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CHECKLIST OF THE LICHENS AND ALLIED FUNGI OF FRONTENAC PROVINCIAL PARK, ONTARIO

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ABSTRACT. Frontenac Provincial Park is located on the Frontenac Axis, a southern extension of the Canadian Shield, linking Algonquin Park to the Adirondack Mountains. To better understand the lichen biota of this interesting ecosystem, an inventory was conducted during several field visits from 2016–2019. During these surveys, 280 species of lichens and allied fungi in 115 genera were discovered. Presented is the first published record of *Lempholemma cladodes* (Tuck.) Zahlbr. in Canada, as well as the first published discoveries of *Cladonia petrophila* R. C. Harris, *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway, and *Leprocaulon adhaerens* (K. Knudsen, Elix & Lendemer) Lendemer & B. P. Hodk. in Ontario. Sixteen species are provincially ranked as critically imperilled (S1, S1S2 or S1S3), sixteen species as imperilled (S2 or S2S3), and nineteen species as vulnerable (S3 or S3S4). Unranked species reported for the second time in Canada are *Dermatocarpon muhlenbergii* (Ach.) Müll. Arg. and *Cladonia atlantica* A. Evans. An undescribed species of *Lempholemma* growing on flooded deciduous tree bases in vernal pools was also discovered. A discussion of *Lobaria pulmonaria* (L.) Hoffm., a pollution and habitat disturbance sensitive species, is presented. The records of *L. pulmonaria* discovered in Frontenac quite possibly represent the most southern observations in the province and are of conservation concern. It is recommended that a lichen awareness and education program be created for the park staff and visitors to highlight these rare and sensitive lichens and habitats within the park in the hope that lichens are protected through appropriate management and planning.

Key Words: Frontenac Provincial Park, *Heterodermia hypoleuca*, *Lempholemma*, *Lobaria pulmonaria*, Ontario, protected areas.

Frontenac Provincial Park covers an area of 5,214 hectares and is characterized by a rugged landscape composed of rock ridges and areas of shallow till (Ecological Services 2004). Located in the Lake Simcoe-Rideau Ecoregion (Crins et al. 2009), Frontenac Provincial Park is positioned in an area referred to as the Frontenac Axis, a southern extension of the Canadian Shield linking Algonquin Park to the Adirondack Mountains. This is a unique landscape in southern Ontario as most of the Canadian Shield ecotone is located in the northern portion of the province (Ecological Services 2004). Since Frontenac Provincial Park was established in 1974, there have been numerous

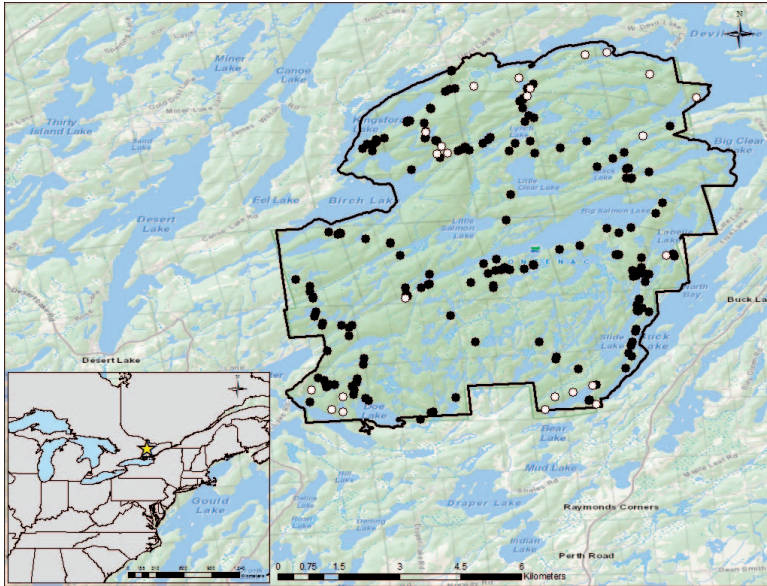


Figure 1. Location of Frontenac Provincial Park in Ontario (yellow star) (Inset). Collection sites within the park (white circles are major collection sites; black circles are incidental or minor collection sites).

natural history surveys conducted in the park to document its biota. The resulting inventory includes over twenty species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), as well as numerous provincially rare and regionally significant plant species (Brinker and McLeish 2006).

The aim of this study was to provide a better understanding of the lichen flora found in Frontenac Provincial Park and to establish baseline knowledge of the lichen species present in this unique landscape in the Lake Simcoe-Rideau Ecoregion (6E). Specific objectives were to record lichen species from as many of the major ecosystems within the park as possible and to highlight rare or unusual species encountered.

MATERIALS AND METHODS

Study Site. Frontenac Provincial Park is located in eastern Ontario, 30 km north of Kingston, Ontario, and about 125 km west of Ottawa, Ontario (Figure 1). The park is located between 44.582462° and 44.495940° latitude and -76.560071° and -76.459235 longitude.

Over the last 30 years, the average January temperature was -8.8°C and the precipitation was 85 mm; the average July temperature was 26.1°C and the precipitation was 107 mm (Environment Canada 2019). It is described as an unevenly rolling natural environment park with four broadly identified vegetation landform associations. 1) Mature maple (*Acer*) - oak (*Quercus*) forested landscape, with older portions located mainly in the northern portion of the park. Mature (*Acer*) forest stands are mixed with forested swamps and fern glades. 2) Young maple (*Acer*)-ironwood (*Ostrya virginiana*) forested landscape, located centrally which exhibits signs of alteration resulting from white-tailed deer (*Odocoileus virginianus*) and beaver (*Castor canadensis*) activity (i.e., heavy grazing and pond creation, respectively). 3) Rock barren landscape, covering the southern third of the park, is composed of exposed outcrops with low-lying bogs with tamarack (*Larix laricina*) and black spruce (*Picea mariana*). 4) Mature mixed deciduous (*Acer saccharum* and *Fraxinus*) and coniferous (*Pinus strobus*) forest landscape, the smallest of the four associations, found in the southeast corner only (Ecological Services 2004). Across the Park the bedrock and soils vary between localized deposits and outcroppings and cliffs/escarpments of metamorphosed marble, offering nutrient enrichment, and bands of granitic gneiss and pockets of metamorphosed igneous rock (Brinker and McLeish 2006).

Frontenac Provincial Park has 48 interior campsites and is open year-round. It has 100 km of backpacking and hiking trails that provide access to the park (Ontario Parks 2017). The natural environment designation means the landscape and special natural features will be protected while providing opportunities to the public for recreation (Ontario Parks 2017).

Lichen Collections/Inventories. Lichen inventories of the four major vegetation-landform associations within Frontenac Provincial Park (mature maple-oak, young maple-ironwood, rock barren, mature mixed deciduous and coniferous forest landscapes) were conducted in 2016, 2017, 2018, and 2019. Following the method presented in Newmaster et al. (2005), I examined the four major vegetation landform areas as floristic habitat sampling was shown to be more effective to assess cryptogam diversity than surveying smaller representative plots. Opportunistic collections were made throughout the park ensuring that there were representative samplings in each of the four defined vegetation landform association types. The “intelligent meander” method described by Selva (1999, 2003) was also used to examine as many mesohabitats and microhabitats in each ecosystem as possible. There were over 470 lichen specimens collected from 24 main

sampling sites (over 10 specimens collected at each site) and 224 incidental sampling sites (1–10 specimens collected) (Figure 1).

