorediate, apotheciate specimens from eastern North America previously referred to *F. recensa* (Stirt.) Hertel, V. Wirth & Vězda are recognized as *Fuscidea recensa* var. *arcuatula* (Arnold) Fryday; and *Fuscidea scrupulosa* (Eckf.) Fryday is shown to be the correct name for *Fuscidea subreagens* (H. Magn.) Oberholl. & V. Wirth. *Fuscidea subfilamentosa* (Zahlbr.) Brako is shown to be a member of the *Lecidea hypnorum* group and the new combination *Lecidea subfilamentosa* (Zahlbr.) Fryday is made, and *Lecidea gyrodes* H. Magn., described from Tennessee, is shown to be a synonym of *F. recensa* var. *arcuatula*. *Fuscidea cyathoides* (Ach.) V. Wirth & Vězda, *F. kochiana* (Hepp) V. Wirth & Vězda and *F. lightfootii* (Sm.) Coppins & P. James are considered not to have been correctly reported from North America.

Key words: Appalachian-Great Lakes distribution, *Lecidea hypnorum* group, lichens, new combinations, new species

Introduction

The genus *Fuscidea* V. Wirth & Vězda (1972) was erected for the well-defined *Lecidea rivulosa* group, which had previously been monographed by Magnusson (1925). The genus is characterized by having *Teloschistes*-type asci, simple (rarely 1–septate), hyaline ascospores that sometimes become brown on maturity, and having only brown (fuscous) apothecial pigments. The identity of this pigment is unclear. It agrees with Leptoclinoides-brown (Meyer & Printzen 2000) in that it becomes dull brown with a slight olivaceous tint in 10% KOH, whereas it is unchanged in 10% HCl, but becomes orange-brown in 50% HNO_3. However, the pigment does not dissolve in KOH, although a brown solution is sometimes obtained suggesting that the pigment is at least partially dissolved. *Fuscidea* is further characterized by having a photobiont that divides by binary fission (B. J. Coppins pers. comm.), resulting in a distinctive arrangement of cells in groups of 2, 4 or 8 (Kantvilas & McCarthy 2003; fig. 3F). Although this type of photobiont also occurs in some other genera of lichenized fungi, especially in the *Trapeliaceae* Hertel (Lumbsch *et al.* 2007; e.g., *Trapelia* M. Choisy and *Trapeliopsis* Hertel & Gotth. Schneid.) it is a useful character for confirming the placement in the genus of specimens without apothecia.

Galloway (2007) has suggested that *Finerania* C. W. Dodge (Dodge 1970), described from New Zealand, is an earlier name for *Fuscidea*. If so, then a case will have to be made for the conservation of *Fuscidea*, which was described after *Finerania*. However, *Fuscidea* has been widely used since its description, whereas *Finerania* has never subsequently been noted by any

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lichenologist since Dodge's original description. Dodge's description is also factually inaccurate as he refers to the photobiont as being *Trentepohlia*.

Traditionally, *Fuscidea* has, with some reservations, been included in the *Teloschistales* D. Hawksw. & O. E. Erikss., but molecular work has suggested that its true affinity lies elsewhere (Lutzoni *et al.* 2004; Reeb *et al.* 2004; Wedin *et al.* 2005), and recent work (Bylin *et al.* 2007; Miądlikowska *et al.* 2006) has shown that it should be included in the *Umbilicariales* J. C. Wei & Q. M. Zhou (Miądlikowska *et al.* 2006; Zhou & Wei 2007), along with other genera of the *Fuscideaceae* Hafellner (e.g., *Maronea* A. Massal., *Orphniospora* Körb., and *Ropalospora* A. Massal.), the *Umbilicariaceae* Chevall. (i.e., *Umbilicaria* Hoffm. and *Lasallia* Mérat), the *Ophioparmaceae* R. W. Rogers & Hafellner *sensu* Wedin *et al.* (2005) (i.e., *Hypocenomyce* M. Choisy, *Ophioparma* Norman and *Boreoplaca* Timdal) and the *Elixiaceae* Lumbsch (i.e., *Elixia* Lumbsch).

The distribution of the genus is interesting in that, although it occurs on all seven continents, the non-sorediate species, at least, often exhibit a high degree of endemism, rarely being reported from more than one region. For example, the common European species *F. cyathoides* (Ach.) V. Wirth & Vězda, *F. kochiana* (Hepp) V. Wirth & Vězda, and *F. lygaea* (Ach.) V. Wirth & Vězda have not been reliably reported from North America [although *F. cyathoides* was reported from Japan by Inoue (1981*a*)], whereas other European taxa have been reported only from the Pacific Northwest [i.e., *F. intercincta* (Nyl.) Poelt, and *F. mollis* (Wahlenb.) V. Wirth & Vězda]. Interestingly, this is largely in line with other genera of the *Umbilicariales*, in which European taxa are largely absent from boreal eastern North America. However, other genera in the *Fuscideaceae* (e.g., *Ropalospora*, *Orphniospora*) do occur in eastern North America and, as North American records of European species of *Umbilicaria* are mainly from northern regions, and *Fuscidea* collections from northern Canada are infrequent, it may be that these species occur there.

Fuscidea has been revised in Japan by Inoue (1981*a*), who also carried out a 'preliminary revision' of the extra-Japanese species (Inoue 1981*b*), in Europe by Oberhollenzer & Wirth (1984, 1985, 1990) and the sorediate, corticolous species by Tønsberg (1992), and in Tasmania and Australia by Kantvilas (2001, 2004). In addition, Hertel (1974) and Kalb (1986) transferred species from Colombia and Venezuela, and Brazil respectively, to the genus, and Breusse (1989) described a new species from South Africa. In North America, Brako (1991) transferred one corticolous species to the genus (*F. subfilamentosa* (Zahlbr.) Brako; but see below), Tønsberg (1993) reported two recently described sorediate, corticolous species (*F. arboricola* Coppins & Tønsberg and *F. pusilla* Tønsberg) from the continent, Brodo & Wirth (1994) revised the species ocurring on the Queen Charlotte Islands and described a new species (*F. thomsonii* Brodo & V. Wirth), and Ekman (1993) provided some useful anatomical information in his study of the closely related *Ropalospora chlorantha* (Tuck.) S. Ekman. Otherwise, the genus has been largely unstudied on the American continent.

In the course of field work on Katahdin, Maine (Dibble *et al.* unpublished, A. L. Hinds *et al.* unpublished, Fryday 2006), the author made numerous collections referable to the genus *Fuscidea*. While attempting to identify and determine the correct names for these collections, it became evident that there were a number of nomenclatural and taxonomic problems attached to the genus in the region. This paper is an attempt to rectify some of these problems.

Materials and Methods

Collections from the following herbaria were studied: ABL, ASU, BG, CANL, DUKE, E, F, FH, H, MICH, MIN, NY, QFA, S, PH, US, UPS, W and WIS along with material from the private herbaria of D. Flenniken (Wooster, OH), J. Gagnon (Quebec), E. Lay (Boston), J. Lendemer (Philadelphia), G. Perlmutter (Chapel Hill, NC), and G. Thor (Uppsala). Additional distribution data was obtained from BG (*F. arboricola* and *F. pusilla*) and NY (*F. arboricola*).

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Apothecial characteristics were examined by light microscopy on hand-cut sections mounted in water or 10% KOH (K). The ascus structure was studied in 0·15% aqueous IKI, both without prior treatment and after pretreatment with 10% KOH. All ascospore measurements were made in 10% KOH. TLC follows the methods of Culberson & Kristinsson (1970).

Additional comparative material examined: Fuscidea cacuminum (Vain.) M. Inoue. **Finland:** *Hogland*: on rock, *Brenner* (H-Nyl—holotype).

Fuscidea circumflexa (Nyl.) V. Wirth & Vězda. **Russia:** *Siberia*: Fretum Beringii, Lawrence Bay, 1879, E. Almqvist (H-Nyl—lectotype, S—isolectotype).

Fuscidea fulva (Malme) Kalb.—**Brazil:** *Minas Gerais*: Serra do Espinhaço, Sierra do Caraça, österlich des Klosters Caraça, in einem Cerrado, 1380 m., 8 7 1978, *K. Kalb & G. Plöbst* (MIN—*Lichens Neotropici Exsiccati* #369).

Fuscidea impolita (Müll. Arg.) Hertel.—**Falkland Islands:** *East Falklands*: Stanley, outcrops along Goat Ridge, UTM: 21F VC 2971, 600 ft, 1968, *Imshaug* (41517) *& Harris* (MSC).—**New Zealand:** *Campbell Island*: Rock outcrops and feldmark on summit of Mt Dumas (500 m), 1970, *Imshaug* 46993 (MSC); *ibid.*, outcrops above Venus Cove on lower slopes of Mt Honey, 1970, *Imshaug* 47093, 47096 (MSC).

Fuscidea ramboldioides Kantvilas.—**Australia:** *Tasmania*: Crandle Mts, Lake St Clair NP, Hounslow Heath, summit knoll, 41°18′S, 145°55′E, 1160 m, on large rock outcrop in alpine heathland, 2002, *G. Kantvilas* 554/02 (HO).

Fuscidea subasbolodes Kantvilas.—**Chile:** *Prov. Magallanes*: Isla Desolacion, Moorland on hill, S side of Caleta San Jose, Bahia Tuesday, on hill, 1969, *Imshaug* (44700, 44722) *& Ohlsson* (MSC).—**Falkland Islands:** *East Falklands*: Stanley, at summit of Mt Kent, cliffs on rock dome, 1968, *Imshaug* (40438, 40467, 40477) *& Harris* (MSC).—**New Zealand:** *Auckland Island*: summit of Cloudy Peak, 1973, *Imshaug* 57561 (MSC).

Fuscidea cf. *umbricolor* (Nyl.) Hertel.—**Brazil:** *Minas Gerais*: Catas Altas, Serra do Caraça, Parque Natural do Caraça, near monastery Santuário do Caraça, 20°06′S, 43°29′W, 1300 m, on sandstone, 1997, *A. Aptroot* 40710 (MSC).

Fuscidea sp. **Dominican Republic:** Summit of Pico Trujillo [Pico Duarte], Cordillera Central (Maciso Central, Sierra de la Pelonia), 10 000 ft, pine woodland, 1958, *Imshaug* 23566 (MSC).

Taxonomy

Fuscidea V. Wirth & Vězda

Mycobank: MB2022.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 91 (1972); type species: *Lecanora austera* Nyl., *Flora* **57:** 309 (1874)=*Fuscidea auster*a (Nyl.) P. James in Hawksworth, James & Coppins, *Lichenologist* **12:** 106 (1980).—*Lecidea contigua* var. *rivulosa* f. *aggregata* Flot., *Flora* **11:** 674 (1882)=*Lecidea aggregata* (Flot.) H. Magn., *Göteborgs Kgl. Vetensk.-och Vetterh.-Handl., ser 4*, **29:** 12 & 20 (1925)=*Fuscidea aggregata* (Flot.) V. Wirth & Vězda, *Beitr. Naturk. Forsch. Südwestdeutschl.* **31:** 92 (1972).

?*Finerania* C. W. Dodge, *Nova Hedwigia* **19:** 459 (1971); type species: *Finerania neozelandica* C. W. Dodge, *Nova Hedwigia* **19:** 459 (1971).

Thallus crustose, grey to brown or greenish, cracked-areolate or areolate, prothallus usually present; *medulla* I− or I+ violet. *Photobiont* chlorococcoid, *Chlorella*-type, cells dividing by binary fission.

Apothecia lecideine, usually sessile or adnate, black or brown, usually with persistent proper margin, 0·1 mm wide in young apothecia 0·05 mm in older ones, thalline margin absent (except in *intercincta* group). *Hymenium* colourless, I−; hamathecium of simple or sparingly branched paraphyses, 1·5–2(–3) µm wide, septate, often moniliform above, apices scarcely enlarged or swollen to 5 µm with a brown cap, lax in K; *epihymenium* brown, 5–20 µm tall. *Hypothecium* colourless. *Exciple* of radiating hyphae, cortical cells with brown pigment, usually paler within but occasionally uniformly brown. *Asci* 8-spored, *Teloschistes*-type; *ascospores* colourless but often becoming brown with age, usually simple but occasionally with a median constriction or septum (1-septate).

Conidiomata pycnidia, often present, immersed in thalline warts or becoming emergent; *conidia* cylindrical or bacilliform.

Chemistry. Divaricatic acid in many species. Also alectorialic, fumarprotocetraric, norstictic and sekikaic acids in some species.

Fuscidea aleutica (Degel.) Fryday comb. nov

Mycobank: MB 511668.

Lecidea aleutica Degel., in *Meddel. Göteborgs Bot. Trädgard* **12:** 111 (1938); type: USA, Alaska, Aleutian Islands, Unalaska Island, 9 v 1932, *E. Hultén* 5319 (UPS—holotype (L74992) 132889!).

(Figs 1A, 2 & 3)

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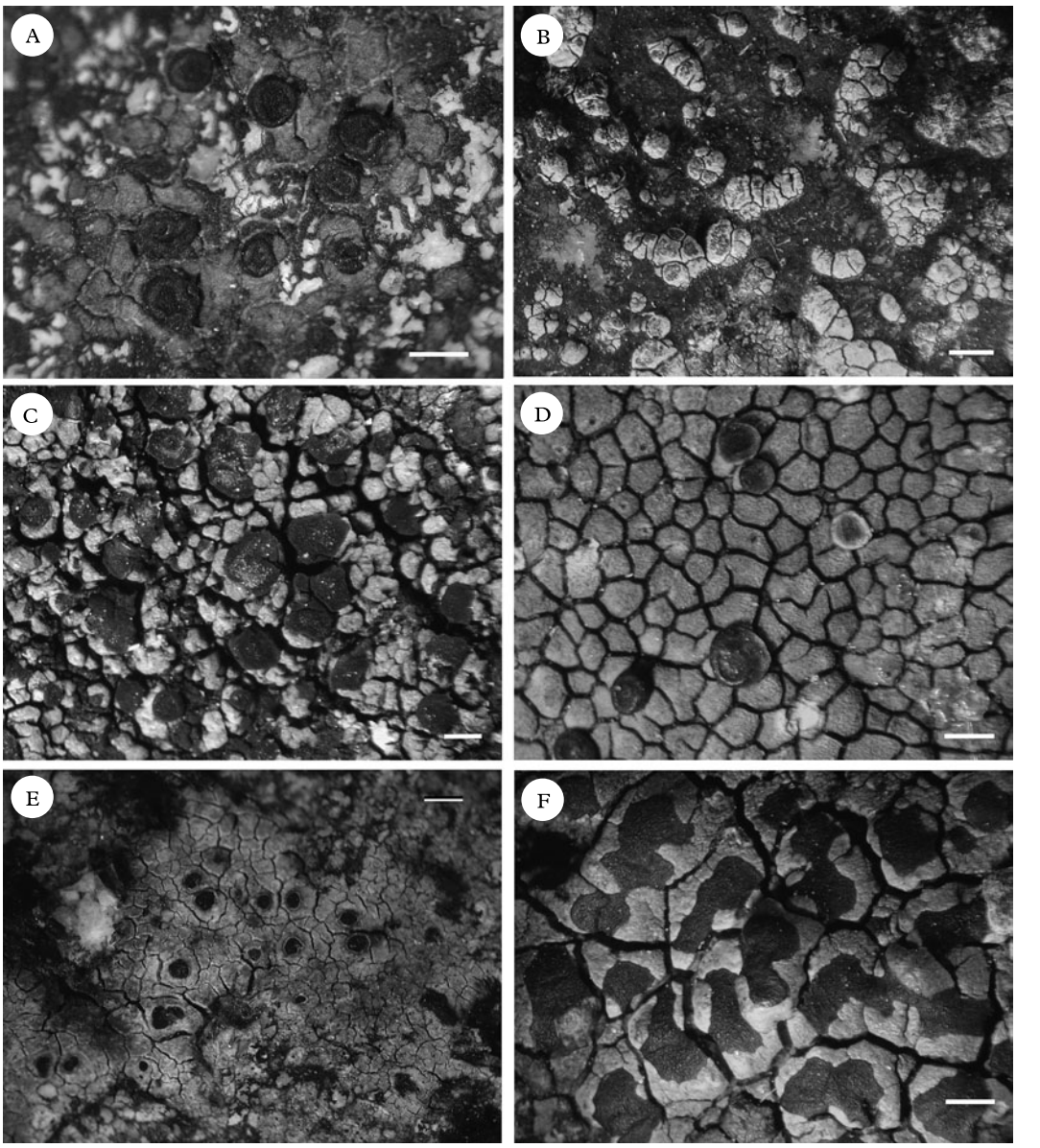


FIG. 1. Thallus and apothecia or soralia of *Fuscidea* species. A, *F. aleutica* (holotype); B, *F gothoburgensis* (*Dibble* 11001); C, *F. lowensis* (*Fryday* 8610); D, *F. mollis* (*Räsänen* s.n.: *Lich. Fenn. Exs.* 974); E, *F. thomsonii* (*Brodo* 17833); F, *F. kochiana* (*Fryday* 6073). Scales: A, E & F =0·5 mm; B, C & D=1·0 mm.

Thallus brown, thin, cracked-areolate, with a thin black prothallus between adjacent thalli; *medulla* I+ violet.

