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Schaereria dolodes (Nyl. *ex* Hasse) Schmull & T. Sprib.: a second corticolous species in the genus

Michaela SCHMULL and Toby SPRIBILLE

Abstract: *Schaereria dolodes* (Nyl. ex Hasse) Schmull & T. Sprib. comb. nov., an epiphytic lichen species known from western North America was originally described as a member of the genus *Lecidea* sensu lato. However, its morphology is very characteristic of the genus *Schaereria* Körb. Here, we lectotypify the species and propose its placement in the latter genus. It is also reported as new to Canada from British Columbia.

Key words: *Agyriaceae*, British Columbia, *Lecanorales*, *Lecideaceae*, *Lecidea*, lichenized Ascomycetes, *Schaereria*, western North America

Introduction

The corticolous species *Lecidea dolodes* Nyl. *ex* Hasse was originally described from southern California in 1897 by Nylander, based on a collection of H. E. Hasse (Hasse 1897). However, in 1903, Hasse published it a second time as *L. dolodes* Nyl. n. sp., mentioning that the species was 'named by Dr. Nylander in 1897, without a description'. Interestingly, however, Hasse (1903) provides only a near-verbatim repetition of the English diagnosis provided in Hasse (1897). Other than its mention by Fink (1935), the species appears to have been largely forgotten until W. A. Weber issued a rich collection of it in 1975 from Yuba County, California, USA, in his *Lichenes Exsiccati* (Weber 1981). About seven years later, McCune (1982) reported its discovery in north-western Montana, USA. Since then, the species has been collected sporadically in western North America but only occasionally reported (e.g. McCune 1984; DeBolt & McCune 1993).

In the course of floristic work on the corticolous crustose lichens of inland northwest North America, *Lecidea dolodes* has repeatedly come to our attention and, in fact, does not appear to be uncommon. However, it was quickly evident upon examining the species that its generic assignment needed to be reassessed. Indeed, several morphological characteristics, especially its *Schaereria*-type ascus and loose paraphyses, suggested a placement in the genus *Schaereria* Körb. Accordingly, we here lectotypify the species *Lecidea dolodes* and propose its placement in the genus *Schaereria*.

Schaereria Körb. is now widely accepted as a well-defined genus (e.g., Wirth 1995; Kantvilas 1999). In the past, the genus was suspected of having a systematic position within the *Pezizales* owing to shared ascus and ascospore characteristics (Hafellner 1984; Eriksson & Hawksworth 1985). However, recent phylogenetic analyses have placed it in the *Agyriineae* of the *Lecanorales* (Lunke *et al.* 1996; Lumbsch 1997) and it is now classified in the family *Agyriaceae* in the order *Agyriales* in the Lecanoromycetes (Eriksson *et al.* 2003). Kantvilas (1999) recognized seven species in the genus: *S. bullata* Kantvilas, *S. cinereorufa* (Schaer.) Th. Fr., *S. corticola* Muhr & Tønsb., *S. fabispora* Hertel & Zürn, *S. fuscocinerea* (Nyl.) Clauz. & Cl. Roux, *S. parasemella* (Nyl.) Lumbsch, and *S. xerophila* H. Mayrhofer & Rambold. To

M. Schmull and T. Spribille: Albrecht von Haller Institute of Plant Sciences, University of Göttingen, Untere Karspüle 2, D-37073 Göttingen, Germany.

these the recently described *S. porpidioides* Fryday & Common (Fryday & Common 2001) can be added, as well as possibly a ninth species from the Russian Far East currently treated as *Lecidea delicatula* Vain. (Printzen 1995). Of these species, six are saxicolous, one is corticolous, one is lichenicolous, and *Lecidea delicatula* is muscicolous (Wainio 1909).

Methods

Characteristics of the apothecia were investigated by light microscopy on hand-cut sections mounted in water and 10% KOH, and stained with I_{Lugol} (Merck 1.09261) and lactophenol cotton blue (LCB; Merck 1.13741). Microscopic measurements were made at × 1000 magnification in water and are given as (smallest single measurement–) smallest mean–largest mean (–largest single measurement). TLC was carried out according to Culberson & Ammann (1979).

Schaereria Körb. (1855)

Syst. Lich. Germ.: 232 (1855); type: '*Schaereria lugubris*', Falkenstein, *Krempelhuber* (M) (type cons.) [=*Schaereria cinereorufa* (Schaer.) Th. Fr. (*Lecidea cinereorufa* Schaer.)].