Lichen Identification and Storage. Lichen specimens were identified with a stereo and/or compound microscope and chemical spot tests with para-phenylenediamine in ethyl alcohol, 10% nitric acid, sodium hypochlorite (bleaching solution), 10% potassium hydroxide, and 1.5% Lugol's solution (iodine) (Brodo et al. 2001). Specimens that could not reliably be identified by morphology or spot tests alone were confirmed using thin-layer chromatography following Culberson and Kristinsson (1970) and Orange et al. (2001) to analyze chemical components. Lichen images were captured with a Sony Alpha 100 digital SLR camera and an iPhone 6. An almost complete set of voucher specimens is stored at the Canadian Museum of Nature (CANL) in Gatineau, Québec, and others have been deposited in Herbarium Hamburgense (HBG), in Hamburg, Germany, North Dakota State University (NDS) in Fargo, North Dakota, and New York Botanical Garden (NY) in the Bronx, New York.

RESULTS

There are no lichen collections known to have been made within Frontenac Provincial Park prior to this study. However, there have been several collections or studies made in the Frontenac Axis area. A. T. Drummond collected many lichens in the Kingston region during 1863 and 1864, which are deposited in the Fowler Herbarium of Queen's University (QK) (Wong and Brodo 1973). During the 1967 and 1968 field seasons, a collection of 400 saxicolous or “rock inhabiting” lichen specimens was collected by Pak Yau Wong as part of his M.Sc. thesis completed at Queens University, Department of Biology. His collections were from several areas located to the east of Frontenac Provincial Park, from Lake Opinicon south to Kingston Mills and as far east as Charleston Lake (Wong and Brodo 1973). Wong's study resulted in the discovery of 97 species, 3 varieties, and 1 form in 39 genera and 22 families, with an additional 39 species not found growing on rocks (Wong and Brodo 1973). In 1985, Irwin M. Brodo was introduced to the lichen flora of Lake Opinicon when he was asked to confirm the identification of lichens used in an ecological succession study (Woolhouse et al. 1985). During this study, he discovered a new species that was described as *Lecanora opiniconensis* Brodo (Brodo 1986) [= *Rhizoplaca opiniconensis* (Brodo) Leavitt, Zhao Xin & Lumbsch].

Since the above surveys occurred outside the park boundary, comparisons and compilations of the species found in those studies were not analyzed or incorporated into this list.

Lichen Diversity. Reported here are 280 lichen and allied fungi species in 115 genera from Frontenac Provincial Park (Appendix). Thirty-three species (9%) are fruticose in growth form, 109 (41%) are foliose, and 133 species (46%) are crustose. Green algae are the photobionts in 240 species (88%) and cyanobacteria are the photobionts in 35 species (12%). Five species are non-lichenized fungi traditionally treated with lichens. *Lempholemma cladodes* (Tuck.) Zahlbr. is documented for the first time in Canada and *Cladonia petrophila* R. C. Harris, *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway, and *Leprocaulon adhaerens* (K. Knudsen, Elix & Lendemer) Lendemer and B. P. Hodk are documented for the first time for Ontario. Sixteen species are provincially ranked as S1, S1S2 or S1S3 (critically imperilled), sixteen species S2 or S2S3 (imperilled) (Table 1) and nineteen species S3 or S3S4 (vulnerable) by the Natural Heritage Information Centre (Ontario Ministry of Natural Resources and Forestry 2018). Unranked species reported for the second time in Canada are *Dermatocarpon muhlenbergii* (Ach.) Müll. Arg. and *Cladonia atlantica* A. Evans. An undescribed species of *Lempholemma*, growing on flooded deciduous tree bases in vernal pools, was also discovered.

Synopsis of Forest and Lichen Communities by Habitat for Frontenac Provincial Park. There are four vegetation landform associations described in the Life Science Survey and Evaluation Report of Frontenac Provincial Park (Ecological Services 2004). These landscape types were delineated from the results of numerous sample plots established throughout the park that characterized underlying soil types, soil depths, moisture regimes, and local topography. While microhabitats exist within each community that may differ from the classification (i.e., wetlands and/or small rock openings), the characterizations were based on the upland communities. The lichen species present in each community can generally be described or grouped into categories similar to the vegetative landform categories identified in the Life Science Survey and Evaluation Report (Ecological Services 2004).

Mature Maple-Oak Forest Landscape. This landform mainly occurs in the northern part of the park between Birch Lake and Devil Lake with a smaller portion in the southwest near Little Salmon and Big Salmon Lakes. Typically dominated by *Acer saccharum* Marsh, *Fagus grandifolia* Ehrh., *Quercus rubra* L. and *Q. alba* L., this zone has

Table 1. Lichen taxa found in Frontenac Provincial Park that are considered critically imperilled or imperilled in Ontario (Ontario Ministry of Natural Resources and Forestry 2018).

S- Rank	Taxon Name	
S1, S1S2, or S1S3 (critically imperilled)	<i>Acrocordia cavata</i> (Ach.) R.C. Harris	
	<i>Arthothelium spectabile</i> A. Massal.	
	<i>Buellia schaeereri</i> De Not.	
	<i>Coccocarpia palmicola</i> (Spreng.) Arv. & D. J. Galloway	
	<i>Inoderma byssaceum</i> (Weigel) Gray	
	<i>Lecanora epanora</i> (Ach.) Ach.	
	<i>Lecidea auriculata</i> Th. Fr. subsp. <i>auriculata</i>	
	<i>Lecidea lapicida</i> (Ach.) Ach. var. <i>lapicida</i>	
	<i>Leproplaca cirrochroa</i> (Ach.) Arup, Frödén & Söchting	
	<i>Myriolecis carlottiana</i> (Lewis & Śliwa) Śliwa, Zhao Xin & Lumbsch	
	<i>Myriolecis crenulata</i> (Hooker) Śliwa, Zhao Xin & Lumbsch	
	<i>Porpidia tuberculosa</i> (Sm.) Hertel & Knoph	
	<i>Punctelia appalachensis</i> (W. L. Culb.) Krog	
	<i>Rhizocarpon lavatum</i> (Fr.) Hazsl.	
	<i>Sticta beauvoisii</i> Delise	
	S2 or S2S3 (imperilled)	<i>Bacidia laurocerasi</i> (Delise ex Duby) Zahlbr. subsp. <i>laurocerasi</i>
		<i>Collema furfuraceum</i> (Arnold) Du Rietz
		<i>Diplotomma alboatrum</i> (Hoffm.) Flot.
		<i>Enchylium polycarpon</i> (Hoffm.) Otálora, P. M. Jørg. & Wedin
		<i>Heterodermia hypoleuca</i> (Ach.) Trevis.
<i>Lempholemma polyanthes</i> (Bernh.) Malme		
<i>Lepraria membranacea</i> (Dicks.) Vain		
<i>Ochrolechia trochophora</i> (Vain.) Oshio var. <i>trochophora</i>		
<i>Phaeophyscia ciliata</i> (Hoffm.) Moberg		
<i>Phaeophyscia hirsuta</i> (Mereschk.) Essl.		
<i>Phaeophyscia squarrosa</i> Kashiw.		
<i>Physcia americana</i> G. Merr.		
<i>Physconia grumosa</i> Esslinger		
<i>Physconia subpallida</i> Essl.		
<i>Placynthiella uliginosa</i> (Schrad.) Coppins & P. James		
<i>Psora pseudorussellii</i> Timdal		

some of the oldest communities in the park: 80+ years with some approaching 100 years. Since this community has a dense, tall canopy (> 25 m), the understory is sparse but contains some indicators of species richness such as trilliums (*Trillium* spp.), wild leek (*Allium tricoccum*), and fern species.

The lichen community is characterized mainly by species commonly associated with dry upland forests with an open understory. Lichens found growing on the hardwood trees were *Lecania croatica*, *Myelochroa aurulenta*, and *Punctelia rufecta* with *Viridothelium virens* on large *Fagus americana* trunks. There were several rare species indicative of rich, remnant, old-growth forests in the low-lying, high humidity, vernal pond areas such as *Arthothelium spectabile*, *Bacidia rubella*, *Heterodermia hypoleuca*, *Lecanora layana*, and *Physcia americana*. Shaded rock faces in areas adjacent to the high humidity areas supported *Cetrelia olivetorum*, *Collema furfuraceum*, *Heterodermia speciosa*, *Lepraria* spp., and *Lobaria pulmonaria*. These typically corticolous species can be found growing on rock in areas with high humidity (Hinds and Hinds 2007).