Apothecia black, ± adnate, not constricted below, orbicular, 0·3–0·4(–0·5) mm diam.; disk black, matt, flat; proper margin persistent, slightly raised, 0·05–0·1 mm thick. *Thecium* 70–80 µm tall, paraphyses simple, upper 20–25 µm brown pigmented, apical cells slightly swollen (3 µm); *excipulum* annular, *intercincta*-type (see below) poorly developed, cortex brown, paler within but

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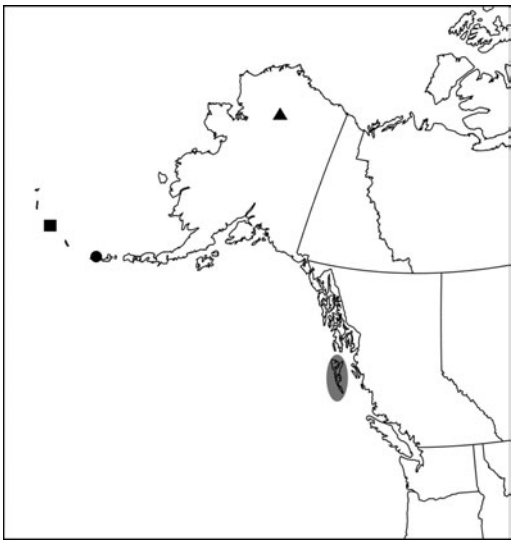


FIG. 2. Known distribution of *Fuscidea aleutica* (●) and *F. thomsonii* (■), and North American distribution of *F. mollis* (▲) and *F. intercincta*. Shaded area (Queen Charlotte Islands), all three species plus *F. intercincta.*

obscured by brownish granules that dissolve in K. *Asci* 75–85 × 12–15 µm, cylindrical to slightly clavate; *ascospores* simple, 8–10 × 6–7 µm, subglobose to broadly ellipsoid.

Conidiomata not observed.

Chemistry. K −, C −, Pd −, UV+ white (medulla). Divaricatic acid by TLC.

Distribution and Ecology. *Fuscidea aleutica* is known from only the type collection from Unalaska Island in the Aleutian Islands, Alaska, and from three collections from the Queen Charlotte Islands, British Columbia, but is probably more widely distributed along the NW coast of North America. The three collections from the Queen Charlotte Islands were mentioned by Brodo & Wirth (1998) as possibly an unnamed species or as aberrant forms of *F. thomsonii*.

Remarks. This species is characterized by having a thallus containing divaricatic acid and an amyloid (I+ violet) medulla, and apothecia with only a lateral (annular) *intercincta*-type exciple (Oberhollenzer & Wirth 1984). In the *intercincta*-type exciple, the proper exciple is poorly developed or non-existent (in immersed apothecia) whereas a pseudothalline exciple is developed from vertical thalline hyphae, the upper 20–30 µm of which are dark-brown pigmented closest to the apothecium giving the appearance of a thick, dark proper exciple surrounded by a thin thalline margin. The inner edge of this pseudothalline margin often has a white pruina, giving the appearance of a ''halo'' around the apothecial disc (Fig. 3).

Fuscidea aleutica is very similar to *F. thomsonii*, with which it is sympatric, and *F. impolita* from the subantarctic. All three species have a thin thallus with an amyloid medulla, and ± adnate apothecia with only a lateral exciple. *Fuscidea impolita* is anatomically distinct in having more robust paraphyses with a darker pigmented cap and with much shorter asci (25–30 µm), but the only anatomical difference between *F. aleutica* and *F. thomsonii* appears to be that *F. aleutica* has more sessile apothecia with a better developed exciple as well as a more intensely pigmented exciple and paraphyses. It is possible that these differences, and those of the gross morphology, are environmentally induced, and only one taxon is involved, in which case *F. aleutica* has nomenclatural precedence. However, when the two species occur together (e.g., *Brodo* 17833; Fig. 3) they remain distinct, and as I have not seen either taxon in the field I prefer, at this stage, to maintain them as distinct species.

When making the new combination *Fuscidea impolita*, Hertel (1984) mentioned that *Lecidea aleutica* Degel. appeared to be closely related, if not identical, to *F. lowensis* (H. Magn.) R. Anderson & Hertel and this opinion has been followed in subsequent North American lichen checklists (Egan 1987; Esslinger 1995; Esslinger 1997). Hertel was probably of the opinion that the two species were closely related because both species (along with *F. incompta* and *F. umbricolor* (Nyl.) Hertel from Colombia and Venezuela) have an amyloid medulla, whereas most other species of the genus do not (e.g., Oberhollenzer & Wirth 1984; Kantvilas 2001). However, two further

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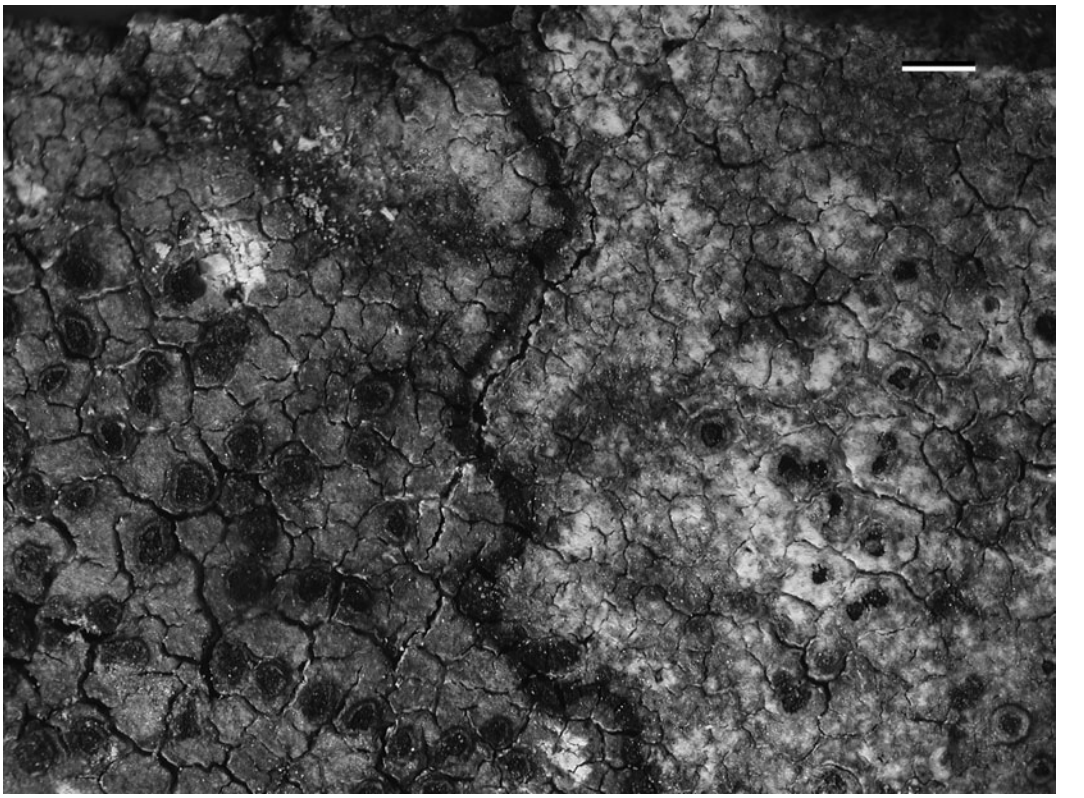


FIG. 3. *Fuscidea aleutica* (left) and *F. thomsonii* (right) growing together on the Queen Charlotte Islands (*Brodo* 17833). Scale = 1 mm.

species with an amyloid medulla have now been described (*F. submollis* Inoue, and *F. thomsonii*), and it is clear that this character is not as critical as Hertel believed. In fact, *F. aleutica* differs from *F. lowensis* in a number of characters. It has a thin, cracked areolate-rimose thallus and flat, ± adnate apothecia with a thick persistent margin (Fig. 1A), contrasting with the thick areolate thallus and convex immarginate apothecia of *F. lowensis* (Fig. 1C). Internally, the excipulum of *F. aleutica* does not extend under the hypothecium, whereas that of *F. lowensis* does, and the paraphyses are also far less conglutinate than those of *F. lowensis*, and at least some are branched and anastomosing, unlike those of *F. lowensis*, which are always simple. The two species are also allopatric and ecologically distinct: *F. aleutica* is confined to the coast of the Pacific NW (Fig. 2), whereas *F. lowensis* occurs only at higher altitudes in NE North America (Fig. 9).

Additional specimens examined. **Canada:** *British Columbia*: Queen Charlotte Islands, Graham Island, Port Channal off Athlow Bay, on south side of inlet (Goose Cove) shoreline rocks and trees and bluffs, on boulder at summit, 320 ft, 1967, *I. Brodo* (10444 p.p.), *M. Shchepanek & W. Schofield* (CANL); *ibid.*, in aerohaline, 1967, *I. Brodo* (10455), *M. Shchepanek & W. Schofield* (CANL); *ibid.*, head of Bigsby Inlet, 52°38′N 131°46′W, along cascade and in forest along south side of first lake west of inlet, *Tsuga-Thuja* forest, on rocks (top surface) at edge of stream, 1971, *I. Brodo* (17833), *P. Wong & W. Schofield* (CANL).

Fuscidea appalachensis Fryday sp. nov.

Mycobank: MB 511666.

Fuscideae kochianae similis sed areolis bullatis et soredia instructis, apotheciis non immersis prominenter marginatis.

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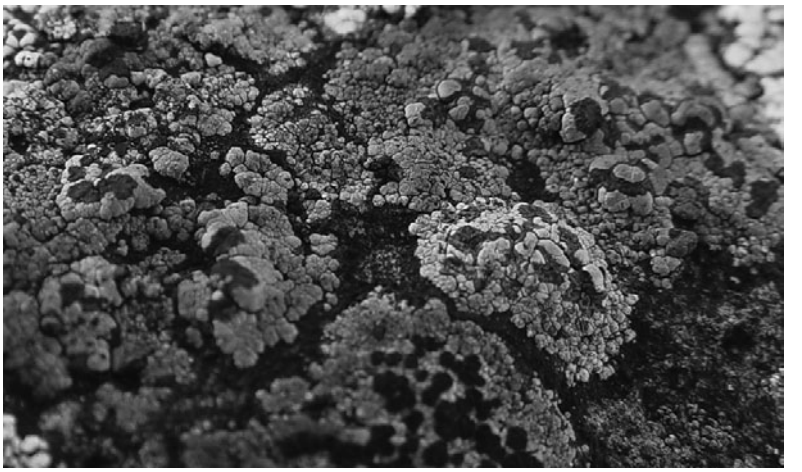


FIG. 4. *Fuscidea appalachensis* at 1400 m on Katahdin, Maine (photo A. Dibble).

Typus: USA, Maine, Piscataquis Co., Baxter State Park, Katahdin, top of Tabor Gully, 45°55.59′N, 68°55.73′W, 1415 m, damp rocks on ledge at side of gully, 4 September 2004, *A. M. Fryday* 8897 (MSC—holotype).

(Figs 4–7)

Thallus (Fig. 4) effuse rarely more than 1–2 cm diam. but with adjacent, confluent thalli sometimes covering a larger area, 0·15–0·2 mm thick; pale grey, composed of flat to strongly convex, ± contiguous areoles (2–)4–6 mm across; cortex 20–25 µm thick, hyaline with minute brown granules; *soralia* (Fig. 5) infrequent in fertile areas of thallus but often abundant elsewhere, ± discrete, *c.* 0·1 mm diam., but often coalescing to form aggregate soralia 0·3–0·5 mm diam.; soredia farinose, 0·01–0·02 mm diam., surface soralia pale brown, green internally; *medulla* I − . *Photobiont Chlorella*-type, cells 8–12(–15 when dividing) µm diam.; dividing by binary fission.

Apothecia (Fig. 5) frequent or lacking, ± immersed to (usually) adnate, not constricted below, orbicular when young becoming flexuose or occasionally linear when mature, 0·7–0·9 mm diam.; *disc* pale to dark brown (rarely black), often with dense grey pruina; *proper margin* persistent, slightly raised, 0·1 mm wide, concolorous with the disc or paler, not pruinose but with white margin on inner edge when young, often deeply radially striate, especially in young apothecia. *Thecium* 50–60 µm tall; *epihymenial layer* brown, 25–30 µm tall, with minute brown granules. *Paraphyses* simple, lax in K, septate, 2–2·5 µm wide, not widening at the apex but with a dark brown cap. *Hypothecium* hyaline, 150–200 µm tall, composed of randomly arranged hyphae not clearly separated from the thecium. *Asci Teloschistes*–type, cylindrical, 45–50 × 8–10(–12) µm; *ascospores* hyaline, becoming brownish when over mature, globose to sub-globose, 8–9 × 6–7 µm, 8/ascus, ± uniseriate in ascus. *Excipulum* cupular, *c.* 25–30 µm thick; composed of radiating hyphae 5 µm wide, inner part hyaline, outer 15–20 µm with minute brown granules, cortical cells with dark brown pigmented walls.

Conidiomata pycnidia (Fig. 6), frequent, immersed in the thallus, 0·05–0·1 mm diam., pale brown, with a dark brown 'involucrellum' developing in older pycnidia, 0·2–0·25 mm across; conidia ellipsoid 4·5–5·0 × 1–1·5 µm.

Chemistry. K − , C − , KC − , Pd − , UV+ white. Divaricatic acid by TLC.

Distribution and ecology. *Fuscidea appalachensis* appears to be restricted to the Appalachian Mountains of eastern North America, where it has been collected from

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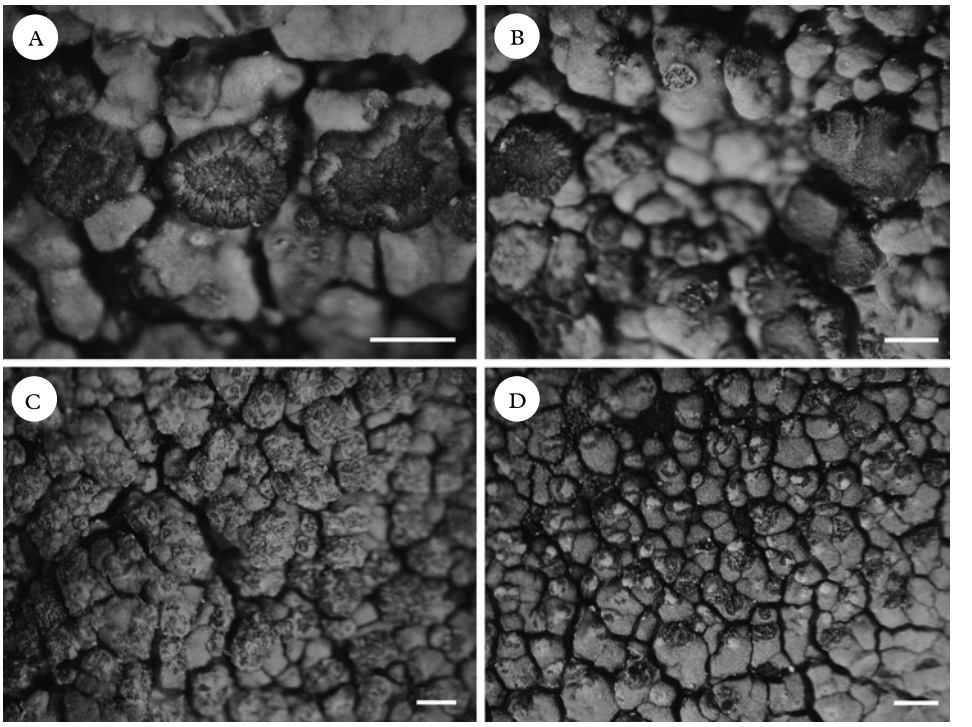


FIG. 5. *Fuscidea appalachensis*. A, apothecia (holotype); B, apothecia and soralia (holotype); C, soralia (*Fryday* 8844); D, soralia (*Fryday* 8873). Scales: A–D = 0·5 mm.

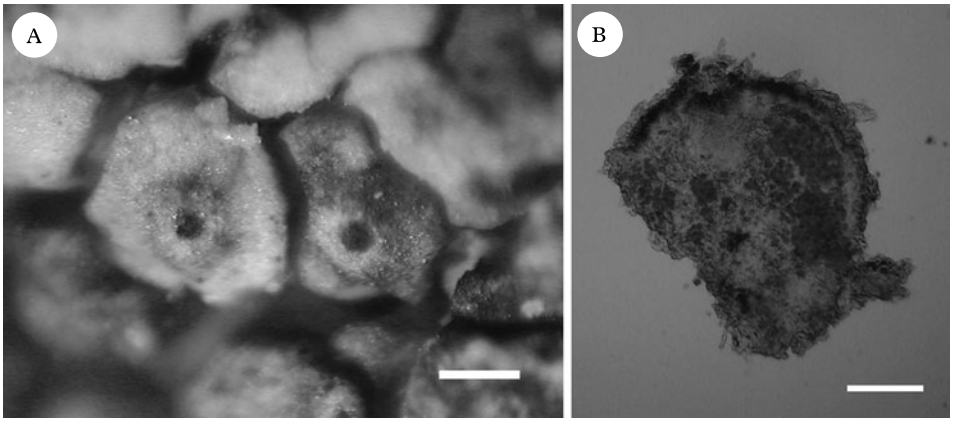


FIG. 6. *Fuscidea appalachensis*; Pycnidia (holotype). Scales: A & B = 0·1 mm.

New Brunswick in the north to Tennessee in the south (Fig. 7). It appears to be particularly frequent in the Adirondack Range of New York, but that may be because of greater collecting activity in that area.

Fuscidea appalachensis is a species of exposed, sunny, hard, siliceous rocks (Fig. 4), usually above the tree-line, where it often grows with other species of the genus.