For details regarding the typification of *Schaereria* Körb. see Hawksworth & David (1989) and Gams (1993).

Schaereria accommodates both saxicolous (especially on granite and schists) and epiphytes on bark, as well as one lichenicolous species. Except for *S. bullata*, *S. porpidioides* and *S. xerophila*, the species are found in the cool to cold climate of the Northern Hemisphere (Kantvilas 1999); *Schaereria fuscocinerea* is found in both hemispheres. Gyrophoric acid can be found (sometimes in low concentrations) as a secondary compound. The characteristics of the genus are summarized by Hawksworth (1992).

Schaereria dolodes (Nyl. ex Hasse) Schmull & T. Sprib. comb. nov.

Basionym: *Lecidea dolodes* Nyl. ex Hasse, *Bull. Torrey Bot. Club* **24:** 447 (1897); type (designated here): USA, California, *Hasse* s.n., 1896 (H-NYL 12060—lectotypus; NY 642—isolectotypus); at 3650 m alt. (NY—paralectotypus).

Note: Although the locality is not specified exactly on the label of the specimen at H-NYL, we are certain that this specimen is the same as the one ('on bark of *Abies*, San Gabriel mountains, at 2000 meters alt., August, 1896') mentioned in the protologue (Hasse 1897). It was collected in California the same year (1896), named by Nylander, and was the only specimen of *L. dolodes* found in his herbarium at the Botanical Museum (Lichenology) of Helsinki University (H). The innermost packet, the one containing the specimen, is a provisional packet made out of an old magazine, labelled with a pencil in the handwriting of Hasse with '*Lecid lugubr.* 5500°' (the handwriting was identified by the first author with the help of a copied label published by Lendemer & Hewitt 2002). In addition, the number 468 added in black ink can be found on the packet and again on the cover of a slide with a section, that is also labelled '*Lecid lugubris*' with pencil in Hasse's handwriting. Both provisional packet and slide are wrapped in a second packet, labelled by Nylander (handwriting identified by the first author with the help of other labels from the H-NYL herbarium), containing the location data mentioned above. The outermost packet is labelled by the Mus. Bot. Univ. Helsinki (H): 'Hb. Nylander 12060, *Lecidea dolodes* Nyl., California. *Dr. Hasse*, 1896. F29:9'.

Both specimens from NY are material from the 'Lichen Herbarium of Dr. H. E. Hasse, presented by Mr. John I. Kane, 1906'. The designated paralectotype was, in contrast to the lecto- and isolectotype, not collected at 5500 ft, but at 3650 m alt. on the 'San Gabriel Mts., Cal.' in 1896.

(Figs 1–4)

Thallus crustose, verrucose to areolate (Fig. 1A); verrucae sometimes slightly constricted at the base to sometimes bullate, (0·1–)0·2–0·3(–0·5) mm diam., with a smooth surface, distinct or coherent, chestnut coloured to olive-brown with a yellowish, reddish, or greenish tinge. Soredia and isidia absent. Photobiont cells globose, trebouxioid, (8–)11–12(–19) µm diam.; cell wall 0·5–1·25 µm wide (Fig. 1D).

Apothecia (Fig. 1A & B) black, numerous, rounded, single, sessile with a constricted base to slightly stalked, (0·5–)0·7–1·0 (–1·2) mm diam. when mature, sometimes with an umbo. [Apothecial size of the designated lectotype differs from the specimens that are included in this description. On the lectotype, only four apothecia are preserved, with three of them being immature; therefore, their size is recorded separately: 0·4 mm diam. (immature apothecia) and 0·9 mm diam. (adult apothecium)]. Disk ±