Young Maple-Ironwood Forest Landscape. This is the largest landform covering extensive areas in the central portions of the park. Until approximately 40 years ago this forest type was subject to livestock grazing. The average age of these forests is 40+ years, which coincides with the approximate time agricultural activities ceased on the landscape. There are a few rare remnant trees of 80+ years that can be found in areas that were difficult for cattle to access and graze such as on steep slopes and in ravines. The forest is composed typically of intolerant deciduous tree species and can be characterized as a middle age successional forest.

The forest was dominated by younger smooth-barked trees that were suitable for a lichen community consisting of generalist and pioneer species such as *Arthonia radiata*, *Graphis scripta*, *Phaeophyscia rubropulchra*, and *Physcia millegrana*. Growing on forest floor boulders and rock faces were *Leptogium cyanescens*, *Peltigera praetextata*, *Physcia thomsoniana*, *Porpidia albocaerulescens*, *Trapelia placodioides*, and *Umbilicaria mammulata*.

Rock Barren Landscape. This area is located in the southeastern portion of the park extending from Doe Lake in the southwest to Big Clear Lake in the northeast. Where sufficient soil is available, vegetation is typically a *Pinus strobus/Quercus rubrus* and *Poa* spp. mix. Vegetation diversity is low and ground cover consists of species that are tolerant of dry conditions.

The lichen community in these areas is typical of granite or acidic rock habitats with most species growing directly on rock: *Acarospora fuscata*, *Aspicilia cinerea*, *Cladonia* spp., *Rhizocarpon grande*, and *Xanthoparmelia* spp. The diversity of the corticolous species was fairly low and included *Flavoparmelia caperata* and *Punctelia rudecta*.

Mature Mixed, Deciduous and Coniferous Forest Landscape. Located in the southeast corner of the park, near Slide Lake and Labelle Lake, this is the smallest landscape in the park. It is a mixed habitat (*Pinus strobus*, *Acer saccharum*, and *Ostrya virginiana*) that has traits of the other landforms and, as such, has been placed into its own category. Some of this landform has been subject to agriculture. The average canopy height is 25 m. The trees are approximately 70+ years old (Ecological Services 2004).

The lichen community, like its vegetation, is composed of mixed species without a “clear” identity and is perhaps successional. Species growing on trees include *Arthonia caudata*, *Evernia mesomorpha*, *Hypogymnia physodes*, and *Parmelia sulcata*; on rocks, *Flavoparmelia baltimorensis* and *Phycia caesia* were found.

DISCUSSION

The establishment of parks and protected areas provides a beneficial service to biodiversity, ecosystems and cultural values on local, regional, and global scales (Chu et al. 2017). Parks and protected areas, when properly managed, shelter ecosystems and species from potential negative (i.e., anthropogenic influences) (Chu et al. 2017). This is critically important for organisms that are particularly sensitive to habitat and climatic changes such as lichens (Brodo et al. 2001).

Prior to beginning these surveys of Frontenac Provincial Park, it was hoped that there would be many unusual lichen species within the park. The presence of provincially uncommon vascular plants suggested that perhaps ecological requirements for other unusual organisms might exist and were worth investigating. A high species count was not expected because the Park’s ecosystem is located in a part of southern Ontario (Ecoregion 6E) known for its poor lichen diversity due to effects from air pollution and habitat loss (Wong and Brodo 1992). Ecoregion 6E extends from Lake Huron in the west to the Ottawa River in the east and includes most of the Lake Ontario shore (Crins et al. 2009). It is the second most densely populated ecoregion in Ontario and has more than 57% of the ecoregion as cropland (44.4% pasture and 12.8% abandoned fields) (Crins et al. 2009). Forest cover includes

Table 2. Number of species discovered during lichen flora studies in Ecoregion 6E of Ontario. *(420 of 547 species occur in Ontario)

Areas Surveyed in Ontario Ecoregion 6E	Author (s)	# of Species
Ottawa Region in Québec and Ontario	Brodo et al. in prep/2019	547*
Bruce Peninsula National Park	Brodo et al. 2013	370
Frontenac Provincial Park	Lewis (this study)	280
Awenda Provincial Park	McMullin and Lendemer 2016	203
Copeland Forest (Simcoe County Forest)	McMullin and Lendemer 2013	154
Sandbanks Provincial Park	McMullin and Lewis 2013	128
Credit River Watershed	Maloles et al. 2018	124
Guelph Arboretum (Guelph University)	McMullin et al. 2014	104

deciduous (16.0%), coniferous (5.3%), and mixed (8.8%) types and water covers the remaining 4% of the ecoregion (Crins et al. 2009).

During this study, 280 species of lichens and allied fungi in 115 genera were discovered. Several relatively recent lichen inventories have been conducted in ecoregion 6E, in protected areas and both national and provincial parks (Brodo et al. 2013, 2019; Maloles et al. 2018; McMullin and Lendemer 2013, 2016; McMullin and Lewis 2013; McMullin et al. 2014). Comparatively, this Frontenac Provincial Park survey ranks as one of the most species diverse studies to date (Table 2). That being said, consideration should be given when comparing differences of the various studies such as size of area searched, landscape disturbance, person hours and effort spent, experience of the collectors, specialty or species focus of the collectors, varying mesohabitats (e.g., forest types, bedrock), and microhabitat presence. When considering all these variables it is difficult to directly compare this study to the aforementioned studies in the 6E ecoregion except to say that the number of species discovered in Frontenac Provincial Park appears to indicate a relatively diverse lichen flora in the region.

Rarity Hotspots and Significant Species. Brodo et al. (2013) identified “hotspots” within Bruce Peninsula National Park, and several mesohabitats that are found within Frontenac Provincial Park could be considered “hotspots” using similar criteria. Unique habitats across the landscape provided suitable conditions required for regionally and provincially rare lichen species. These habitats include the following.

1. Arab Lake Gorge. A steep-sided, shaded, wet humid gorge with a north-south orientation is located between Arab Lake

and the Visitor Center. It provided habitat characteristics suitable for *Coccocarpia palmicola* (S1?), *Lempholemma polyanthes* (S2S3), *Parmotrema crinitum* (S3), *Punctelia appalachensis* (S1?), and *Sticta beauvoisii* (S1?). The richness and diversity of its vascular flora is well known, as it holds several regionally and provincially rare plants as well (Ecological Services 2004). *Coccocarpia palmicola* is rare within the province (Ontario Ministry of Natural Resources and Forestry 2018). Its distribution is largely dictated by its need for high humidity levels normally associated with oceanic coastal areas and its extreme sensitivity to air pollution (Hinds and Hinds 2007).

2. Marble shoreline cliffs of Devil Lake and Birch Lake. Vertical white marble cliffs emerging from Devil and Birch Lake shorelines provide not only a visually stimulating sight, but also the preferred conditions for several provincially rare calciphile lichen species such as *Anema* cfr. *decipiens*, *Enchylium polycarpon* (S2S3), *Lempholemma cladodes* (first published record for Canada), *Leproplaca cirrochroa* (S1S2), *Myriolecis carlottiana* (S1S3), *Myriolecis crenulata* (S1S2), and *Psora pseudorussellii* (S2S3).
3. Rich, old-growth, humid forest with vernal pools. Scattered throughout the mature maple-oak forest landscape are isolated low-lying areas or shaded valleys that, when combined with nutrient-rich soils and mature deciduous forest cover, create habitats suitable for *Arthothelium spectabile* (S1?), *Heterodermia hypoleuca* (S2), *Inoderma byssaceum* (S1S2), *Lempholemma* sp., *Leptogium rivulare* (S3), *Lobaria pulmonaria* (S4), *Physcia americana* (S2S3), *Physconia grumosa* (S2S3), and *Verrucaria* cfr. *trabalis* Nyl.