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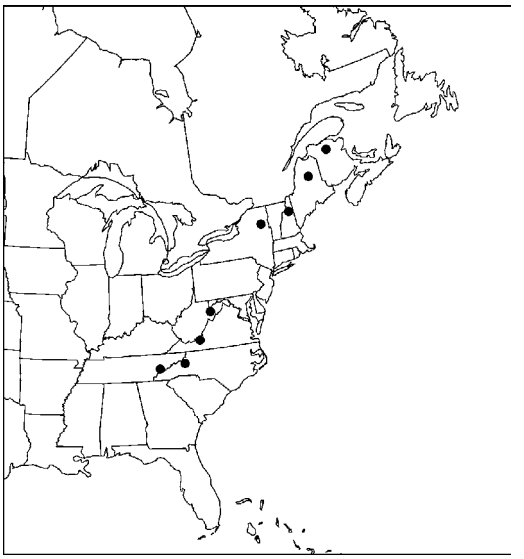


FIG. 7. Known distribution of *Fuscidea appalachensis*.

Remarks. In the past, *F. appalachensis* has usually been identified in North America as *Fuscidea kochiana* (e.g., Lowe 1939, and probably Eckfeldt 1895) but that species has immersed, immarginate apothecia (Fig. 1F) and has not been correctly reported from North America. In the absence of soralia, *F. appalachensis* could be confused with *F. mollis* (Wahlenb.) V. Wirth & Vězda, but that species has sessile apothecia (Fig. 1D) and a thallus composed of flat areoles. *Fuscidea appalachensis* could also be mistaken for *F. recensa* var. *arcuatula*, but that species has very different ascospores (Fig. 12), and also a more heavily pigmented exciple and paraphyses with the top two cells pigmented, not just a pigmented cap as in *F. appalachensis*. In the absence of apothecia, *F. appalachensis* and *F. recensa* var. *recensa* are difficult to separate, although if pycnidia are present they can be separated by *F. appalachensis* having immersed pycnidia whereas those of *F. recensa* var. *recensa* are raised. Also, *F. appalachensis* tends to have a thicker thallus, is not known to occur at low altitudes and appears to be confined to eastern North America, whereas *F. recensa* var. *recensa* is most frequent in central USA.

A further collection from Katahdin (*Fryday* 8870) is also possibly referable to the new species. It differs in having more sessile, strongly gyrose/contorted apothecia but is otherwise similar. Also from the same location is a collection with sessile apothecia that resembles *F. cacuminum* (Vain.) M. Inoue, but the holotype, and only collection of that species is very poor and more material is required to determine whether the two collections are conspecific.

Additional specimens examined. **Canada:** *New Brunswick*: Northumberland Co., Mount Carleton P.C., summit of Mount Carleton, 47°24′N 66°53′W, 820 m, on rock, 11 Aug 1988, *E. Haber & H. R. Hinds* s.n. p.m.p. (CANL).—**USA:** *Maine*: Piscataquis Co., Baxter State Park, Katahdin, North Basin, 45°55.76′N 68°54.86′W, 975 m, granitic boulder, 2004, *Fryday* 8844 (MSC); *ibid.*, just east of the 'calcareous seep', 45°55.78′N 68°55.50′W, 1120 m, on exposed, vertical rock face with no calcareous influence, 2004, *Fryday* 8866, 8872, 8873 (MSC). *New Hampshire*: Coos Co., White Mountain NF, Mt Washington, along Auto Road at Cragway Spring, along Nelson Crag Trail, 44°17′N 71°18′W, 1430–1465 m, heath and krummholz vegetation on leeward slope, 1999, *R. Harris* 4319 p.p. (NY). *New York*: Essex Co., Mount Marcy (near Lake Placid), 5300 ft, on rocks on N side, 1933, *J. Lowe* 2604 (MICH); *ibid.*, on exposed rock, 1933, *J. Lowe* 2888 p.m.p. (FH); *ibid.*, 5300 ft, on rocks, 1933, *J. Lowe* 2946 p.p. (MICH); *ibid.*, 5300 ft, on rocks north exposure, 1933, *J. Lowe* 3037 (MICH); *ibid.*, 4900 ft, on rocks in gully, 1933, *J. Lowe* 3187 (MICH); *ibid.*, summit 5110 ft in alpine zone, at summit 5100 ft, 1963, *I. Brodo* 4768 (MSC); *ibid.*, Adirondack Mts, Algonquin Peak, McIntyre Mt, south of Lake Placid, 5100 ft, on summit above tree line, 1963, *C. Wetmore* 12288 p.p. (MIN); *ibid.*, lower part of alpine zone, on rocks, 1963, *J. Thomson* 11234 (WIS). *North Carolina*: Burke Co., Linville Gorge Wilderness Area, on exposed cliff face, 1997, *P. Smith* 3114 (NY). *Tennessee*: Great Smoky Mountains, near Alum Cave, *c.* 1500 m. 13 ix 1939, *G. Degelius* s.n. p.p. (US). *Virginia*: Giles Co., Bald Knob near Mountain Lake, on exposed rocks, 22 iii 1975, *D. Fahselt* s.n. (DUKE). *West Virginia*: Tucker Co., Monongahela National Forest, Dolly Sods Wilderness, Bear Rocks, 39°03′58″N 79°18′06″W, 1205 m, ericaceous heath and sandstone exposures, 2001, *W. Buck* 38985 (NY).

Fuscidea arboricola Coppins & Tønsberg

Mycobank: MB358665.

In Tønsberg, *Sommerfeltia* **14:** 134 (1992); type: Norway, Nordland, Bindal, Skjelsvik, UTM 33W UN 7131 (1825 III), 0–10 m., on trunk of *Betula pubescens*, 1 June

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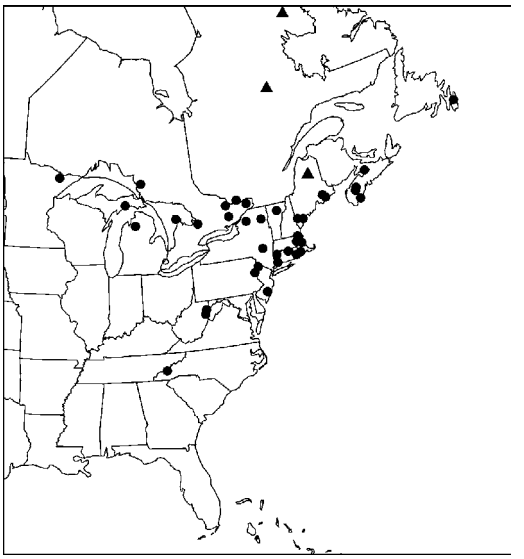


FIG. 8. Known North American distribution of *Fuscidea arboricola* (●), and *F. gothoburgensis* (▲). Includes one record of *F. arboricola* from North Carolina not seen by the author that was collected and identified by T. Tønsberg (BG), and several from northeast North America from New York Botanic Garden's "Virtual Herbarium" <http://sciweb.nybg.org/science2/VirtualHerbarium.asp>, also not seen by the author.

1982, *Tønsberg* 6865 (BG—holotype; E, UPS—isotypes).

(Fig. 8)

Thallus areolate to warted, green-brown; *soralia* pale yellow-green, initially discrete, becoming confluent towards the centre; distinct, brown prothallus visible between areoles and at margin; *medulla* I−.

Apothecia rare, sessile, disc dark brown, proper margin often becoming flexuose. *Ascospores* simple or 1-septate, with a median constriction, 7–9 × 4–5 µm.

Chemistry. K−, C−, Pd+ red, UV−. Fumarprotocetraric acid by TLC.

Distribution and ecology. *Fuscidea arboricola* is a frequent, corticolous species in eastern North America, where it has an Appalachian-Great Lakes distribution. Fertile material is known from Maine, Massachusetts and Newfoundland.

Remarks. A usually sterile, sorediate corticolous species containing fumarprotocetraric acid (Pd+ red). It was first reported for North America by Tønsberg (1993) from Newfoundland, New York and North Carolina, although numerous earlier collections are now known (mostly misidentified as *F. lightfootii* (Sm.) Coppins & P. James), including two fertile specimens collected by Henry Willey from Massachusetts in 1868 and 1869 (in US).

Fuscidea arboricola is the only North American species of the genus containing fumarprotocetraric acid (*F. cyathoides*, a usually saxicolous species, also contains fumarprotocetraric acid but is considered not to occur in North America; see below).

Selected specimens examined. **Canada:** *Newfoundland*: Newfoundland Island, Avalon Peninsula, Butterpot Provincial Park, east side of Big Otter Pond, 47.399°N 53.043°W, *c.* 160 m., mesic to wet coniferous forest, 2007, *J. Lendemer* 10153 (NY: fertile). *Ontario*: Algoma District, Lake Superior P.P., Crescent Lake campground, 47°17′N 84°33′W, maple forest, on *Betula papyrifera*, 1993, *S. D. & S. Sharnoff* 1106.16 (CANL); Bruce Co., 2 miles SE of Miller Road, on Hwy 6, 45°04′N 81°24′W, *Abies-Thuja* forest, on *Abies balsamea*, 1976, *P. Wong* (2039) *& P. Bowler* (CANL); Renfrew Co., SW of Kennellys Mountain, 45°17′N 76°54′W, deciduous forest, on *Ostrya virginia*, 1985, *P. Wong* 3777 (CANL); Lennox & Addington Co., Centerville, 10 miles NE of Napanee, Basswood Hill, 44°25′N 76°55′W, 150 m, on sugar maple in deciduous forest, 1977, *P. Wong* 2494 (CANL); Simcoe Co., Hillsdale, SE of town, 44°35′N 79°45′W, deciduous woods, on young tree, 1984, *P. Wong* (3526, 3530, 3532) *& J. Krug* (CANL). *Quebec*: Gatineau, Aylmer, N of Pink Road, E of Vanier Road, 45°25′N 75°23′W, mature lowland *Thuja occidentalis* stand, on *Acer rubrum*, 1995, *I. Brodo* (28912) *& F. Brodo* (CANL).—**USA:** *Maine*: York Co., Alfred, Massabesic Experimental Forest, *Chamaecyparis* swamp, 43°26′53″ 70°40′18″W, 60 m, on branches of *Chamaecyparis*, 2002, *R. Harris* 46244 (hb. Lendemer, ex NY—fertile). *Massachusetts*: [Bristol Co.,] New Bedford, 1868, *H. Willey* (US—fertile); *ibid.*, Weymouth, 1869, *H. Willey* (FH, US—fertile); Norfolk Co., Blue Hills Reservation, Canton, 25 vii 2000, *E. Kneiper, S. LaGreca & D. Greene* (FH). *Michigan*: Kalkaska Co., Kalkaska, Kalkaska RV Park & Campground, 44°42.6′N, 85°10.0′W, 330 m, *Acer*, 2007, *Fryday* 9130 (MSC). *Minnesota*: Lake Co., Boundary Water Canoe Area Wilderness, North of Gabbro Lake, 47°52′28″N, 91°35′25″W, mixed upland forest, 2003, *P. Johansson* 51, 52, (MIN). *West Virginia*: Tucker Co., Momongahele National Forest, Olsen's Bog, 39°07′N, 79°36′W, 1000 m, at edge of bog, on *Rhododendron* branches, 2001, *S. LaGreca* 795 (FH).

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Fuscidea gothoburgensis (H. Magn.) V. Wirth & Vězda

Mycobank: MB342003.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lecidea gothoburgensis* H. Magn., *Kongl. Götheborgska Wetensk. Samhällets Handl., Wetensk. Afd.* **29:** 15 (1925); type: Sweden, Göteborg, Botanical Garden, on steep rocks, 1925, *A. H. Magnusson* 7614a (UPS—lectotype, *fide* Oberhollenzer & Wirth 1985: 2).

(Figs 1B & 8)

Thallus pale grey, areolate; areoles either dispersed or contiguous, flat to slightly convex; *soralia* usually concolorous with the thallus, rounded, often delimited by a raised margin; prothallus black, well-developed between areoles and at margin; *medulla* I − (rarely I+ violet).

Apothecia uncommon; unknown in North American collections; generally small, 0·3–0·9 mm diam., but occasionally larger, sessile. A*scospores* broad ellipsoid, 7–10 × 5–7 μm.

Chemistry. K − , C − , Pd − , UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. *Fuscidea gothoburgensis* is a saxicolous species that was recently reported for North America from a single collection from Katahdin, Maine (Fryday 2006), but earlier, unidentified, collections have since been discovered from Quebec (see below).

Remarks. *Fuscidea gothoburgensis* is characterized by a sorediate thallus composed of ± confluent areoles containing divaricatic acid, and with small apothecia, although these are not known in North American material. Forms consisting of dispersed areoles on a black hypothallus have been recognized as f. *maculosa* (H. Magn.) Poelt) but, as in the Katahdin collection, this intergrades with the typical form.

As with other saxicolous species of the genus it occurs on hard, siliceous rocks, but usually in shaded habitats.

Specimens examined. **Canada:** *Quebec*: N side of Lake Louis, *c.* 80 mi N of Schefferville, on rock, 1990, *D. Wehr* 39 (with *F. scrupulosa*) (NY); Monte Otish, Monte Centlans, 22 vii 2003, *J. Gagnon* (hb. Gagnon); *ibid.*, Monte Maria-Victoria, 24 vii 2003, *J. Gagnon* (hb. Gagnon).—**Great Britain:** *Scotland*: **V.C. 88** Mid Perthshire: Ben Lawers, Allt a' Mhoirneas, 27/6137, 250 m, wooded ravine, 1989, *Fryday* s.n. (hb. Fryday); **V.C. 92** South Aberdeen: Braemar, Eastern Cairngorms SSSI, Mar Lodge Estate, Clais Fhearnaig, 37(NO)/066.930, 505 m, acid rock boulder field above lochan on S side of narrow valley, 2005, *Fryday* 8979, 8985 (MSC). **V.C. 105** West Ross-shire: Beinn Eighe NNR, Meall na h-Airgh-ardain, 18/9865, 300 m, shaded north-east facing rock face, 1991, *Fryday* 2768 (hb. Fryday).—**Sweden:** *Värmland*: Munkfors: Bryngelstorp, on vertical rock face, 21 v 1951, *S. Sundell* s.n. (MSC).—**USA:** *Maine*: Piscataquis Co., Baxter State Park, Katahdin, North Basin, calcareous seep, 45°55.78′N, 68°55.50′W, 1120 m, shaded granitic rock face, 2003, *A. Dibble* 11001 (MAINE).

Fuscidea intercincta (Nyl.) Poelt

Mycobank: MB342005.

Norw. J. Bot. **25:** 127 (1978).—*Lecanora intercincta* Nyl., *Flora* **64:** 531, (1881); type: Portugal, Beira Alta, Serra de Estrella, 8 1881, *J. Henriques* (H-Nyl—holotype).

(Fig. 2)

Thallus grey, areolate; areoles continuous or dispersed (North American material) on a black prothallus; *medulla* I − .

Apothecia immersed or slightly emergent, 0·3–0·6 mm diam., thin, pseudothalline margin present, forming a pale 'halo' around thick black zone, *intercincta*-type (*cf. F. aleutica*), disc black, flat, matt. *Ascospores* broad-ellipsoid, 10–13 × 7–8 μm.

Chemistry. K − , C − , Pd − , UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. *Fuscidea intercincta* is a saxicolous species that was reported from the Queen Charlotte Islands by Brodo & Wirth (1998), although these collections differ from European ones in having a less well-developed thallus and somewhat larger ascospores.

Remarks. This species is characterized by a grey thallus containing divaricatic acid and

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having a non-amyloid medulla (I −), and by semi-immersed apothecia with a lateral exciple that have a white ring around the outside of the disc. The Canadian collections resemble *F. thomsonii*, but differ in having an I − medulla. However, this reaction can be variable in other species of *Fuscidea* (e.g., *F. gothoburgensis*) and it is not impossible that these specimens are an aberrant form of *F. thomsonii*.

Specimens examined. **Canada:** *British Columbia*: Queen Charlotte Islands, Moresby Island, Takakia Lake, east side 52°56′N 132°03′W, 1930 ft, along shore and in fens just back from shore, on vertical face of shoreline rock, 1967, *I. Brodo* (10920) *& M. Shchepanek* (CANL); *ibid.*, on boulder at water's edge, 1967, *I. Brodo* (10909) *& M. Shchepanek* (CANL).—**Great Britain:** *Scotland*: **V.C. 98** Argyll Main: Glen Coe, Aonach Eagach, Creag nan Gabhar, G.R. 27/1357, 600 m, top of siliceous boulder, 1992, *Fryday* 3329 (hb. Fryday).—**Norway:** *Møre og Romsdal*: Bogeskarnakken, Stadt, 1904, *J. Havaas* (DUKE); *ibid.*, Dalsbø, Stadt, 17 viii 1911, *J. Havaas* (DUKE). *Nordland*: Sandnessjön, 30 m, on a steep rock facing the north, 5 vii 1924, *A. Magnusson* (DUKE: Magnusson, *Lichenes selecti scandinavici exsiccati*).

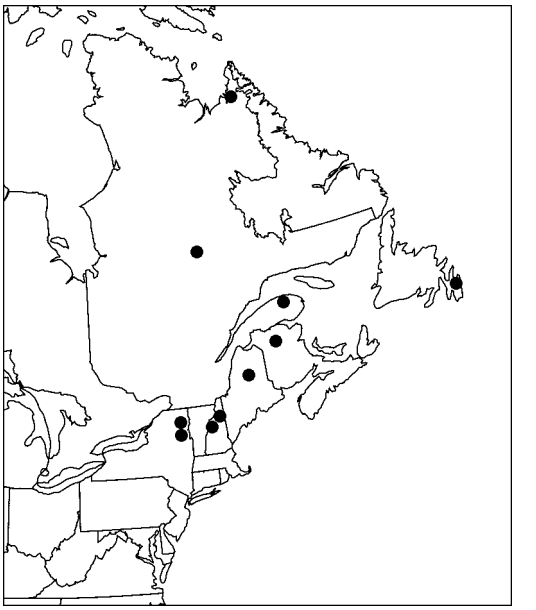


FIG. 9. Known distribution of *Fuscidea lowensis*.