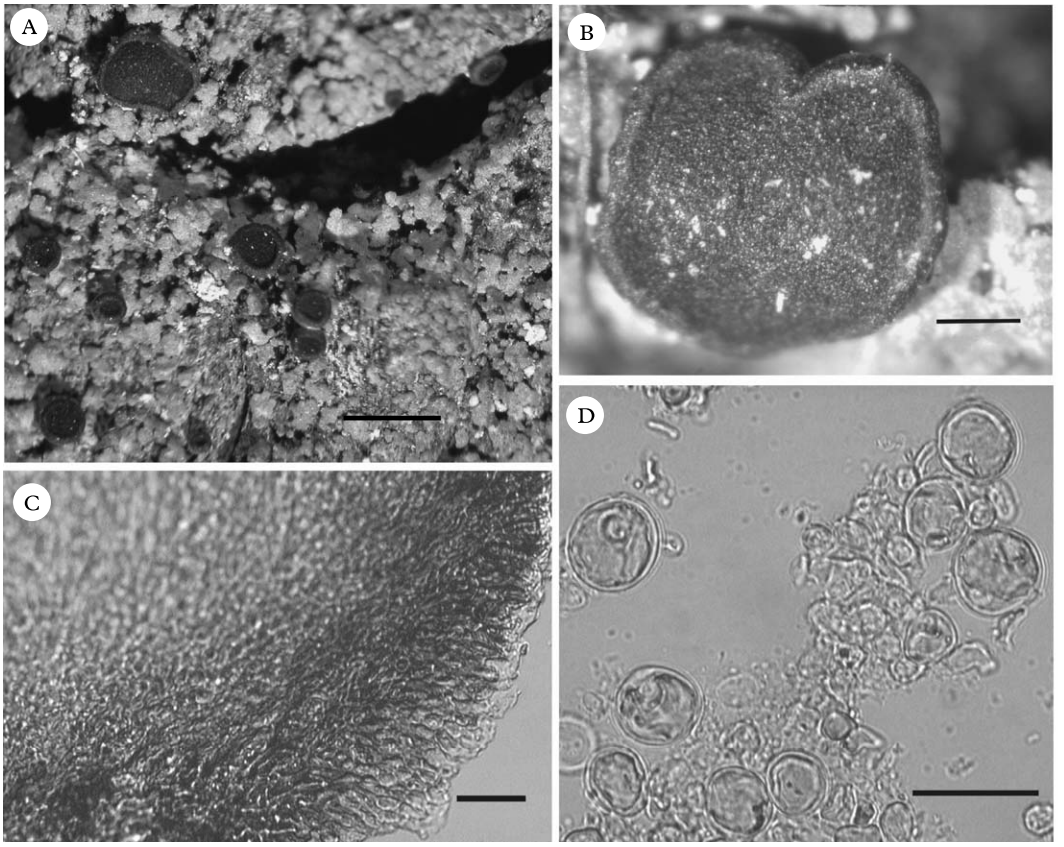

FIG. 1. *Schaereria dolodes*. A, habit of thallus and apothecia (exsiccate COLO 478); B, a single apothecium (hb. B. McCune 19171); C, section of the excipulum (LCB; hb. *B. McCune* 24043); D, photobiont (lectotype). Scales: A=1·2 mm; B=125 μm; C & D=20 μm.

concave when immature, becoming ± plane to sometimes slightly convex. Margin persistent, prominent (when apothecia convex, then apothecia somewhat immarginate), the upper part mostly concolorous with the disc, towards the base turning brown. *Exciple* in section black to brown, or dark bluish, or dark greenish (upper part) to brownish (lower part), with slightly swollen apical cells, 3–5(–6) μm diam. (Fig. 1C); when dark bluish or dark greenish, then K+ green to turquoise, otherwise K−, I−, basally 90–250 μm, laterally 55–163 μm thick. *Hypothecium* brown to orange-brown, K−, I−, 50–104 μm thick. *Subhymenium* hyaline to yellowish to pale brown, K−, I+ blue, (18–)33–100(–138) μm thick. *Hymenium* hyaline to pale blue or pale green below the epihymenium; when pale blue or pale green, then K+ intensifying, otherwise K−, I+ blue, (40–)53–81(–100) μm tall, frequently with hyaline, plane crystals in squashed preparation, not dissolving in K. *Epihymenium* blackish blue to green, K+ green to turquoise, I−, 13–25(–38) μm. *Asci* of *Schaereria*-type, I+ blue, lacking tholus, eight spored, ± cylindrical, (55–)57–90 (–100) × (7–)7·7–10(–12) μm; thin-walled 0·75–1(–1·25) μm, with a single wall layer (Fig. 2A, B). *Ascospores* uniseriately arranged in the ascus, globose, hyaline, (5–)6–7.8 (–10) μm diam., I−, sometimes containing purple, K+ bright turquoise, granules (Fig. 3B). *Paraphyses* simple or (strongly)