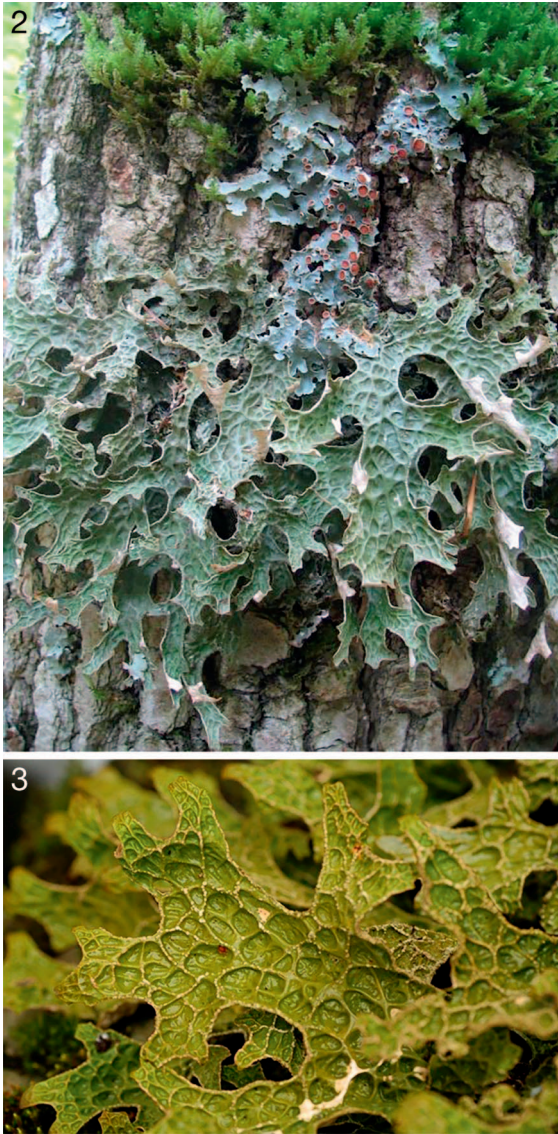
The loss of old-growth forests, particularly their unique interior microclimates, has undoubtedly resulted in the loss of a large portion of suitable habitat for *Heterodermia hypoleuca*, which is listed as a species in decline in three or more New England states by Hinds and Hinds (2007). The ecorticate lower surface, discrete lobes with small adventive lobes, and lobulate apothecia distinguish the species from other species of *Heterodermia* in eastern North America (Lendemer 2009a). Throughout much of its potential range in Southern Ontario, this habitat has all but disappeared owing to deforestation and land use and climate changes (COSEWIC 2015; Elliot 1998; Riley and Mohr 1994). Remnants of suitable habitat do exist in its potential range but are rare

and fragmented across the landscape (Elliot 1998). Approximately three of the eight modern-day Ontario populations are fertile (e.g., bearing apothecia) (pers. obs.). As such, dispersal of this species across this region is mainly limited to vegetative reproduction (via fragmentation), which would limit its dispersal across an already fragmented suitable habitat (Sillet et al. 2000).

Four populations of *Heteroderma hypoleuca* were found within Frontenac Provincial Park. Two of these populations are on living trees (maple and ash) while two are on dead, recently fallen trees (*Fraxinus* sp.). The total population within the park would have been 15 individuals but, due to the recent loss of two host trees, it can be assumed that the 12 thalli growing on those now dead trees will be lost, or will likely be lost, when the bark characteristics change over time as the tree decays (Yin 1999). If they do not die from the inevitable change in bark characteristics, they may physically fall to the ground when the bark sloughs off. This loss is not only significant to the Frontenac Park *H. hypoleuca* population but will also be a significant loss on a provincial and national scale. The loss would result in an approximate 20 to 25 percent decrease of the overall provincial extant population and an approximate 15 to 20 percent decrease of the extant national population (based upon estimates of currently known populations by the author and data from Lewis and Brinker 2017).

Lobaria pulmonaria (Figures 2 and 3) is the core member of a suite of species known as the *Lobarion pulmonariae* Ochn. Community, which is a conglomeration of species that, in Europe, represents a climax lichen community that often includes many rare or endangered lichen species (Jüriado and Liira 2010, Nascimbene et al. 2016). These climax communities are characteristic of mature hardwood forests and *L. pulmonaria* has been used as an indicator of undisturbed mature forest ecosystems with lasting temporal ecological continuity (Brodo et al. 2001, Jüriado and Liira 2010, Nascimbene et al. 2016, Richardson and Cameron 2004). As such, it has been given the distinction of a “flagship” or “umbrella” species for ecological conservation as an indicator of unique and potentially biodiverse habitats (Jüriado and Liira 2010). Possible management strategies have been suggested specifically for similar Lobarion/cyanolichen communities in the northeastern U.S. and Atlantic Provinces of Canada in hopes of conserving these species and their habitats (Richardson and Cameron 2004).

Lobaria pulmonaria and other cyanolichens are sensitive to atmospheric pollutants (SO_x and O_3) as well as acid rain (Gauslaa 1995, Goward and Arsenault 2000, Richardson and Cameron 2004).



Figures 2–3. Figure 2. *Lobaria pulmonaria* (dry) growing on deciduous tree trunk (photo taken in the field without a scale bar). Figure 3. Close-up of *L. pulmonaria* lobes (wet) (photo taken in the field without a scale bar).

Acid rain appears to be especially toxic to cyanobacteria-containing lichens such as *Lobaria* spp. (Richardson 1992). This effect has been convincingly illustrated in the disappearance of *L. scrobiculata* (Scop.) DC. from large parts of Sweden where there is a correlation with acid rain deposition patterns from Germany and the United Kingdom (Hallingback 1989).

There are three species of *Lobaria* documented from Ontario *L. pulmonaria* (L.) Hoffm., *L. quercizans* Michx., and *L. scrobiculata* (Scop.) DC. (Ontario Ministry of Natural Resources and Forestry 2018). They have provincial conservation status ranks of S4S5, S4S5, and S1S2, respectively. *Lobaria scrobiculata* (S1S2) is the rarest of the currently known *Lobaria* species and has been found at only a handful of scattered localities in northern Lake Superior and Hudson Bay lowlands (Consortium of North American Lichen Herbaria 2018; pers. obs.). *Lobaria pulmonaria* and *L. quercizans* are more widespread across the province (Brodo et al. 2001; Consortium of North American Lichen Herbaria 2018).

Just as in Europe, there still appears to be a relative abundance of *Lobaria pulmonaria* in Ontario (Consortium of North American Lichen Herbaria 2018). However, the areas where it is found are not evenly distributed, and the observations indicate that *L. pulmonaria* has essentially been extirpated from the southern portion of its range in S. Ontario, an area that has been well studied (Brodo et al. 2013, Maloles et al. 2018; McMullin and Lendemer 2013, 2016; McMullin and Lewis 2013; McMullin et al. 2014; Wong and Brodo 1992). The occurrences documented in Frontenac Provincial Park are quite possibly the most southerly known occurrences of *L. pulmonaria* in Ontario.

Historic herbarium specimens and published reports yield comparatively few records of *Lobaria pulmonaria* from southern Ontario, and as such, it may have never been abundant in those areas (Figures 4 and 5). However, ease of accessibility, collection intensity and knowledge of lichen species in Ontario has changed over the years. More individuals are studying lichens and the literature available is much easier to use and of better quality, especially for general ecologists/naturalists.