Fuscidea lowensis (H. Magn.) R. Anderson & Hertel

Mycobank: MB115835.

In Hertel, *Herzogia* **5:** 450 (1981).—*Lecidea lowensis* H. Magn., *Acta Horti Gothob.* **10:** 11 (1936); type: USA, New York, Essex Co., Mt Marcy (near Lake Placid), 5300 ft, 16 Aug. 1933, *J. L. Lowe* 2860 (UPS—holotype; US, FH—isotypes!).

(Figs 1C & 9)

Thallus brown, often with a grey pruina, thick, of convex, warted areoles, occasionally thinner with flatter areoles; black prothallus visible at margin; *medulla* I+ violet.

Apothecia black, flat, sessile, constricted below 0·4–0·7(–0·9) mm diam.; proper margin persistent, becoming flexuose, 0·05–0·1 mm wide. *Thecium* 60–70 µm; *paraphyses* simple, branched above, 1·5–2 µm thick with apical cell swollen (to 5 µm), upper 10–20 µm brown pigmented. *Asci* cylindrical 20–50 × 12–15 µm; *ascospores* subglobose, 7–10 × 6–7 µm. *Exciple* cupular, uniformly dark brown.

Conidiomata: pycnidia, immersed in thallus but becoming emergent, black, to 0·02 mm diam. with gaping ostiole; *conidia* broad ellipsoid 4 × 2 µm.

Chemistry. K −, C −, Pd −, UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. Fuscidea lowensis is a saxicolous species widespread in NE North America on acidic rocks at higher elevations, reaching almost sea-level near the Atlantic Coast (Newfoundland).

Remarks. This species is characterized by a thick dark brown verrucose thallus containing divaricatic acid (by TLC) and with an amyloid (I+ violet) medulla. It was described by Magnusson (1935) from a collection by J. Lowe from Mt Marcy.

One collection (*Harris* 53860) from Newfoundland agrees with *F. lowensi*s in gross morphology and anatomy but has a thallus with a non-amyloid medulla (I −) and lacking divaricatic acid. As there are several typical collections of *F. lowensis* from

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the same locality, I consider it to be an anomolous form of that species.

Selected specimens examined. **Canada:** *New Brunswick*: Northumberland Co., Mount Carleton P.C., summit of Mount Carleton, 47°24′N 66°53′W, 820 m, on rock, 11 viii 1988, *E. Haber & H. Hinds* s.n. (CANL). *Newfoundland*: Newfoundland Island, Avalon Peninsula, Hawke Hills Ecological Reserve, 47.316°N 53.128°W 100 m., on pebble in rocky ground in alpine tundra, 2007, *J. Guccion* 1187 (MSC), *J. Lendemer* 10057, 10059 (NY), *R. Harris* 53841, 53860 (NY). *Quebec*: Parc de la Gaspésie, Mont Albert, près du sommet nord, 48°55′N 66°10′W, sur roc (amphibolite), 1977, *M.-C. Hamel* 13 (CANL); Mistassini Territory, Otish Mountains, in subalpine zone on Mont du Lagopé [??], 52°18′M 70°24′W, 2800 ft, on exposed rock, 1971, *M. J. Shchepanek* 71-L-32 (CANL); L'Ungava Oriental, Rivière George, Lac Indian House, 56°03′N 58°50′–60°00′W, sommet de colline à l'est de la rivière, 1947, *J. Rousseau* 482 (US).—**USA:** *Maine*: Piscataquis Co., Baxter State Park, Katahdin, summit area, 45°54.13′N, 68°55.64′W; 1475 m, granitic boulder, 2003, *Fryday* 8610 (MSC); *ibid.* North Basin, 45°55.67′N, 68°54.52′W, 935 m, granite boulder, 2003, *Fryday* 8625 (MSC). *New Hampshire*: [Grafton Co.,] Franconia Mountains, summit of Mt Moosilauke, 4811 ft, 10–17 Aug 1898, *C. Cummings* (DUKE, MSC, WIS: *Decades of North American Lichens Exsiccati* #311: as *Lecidea tenebrosa*); *ibid.* (FH; *Lichenes Boreali-Americani* #240: as *Lecidea tenebrosa*); Coos Co., Presidential Dry River Wilderness Area, knob half mile NE of Mt Crawford along Davis Path, 2950 ft, 1988, *C. Wetmore*, 61941 (MIN); *ibid.*, on east side of Mt Monroe, 5000 ft, 1988, *C. Wetmore* 62412 (MIN); *ibid.*, White Mountain NF, Mt Washington, along Auto Road at Cragway Spring, 44°17′N, 71°18′W, 1430–1465 m, heath and krummholz vegetation on leeward slope, 1999, *R. Harris* 43191, 43193, 43197 (NY). *New York*: Essex Co., summit ridge of Whiteface Mountain, 4600 ft, 1983, *R. Harris* 16612 (NY); Mount Marcy (near Lake Placid), 5300 ft, on face of rock, 1933, *J. Lowe* 2607, 2665 (MICH); *ibid.*, underside of rock NW exposure, 4900–5300 ft, 1933, *J. Lowe* 2836 p.p. (FH, syntype of *L. kochiana* var. *subregens*); *ibid.*, Lake Placid, Algonquin Peak south of Mt Marcy, 5110 ft [1558 m], 1963, *I. Brodo* 4750 (CANL, MSC), 4768 (MSC).

Fuscidea mollis (Wahlenb.) V. Wirth & Vězda

Mycobank: MB342009.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lecidea rivulosa* β mollis Wahlenb., *Fl. Lapp.* 472 (1812).—*Lecidea mollis* (Wahlenb.) Nyl., *Lich Scand.* 223 (1861); type: Norway, Finmark, Rypklubb, 8 vi 1802, *G. Wahlenberg* (UPS—lectotype, *fide* Hertel 1997: 197).

(Figs 1D & 2)

Thallus pale grey, regularly and finely cracked, areoles flat, contiguous (groups of areoles dispersed on a black prothallus in some North American material); black, delimiting prothallus at margin; *medulla* I − .

Apothecia to 1 mm diam., rounded, discrete, sessile. *Ascospores* broad-ellipsoid, 8–10 × 5–6 μm.

Chemistry. K − , C − , Pd − , UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. *Fuscidea mollis* is a saxicolous species correctly reported in North America only from the Queen Charlotte Islands and Alaska. The specimens from the Queen Charlotte Islands reported by Brodo (1976) and Brodo & Wirth (1998), have a thinner, more dispersed thallus, but are otherwise identical to European collections of this species.

Remarks. *Fuscidea mollis* is characterized by a smooth, finely cracked areolate thallus containing divaricatic acid, and sessile apothecia. In North America, it has been reported from Labrador (Eckfeldt 1895), the White Mountains (Tuckerman 1888), and the Queen Charlotte Islands (Brodo & Wirth 1998). Thomson (1997) also gives localities in New York, Nunavut, and Alaska. Of the specimens referred to this species in Thomson's herbarium (in WIS), one, from Alaska, is *F. mollis*, but the rest are incorrectly identified. No specimens of *F. mollis* could be found in PH where Eckfeldt's collections are housed (J. Lendermer pers. comm.), and other collections from elsewhere in northeastern North America are misidentifications of other species, mostly *F. appalachensis*.

Selected specimens examined. **Canada:** *British Columbia*: Queen Charlotte Islands, Graham Island off Athlow Bay, 53°35′N 132°55′W, shoreline rocks and bluffs on south side of inlet (Goose Cove), 1967, *I. Brodo* (10434), *M. Shchepanek & W. Schofield* (ASU, CANL, DUKE, MSC, WIS—*Lichenes Canadenses Exsiccati* #115); *ibid.*, Moresby Island, "Blue Heron Bay", north of Sunday Inlet, bluff above bay, 54°41′N

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FIG. 10. Known North American distribution of *Fuscidea praeruptorum*. Corticolous (●), saxicolous (■), and known distribution of *F. texana* (▲).

132°02′W, 500 ft, *Pinus contorta* stand, on quartz vein on summit boulder, 1968, *I. Brodo* 14094 (DUKE, CANL); *ibid.*, Pocket Inlet, close to mouth of inlet, 52°37′N 131°48′W, in open fens, 1968, *I. Brodo* (14227), *P. Wong & N. Turner* (CANL).—**Finland:** *Ostrobottnia borealis*: Sino, Kivalot, Alapenikka, ad rupen graniticam apricamque, 21 viii 1942, *V. Räsänen* (MSC—*Lichenes Finniae Exsiccati* No. 974).—**Norway:** *Finnmark*: Fredheim i Sydvaranger [Sør-Varanger, near Fredheim, Alt.: 15–70 m], 1906, *J. Havaas* (Hav 3319, 3324) (DUKE); Mehavn i Finnmark [Gamvik, Mehavn, Alt.: 1–80 m], 1906, *J. Havaas* (Hav 3325, 3326) (DUKE); Nordl., Lödingen, vii 1919, *E. Vrang* (NY).—**Sweden:** *Jämtland*: Snasahögen, in rupibus apricis, 10 vii 1912, *G. Malme* (NY—*Malme, Lichenes suecici exsiccati* #272). *Lapponica Tornensis*, Karesuando, in summo monte Vuokavaara, *c.* 600 m., ad saxa granitica, *G. Lang* (NY—*Kryptogammae exsiccatae; editae a Museo Palatino Vindobonensi* #1955). *Torne Lappmark*: Jukkasjärvi, in alp. Vassiåive (Vassitjåkko), 68°22′0″N, 18°12′0″E, 1 Jul. 1927, *E. Vrang* (ASU).—**Korea:** *Gangwon Province*: Sorak Mts, Sorak-san National Park, Mt Dachong, 1·5–2·5 km NNE of Osaeck, 38°05.30–06.45′N, 128°27.00–30′E, 700–1400 m, siliceous rocky outcrops, 2006, *G. Thor* 20264 (KB, UPS).—**USA:** *Alaska*: Endicott Mts. of Brooks Range, Arrigetch Creek valley, 67°26′30″N, 154°05′W, 4000 ft, morraine in glacial cirque, on granitic rocks, 1980, *D. Cooper* CL-348 (WIS).

Fuscidea praeruptorum (Du Rietz & H. Magn.) V. Wirth & Vězda

Mycobank: MB342011.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lecidea praeruptorum* Du Rietz & H. Magn., in Du Rietz, *Zur method. Grundl. d. mod. Pflanzensoz. (Akad. Abh.)*: 164 (1921); type: Sweden, Bohuslän, Hällesdalen par Ödsmål, on stone fence, 21 vi 1918, *A. H. Magnusson* (UPS—lectotype, *fide* Skjolddal 1983: 100).

(Fig. 10)

Thallus brown, areolate, delimited by a black prothallus; *soralia* initially discrete and pale green to cream-coloured, becoming confluent and brownish; *medulla* I − .

Apothecia very rare; sessile with a narrow proper margin, *Ascospores* 9·5–12 × 3–4 μm, bean-shaped.

Chemistry. K − , C+ red, KC+ red, Pd+ yellow, UV+ orange. Alectorialic acid by TLC.

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Distribution and ecology. In Europe, *F. praeruptorum* is usually a saxicolous species of damp, shaded siliceous rocks, although several corticolous collections were reported from Norway by Tønsberg (1992). In North America, however, it is known from several corticolous collections from SE Alaska, British Columbia and Newfoundland (in BG), but by only four saxicolous collections from New York, Newfoundland and West Virginia. It is probable that this reflects a collecting bias towards corticolous specimens rather than a habitat preference for this species in North America.

Remarks. This is the only sorediate species of the genus that contains alectorialic acid. Although it usually lacks apothecia, it is further characterized by having somewhat curved, ellipsoid, 9–12 × 4–5 µm ascospores (Magnusson 1925).

Fuscidea praeruptorum was first reported in North America from rocks in the Adirondack Mountains of New York by Lowe (1939). The specimen (in MICH) now lacks apothecia, although they were previously present (Lowe 1939), but has a *Chlorella*-like photobiont and soredia that are KC+ red, Pd+ yellow, UV+ yellow, indicating the presence of alectorialic acid, and I see no reason to doubt the determination. In addition, I have also seen recent saxicolous collections from West Virginia and Newfoundland (see below).

The report of this species from Glacier National Park, Montana by DeBolt & McCune (1993) is an error. A specimen of this collection (*DeBolt* 636) in WIS has a sorediate thallus containing norstictic acid and a *trebouxioid* photobiont. Also in WIS are several collections from Wisconsin identified as *F. praeruptorum*, but these are *F. recensa* var. *recensa* (see below).

Fuscidea cyathoides var. *suborientalis* (Zahlbr.) M. Inoue, known only from Taiwan and Japan also contains alectorialic acid (Inoue 1981*a*; as *Fuscidea*-1) and was reported by Inoue as having curved, ellipsoid ascospores of similar dimensions to those reported for *F. praeruptorum*. The relationship between these two taxa is worthy of further investigation, but, unfortunately, I have been unable to obtain any of Inoue's collections for comparison because all the Japanese collections are presently unavailable [on permanent loan from HIRO to Dr. Inoue (see below under *F. scrupulosa*)].

Selected corticolous specimens examined. **Canada:** *British Columbia*: Vancouver Island, along Pacific Rim Hwy, 22·5 km along the road S of Sutton Pass, 20 m on *Alnus rubra*, 1989, *T. Tønsberg* 12298b (BG). *Newfoundland*: Newfoundland Island, Avalon Peninsula NW, between Branch and North Harbour, 0–100 m, on *Abies balsamea*, 1991, *T. Tønsberg* 17103 (BG); Burin Peninsula, Placentia West District, *c.* 6 km ESE of Terenceville, 54.6333°W, 47.6333°N, 150 m, 2000, *C. Printzen* 5668a (BG).—**USA:** *Alaska*: City and Borough of Juneau, Douglas Island E, West of Juneau, 0·5 miles along Douglas Hwy NW of Juneau-Douglas Bridge, 58°18′N, 134°27′W, 10 m, on *Alnus rubra*, 1991, *T. Tønsberg* 16118 (BG); *ibid.*, Baranof Island, *c.* 10 km E (direct) of Sitka, off the main road from Sitka to Herring Cove (Sawmill Cr. Rd) 60 m, on *Alnus rubra*, 1991, *T. Tønsberg* 16347 (BG; fertile).

Selected saxicolous specimens examined. **Canada:** *Newfoundland:* Newfoundland Island, Hawke Hills, 47°19′20″N 53°07′37″W, 250–320 m, on rock, rocky, montane to subalpine oceanic heathland, 2007, *J. Lendemer* 10055, *R. Harris* 53845 (NY).—**Sweden:** *Skaftö*: Kristineberg, 14 August 1967, *P. James* s.n. (MSC).—**USA:** *New York*: Warrensburg, on rock in open field, 1933, *J. Lowe* 3539 (MICH). *West Virginia*: Pendelton Co., Kile Knob, Fork Mountian, 38°35′44″N, 79°28′57″W, 4588 ft [1398 m], on massive sandstone, 2005, *J. Vanderhorst* 7119 (hb. Flenniken, MSC).

Fuscidea pusilla Tønsberg

Mycobank: MB358666.

Sommerfeltia **14:** 138 (1992); type: Norway, Hedmark, Åmot, Åset-Bechsminne, along state road 3, UTM 32W PN 2674 (1917 II), 240 m., on *Betula pubescens/pendula* (road-side tree), 6 August 1983, *Tønsberg* 8041 (BG—holotype; E, UPS—isotypes).

(Fig. 11)

Thallus usually of small thalli up to 10 mm diam., composed of convex greenish areoles; *prothallus* distinct, pale to dark brown; *soralia* irregular, becoming confluent, soredia farinose; *medulla* I − .

Apothecia and conidiomata. Unknown.

Chemistry. K − , C − , Pd − , UV+ white (medulla). Divaricatic acid by TLC.