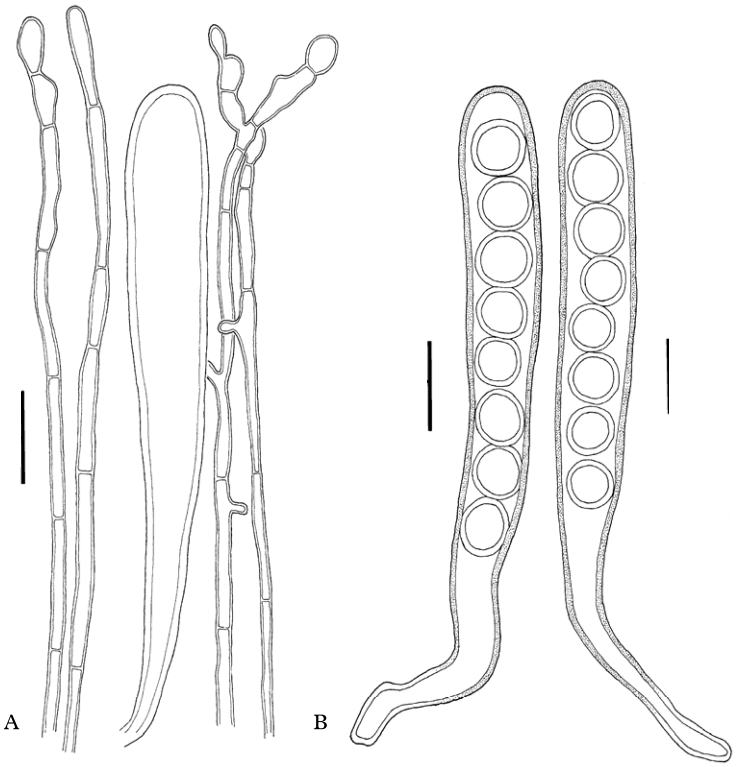

FIG. 2. *Schaereria dolodes* (lectotype). A, asci and paraphyses. B, asci and ascospores, with amyloid parts stippled. Scales: A & B=10μm.

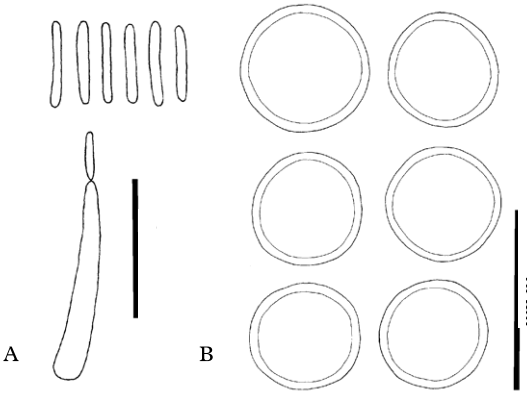

FIG. 3. *Schaereria dolodes* (lectotype). A, conidiophore and conidia. B, ascospores. Scales: A & B=10 μm.

branched, 1–1·5(–2·5) μm thick, free in water; apical cells often swollen, 4–7(–8) × 2–4(–5) μm (Fig. 2A).

Pycnidia frequent, reddish brown to brown or blackish, round, convex, with smooth surface, (50–)69–85(–100) μm diam.; conidiophores (9–)12–15 × 2 μm; conidia bacilliform 4–5(–7) × 0·75–1 μm (Fig. 3A).

Chemistry. No lichen substances, or faint traces of atranorin and '*cinereorufa* unknown' visible in UV light in Rf class 4–5 (B) and 2 (C), not seen in solvent system A. Gyrophoric acid was not detected by TLC.

Distribution and habitat. Schaereria dolodes has a temperate distribution in areas of precipitation-rich winters and dry summers in western North America (Fig. 4). In western Montana and northern Idaho, where it is not uncommon, it occurs on the bark of coniferous trees in semi-shaded areas at