In Europe, populations of *Lobaria pulmonaria* also appear to be increasingly isolated (Gu et al. 2001). This presents additional threats to this species and affects its spatial distribution and dynamics (Gu et al. 2001). In Southern Ontario, this phenomenon is slowly developing as well (Figure 6). The range reduction trend of once-common cyanolichen species, such as *L. pulmonaria*, has also been observed in New Hampshire and Maine (Richardson and Cameron 2004). Furthermore, it should be noted that *L. pulmonaria* was not found in



Figures 4–5. Figure 4. A collection of *Lobaria pulmonaria* housed in the permanent collections at the Canadian Museum of Nature (CANL), collected by John Macoun in 1905 from Ottawa, ON (no. 74). Figure 5. A collection of *Lobaria pulmonaria* housed in the permanent collections at the Canadian Museum of Nature (CANL), collected by John Macoun in 1898 from Guelph, ON (no. 1540).

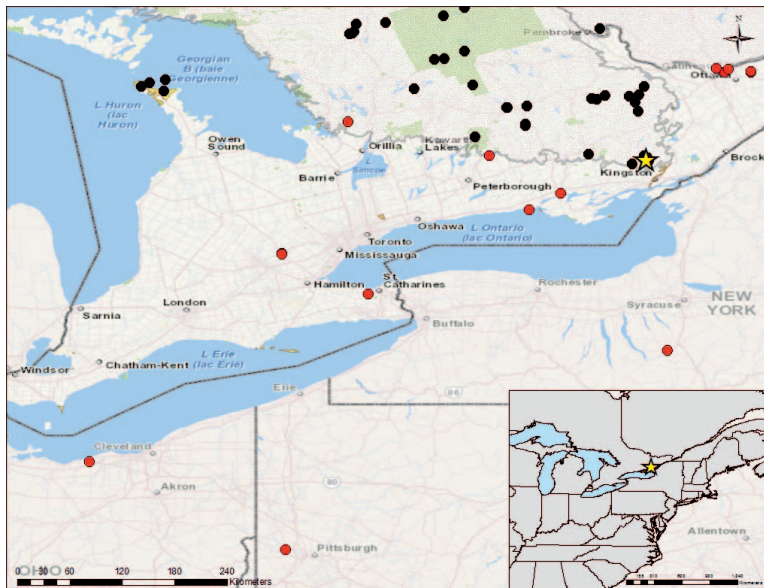


Figure 6. Known distribution of *Lobaria pulmonaria* in southern Ontario. Black dots represent records discovered after 1967. Red dots represent discoveries of *L. pulmonaria* prior to 1967. Green polygons are provincial parks and conservation reserves, yellow polygons are national parks. The extent of the Canadian Shield is outlined in thick dark gray. Yellow star is Frontenac Provincial Park.

the park growing on trees but rather on shaded moist cliff faces, another phenomenon/trend that seems to be occurring in stressed or range extremes for “old growth” indicator lichen species (Hinds and Hinds 2007).

A study in Italy using ecological niche modeling suggested that climate change patterns will evolve over the next few decades (Nascimbene et al. 2016). The results indicate that there will be a significant reduction in suitable habitat for *L. pulmonaria*, a reduction so drastic that there is a serious risk of local extirpation (Nascimbene et al. 2016). Relictual fragments represent hotspots of lichen biodiversity but have also been considered a delayed response or time lag between habitat fragmentation and degradation and extinction at the local population level (Gu et al. 2001). Studies have shown that over 50% of vulnerable rare lichen communities have disappeared within 6–10 years of disturbance or activity.

The ecosystems in Frontenac Provincial Park are protected, so the unusual lichen biota they contain is unlikely to be disturbed by large-scale development or habitat degradation. However, the large number of park visitors each year could be having a negative effect on some of the rare lichen communities, especially those located in potentially sensitive areas (e.g., Arab Lake Gorge, Birch and Devil Lake marble cliffs). A lichen education program for Frontenac visitors and staff would be beneficial. It could include pamphlets, guidebook, posters, and interpretive talks and walks that highlight the rare and interesting species in the park. Such a program might ensure the sustainability of these rare and sensitive ecosystems. Making visitors and staff aware of what lichens are, and how many species in the park are rare or sensitive, will undoubtedly draw more attention and appreciation to these often-overlooked organisms, in turn promoting their conservation and protection.

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APPENDIX

ANNOTATED LIST OF LICHENS AND RELATED FUNGI FROM FRONTENAC
PROVINCIAL PARK

The lichens and related fungi listed below are arranged alphabetically by genus and species. Status ranks (S-ranks) following species names and collection details are conservation status ranks assigned by the Ontario Ministry of Natural Resources and are not legal determinations. Conservation status is designated by a number between 1 and 5, which mean the following: 1 = critically imperilled, 2 = imperilled, 3 = vulnerable, 4 = apparently secure, 5 = secure, U = 'unrankable' due to a lack of information, "?" = rank uncertain, NR = not ranked yet (Ontario Ministry of Natural Resources and Forestry 2018).

Species in **bold** have Provincial Conservation status ranks of S1 to S3.

Non-lichenized fungi treated with lichens are preceded by a dagger "†".

Saprophytic fungi related to either lichens or lichenicolous fungi are marked with a "+".

Species preceded by a star "*" are newly discovered in Ontario.

Species preceded by two stars "**" are newly discovered in Canada.

Nomenclature follows Brummitt and Powell (1996) and the 18th edition of the North American Lichen Checklist (Esslinger 2018). Any deviance from these sources reflects the opinions of the author.

Absoconditella lignicola Vězda & Pišút - West of Slide Lake, growing on a rotting log. *C. Lewis* 3104 (CANL). SNR

Acarospora badiofusca (Nyl.) Th. Fr. - NE near Devil Lake, inland forested rocky ridge; Doe Lake Trail, mixed woods with rock cliffs growing on rock. *C. Lewis* 2759, 2728 (CANL). S3

Acarospora fuscata (Schrad.) Arnold - Doe Lake Trail, mixed woods with rock cliffs, growing on granite rock. *C. Lewis* 2764 (CANL). S5

Acarospora glaucocarpa (Ach.) Körb. - NE near Devil Lake, inland forested rocky ridge, growing on rock. *C. Lewis* 2731 (CANL). S4S5

Acrocordia cavata (Ach.) R.C. Harris - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana*. *C. Lewis* 3001 (CANL). S1

Alyxoria varia (Pers.) Ertz & Tehler (syn. *Opegrapha varia* Pers.) - Slide Lake Small loop, silver maple swamp on *Thuja occidentalis* trunk. *C. Lewis* 2768, 2810 (CANL). S4

Amandinea polyspora (Willey) E. Lay & P. May - Slide Lake Large Loop, granite ridge top with sparse *Quercus/Pinus* mix, growing on *Pinus strobus* twigs. *C. Lewis* 2802 (CANL). SNR

- Amandinea punctata* (Hoffm.) Coppins & Scheid. - Slide Lake Small loop, silver maple swamp, growing on a snag. *C. Lewis 2809* (CANL). S5
- Anaptychia palmulata* (Michx.) Vain. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on shaded cliff. *C. Lewis 2933* (CANL); Tetsmine Trail, mature deciduous stand with low-lying *Fraxinus*-dominated area, growing on mossy *Fraxinus* sp. *C. Lewis 2666* (CANL); Slide Lake, Calcareous lakeshore cliff (Doe Lake), growing on a boulder. *C. Lewis 2778* (CANL); Arkon Lake Trail, growing on moist shaded cliff. *C. Lewis 3216, 3219* (CANL). S3
- Anema* cfr. *decipiens* (A. Massal.) Forssell. - Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3199, 3200, 3229* (CANL). SNR

The material examined here matches very well the descriptions in Wirth (1995), Jørgensen (1988, 2007), and Prieto et al. (2015) in having blue-gray pruinose squamules attached to dry calcareous rock. The material, however, was not fertile, and hence lacks the characteristic apothecia and spores that would establish the identity of this species, which is not currently known from North America (Esslinger 2018). This species could be confused with *Thyrea confusa* Henssen as they share a similar chroococcoid photobiont and can both have blue-gray pruina; they differ in that *T. confusa* is foliose with sunken pycnascocarps whereas *A. decipiens* is squamulose with sessile, open apothecia with a thickened margin (Jørgensen 2007).