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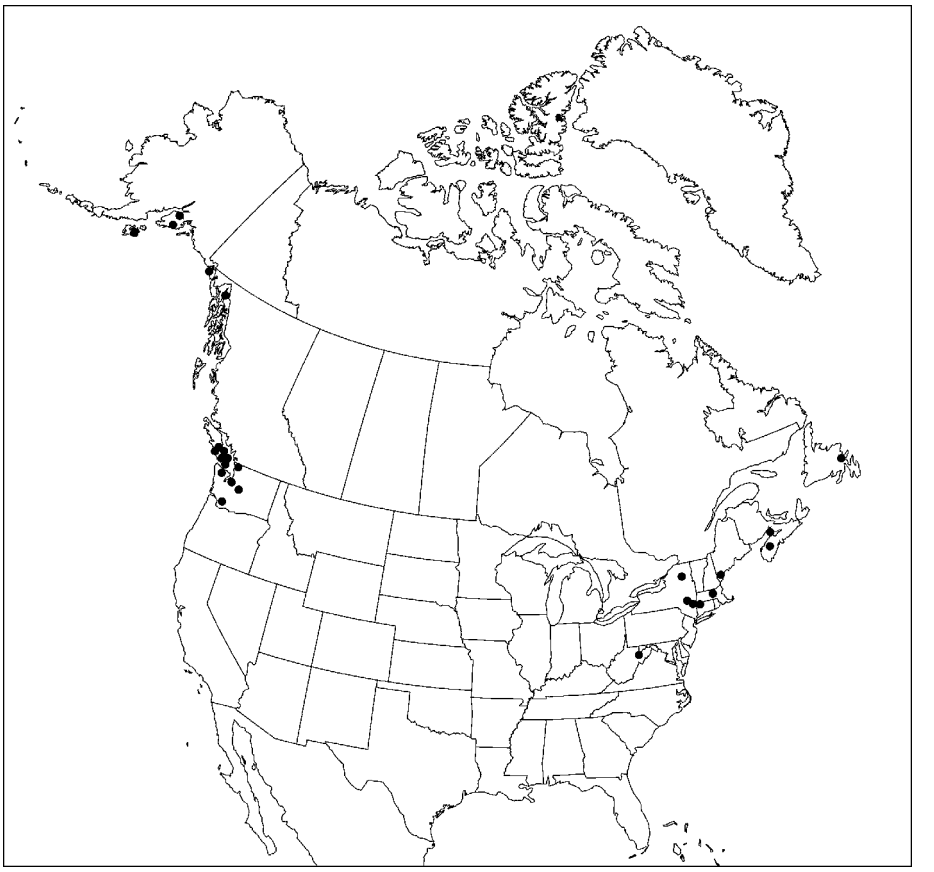


FIG. 11. Known North American distribution of *Fuscidea pusilla*. Includes some records from the Pacific Northwest and Newfoundland collected and identified by T. Tønsberg (BG) but not seen by the author.

Distribution and ecology. *Fuscidea pusilla* was first reported in North America by Tønsberg (1993) from the Adirondack Mountains, New York. It has subsequently been collected in eastern North America from Nova Scotia to West Virginia and in the Pacific Northwest from Washington State to Kodiak Island, Alaska. This suggests that *F. pusilla* has an Appalachian-Great Lakes distribution in the east and an oceanic one in the west, but it appears to be an infrequent species, at least in the east, and records are few. A collection from the Thunder Bay District of Ontario on the northern shore of Lake Superior previously refered to this species is better placed in *F. recensa* var. *recensa*.

Remarks. *Fuscidea pusilla* is the most frequent sorediate, corticolous species of the genus containing divaricatic acid that has been correctly reported from North America. *Fuscidea recensa* var. *recensa*, which is known from a single North American corticolous collection, differs in having a more widely-spread, predominantly brown thallus with discrete soralia, the outer soredia of which have a brown colouration. The European species *Fuscidea lightfootii* (Sm.) Coppins & P. James, which has been incorrectly reported from the Pacific Northwest, is similar but has a more widely-spread thallus, ulcerous soralia that often become confluent, and is usually fertile.

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Specimens examined. **Canada:** *Nova Scotia*: Queens Co., Kejemkujic N.P., Grafton Lake, along east shore of Kejemkujic Lake near inlet from Grafton lake, 44°23′N, 65°12′W, 110 m, hardwood forest (*Quercus-Acer-Ostrya*), on *Betula papyrifera*, 1999, *I. Brodo* 29675 (CANL); Cumberland Co., Cape Chigneto Provincial Park, along trail from Red Rocks to McGahey Brook, 45°21′00″N, 64°49–50′26–30″W, 20–150 m, coastal forest, 2004, *W. Buck* 47134 (NY).—**USA:** *Connecticut*: Litchfield Co., Town of Norfolk, Holleran Swamp Preserve, E of Elmore Road, 0·3 mi N of CT 272, 42°02′19″N, 73°12′23″W, hardwood-conifer swamp, 2003, *R. Harris* 47953 (NY). *Maine*: York Co., Town of Saco, Saco heath Preserve, 43°32′48″N, 70°28′25″W, *c.* 60 m., *Sphagnum-Ericaceae* heath, with scattered trees of *Pinus rigida* and *P. strobus*, 2002, *R. Harris* 46314 (NY). *New York*: Duchess Co., Cary Arboretum, along E. Branch Wappinger Creek, between Fern Glen and Gifford House, hardwoods, on *Carya*, 1981, *R. Harris* 14062 (NY). *West Virginia*: Tucker Co., Monongahela N.F., Olsen's Bog, 39°07′N 79°36′W, 1000 m, open spruce bog, on twigs of shrub (*Vaccinium*) in bog, 2001, *I. Brodo* 30360 (CANL).

Fuscidea recensa (Stirt.) Hertel, V. Wirth & Vězda

Mycobank: MB342012.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lecidea recensa* Stirt., *Scottish Naturalist* **5:** 219 (1880); type: Great Britain, Scotland, Perthshire, Kinloch Rannoch, Craeg Var, 09 1879, *Stirton*. (BM—holotype).

(Figs 12 & 13)

Thallus usually pale grey to brown and areolate, but occasionally almost white or red-brown and either continuous-rimose or areoles convex and bullate; *soralia* present or absent, if present, discrete, initially pale but becoming brown, greenish where abraded, soredia granular; *medulla* I − .

Apothecia black or brown, sessile, ± constricted below, usually flat, 0·5–0·8 mm diam. with a thin persistent proper exciple, often becoming flexuose and occasionally almost gyrose, occasionally convex and immarginate; rarely pruinose. *Thecium* 55–65 µm tall, *paraphyses* simple, 1·5–2 µm, apical cell barely swollen to 3 µm, no pigmented cap. *Excipulum* uniformly brown pigmented. *Ascospores* simple to 1-septate, ellipsoid, curved, 9–12 × 4–5 µm (Fig. 12).

Conidiomata not observed.

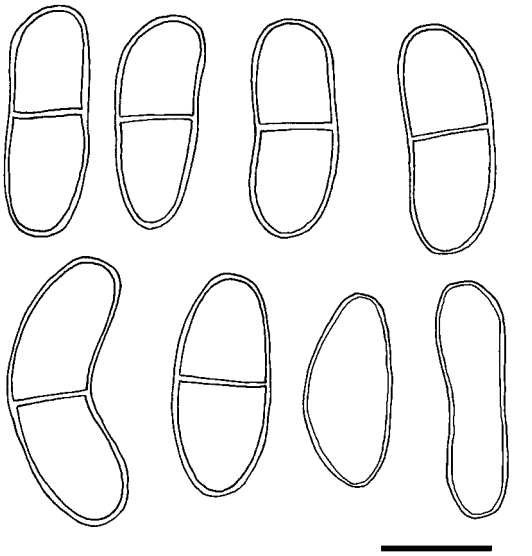


FIG. 12. *Fuscidea recensa* var. *arcuatula*, ascospores of (*Brodo* 30610, *Fryday* 8873). Scale = 10 µm.

Chemistry. K − , C − , Pd − , UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. *Fuscidea recensa* is a predominantly saxicolous species that is widespread in eastern North America. The non-sorediate variety (var. *arcuatula*—see below), which is occasionally corticolous, is most frequent in the Appalachian Mountains and the east coast, whereas the sorediate variety (var. *recensa*) is most frequent further west (Ozark Plateau, Wisconsin) and is almost exclusively saxicolous, being known from a single North American corticolous collection.

Remarks. *Fuscidea recensa* is characterized by its long (10–12 µm), often curved, 0–1-septate ascospores (Fig. 12) and a thallus containing divaricatic acid. The type collection and all European specimens are sorediate and only rarely fertile, whereas most collections referred to this species from North America are fertile and lack soredia (e.g., Brodo *et al.* 2001). Fertile, non-sorediate collections are mostly from eastern North America, whereas several collections from further west (Arkansas, Missouri and

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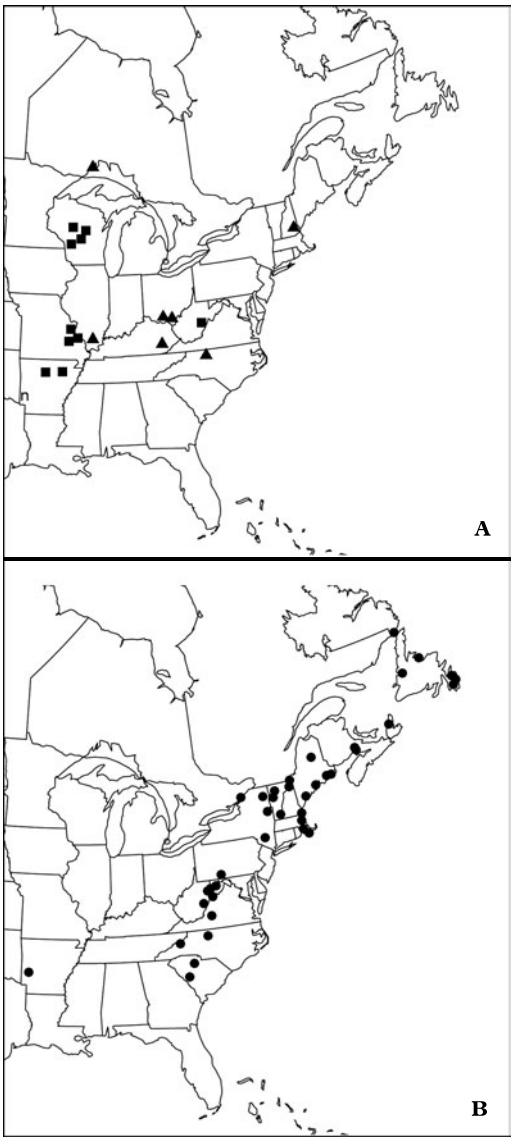


FIG. 13. Known North American distribution of *Fuscidea recensa*. A, var. *recensa* (■ soredia and apothecia, ▲ soredia only); B, var. *arcuatula* (●).

Wisconsin) and one from West Virginia are both sorediate and fertile (Fig. 13). The fertile, non-sorediate specimens have an identical apothecial anatomy and thalline chemistry to European collections and are treated here as *F. recensa* var. *arcuatula* (see below).

Fuscidea recensa has an extremely variable thalline morphology, but all North American collections with soredia and apothecia (i.e., var. *recensa*) have a thick, white thallus, whereas the thallus of non-sorediate collections is often dark grey. However, the thick, pale thallus morphology is shared by non-sorediate specimens from Arkansas and North Carolina (see below) and also by several collections from the north-east (e.g., *Brodo* 22820B, *Wong* 435), whereas others (e.g., *Brodo* 30342 from West Virginia) have an intermediate thick pale brown/fawn thallus. In fact, the thick, pale thallus morphotype is the most frequent for the species, specimens with a darker thallus occurring in more exposed habitats, and those with a thinner thallus in shaded ones.

Five other sorediate collections, from Illinois, Kentucky, Ohio (two) and New Hampshire, lack apothecia but have a *Chlorella*-type photobiont and are probably referable to *F. recensa* var. *recensa*, whereas a collection from North Carolina growing with *F. recensa* var. *arcuatula* (*Perlmutter* 598 *p.p.*), is definitely var. *recensa*. However, saxicolous sorediate crusts are poorly collected in North America, and it is probable that *F. recensa* var. *recensa* is more widespread than reported here. The single North American corticolous collection of var. *recensa*, from the Thunder Bay District of Ontario, has a shiny brown thallus with discrete soralia and and was previously identified as *F. pusilla*.

Brodo *et al.* (2001) show the distribution of *F. recensa* as extending to northern Colorado, but the specimen on which this record was based is not a species of *Fuscidea*. In Europe, the sorediate taxon occasionally occurs on trees (Tønsberg 1992) but in North America var. *recensa* is almost exclusively saxicolous, although corticolous collections of var. *arcuatula* are relatively frequent.

Selected specimens examined. **Great Britain:** *Scotland*: **V.C. 88** Mid Perthshire, Crieff, Ben Chonzie, 2250 ft, south facing crag, 1976, *B. Coppins* 2079 (E); Breadalbane Mts, Beinn nan Eachan, GR: 27/57.38, 3000 ft, S-facing crags, exposed outcrop of schistose rock, 1985, *B. Coppins* (10997) *et al.* (E). **V.C. 92**

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South Aberdeen, Ballochbuie Forest; above Bridge of Dee, GR: 37/18.90, 335–460 m, on vertical side of large boulder on hillside, 1984, *B. Coppins* (10601) *et al.* (E).—**USA:** *Arkansas*: Stone Co., Cherokee Wildlife Management Area, 35°45′46″N, 92°03′16″W, sandstone bluff in mixed hardwoods, 2001, *R. Harris* 45464 (NY), *Buck* 40351 (NY); Pope Co., Ozark National Forest, Pedestal Rocks Scenic Area, 35°43′09″N, 93°03′29″W, 550 m, sandstone bluffs in oak-dominated forest, 2005, *W. Buck* 49404 (NY); Polk Co., Ouachita National Forest, Caney Creek Wilderness Area, 34°24′18″N, 94°04′23″W, 1700 ft, oaks, hickory, and rock cliffs on S facing slope, 2000, *C. Wetmore*, 84444 (MIN). *Missouri*: Ste Genevieve Co., Pickle Springs Natural Area, on boulder in shade, 1990, *R. Harris* 25986, 25992 (NY); Reynolds Co., St. Francis Mountains, Johnson Shut-Ins State Park, 37°32′N, 90°50′W, 245–310 m, oak-hickory-juniper forest on rhyolite and granite talus slope, 1993, *R. Harris* 31222 (NY); Jefferson Co., St. Peters Sandstone ravine and glades, 38°23′13–41″N, 90°41′49″W, 165–260 m; on sandstone, 2001, *W. Buck* 45128 (NY). *West Virginia*: [Pocahontas Co.], Huntersville, 9 I 1930, *F. Gray* (F). *Wisconsin*: Portage Co., Cambrian sandstone, NW slope, 90°, shady and dry, 1962, *KGF[oote]* 62297 (WIS); Juneau Co., Cambrian sandstone, level sunny and dry, 1962, *K. Foote* 62696 (WIS); Vernon Co., St. Peter sandstone, NW slope, 90°, shady and dry, 1962, *K. Foote* 621096 (WIS); Clark Co., Cambrian sandstone, S slope, 45°, sunny and dry, 1962, *K. Foote* 61111a (WIS).

Sterile collections examined. **Canada:** *Ontario*: Thunder Bay District, Sleeping Giant P.P., west of Silver Islet on trail to Sea Lion, 48°20′N 88°50′W, *Abies-Picea* forest, 1993, *I. Brodo* (29675) *& S. Sharnoff* (CANL; corticolous).—**USA:** *Illinois*: Union Co., Panther Den, Shawnee National Forest, 37°33′N, 89°05′W, moist sandstone bluff along river, maple-oak woods and second growth, 1993, *R. Harris* 31432 (NY). *Kentucky*: Harlan Co., Kentenia State Forest, Profile Rock, 2·7 mi SW of KY 2010 on Little Shepherd Trail, *c.* 765 m, large sandstone outcrop along ridge of Pine Mountain, 1991, *W. Buck* 20814 (NY). *Ohio*: Gallia Co., Wayne National Forest, above Symmes Creek, 8°49′34N, 82°28′19″W, 700–800 ft, southwest facing slope, on sandstone, 2006, *J. Lendemer* (7408, 7446) with participants of 15th Tuckerman Workshop (hb. Lendemer); Scioto Co., Niles Twp. Shawnee State Park, road to Lodge, 2006, *D. Flenniken* 7703 with participants of 15th Tuckerman Workshop (hb. Flenniken). *New Hampshire*: Rockingham Co., Nottingham, northern portion of North Mt, 43°07′00″N 71°12′00″W, poor fen, volcano vent, erratics, mixed forest, 1994, on siliceous rock, *E. Lay* 94-1588 (hb. Lay). *North Carolina*: Surry Co., Pilot Mountain State Park, 36°20′23″N 80°28′29″W, *c.* 666 m, low elevation rocky summit plant community, sunny, 2006, *G. Perlmutter* (598 p.p.) *& J. Pearson* (MSC).

Fuscidea recensa var. arcuatula (Arnold) Fryday comb. nov.

Mycobank: MB 511669.

Biatora arcuatula Arnold, *Flora* **71:** 107–108 (1888).—*Lecidea arcuatula* (Arnold) Nyl. in Hue, *Nouv. Archiv. du Muséum, sér* **3:** 129 (1891).—*Biatora arcuatula* (Arn.) Eckf., *Bull. Torrey Bot. Club* **22:** 252 (1895).—*Lecidea recensa* f. *arcuatula* (Arnold) I.M. Lamb, *Natl. Mus. Canad. Bull.* **132:** 254 (1954); type: Miquelon, 1884–1886, *E. Delamare* (W—isotype!, holotype not in M according to Hertel 1977).

Lecidea gyrodes H. Magn. in Degelius, *Ark. Bot. 30A, no. 3*: 36 (1942); type: USA, Tennessee, Great Smoky Mountains, above Alum Cave, 1520 m, on granite rock, 1939, *G. Degelius* (UPS—isotype!).

Remarks. *Fuscidea recensa* var. *arcuatula* differs from var. *recensa* only in lacking soralia and in being more or less confined to eastern North America.

Arnold (1887) initially determined Delamare's collection from Miquelon as *Biatora circumflexa* (Nyl.) Arnold, a species described by Nylander from Lawrence Bay on the Asian side of the Bering Straits (Nylander 1885, 1887), but the following year described it as a distinct species, *Biatora arcuatula* (Arnold 1888), specifically mentioning the curved ascospores. Delamare *et al.* (1888) included the species under *Biatora circumflexa*, but Le Gallo (1952), although acknowledging Delamare's *et al.* (1888) assertion that it is ''commune sur les rochers du Calvaire et du Capeau á Miquelon'', mentions *Lecidea circumflexa* as doubtfully present on Miquelon because Zahlbruckner (1925) reported it only from Asia.