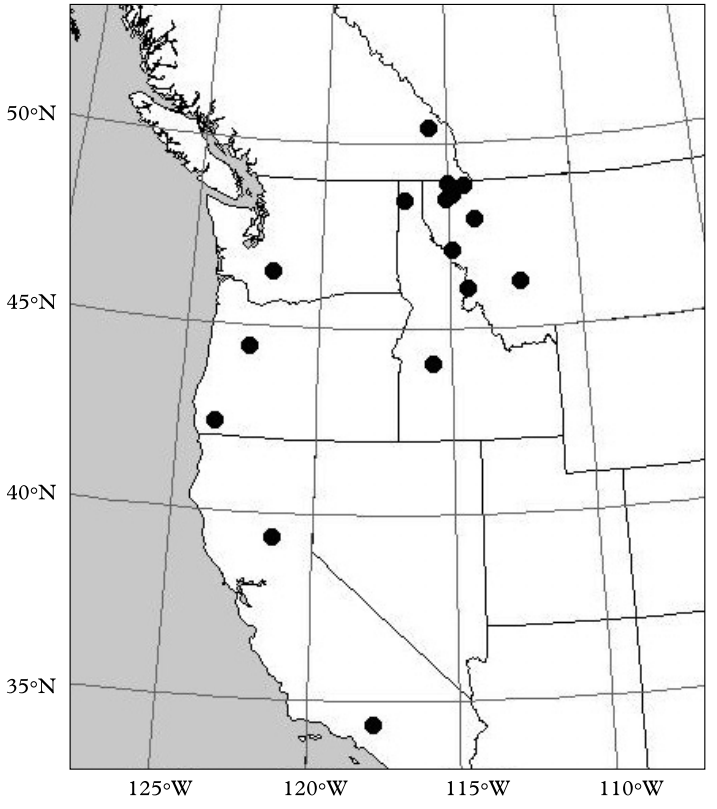

FIG. 4. Map of distribution of *Schaereria dolodes*.

elevations ranging from 450 to 1400 m. In the southern part of its range (from southwestern Idaho to southern California), *S. dolodes* can occur at elevations of up to 3650 m. It prefers mature *Pseudotsuga menziesii* on west- to south-facing slopes, and over half of all known collections are from the trunks of this phorophyte. In the northern part of its range, it is particularly frequent in *Pseudotsuga*/*Physocarpus malvaceus* and *Pseudotsuga*/*Holodiscus discolor* forests, and appears to be absent in both drier, low elevation forests and montane *Abies*/*Picea* forests. Other substrata include *Betula papyrifera*, *Larix occidentalis*, *Thuja plicata* and charred logs in inland regions, and *Arctostaphylos columbiana* and *Libocedrus decurrens* in coastal and southern areas. Associated species typically include *Trapeliopsis flexuosa*, *Lecidea nylanderi*, *Placynthiella icmalea*, *Ophioparma rubicosa*, *Biatora rufidula*, *Parmeliopsis ambigua*, *Parmelia sulcata*, and *Platismatia glauca*.

Exsiccati examined: Weber, *Lich. Exs.* 478 (BG, COLO, UBC).

Additional specimens examined. **CANADA:** *British Columbia*: Rocky Mountains, Kootenay River drainage E of Canal Flats, just south of Mary Anne Creek, 2004, *T. Spribille & I. Houde* 14845 (CANL, UBC).—**USA:** *Idaho*: Boise Co., 5 km N of the Payette River on the Deadwood Pass Road, 44°09′N, 115°53′W, alt. 1980 m, 1995, *R. Rosentreter* 9391b (hb. B. McCune); Bonner Co., Priest River Experimental Forest, on Canyon Creek Road, 48°21.30′N, 116°50.19′W, 2004, *T. Spribille* 14740 (B, BG, COLO, GZU, H, OSC, UBC). *Montana*: Flathead Co., 45 km north of Whitefish, Point of Rocks, along Highway 93, 48°38′30″N, 114°42′40″W, alt. 990 m, 2001, *T. Spribille* 10319 (hb. Spribille); Flathead Co., Glacier National Park, steep slope above NW shore of Bowman Lake, 48°53′N, 114°9′W, alt. 1340 m, 1991, *B. McCune* 19171 (hb. B. McCune); Lake Co., near Bug Creek Road, alt. 1110 m, 1977, *B. McCune* 7487 (hb. B. McCune); Lincoln Co., E of Eureka, Sinclair Creek, alt. *c.* 1000 m, 1995, *T. Spribille* 2978-C (hb. Spribille);