- †*Arthonia caudata* Willey - Labelle Lake, mixed *Pinus/Quercus/Populus* forest, with lakeshores and creeks, growing on *Pinus strobus*. *C. Lewis 2912* (CANL). SNR
- Arthonia helvola* (Nyl.) Nyl. - Arab Lake Trail, shaded rich valley with high humidity, growing on *Betula* sp. *C. Lewis 2598b* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on *Pinus strobus* trunk base. *C. Lewis 3043* (CANL). S4
- Arthonia radiata* (Pers.) Ach. - Tetsmine Trail, mix forest with cliffs and open oak ridges, growing on young *Tilia* sp. *C. Lewis 2640* (CANL). S5
- Arthothelium spectabile* A. Massal. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Fraxinus* trunk. *C. Lewis 2964* (CANL); Tetsmine Trail, old growth rich valley with deciduous tree mix, growing on old *Fraxinus* trunk. *C. Lewis 2624* (CANL); McNally Bay, Tetsmine loop, growing on *Acer saccharum*. *C. Lewis 3144* (CANL). S1?
- Aspicilia cinerea* (L.) Körb. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rock face. *C. Lewis 2685* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock cliff. *C. Lewis 2974* (CANL). S4S5
- Athallia holocarpa* (Hoffm.) Arup, Frödén & Søchting [syn. *Caloplaca holocarpa* (Hoffm. ex Ach.) A. E. Wade] - West of Slide Lake, on calcareous rock face. *C. Lewis 3093* (CANL). S5
- Athallia pyracea* (Ach.) Arup, Frödén & Søchting [syn. *Caloplaca pyracea* (Ach.) Th. Fr.] - Big Salmon Lake Trail mixed forest with rich humid valleys, growing on *Tilia americana* twigs. *C. Lewis 2992* (CANL). SNR
- Bacidia diffracta* S. Ekman - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Fraxinus* bark. *C. Lewis 2969* (CANL). SNR

- Bacidia laurocerasi*** (Delise ex Duby) Zahlbr. *subsp. laurocerasi* - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Fraxinus* trunk. *C. Lewis 2957* (CANL). S2
- Bacidia rubella*** (Hoffm.) A. Massal. - Tetsmine Trail, mature deciduous stand with low-lying *Fraxinus*-dominated area, growing on a *Fraxinus* trunk. *C. Lewis 2671* (CANL); Slide Lake small loop, silver maple swamp, growing on a *Fraxinus* trunk. *C. Lewis 2766* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Acer* bark. *C. Lewis 2968* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on large *Fraxinus* trunk, with *Caloplaca ulmorum*. *C. Lewis 3028* (CANL). S4
- Bacidia schweinitzii*** (Fr. ex E. Michener) A. Scheid. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on a *Fraxinus* trunk. *C. Lewis 2703* (CANL); McNally Bay, low-lying, humid, shady rich forest growing on *Thuja* trunk. *C. Lewis 3152* (CANL). S5
- Bacidia suffusa*** (Fr.) A. Scheid. - Tetsmine Trail, old-growth rich valley with deciduous tree mix, growing on *Fraxinus* sp. trunk. *C. Lewis 2621* (CANL). S4
- Biatora chrysantha*** (Zahlbr.) Printzen - Tetsmine Trail, mature deciduous stand with low-lying *Fraxinus*-dominated area, growing on *Fagus americana* trunk. *C. Lewis 2675* (CANL). SNR
- Bilimbia sabuletorum*** (Schreber) Arnold - Tetsmine Trail, mature deciduous stand with low-lying *Fraxinus*-dominated area, growing on moss. *C. Lewis 2672* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing over moss on rock. *C. Lewis 2944* (CANL). S5
- Bryoria furcellata*** (Fr.) Brodo & D. Hawksw. - Labelle Lake, mixed *Pinus/Quercus/Populus* forest with lakeshores and creeks, growing on *Abies* twig. *C. Lewis 2899* (CANL). S5
- Buellia schaeveri*** De Not. - Slide Lake Large Loop, granite ridge with sparse *Quercus/Pinus* mix, growing on *Pinus strobus* bark. *C. Lewis 2804* (CANL). S1S2
- Calicium trabinellum*** (Ach.) Ach - Labelle Lake, mixed *Pinus/Quercus/Populus* forest with lakeshores and creeks, growing on shaded snag. *C. Lewis 2905* (CANL). S4S5
- Caloplaca cerina*** (Ehrh. ex Hedw.) Th. Fr. - Doe Lake Trail, mixed woods with rock cliffs, growing on *Tilia americana* twigs. *C. Lewis 3031* (CANL). S5
- Caloplaca stillicidiorum*** s.str. (Vahl) Lyngé - Slide Lake small loop, silver maple swamp, growing on *Thuja occidentalis* trunk. *C. Lewis 2772* (CANL). SNR
- Candelariella efflorescens*** R.C. Harris & W.R. Buck - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock. *C. Lewis 2982* (CANL). S5
- Candelariella vitellina*** (Hoffm.) Müll. Arg. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite rock. *C. Lewis 2945* (CANL). S5
- Candelariella xanthostigma*** (Ach.) Lettau - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Thuja occidentalis* trunk. *C. Lewis 2689* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on large *Acer* trunk. *C. Lewis 2984*. S5
- Catillaria lenticularis*** (Ach.) Th. Fr. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite. *C. Lewis 3003* (CANL). SNR

- Catillaria nigroclavata*** (Nyl.) Schuler - Doe Lake Trail, mixed woods with rock cliffs, growing on *Pinus* bark. *C. Lewis* 3041 (CANL). S3
- Cetrelia olivetorum* (Nyl.) Culb. & C. Culb. - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis* 2582 (CANL); Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on nutrient-rich shaded cliff, *C. Lewis* 2898 (CANL); Big Salmon Lake, on mossy rock face. *C. Lewis* 3088 (CANL). S4
- Chaenotheca brunneola* (Ach.) Müll. Arg. - Big Salmon Lake, growing on a snag. *C. Lewis* 3091 (CANL). S4
- Chaenotheca xyloxena* Nádvy. - Doe Lake Trail, mixed woods with rock cliffs, growing on lignum. *C. Lewis* 2761, 3022 (CANL). SNR
- Chrysothrix caesia* (Flotow) Ertz & Tehler [syn. *Arthonia caesia* (Flot.) Körb.] - Slide Lake Large Loop, granite ridge top with sparse *Quercus/Pinus* mix, growing on *Pinus strobus* twigs. *C. Lewis* 2803 (CANL). S5
- Cladonia arbuscula* (Wallr.) Rabenh. subsp. *mitis* (Sandst.) Ruoss - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil. *C. Lewis* 2917 (CANL). S5
- Cladonia atlantica*** A. Evans - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on soil along south-facing lakeshore. *C. Lewis* 2997 (CANL). S1?

This taxon is endemic to eastern North America (Hinds and Hinds 2007), where it is common in the Coastal Plain and Piedmont of the middle Atlantic states (New Jersey to Virginia) (Lendemer 2009b) and also along the Atlantic coast in bogs and over rocks (Hinds and Hinds 2007). There are also historical records from southern New York State and recent rare scattered reports for Pennsylvania (Lendemer 2009b). In Canada, this mainly coastal plain species is known from Nova Scotia, with a disjunct occurrence on the Bruce Peninsula where it was reported new to Ontario (Brodo et al. 2013). The present record represents the second discovery of this species in Ontario. Superficially it is morphologically identical to *C. crispata* (Lendemer 2009). *Cladonia atlantica* contains baeomycesic acid resulting in a P+ yellow reaction, compared with P- and baeomycesic acid-deficient *C. crispata*. *Cladonia atlantica* also contains squamatic acid resulting in a Long wave UV+ (Lendemer 2009).