Fuscidea recensa var. *arcuatula*, like European specimens of var. *recensa*, is very variable in thallus and apothecia gross morphology. The thallus varies from pale grey to dark brown, from thin and rimose to (usually) thick and areolate, whereas the apothecia are usually black and prominent, constricted below and with a thick persistent proper margin, but may also be paler, and almost adnate with an ± excluded margin, and occasionally with a slightly pruinose disc. Lamb (1954) recognized the morph with a dark brown thallus as f. *arcuatula* and Brodo (1984) suggested that this morph

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may not occur in Europe because the type collection of *Lecidea recensa* had a pale grey thallus and "European authors . . . invariably describe the thallus as pale grey (Poelt & Vězda 1981, Wirth 1980)". However, subsequent European authors have described the thallus as pale grey to brown-grey (Purvis *et al.* 1992; Wirth 1995) or green to dark brown (Tønsberg 1992) and, in fact, European specimens of var. *recensa* show a similar variation in thallus colour to those of var. *arcuatula* from North America; for example two collections from Scotland (*Coppins* 2079 & 10997*)* are as dark as the exsiccate specimen Brodo was describing (*Gowan* 5017) when he made this suggestion. Oberhollenzer & Wirth (1990) suggested that this variation in colour was a consequence of the light intensity to which the specimen was exposed; specimens from shaded habitats having a lighter thallus, whereas those from more exposed habitats were darker. This is supported by specimens from North America; for example, two specimens collected from the same area of Maine (*Brodo* 30502, 30610), in which the specimen from a shaded locality has a thin, pale thallus whereas that from an exposed rock has a thick, dark thallus. The species described and illustrated by Brodo *et al.* (2001) as *F. recensa*, represents the dark form of this taxon.

The North American distributions of var. *arcuatula* and var. *recensa* are parapatric; *Fuscidea resensa* var. *recensa* having the centre of its North American distribution in central USA (Arkansas, Missouri, Wisconsin), where it is often fertile, with scattered records of, usually, non-fertile, sorediate specimens further east, whereas var. *arcuatula* is largely confined to eastern North America with only a few records from further west. However, the separation is not complete; in particular, three collections from western Arkansas (Polk Co.) are non-sorediate (i.e., var. *arcuatula*: *Wetmore* 84283, 84371, 84572) whereas another collection from the same locality is morphologically identical except for the presence of soralia (i.e., var. *recensa*: *Wetmore* 84444). The two taxa also occur together in the southern Appalachians (*Perlmutter* 598) and there is a record of *F. recensa* var. *recensa* from New Hampshire (*Lay* 94-1588). It is probable that the overlap may be more extensive because sorediate saxicolous crustose lichens are infrequently collected in North America, and non-fertile var. *recensa* may be much more common in the east than records indicate. For this reason I prefer, at this stage, to recognise the non-sorediate entity at the level of variety rather than as a distinct species.

The type, and only collection of *Lecidea gyrodes* H. Magn. differs from typical *F. recensa* var. *arcuatula* only in having a thallus composed of brown, convex areoles and somewhat gyrose apothecia, other apothecial characters being identical to typical *F. recensa*. These gross morphological characters are at the extreme range of the morphology of the taxon, but specimens with an equally dark thallus or consisting of equally convex areoles are known. For example, a corticolous collection from West Virginia (*Lay* 01-0460) has a thick, ± bullate thallus that is partly dark brown (as in *L. gyrodes*) and partly pale, but has non-gyrose apothecia. Contorted, ± gyrose apothecia are, however, known from some specimens of typical var. *arcuatula* and, consequently, *L. gyrodes* is here included as a synonym of *F. recensa* var. *arcuatula*.

Fuscidea ramboldioides Kantvilas (Kantvilas 2001, 2004), known from Australia (New South Wales, South Australia, Tasmania), has similar curved 0–1 septate ascospores but these are shorter than in *F. recensa* and it also differs in having a smoother thallus and a less pigmented exciple.

Selected specimens examined. **Canada:** *New Brunswick*: Albert Co., Fundy N.P., Matthew's Head, 45.5667°N 64.9667°W, in old field on unshaded boulder, 1981, *S. Gowan* (5017) *& I. Brodo* (DUKE, MSC, WIS, *Lichenes Canadenses Exsiccati* #178). *Newfoundland*: Labrador, L'anse au Clair, 1894, *A. Waghorne* 20, p.p. (US); Sparrible Cove, Notre Dame Bay, 1894, *A. Waghorne* 23, (MIN); Newfoundland Island, Avalon Peninsula, Hawke Hills, 47°19′20″N 53°07′37″W, 250–320 m, on rock, rocky, montane to subalpine oceanic heathland, 2007, *J. Lendemer* 10011, 10050 (NY), *E. Lay* 07-0025 (hb. Lay); *ibid.*, Butterpot Provincial Park, E of Big Otter Pond, 47.399°N 53.043°W, 160 m, mesic to wet coniferous *Pinus*

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mariana forest, rock bluffs along banks, 2007, *E. Lay* 07-0026, 07-0028, 07-0029 (hb. Lay). *Nova Scotia*: Inverness Co., Cape Breton Highland NP, Presqu'ile, 46°42′N 60°57′W, on exposed rocks on bluff, 1972, *I. Brodo* 18979 (CANL, WIS); *ibid.*, Cape Breton Island, Cape Breton Co., Mainadieu, on cliff face about 10 m above the sea, 1952, *I. Lamb* 6916 (CANL). *Ontario*: Leeds & Grenville Co., Morton, Pitch Pine Ridge, 44°24′N 75°53′W, on granite cliff, 1968, *P. Wong* 435 (CANL).—**USA:** *Arkansas*: Polk Co., Ouachita National Forest, Caney Creek Wilderness Area, 34°25′22″N, 94°08′22″W, 1150 ft, N facing hillside and river bottom, 2000, *C. Wetmore* 84283 (MIN). *Maine*: Knox Co. Rockport, on quartz rock, 9 v 1911, *G. K. Merrill*, (FH, *Lichenes Exsiccati* #256);. Washington Co., McLellan Park, 44°29′N 67°51′W, on exposed rocks at edge of shore, 2001, *I. Brodo* (30583), *F. Brodo & F. Schumm* (CANL); Steuben, Eagle Hill Field Research Institute, 44°28′N 67°56′W, under overhang, in crevice of rockface, 2001, *I. Brodo* 30502 (CANL); *ibid.*, open disturbed site, 44°29′N 67°56′W, on exposed boulder, 2001, *I. Brodo* 30610 (CANL); Town of Beals, Great Wass Island, Great Wass Island Preserve, 44°28′52″N 67°35′41″W, red spruce-balsam fir coastal forest and jack pine bald, 2007, *R. Harris* 53803 (NY); Hancock Co., Black Mountain trail, just south of Tunk Lake. 44°34′50″N 68°6′22″W, *c.* 230 m, *Picea rubens* stand, on boulder on trail in forest, 2004, *I. Brodo* (31488) *& Eagle Hill class* (DUKE); *ibid.*, Black Mountain, 44°34′52″N 68°6′24″W, *c.* 246 m, on boulder in old maple forest, shady, 20 vii 2006, *G. Perlmutter* s.n. (MSC). *Massachusetts*: Essex Co., Cape Elizabeth, 1861, *E. Tuckerman* (FH); New Bedford, 1862–1898, *H. Willey* (FH, US), Weymouth, 1862–1898, *H. Willey* (US); Dukes Co., Martha's Vineyard, Francis Wood TNC Preserve, 41°24′N 70°42′W, old field, on rockfall, 1994, *S. D. Sharnoff & S. Sharnoff* 1511.01 (CANL–LNA voucher). *New Hampshire*: Coos Co., Great Gulf Wilderness Area, around Great Gulf Trail and W. Peabody River, 2300 ft, along ridge and river, 1988, *C. Wetmore* 61838, 61842 (MIN); White Mountains, 1843, *E. Tuckerman* (FH); Mt Monadnock, *C. Frost* (FH); White Mountains, 1878, *H. Willey* (US). *New York*: Washington Co., West Fort Ann, flinty rocks east of Lake Hadlock, 24 xi 1915, *S. Burnham* (FH, ex hb. G.K. Merrill); Essex Co., Wilmington, notch on Rt. 86, 5·8 miles S of Wilmington, exposed talus slope on steep grade, 1963, *I. Brodo* 4714 (CANL, MSC). *North Carolina*: Surry Co., Pilot Mountain State Park (Mtn Section), 36°20′23″N 80°28′29″W, *c.* 666 m, low elevation rocky summit plant community, sunny, 2006, *G. Perlmutter* (594, 598) *& J. Pearson* (MSC); 1883, *Jos. Hooker* (FH, US); *ibid.*, Crowden Mt, 1883, *H. Green* (PH); *ibid.*, 1886, *H. Green* (US). *Pennsylvania*: Bedford Co., Buchanan State Forest, Cumberland Valley township, Pleasant Valley, 40°03′18″N, 78°39′43″W, 1700–1800 ft, west facing slope with granite exposures, on sandstone, 2006, *J. Lendemer* 7285 (with *W. Buck, R. Harris, S. LaGreca & N. Wood*) (hb. Lendemer). *South Carolina*: Mitchell Co., Roan Mountain, Roan High Bluff, 6200 ft, spruce-fir, on *Picea*, 1895, *R. Harris* 18305 (NY: no apothecia, divaricatic acid); Aiken, *H. Ravenel* (FH); Chester, 1883, *J. Eckfeldt* (PH). *Tennessee*: *GD[egelius]* (MIN; ex hb. G. Llano; topotype of *L. gyrodes*; possible isotype); *ibid.*, Great Smoky Mountains, near Alum Cave, *c.* 1500 m. 13 ix 1939, *G. Degelius* (US—topotype of *L. gyrodes*; possible isotype). *Vermont:* Addison Co., Bristol, Bristol Cliffs Wilderness Area, 44°06′19″N 73°04′34″W, cold air talus slope, silicous, 2000, *E. Lay* 00-0071 (hb. Lay); Lamoille Co., Battleboro & Mt Mansfield, *C. Frost* (FH); Mt Mansfield State Forest, Runny Nose Spring, 44°31′41″N 72°48′54″W, krumholtz and siliceous ledges in open, 2000, *E. Lay* 00-0072 (hb. Lay). *Virginia*: Bedford Co., The Peaks of Otter, 3875 ft, oak-hickory forest over granite and sandstone, on rock overhang, 1978, *I. Brodo* (22820B) *& D. Pierson* (CANL). *West Virginia*: Grant Co., Greenland Gap, 39°11′07″N, 79°08′25″W, 450–475 m, on rocks at edge of dashing brook, 2001, *S. LaGreca* 799 (FH); Tucker Co., Monongahela N.F., Dolly Sods Wilderness, Bear Rocks, 39°04′N 79°18′W, 1217 m, on boulder on ridge, 2001, *I. Brodo* 30342 (CANL); Pendelton Co., Kile Knob, Fork Mountian, 38°35′44″N, 79°28′57″W, 4588 ft [1398 m], on massive sandstone, 2005, *J. Vanderhorst* 7119 (hb. Flenniken).

Corticolous or lignicolous. **USA:** *Maine*: Washington Co., Eagle Hill, 44°27′30″N, 67°56′00″W, *Acer rubrum*, 2006, *R. Harris* 53102 (NY). *New York*: Ulster Co., Ellenville Ice Caves, 1937, collector unknown (NY, ex Herb. G. G. Nearing). *Vermont:* Addison Co., Bristol, Bristol Cliffs Wilderness Area, 39°04′34″N 44°06′19″W, cold air talus slope, siliceous, 2000, *E. Lay* 00-0071 (hb. Lay). *West Virginia*: Tucker Co., Monongahele National Forest, Dolly Sods Wilderness, near headwaters of Red Creek, on *Acer rubrum*, 1975, *R. Harris* 10446 (NY); *ibid.*, Bear Rocks, exposed stunted trees, 2001, *E. Lay* 01-0460 (hb. Lay).

Fuscidea scrupulosa (Eckf.) Fryday comb. nov.

Mycobank: MB 511670.

Biatora scrupulosa Eckf., *Bull. Torrey Bot. Club* **22:** 253 (1895).—*Lecidea (Biatora) scrupulosa* (Eckf.) H. Magn., *Meddel. Göteborgs Bot. Trädgard/Acta Horti. Gothob.* **10:** 9 (1935); type: Canada, Labrador, on rock, 1894, *A. C. Waghorne* (PH—lectotype!, designated here).

Lecidea kochiana var. *subreagens* H. Magn. *syn nov.*, *Meddel. Göteborgs Bot. Trädgard/Acta Horti. Gothob.* **10:** 10 (1935).—*Fuscidea subreagens* (H. Magn.) Oberholl. & V. Wirth, *Beiheft zur Nova Hedwigia* **79:** 575 (1984); type: USA, New York, Adirondak Region, Mount Marcy, 4900–5300 ft, 1933, *J .L. Lowe* 2701 (UPS—holotype), 2836, 3111, 3096 (FH, NY, US—syntypes!).

(Figs 14 & 15)

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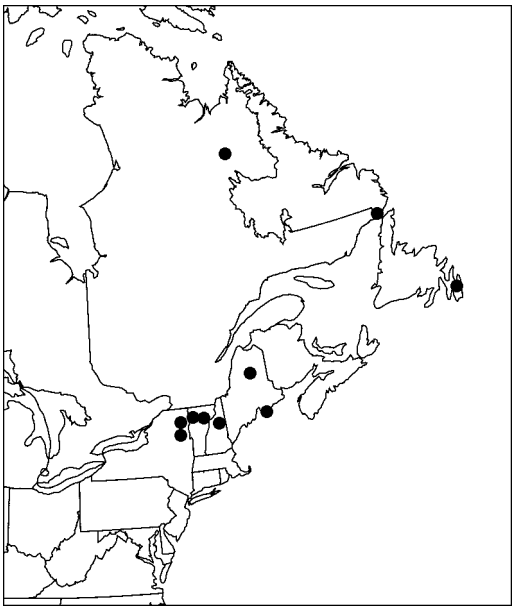


FIG. 14. Known distribution of *Fuscidea scrupulosa*.

Thallus grey to brown (becoming reddish-orange in the herbarium), moderately thick, areolate, areoles flat, thin black prothallus at margin; *medulla* I −.

Apothecia black to dark-brown, rounded, becoming slightly flexuose, 0·5–0·9 mm diam.; proper margin persistent and slightly raised, 0·05–0·1 mm wide. Thecium 70–80 μm tall; paraphyses sparingly branched with upper 5 μm pigmented, apical cells swollen to 5 μm with a brown cap. Exciple of radiating hyphae, outer 20 μm pigmented, inner colourless. *Ascospores* simple, becoming brown, sub-globose to broad-ellipsoid, 8–10 × 5–6 μm

Conidiomata pycnidia, rare, immersed in thallus; *conidia* bacilliform 3–4 × 0·8 μm.

Chemistry. K −, C+ red, KC+ red, Pd+ yellow, UV+ orange. Alectorialic acid by TLC.

Distribution and ecology. This saxicolous species is confined to higher altitudes in north-east North America (Fig. 14) where it is not rare.

Remarks. *Fuscidea scrupulosa* is characterized by the presence of alectorialic acid in the thallus and apothecia. This substance is responsible for the 'yellow mist' produced with K that was noted by Magnusson (1935), and also causes the thallus to react Pd+ yellow, KC+ red, UV+ orange. Alectorialic acid is otherwise known in the genus in North America only in the sorediate species *F. praeruptorum* (Du Rietz & H. Magn.) V. Wirth & Vězda.

It is surprising that Magnusson (1935) did not realize that his new variety, *Lecidea kochiana* var. *subreagens*, was identical to the species he newly combined into the *Lecidea rivulosa* group in the same publication. He described them in successive entries and keyed them out together in the same couplet, separating them by *L. scrupulosa* having a thicker thallus, sessile apothecia with a more prominent margin, and slightly smaller ascospores. However, it is probable that Magnusson had seen only the holotype material of his new variety sent to him by Lowe and the fuller range of Lowe's collections from Mt Marcy, and numerous other collections from NE North America, show that these distinctions are not consistent.