Ravalli Co., Big Creek Canyon, Bitterroot Range, alt. 1340 m, 2 viii 1980, *B. McCune* s.n. (hb. B. McCune); Ravalli Co., Big Creek Canyon, Bitterroot Range, alt. 1370 m, 1978, *B. McCune* 9448 (hb. B. McCune); Sanders Co., NE-facing slope above Clark Fork River, 47°18.607′N, 114°57.099′W, outcrops and talus with scattered trees and shrubs, on charred log on talus, alt. 805 m, 2003, *B. McCune* 27104 (hb. B. McCune). Sanders Co., Clark Fork River valley, Cascade Campground, 20 km east of St. Regis, 47°18.2′N, 114°49.4′W, alt. 790 m, 2001, *B. McCune* 26192 (hb. B. McCune). *Oregon*: Josephine Co., T40S R9W S15, floodplain of Rough and Ready Creek and lower slopes, S of creek, *c.* 10 km SW of Cave Junction, 42°5.6′N, 123°44.5′W, alt. 488 m [1600 ft.], 1998, *B. McCune* 24043 (hb. B. McCune); Linn Co., Horse Rock Ridge Research Natural Area, 44°18′N, 122°52′W, alt. 760 m, 1996, *B. McCune* 23418 (hb. B. McCune); Linn Co., Horse Rock Ridge, *c.* 15 mi. NE of Marcola, alt. 450 m, 21 iii 1979, *M.A. Sherwood et al.* s.n. (COLO). *Washington*: Lewis Co., Cowlitz Valley Ranger District, Gifford Pinchet National Forest, Camp Creek Cliffs, steep south slopes north of Cispus River, 46°27.01′N, 121°48.85′W, alt. 460 m, 1999, *B. McCune* 24435 (hb. B. McCune).

Discussion

Schaereria dolodes is only the second corticolous species reported from the genus. It can be readily distinguished from the other known corticolous species, *S. corticola* Muhr & Tønsb., by its robust, bullate thallus, lack of soredia, smaller spores and different chemistry. Instead, *S. dolodes* appears to be more closely related to the saxicolous species *Schaereria cinereorufa* (Schaer.) Th. Fr. Both species have a bluish to greenish-blue, K+ green to turquoise hymenial pigment, a brown to orange-brown hypothecium, and globose spores 6–8 μm in diameter. However, several significant characteristics separate the two species. The thallus of *S. dolodes* consists of tan to chestnut brown, smooth, often ± bullate areoles that can be confluent to ± discontinuous. *Schaereria cinereorufa*, by contrast, has ± flattened areoles that form a grey to dark brown, sometimes reddish-tinged, contiguous crust of grey to dark brown colour with sometimes a reddish tinge, and the areole surface is often distinctly wrinkled. The individual areoles can be constricted at the base and thus appear subsquamulose, a characteristic sometimes attributed to the otherwise rather dissimilar *S. fuscocinerea* (Nyl.) Clauz. & Cl. Roux (Hawksworth 1992). The apothecia of *S. dolodes* are mostly flat to weakly convex when mature, constricted at the base and sessile, whereas those of *S. cinereorufa* are closely adnate or almost level with the thallus and the mature discs are commonly concave. The two species also differ in secondary chemistry: *S. dolodes* can vary from having no detectable secondary substances to having faint traces of atranorin, while *S. cinereorufa* consistently possesses gyrophoric acid, although often in such trace amounts that it cannot be detected by spot tests. Interestingly, both species contain an unknown substance visible in shortwave UV light in Rf class 4/5 (B) and Rf class 2 (C); the substance is more consistently present in *S. cinereorufa* than in *S. dolodes* and has been termed here '*cinereorufa* unknown'. Finally, the two species differ significantly in their ecology and distribution. *Schaereria dolodes* appears to be a strictly corticolous species, common on the corky bark of *Pseudotsuga menziesii* as well as other phorophytes in the Mediterranean climates of western North America (Fig. 4). *Schaereria cinereorufa* is, in contrast, a boreal to low arctic species of mainly vertical siliceous rock faces; in western North America, the species is known from northern Alaska (Thomson 1997) and is disjunct in the high mountains of Colorado (Weber & Wittman 1992).

In the field, *Schaereria dolodes* can be easily recognized by its bullate, ± chestnut brown thallus and jet black apothecia (Fig. 1). Macroscopically, the species can resemble the unrelated *Lopadium disciforme* (Flot.) Kullh., and indeed numerous packets had been provisionally marked with this field name. However, even in the field this species can be distinguished by its more distinctly short-stipitate apothecia and concave disc (the disc of *S. dolodes* is mostly flat to convex) and the flattened rather than rounded and bullate areoles. *Lopadium disciforme* also tends to occur in moister forests, and the two species have not been found growing together. The habit of the thallus also vaguely suggests *Protoparmelia ochrococca* (Nyl.) P. M. Jørg., with which it

sometimes co-occurs, but that species is usually much smaller and the constant presence of apothecia in *S. dolodes* (no sterile specimens have been seen) should permit easy differentiation between the two species.

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