- Cladonia caespiticia*** (Pers.) Flörke - Slide Lake Small loop, silver maple swamp, growing on tree base. *C. Lewis* 2808 (CANL). S3
- Cladonia chlorophaea* s. str. (Flörke ex Sommerf.) Spreng. - NE near Devil Lake, inland forested rocky ridge, growing on soil. *C. Lewis* 2738 (CANL); Calcareous lakeshore cliff (Doe Lake), growing on soil. *C. Lewis* 2797 (CANL); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil, *C. Lewis* 2934 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on soil. *C. Lewis* 2991 (CANL); Tetsmine Trail, mix forest with cliffs and open oak ridges, growing on the base of a tree. *C. Lewis* 2612 (CANL). S5
- Cladonia coccifera* (L.) Willd. - Doe Lake Trail, mixed woods with rock cliffs, growing on soil. *C. Lewis* 3011 (CANL). S5
- Cladonia coniocraea* (Flörke) Spreng. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rotting wood. *C.*

- Lewis* 2696, 2697 (CANL); NE near Devil Lake, inland forested rocky ridge, growing on tree base. *C. Lewis* 2739 (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on rotting log. *C. Lewis* 3026 (CANL). SU
- Cladonia cristatella* Tuck. - Doe Lake Trail, mixed woods with rock cliffs, growing on log. *C. Lewis* 3032 (CANL). S5
- Cladonia fimbriata* (L.) Fr. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil. *C. Lewis* 2926 (CANL). S5
- Cladonia furcata* (Huds.) Schrad. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on the ground. *C. Lewis* 2634 (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on cliff ledge. *C. Lewis* 2754 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on soil. *C. Lewis* 2978 (CANL). S5
- Cladonia macilenta* Hoffm. var. *macilenta* - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rotting wood. *C. Lewis* 2694 (CANL). S5
- Cladonia macilenta* var. *bacillaris* (Genth) Schaer. - Doe Lake Trail, mixed woods with rock cliffs, growing on boulder. *C. Lewis* 3020, 3037 (CANL). S5
- Cladonia macrophylla* (Schaer.) Stenh. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil. *C. Lewis* 2928 (CANL). S4?
- Cladonia multififormis* G. Merr. - Doe Lake Trail, mixed woods with rock cliffs, growing on soil. *C. Lewis* 3033 (CANL). S5
- Cladonia ochrochlora* Flörke - Doe Lake Trail, mixed woods with rock cliffs, growing on boulder. *C. Lewis* 3025, 3027 (CANL). S5
- **Cladonia petrophila* R. C. Harris - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs on acidic rock. *C. Lewis* 2679 (CANL). SNR

This is the first published report from Ontario of this eastern North American endemic (Lendemer and Hodkinson 2009) (Figure 7). Brodo et al. (2019) recently published this species as new to Canada and Québec. *Cladonia petrophila* is a common species found growing on non-calcareous rock in areas of high humidity throughout eastern North America in the Appalachian, Piedmont and the Ozark Ecoregions (Lendemer and Hodkinson 2009). Several morphologically similar squamulose *Cladonia* species are compared in detail in Lendemer and Hodkinson (2009). In the field this species can be confused with several sterile *Cladonia* species but can be distinguished based on its chemistry (medulla LW UV+ blue-white, containing sphaerophorin) (Figure 8), habitat (*C. petrophila* grows on rocks in shaded humid sites) (Figure 9), and morphology (Lendemer 2009b).

- Cladonia phyllophora* Hoffm. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on soil. *C. Lewis* 2948 (CANL). S5
- Cladonia pleurota* (Flörke) Schaer. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil. *C. Lewis* 2918 (CANL); Big Salmon Lake, growing on soil. *C. Lewis* 3089 (CANL). S5
- Cladonia pocillum* (Ach.) Grognot - Tetsmine Trail, marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis* 2658 (CANL). S4S5
- Cladonia rangiferina* (L.) F.H. Wigg. - Slide Lake Large Loop, granite ridge with sparse *Quercus/Pinus* mix, growing on soil. *C. Lewis* 2805 (CANL). S5

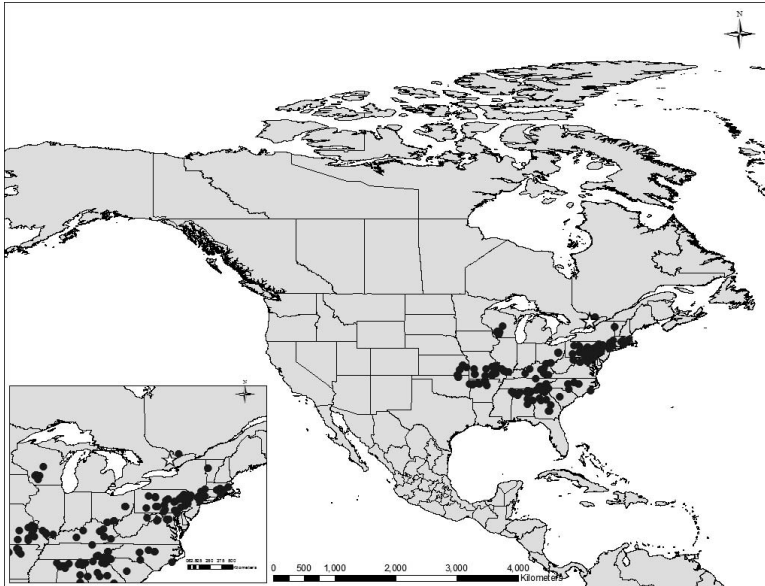


Figure 7. North and Central American range map of *Cladonia petrophila* R. C. Harris. Previous known locations, based on herbarium specimens, are indicated with black dots. The new collection is shown by the white star. Insert in the bottom left shows a close-up of Eastern North America. Data are from Consortium of North American Lichen Herbaria (2018).

Cladonia rei Schaer. - Slide Lake Large Loop, granite ridge with sparse *Quercus/Pinus* mix, growing on soil. *C. Lewis* 2806, 2807 (CANL). S5

Cladonia squamosa Hoffm. - Calcareous lakeshore cliff (Doe Lake), growing on soil. *C. Lewis* 2786 (CANL); Big Salmon Lake Trail; mixed forest with rich humid valleys growing on soil. *C. Lewis* 2965 (CANL). S5

Cladonia sp. #1- Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite cracks. *C. Lewis* 2951 (NY). SNR

This squamulose specimen is similar in chemistry to *Cladonia stipitata*, which is characterized by UV-, PD + red (fumarprotocetraric acid), and K+ yellow (containing atranorin). It is somewhat similar in growth form, having short and distinctively erect squamules in low dense cushions or mats on granitic rock outcrops in sunny openings. However, this specimen differs in the lack of a distinct blackened narrowed stipe and general appearance (i.e., thallus is brown vs greenish) and as such could be a non-podetiate form of a species that typically produces podetia (i.e., *Cladonia pyxidata*) (Lendemer pers. comm.) Lendemer and Hodkinson (2009) noted *C. stipitata* occurrences from the southern Appalachian Mountains in the states of Georgia, Kentucky, North Carolina, and South Carolina, as well as a single record from Rhode Island;



Figures 8–9. Figure 8. *Cladonia petrophila* R. C. Harris. (photo taken in the field without a scale bar). Figure 9. Humid cliff habitat.

Frontenac Provincial Park would be a considerable disjunction. More study is needed.