Fuscidea circumflexa (Nyl.) V. Wirth & Vězda, described from the Asian side of the Bering Straits, is very similar to *F. scrupulosa* and may be conspecific with it, as it apparently differs only in having a thicker, verrucose thallus (Fig. 15). The lectotype of *F. circumflexa* (not holotype as stated by Inoue 1981*a*) is extremely poor, being less than 1 cm^2 and having only two apothecia (both of which have been sectioned by previous investigators). An isotype in S is larger, although still small, and has several apothecia, but it is impossible to be certain that the two species are not conspecific. Consequently, given that the two taxa are allopatric and appear to differ in gross morphology, I here retain them as separate species. A similar situation occurs with *Lecidea gyrodes* and *F. recensa* var. *arcuatula* (see above), but in that case other specimens of *F. recensa* var. *arcuatula* exist with the properties of *L. gyrodes* and, as the two entities are not widely separated geographically, they are included

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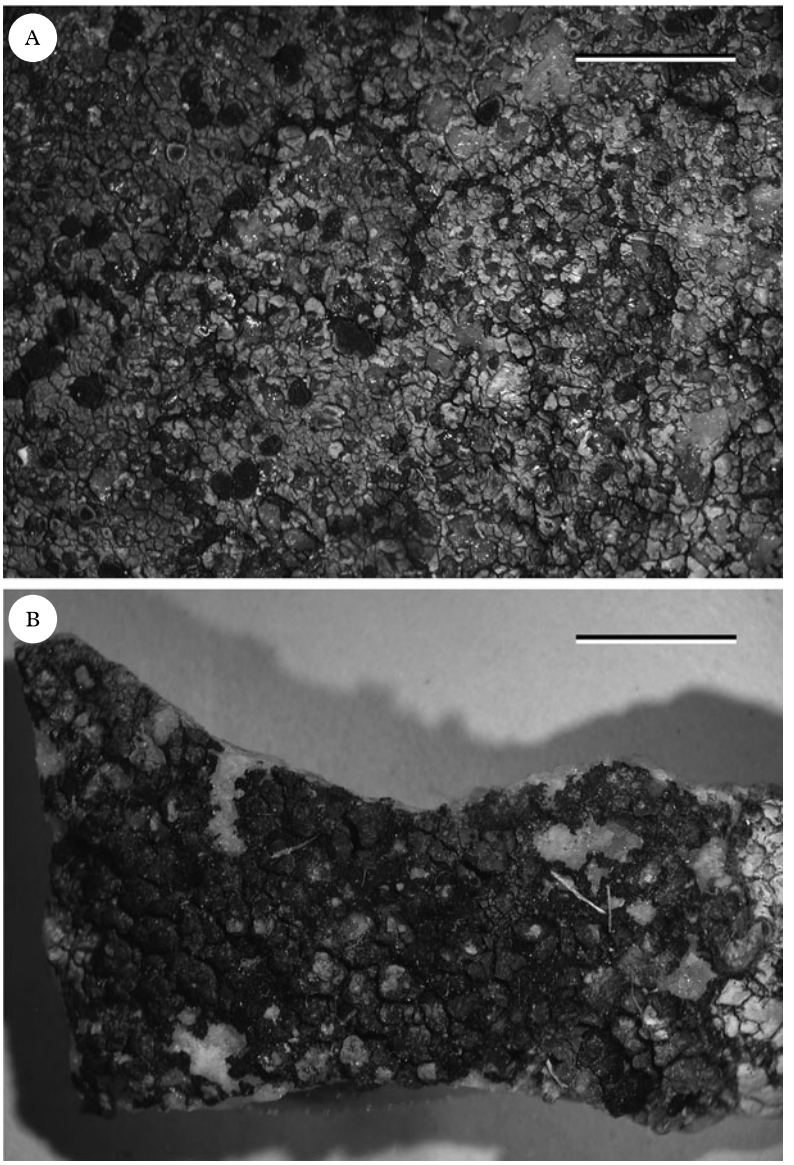


FIG. 15. Thallus and apothecia of A, *Fuscidea scrupulosa* (holotype) and B, *F. circumflexa* (isolectotype). Scales: A & B = 5 mm.

in the same taxon. Inoue (1981*a*) reported *F. circumflexa* from Japan but from his description ''areoles plane or slightly convex'' and his illustration, it appears his specimens may represent *F. scrupulosa*. Examination of these collections may help to determine whether *F. scrupulosa* should be reduced to synonymy with *F. circumflexa*, but, unfortunately, I have been unable to obtain any for study because they are on permanent loan from HIRO to Dr Inoue.

Eckfeldt's collection of *F. scrupulosa* in PH is marked 'syntype', but I have seen no other original collections among the numerous other collections I have examined from all the major North American herbaria.

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Eckfeldt mentions no specific collections and the PH specimen is an excellent specimen in good condition so I here designate it as the lectotype.

Selected specimens examined. **Canada:** *Newfoundland*: Labrador, L'anse au Clair, 23 vii 1894, *A.C. Waghorne* (US, p.p., not type material); Newfoundland Island, Avalon Peninsula, Hawke Hills, 47°19′20″N 53°07′37″W, 250–320 m, on rock, rocky, montane to subalpine oceanic heathland, 2007, *J. Lendemer* 10011, 10057 (NY). *Quebec*: N side of Lake Louis, *c.* 80 mi N of Schefferville, on rock, 1990, *D. Wehr* 39 (NY).— **USA:** *Maine*: Hancock Co., Acadia N.P., Mt Desert Island, in gorge, birch, oak and young spruce woods, 1984, *T. Sullivan* 4386 (MIN); Piscataquis Co., Baxter State Park, Katahdin, North Basin, 45°55.76′N, 68°54.86′W, 975 m, granitic boulder, 2004, *Fryday* 8843, 8844 (MSC); *ibid.*, Tableland, 18 ix 1922, *A. Norton, Pope & Perkins* (FH). *New Hampshire*: Coos Co., Great Gulf Wilderness Area, NE slope of Mt Clay, 6050 ft, in alpine area with rock tallus, heath meadow and some areas of krumholtz, 1988, *C. Wetmore*, 61623 (MIN); *ibid.*, Presidential Dry River Wilderness Area, on east side of Mt Monroe, 5000 ft, in sedge and heath meadow in alpine area, 1988, *C. Wetmore* 62426 (MIN); White Mountain NF, Mt Washington, along Auto Road at Cragway Spring, 44°17′N, 71°18′W, 1430–1465 m, heath and krummholz vegetation on leeward slope, 1999, *R. Harris* 4319 p.p. (NY), *W. Buck* 36167 (NY); White Mountains, 1843, *E. Tuckerman* (FH); Mt Monadnock, *C. Frost* (FH). *New York*: Essex Co., Mount Marcy (near Lake Placid), 5300 ft, on rock on N side, 1933, *J. Lowe* 2604 p.p. (MICH); *ibid.*, underside of rock NE exposure, 1933, *J. Lowe* 2607 p.p. (MICH); *ibid.*, Avalanche Lake (near Lake Placid), 1000 ft, 1936, *J. Lowe* 6237 (MICH); Lake Placid, Algonquin Peak south of Mt Marcy, 5110 ft [1558 m], 1963, *I. Brodo* 4750 p.p. (CANL, MSC); Wilmington, Whiteface Mountain, summit, *c.* 4500 ft, on eastern slope in krumholtz zone, in shady little nook, 1960, *I. Brodo* 492 (CANL, MSC); *ibid.*, 4872 ft, on top above tree line, 1963, *C. Wetmore* 12209 p.p. (MIN); *ibid.*, at summit, on rocks, 1963, *J. Thomson* 11221, 11235 (WIS); *ibid.*, near summit of Whiteface Mountain, 8 miles NE of Lake Placid, 44°22′N, 73°54′W, 4800 ft (1445 m), *Abies balsamea* krumholtz, 1971, *R. Egan* EL-4678, EL-4680 (MIN). *Vermont*: *C. Frost* (FH); Lamoille Co., Mt Mansfield State Forest, Runny Nose Spring, 44°31′41″ 72°48′54″W, krumholtz and siliceous ledges in open, 2000, *E. Lay* 00-0073, 00-0074 (hb. Lay).

Fuscidea texana Fryday sp. nov.

Mycobank: MB 511667.

Fuscideae molli similis sed thallo acidum norsticticum continenti differens.

Type: USA, Texas, Brewster Co., Big Bend National Park, on north slope of Emory Peak, [*c.* 29°15′N, 103°15′W,] 6300 ft, pinyon pine, oaks and junipers, 16 May 1970, *C. M. Wetmore* 19651 (MIN—holotype!).

(Figs 10 & 16)

Thallus to 5 cm diam., with distinct margin, *c.* 0·2 mm thick, pale pinkish-grey, areolate; areoles flat, 2·5–4·0 mm across, often subdivided into smaller 'subareoles'; cortex absent but with numerous minute brown crystals on the surface; *medulla* I − . *Photobiont Chlorella*–type, cells 8–12(–15 when dividing) µm diam.; dividing by binary fission.

Apothecia sessile to adnate, (0·3)0·6–1·0(1·3) mm diam. mostly round but some irregular, dark brown, slightly pruinose; margin indistinct even in very young apothecia, when present barely discernable as a thin, pale margin 0·01–0·02 mm across and not raised above the level of the disc. *Thecium* 50–60 µm tall; *paraphyses* simple, lax and readily separating in K, 2–2·5 µm wide with upper 10–15 µm with brown pigment, distinctly capitate, to 5 µm across with dark brown pigmented cap. *Hypothecium* hyaline 75–80 µm tall. *Ascus Teloschistes*-type, 40–55 × 10–12 µm, cylindrical to slightly clavate; *ascospores* broad-ellipsoid, 8–9 × 4·5–5·5 µm, thick walled, becoming pale brown with age. *Exciple* cupular, very thin with only the outer 5 µm with brown pigment.

Conidiomata rare, immersed, pale reddish-brown 0·05 mm diam.; *conidia* narrow ellipsoid 5–6 × 1·5–2·0 µm.

Chemistry. K+ red (acicular crystals in section), C − , Pd+ yellow; norstictic acid.

Distribution and ecology. The occurrence of a species of *Fuscidea* in southern Texas is unexpected. The genus otherwise exhibits a predominantly cool temperate-boreal/austral distribution, being especially frequent in areas with an oceanic climate. Southern Texas is in the ''arid-subtropical'' climatic region, and although *F. texana* was collected from high elevations (1920 and 2255 m), the climate is still dry with an annual precipitation of 48·7 cm, and quite unlike that of any

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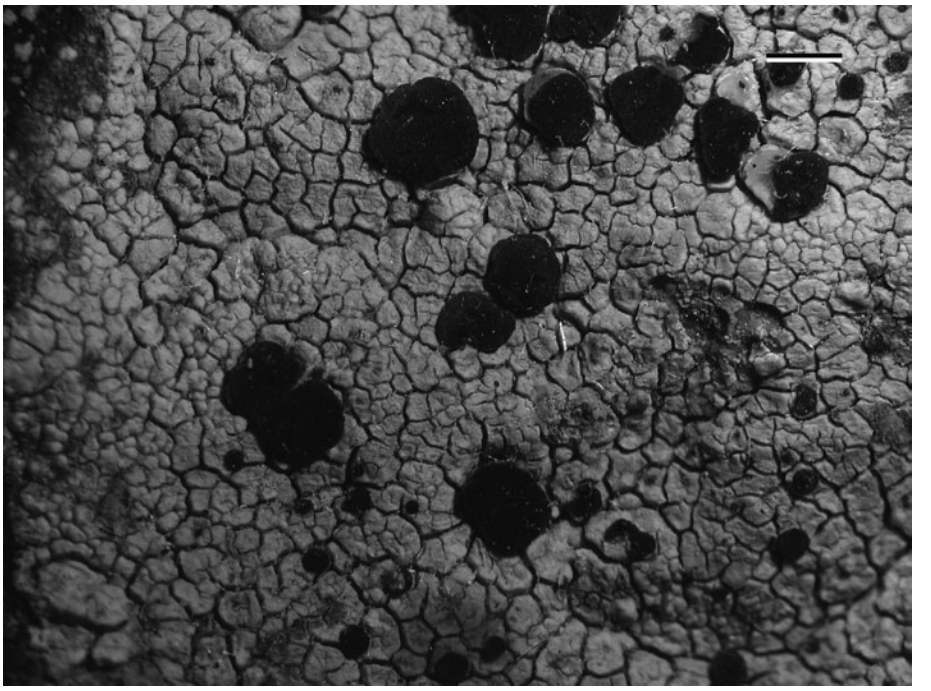


FIG. 16. Thallus and apothecia of *Fuscidea texana* (*Wetmore* 19651, holotype). Scale=1 mm.

other area where the species of the genus occur in North America. However, *Fuscidea fulva* (Malme) Kalb from Central and South America, *F. hottentotta* Brusse from South Africa, *F. umbricolor* (Nyl.) Hertel from northern South America, and an undescribed species from the West Indies (A. M. Fryday unpublished.) also do not fit with this general distribution pattern. These species differ from *F. texana* in chemistry and, in addition, *F. fulva* is corticolous, *F. hottentotta* has curved ascospores, and *F. umbricolor* has an amyloid medulla.

Remarks. Norstictic acid is otherwise known in *Fuscidea* only in two southern hemisphere species; *F. subasbolodes* Kantvilas from the cool-temperate/subantarctic (Kantvilas 2001; Fryday 2003) and *F. mayrhoferi* Kantvilas from Western Australia (Kantvilas 2004). These species differ in having innate apothecia with an '*intercincta*-type' exciple (Oberhollenzer & Wirth 1984). The conidia of *F. texana* are longer than is usual in the genus, most other species having conidia 2·5–4 × 1·2–2·0 μm, although those of *F. mayrhoferi* are reported as 4–5 × 1–2 μm (Kantvilas 2004) and in the related *Ropalospora lugubris* (Sommerf.) Poelt they are bacilliform, 4–6 × 1 μm.

Only nearly 40-year-old herbarium material of *F. texana* was available for study and given that the thallus apparently lacks a cortex, the phobiont cells reaching to the upper surface of the thallus, this species is likely to appear a very different colour when fresh.

Other lichen species associated with the holotype collection of *F. texana* included *Caloplaca* sp., *Candelariella* sp. and *Dimeleana* sp.

Additional specimen examined. **USA:** *Texas*: Brewster Co., Big Bend National Park, on top of east rim, [29°14′N, 103°17′W], 7400 ft, in pinyon pine-juniper

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forest and on edge of cliffs, 1969, *C. Wetmore* 18333 (MIN, MSC).

Fuscidea thomsonii Brodo & V. Wirth

Mycobank: MB446213.

Lichenographia Thomsoniana: 156 (1998); type: Canada, British Columbia, Queen Charlotte Islands, Moresby Island, east end of Mike Inlet on shore and along stream to exposed bluffs, 52°32′N 131°45′W, 36 m, 1 Aug. 1968, *I. M. Brodo* 14173 (CANL—holotype).

(Figs 1E, 2 & 3)

Thallus grey to greyish-brown, cracked areolate; black prothallus usually present at margin; *medulla* I+ violet.

Apothecia immersed to adnate, not constricted below; disc black, flat; pseudothalline margin usually apparent, paler than the disc giving the appearance of a 'halo' *intercincta*-type (*cf. F. aleutica*). *Thecium* 55–75 µm; *paraphyses* simple, lax in K, upper 20–25 µm with brown pigment, 1·5–2·0 µm wide scarcely swollen at apices (to 3·0 µm). *Exciple* annular, poorly defined, only outermost cells with brown pigment. *Ascospores* subglobose to broad-ellipsoid, 7–9 × 5–6 µm.

Conidiomata pycnidia, immersed in thallus; *conidia* bacilliform 3–4 × 0·8 µm.

Chemistry. K −, C −, Pd −, UV+ white (medulla). Divaricatic acid by TLC.

Distribution and ecology. This species was described from the Queen Charlotte Islands by Brodo & Wirth (1998) and is here reported for the first time from Alaska from two collections from the Aleutian Islands previously identified as *F. lowensis* (Talbot *et al.* 1997).

Remarks. *Fuscidea thomsonii* is characterized by having innate apothecia and a pale grey thallus containing divaricatic acid and an amyloid (I+ violet) medulla. *Fuscidea aleutica* is similar but differs in having a brown thallus, more sessile apothecia with a better developed exciple that lack a white ring around the inner margin, and a more densely pigmented epihymenium and exciple.

Two collections with a dispersed thallus, which were mentioned by Brodo & Wirth (1998), are provisionally included here (see below). In one instance, the two forms occur on the same collection (*Brodo* 26977) and additional material may show that they represent distinct taxa. One collection (*Brodo* 26977) considered by Brodo & Wirth (1998) to be an aberrant form of *F. mollis*, is here included in *F. thomsonii*, whereas three other collections from the Queen Charlotte Islands (*Brodo* 10444 p.p., 10455, 17833), mentioned by Brodo & Wirth (1998) as possibly an unnamed species or aberrant forms of *F. thomsonii*, are included in *F. aleutica*.

Selected specimens examined. **Canada:** *British Columbia*: Queen Charlotte Islands, Graham Island, Port Channal off Athlow Bay, on south side of inlet (Goose Cove), shoreline rocks and trees and bluffs, on boulder at summit, 320 ft, 1967, *I. Brodo* (10444 p.p.), *M. Shchepanek & W. Schofield* (CANL); *ibid.*, Moresby Island, on west coast, Kootenay Inlet, spruce forest and *Pinus contorta-Chamaecyparis* stand on bluffs, 52°51′N 132°13′W, on top of exposed bluff, 1967, *I. Brodo* (12155) *& M. Shchepanek* (CANL); *ibid.*, Hibben Island (off west coast of Moresby Island), 53°00′N 132°22′W, headland rocks and rocky shore at north end of island, on rock in salt-spray zone, 1968, *I. Brodo* 14058 (CANL); *ibid.*, Chaatl Island, cove on west coast, on NE corner of island, facing ocean, 53°08′N 132°35′W, 0–9 m, on lower aerohaline on headland rocks, 1988, *I. Brodo* 26977 p.p. (CANL); *ibid.*, Ingraham Point, entrance to Carpenter Bay, south shore, 52°14′N 131°02′W, exposed headland rocks,, on rocks in salt-spray zone, 2000, *I. Brodo* 29958 (DUKE, MSC, WIS: *Lichenes Canadenses Exsiccati* #260), 29959 (CANL).—**USA:** *Alaska*: Aleutian islands, Adak Island, Finger Bay area, 51°49.782′N, 176°37.886′W, 0·5 m, on coastal outcrop, epilithic, 1994, *S. & S. Talbot* 635 (WIS); *ibid.*, 51°49.639′N, 176°37.634′W, 200 m, alpine tundra, on rocks in creek bed, 1994, *S. & S . Talbot* 652A (WIS).

Specimen with dispersed thallus examined. **Canada:** *British Columbia*: Queen Charlotte Islands, Chaatl Island, cove on west coast, on NE corner of island, facing ocean, 53°08′N 132°35′W, 0–9 m, on lower aerohaline on headland rocks, 1988, *I. Brodo* 26977 p.p. (CANL): *ibid.*, Graham Island, Seal Inlet in Rennell's Sound, bluffs and boggy area above forest and shoreline around a small cove on the west shore of the inlet, 53°31′N 132°44′W, on vertical faces of exposed rocks, 1967, *I. Brodo* (10455) *& M. Shchepanek* (CANL).

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Excluded species

Fuscidea cyathoides (Ach.) V. Wirth & Vězda

Mycobank: MB417673.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lichen cyathoides* Ach., *Lichenogr. Suec. Prodr.*: 62 (1798); type: Sweden, in saxis et rupibus (H-Ach 273 F & G—lectotype, *fide* Oberhollenzer & Wirth 1984: 552).

Fuscidea cyathoides is a saxicolous species with bean-shaped ascospores and a thallus containing fumarprotocetraric acid (Pd+ red). The occurrence of this species in North America was discussed by Thomson (1997) who concluded that it has not been reliably reported from the continent; a conclusion with which I fully concur.

Specimens examined. **France:** *Vosges*: Col de la Schlucht, 1140 m, sur *Fagus*, 25 9 1959, *R. Werner* (MSC).—**Great Britain:** *Scotland*: **V.C. 92** South Aberdeenshire: Braemar, Invercauld Estate, Craig Leek, 37(NO)/192.931, 400 m, quartzite outcrops below crags, 2005, *Fryday* 9011, 9012 (MSC).—**Norway:** *Nordlandia*: Gróló, *J. Norman* (DUKE).

Fuscidea kochiana (Hepp) V. Wirth & Vězda

Mycobank: MB342006.

Beitr. Naturk. Forsch. Südwestdeutschl. **31:** 92 (1972).—*Lecidea kochiana* Hepp, *Lichenen Flora von Würzburg*: 61 (1824); type: Germany, Hessen, Rhön, Milsburg, 770 m, 21 ix 1968, *V. Wirth* (STU-WIRTH 885—neotype, *fide* Oberhollenzer & Wirth 1984: 570).

(Fig. 1F)

Fuscidea kochiana is a saxicolous species with innate apothecia and a thallus containing divaricatic acid. It was reported from Newfoundland by Eckfeldt (1895) and from the Adirondacks (New York) by Lowe (1939). However, no specimens of this species could be found in PH, where Eckfeldt's collections are housed (J. Lendemer pers. comm.) and Eckfeldt's description of the thallus as ''pale ashy brown to fuscesent, rimose, areolate, broken, areoles sunken, plane, bordered by a black margin'' suggests that his specimen is not this species. Lowe's collections (in MICH) determined as *Fuscidea kochiana* by Lowe and Magnusson are referable to other species of *Fuscidea* (mostly *F. appalachensis* and *F. scrupulosa*). *Fuscidea kochiana* was typified by Oberhollenzer & Wirth (1984) and Magnusson appears to have had a different concept of this species from that now accepted. Although he correctly identified the distinguishing morphological character as the innate, immarginate apothecia (Magnusson 1925), he determined several of Lowe's collections from the Adirondacks as this species, even though they had sessile apothecia with a well-developed margin. He also described the new variety *F. kochiana* var. *subreagens* (a synonym of *F. scrupulosa*, see above), which has sessile apothecia with a well-defined margin, as ''outwardly not differing from the type which is collected in the same localities'' (Magnusson 1935). *Fuscidea kochiana* was not treated by Thomson (1997) and as I have seen no other collections from North America I conclude that *Fuscidea kochiana* has not been correctly reported from the continent.

Fuscidea kochiana was also recently reported from Brazil (Aptroot 2002) but the collection upon which that report was based is referable to a species similar to *F. umbricolor*, but lacking an I+ medulla (*cf.* Additional comparative material examined—Materials and Methods).

Specimens examined. **France:** [*Vosges*:] La Schlucht, 1890 (Harmand, *Lichenes in Lotharingia*, #1046) (MSC).—**Great Britain:** *Scotland*: **V.C. 92** South Aberdeen: between Meall Odhar and Glas Maol, 37/1577, 900 m, on top of siliceous rock outcrop (?schist), 1995, *Fryday* 6073 (herb. Fryday); *ibid.*, Braemar, Eastern Cairngorms SSSI, Mar Lodge Estate, Clais Fhearnaig, 37(NO)/066.930, 505 m, acid rock boulder field above lochan on S side of narrow valley, 2005, *Fryday* 8978 (MSC).

Fuscidea lightfootii (Sm.) Coppins & P. James

Mycobank: MB342007.

Lichenologist **10:** 201 (1978).—*Lichen lightfootii* Sm, in Sowerby, *English Botany* 21: tab. 14541. 1805; type: Great Britain, England, Sussex, St. Leonards Forest, *W. Borrer* (BM—holotype).

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Fuscidea lightfootii is a corticolous, sorediate species with a thallus containing divaricatic acid, and 'dumbell-shaped' ascospores (*cf.* Kantvilas 2002; fig. 1C). It was reported from British Columbia by Aptroot (1996), but the two collections upon which this report was based were shown to be referable to other species by Tønsberg (2002). Collections from the north-east previously referred to this species are *F. arboricola*.

Fuscidea subfilamentosa (Zahlbr.) Brako

Mycobank: MB132216.

In Egan, *Bryologist* **90:** 163 (1987).—*Phyllopsora subfilamentosa* Zahlbr., *Ann. Mycol.* **33:** 44 (1935); type: USA, Florida, [Seminole Co.], Sanford, on dead trunk of *Quercus virginiana*, 3 10 1919, *S. Rapp* (W—holotype!).

This species was described from a collection from Florida that is, to my knowledge, still the only record. The holotype in W, a specimen in F, and collections from Rapp's herbarium in FLAS (not seen) all appear to be from the same collection, having been collected by S. Rapp from the same locality in March 1919, the only difference being that the holotype has the number "62" and the name "*Psora*" whereas the F collection and one of the FLAS collections have the number "3109" and the name "*Phyllopsora subfilamentosa*". The other FLAS collection has no number and the name "*Phyllopsora subfilamentosa*" (R. Harris, pers. comm.). It is unlikely that these are collection numbers, as this would have meant Rapp would have collected almost 3000 collections in a single month, but are more likely numbers referring to individual determinations or taxa. It appears that Rapp initially determined the collection as *Psora* and gave it the number 62; he then sent part of the collection to Zahlbruckner, who, 16 years later in 1935, named it *Phyllopsora subfilamentosa*, at which point Rapp renamed his duplicate and gave it the new number 3109. Unfortunately, although the FLAS and F collections are clearly topotypes, it is not possible to positively identify them as isotypes.

The holotype in W is in good condition with numerous apothecia, but it is not a species of *Fuscidea*. It is easy to see, however, why this species was referred to that genus. The apothecia have exclusively brown apothecial pigments and simple hyaline ascospores that soon become pigmented. On the other hand, the pigment is more red-brown than the fuscous-brown in *Fuscidea*, the ascospores are larger (14–16 × 8–9 µm) than those of any known *Fuscidea* sp., and large, dark blue (K+ bright blue, 15% HCl+ violet) granules are present in the hypothecium. In addition, the specimen has a squamulose thallus, and the exciple is composed of swollen radiating hyphae—both characters unknown in *Fuscidea*. Moreover, the ascus apex has an IKI+ blue conical 'plug' or 'tube' of the *Porpidia*-type and is clearly not *Teloschistes*-type.

All the above characters suggest that this species is referable to the *Lecidea hypnorum* group. This group is closely related to *Clauzadea* and is not congeneric with the type species of *Mycobilimbia*, where it is often placed. It is worthy of generic rank but as no generic name is currently available the species is here transferred to *Lecidea* and the necessary new combination made.

Lecidea subfilamentosa (Zahlbr.) Fryday comb. nov.

Mycobank: MB 511671.

Phyllopsora subfilamentosa Zahlbr., *Ann. Mycol.* **33:** 44 (1935); type: USA, Florida: [Seminole Co.], Sanford, on dead trunk of *Quercus virginiana*, 3 10 1919, *S. Rapp* (W— holotype!).

Thallus composed of minute, dispersed, slightly convex, pale, creamy grey squamules, 0·4–0·7 × 0·15 mm. *Photobiont* chlorococcoid, cells 5–6(–8) µm diam.

Apothecia lecideine, 0·4–0·6 mm diam., flat, constricted below, with a black to red-brown disc and black, slightly raised proper margin 0·05–0·1 mm wide. *Hymenium* 70–80 µm tall, *epihymenium* 15 µm tall, diffuse pale golden-brown (superba-brown); *paraphyses*, slender, 0·1–0·15 µm thick, simple, conglutinate, slightly branched and septate above, constricted at septa, apical cells ± swollen to 3 µm. *Hypothecium* golden brown, K+ brown (superba-brown). *Exciple*

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TABLE 1. *Key characters of* Fuscidea *species reported from North America (italics) and outside North America (no italics)*

Taxon	Substratum	Distribution	Soredia	Chemistry	Thallus		Apothecia	Ascospores
					Colour and texture	Medulla		
F. aleutica	saxicolous	western	absent	divaricatic acid UV+ white	brown, thin, rimose	I+ violet	sessile	broad-ellipsoid
F. appalachensis	saxicolous	eastern	± present	divaricatic acid UV+ white	grey, areoles convex	I−	sessile	subglobose
F. arboricola	corticolous	eastern	present	fumarprotocetraric acid Pd+ red	grey	I−	sessile	straight
F. circumflexa	saxicolous	Japan(?), Bering Straits	absent	alectorialic acid C & KC+ red; Pd+ yellow UV+ orange	brown, areoles convex	I−	sessile	straight
F. cyathoides	saxicolous	Europe, Asia	absent	fumarprotocetraric acid Pd+ red	brown or grey, smooth	I−	sessile	curved simple
F. gothoburgensis	saxicolous	eastern	present	divaricatic acid UV+ white	grey areoles ± dispersed, smooth	I−	sessile	straight
F. intercincta	saxicolous	western	absent	divaricatic acid UV+ white	grey, areoles smooth	I− (rarely+violet)	innate	straight
F. kochiana	saxicolous	Europe	absent	divaricatic acid UV+ white	grey, areoles smooth	I−	innate	straight
F. lightfootii	corticolous	Europe	present	divaricatic acid UV+ white	greyish to green	I−	sessile	constricted at centre
F. lowensis	saxicolous	eastern	absent	divaricatic acid UV+ white	brown, thick, areoles convex	I+ violet	sessile	straight
F. mollis	saxicolous	western	absent	divaricatic acid UV+ white	grey, areoles smooth	I−	sessile	broad-ellipsoid/ subglobose
F. praeruptorum	saxicolous/ corticolous	eastern	present	alectorialic acid C & KC+ red; Pd+ yellow UV+ orange	brown or grey	I−	sessile	bent
F. pusilla	corticolous	eastern and western	present	divaricatic acid UV+ white	grey	I−	unknown	unknown
F. recensa var. *arcuatula*	saxicolous/ corticolous	eastern	absent	divaricatic acid UV+ white	brown (or grey)	I−	sessile	curved 0–1-septate
F. recensa var. *recensa*	saxicolous/ corticolous	central	present	divaricatic acid UV+ white	grey (or brown), areoles convex	I−	sessile	curved
F. scrupulosa	saxicolous	eastern	absent	alectorialic acid C & KC+ red; Pd+ yellow UV+ orange	brown, areoles smooth	I−	sessile	straight
F. texana	saxicolous	southern	absent	norstictic acid K+ red, Pd+ yellow	pinkish-grey, areolate	I−	sessile	broad-ellipsoid
F. thomsonii	saxicolous	western	absent	divaricatic acid UV+ white	grey, areoles smooth	I+ violet	innate	broad-ellipsoid

of radiating hyphae, with golden-brown, K+ brown, pigment (superba-brown). *Asci* cylindrical, 60–70 × 10–12 µm, 8-spored, *hypnorum*-type, similar to *Porpidia*-type but with a tholus with a solid I+ blue 'plug', rather than a hollow 'tube'; *ascospores* simple, hyaline but old spores becoming brown, ± uniseriate in ascus, thick-walled, 14–15 × 8–9 µm.

Conidia not observed.

Chemistry. K −, C −, KC −, Pd −, UV+ pale yellow. No substances by TLC (*fide* Brako).

Distribution and ecology. Known only from the type collection from a mossy, dead tree trunk (*Quercus*) in Florida.

Additional specimen examined. **USA:** *Florida*: [Seminole Co.], Sanford, on dead trunk of *Quercus virginiana*, 3 1919, *S. Rapp* (F—topotype).

Key to species of *Fuscidea* reported from North America

(Names in bold are accepted North American taxa.)

1 Thallus with soredia 2
Thallus lacking soredia 9

2(1) Soredia Pd+ red, C −, KC −, UV − (fumarprotocetraric acid) or Pd+ yellow, C+ red, KC+ red, UV+ orange (alectorialic acid) 3
All spot tests negative, UV+ white (divaricatic acid) 4

3(2) Soredia Pd+ red, UV −, C −, KC − (fumarprotocetraric acid); corticolous . . . . . **F. arboricola**
Soredia Pd+ yellow, UV+ orange, C+ red, KC+ red, (alectorialic acid), saxicolous or corticolous . . . . . **F. praeruptorum**

4(2) Corticolous 5
Saxicolous 7

5(4) Thallus indistinct, rarely more than 10 mm diam., greyish green to green, composed of scattered to confluent granules 0·08–0·16 mm diam; soralia efforescent and irregular; prothallus brown, typically broad & conspicuous. Apothecia and pycnidia unknown . . . . . **F. pusilla**
Thallus distinct, widespreading, greyish-green to brown, composed of corticate granules 0·1–0·25 mm diam.; soralia usually well developed and ulcerous . . 6

6(5) Thallus olivaceous to dull green; soralia pale or yellowish-green; apothecia and/or pycnidia usually present . . . . . F. lightfootii
Thallus brown to grey; soralia creamish-green, surface soralia brown; apothecia and/or pycnidia usually absent . . . . . **F. recensa var recensa**

7(4) Thallus grey, thin, often of dispersed areoles; apothecia, when present small, with white ring around inner margin of proper exciple . . . . **F. gothoburgensis**
Thallus thicker, of contiguous areoles; apothecia, when present, without white ring around inner margin of proper exciple 8

8(7) Ascospores simple, globose to sub-globose, 8–9 µm long; apothecia pale brown, mostly adnate with irregular, often striate margin; disc often pruinose . . . . . **F. appalachensis**
Ascospores 0–1 septate, ellipsoid, 10–12 µm long, often curved; apothecia dark brown to black, sessile, apothecial margin at most flexuose; disc rarely pruinose . . . . . **F. recensa var. recensa**

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9(1) Medulla with positive spot test reactions: K+ red (norstictic acid), Pd+ red (fumarprotocetraric acid), or C & KC+ red, Pd+ yellow, UV+ orange (alectorialic acid) 10
All spot tests negative, medulla UV+ white (divaricatic acid) 13

10(9) Medulla K+ red (acicular crystals in section), Pd+ yellow (norstictic acid). Known from a single locality in southern Texas (Big Bend NP) . . . . . **F. texana**
Medulla K−, Pd+ red (fumarprotocetraric acid) or Pd+ yellow (alectorialic acid) 11

11(10) Medulla Pd+ red, K, C, KC & UV− (fumarprotocetraric acid); ascospores bean-shaped. Not correctly reported from North America . . . F. cyathoides
Medulla Pd+ yellow, K−, C & KC+ red; UV+ orange (alectorialic acid); ascospores globose to sub-globose 12

12(11) Areoles flat. Known only from boreal north-eastern North America . . . . . **F. scrupulosa**
Areoles convex. Known only from Japan and the Bering Straits . . . . . F. circumflexa

13(9) Medulla I+ violet 14
Medulla I− 16

14(13) Thallus thick, with convex areoles; apothecia with constricted base and cupular exciple. Mountain rocks in north-eastern North America . . . . . **F. lowiana**
Thallus brown or grey; apothecia innate to sessile but not constricted at base and with annular exciple. Maritime rocks in north-western North America . . 15

15(14) Thallus grey to pale brown; apothecia ± innate with poorly developed margin and a white ring around inside of margin; epihymenium and exciple pale brown . . . . . **F. thomsonii**
Thallus pale to mid-brown; apothecia ± sessile with a well developed margin and lacking a white ring around inside of exciple; epihymenium and exciple dark brown . . . . . **F. aleutica**

16(13) Ascospores often curved, 10–12 μm long, often 1-septate . . . . . **F. recensa var. arcuatula**
Ascospores not curved, globose to sub-globose or broadly ellipsoid, 8·0–11·5 (–12·5) μm, always simple 17

17(16) Apothecia sessile 18
Apothecia innate 19

18(17) Thallus verrucose. Known only from eastern North America . . . . . **F. appalachensis**
Thallus smooth. Known only from north-western North America . . **F. mollis**

19(17) Apothecia with white ring around inner margin of proper exciple . . . . . **F. intercincta**
Apothecia without white ring around inner margin of proper exciple 20

20(19) Apothecia completely innate, proper margin very thin; thallus composed of smooth areoles. Not correctly reported from North America . . . . . F. kochiana
Apothecia adnate with thick, often striate proper margin; thallus composed of convex areoles . . . . . **F. appalachensis**

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