Cladonia stellaris (Opiz) Pouzar & Vězda - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, over soil. *C. Lewis* 2919 (CANL). S5

Cladonia stygia (Fr.) Ruoss - Doe Lake Trail, mixed woods with rock cliffs, growing in wet area over rock. *C. Lewis* 3034 (CANL). S5

Cladonia symphyrcarpia (Flörke) Fr. - Tetsmine Trail, marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis* 2657 (CANL). S4S5

Cladonia turgida Hoffm. - Tetsmine Trail marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis* 2656 (CANL). S5

Cladonia uncialis (L.) F. H. Wigg. subsp. *uncialis* - Doe Lake Trail, mixed woods with rock cliffs, growing on soil. *C. Lewis* 2760, 3010 (CANL); Dedication Trail, Central, growing over thin soil. *C. Lewis* 3065, 3066 (CANL). S5

Cladonia verticillata (Hoffm.) Schear. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on soil. *C. Lewis* 2929 (CANL). S4S5

**Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis* 2584 (CANL); Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on nutrient-rich shaded cliff. *C. Lewis* 2896 (CANL); Algonquin Provincial Park, Barron Canyon, growing on calcareous rock cliff, 6 Jun 2010, *C. Lewis* 393 (CANL). S1?

Coccocarpia palmicola is a striking foliose lichen that has a lead-gray upper surface and a black to blue-green fuzzy lower surface (Figures 10 and 11). It is a cyanolichen with a mainly pantropical to subtropical distribution. In Canada, it has been found historically only in the Maritimes (Nova Scotia, Newfoundland and New Brunswick). Most of the known records are from eastern North America from Virginia and West Virginia south to Alabama and Texas. A previously unpublished record of *C. palmicola* was discovered in Algonquin Provincial Park (2010), growing high up on a shaded moist cliff face in the Barron Canyon (*C. Lewis* 393 CANL). These two provincial parks are the only currently known locations of this species in Ontario and the most westerly occurrences of this species in Canada. These are the first published records of this species in Ontario and represent a significant western disjunction (Figure 12).

Collema furfuraceum (Arnold) Du Rietz - Arab Lake Trail, shaded rich valley with high humidity growing on a mossy cliff face. *C. Lewis* 2586 (CANL); Calcareous lakeshore cliff (Doe Lake), growing on a rock cliff. Fertile. *C. Lewis* 2776 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock cliff. *C. Lewis* 2955 (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on large *Fraxinus* trunk. *C. Lewis* 3015 (CANL). S2S3

Collema subflaccidum Degel. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rock face. *C. Lewis* 2684 (CANL). S4S5

Cresponea chloroconia (Tuck.) Egea & Torrente - Tetsmine Trail, mix forest with cliffs and open oak ridges, growing on *Thuja occidentalis* trunk. *C. Lewis* 2637 (CANL). S4



Figures 10–11. *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway (photos taken in the field without a scale bar).

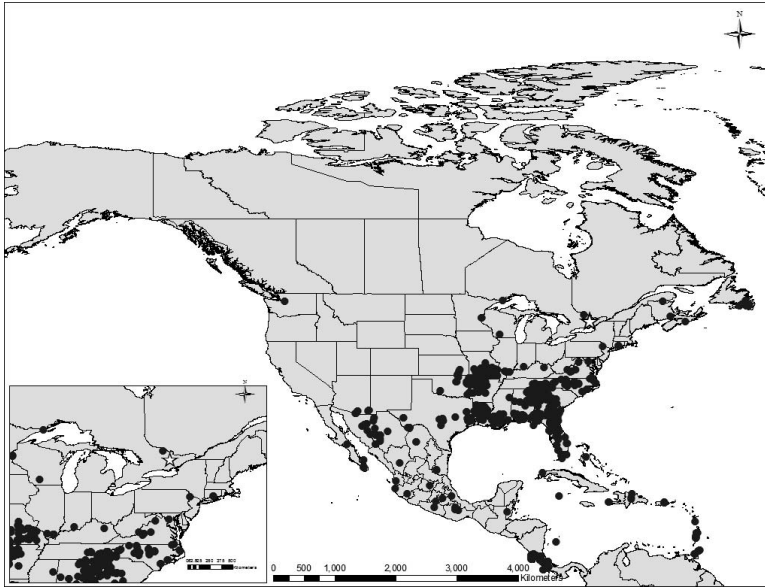


Figure 12. North and Central American range map of *Coccocarpia palmicola* (Spreng.) Arv. & D. J. Galloway. Previous known locations, based on herbarium specimens, are indicated with black dots. The new collection is shown by the white star. Insert in the bottom left shows a close-up of Eastern North America. Data are from Consortium of North American Lichen Herbaria (2018).

Dermatocarpon luridum (With.) J. R. Laundon - Doe Lake Trail, mixed woods with rock cliffs, growing on rock in vernal stream. *C. Lewis* 3019 (CANL). S5
Dermatocarpon miniatum (L.) W. Mann - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rock. *C. Lewis* 2682 (CANL); Calcareous lakeshore cliff (Doe Lake) on rock. *C. Lewis* 2794 (CANL). S4?

Dermatocarpon muhlenbergii (Ach.) Müll. Arg. - Slide Lake Loop, Calcareous lakeshore cliff (Doe Lake) on rock. *C. Lewis* 2784 (CANL). SU

Growing on both calcareous and acidic rock, this generalist species is common and widely distributed in eastern United States (Amtoft et al. 2008). It resembles *D. miniatum* s. str. and *D. americanum* Vainio but has large pear-shaped perithecia with convex ostioles vs small globular perithecia with concave ostioles (Amtoft et al. 2008; Brodo 2016). First reported in Canada from Brodo et al. (2013), this represents the second published discovery of this species in Canada. However, as Brodo et al. (2013) noted, previous records of *D. miniatum* (L.) W. Mann represent this species and should be checked carefully. This species is likely more widespread than the few published records indicate.

- Dictyocatenulata alba* Finley & E. F. Morris - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on *Fagus americana* tree base. *C. Lewis* 2674 (CANL). SNR
- Dimelaena oreina* (Ach.) Norman - Clear Lake, large lakeshore cliff, south-facing rock cliff with some calcareous influence, on rock. *C. Lewis* 3225 (CANL) S4
- Diploschistes scruposus* (Schreb.) Norman - NE near Devil Lake, inland forested rocky ridge, growing on a rock. *C. Lewis* 2740 (CANL); Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on a rock. *C. Lewis* 2639 (CANL). S4S5
- Diploptomma alboatrum* (Hoffm.) Flot. - Birch Lake, growing on sunny calcareous rock wall along the shoreline. *C. Lewis* 3228 (CANL). S3?
- Enchylium bachmanianum* (Fink) Otálora, P. M. Jørg. & Wedin [syn. *Collema bachmanianum* (Fink) Degel] - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on a marble cliff. *C. Lewis* 2688 (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis* 3205 (CANL). S4
- Enchylium polycarpon* (Hoffm.) Otálora, P. M. Jørg. & Wedin (syn. *Collema polycarpon* Hoffm.) - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2723 (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on a calcareous cliff. *C. Lewis* 2747 (CANL). S2S3
- Enchylium tenax* (Sw.) Gray [syn. *Collema tenax* (Sw.) Ach.] - NE near Devil Lake, inland forested rocky ridge, growing on soil. *C. Lewis* 2732 (CANL). S4
- Endocarpon pallidulum* (Nyl.) Nyl. - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2712 (NY) det. Lendemer; Tetsmine Trail, marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis* 2654 (CANL); Doe Lake Trail, mixed woods with rock cliffs, on calcareous cliff. *C. Lewis* 3132 (NY) det. Lendemer. SNR
- Enterographa zonata* (Körber) Källsten (syn. *Opegrapha zonata* Körb.) - McNally Bay, low-lying, humid, shady rich forest, growing on shaded cliff face. *C. Lewis* 3154 (CANL). SNR
- Ephebe lanata* (L.) Vain. - Clear Lake, large lakeshore cliff, south-facing rock cliff with some calcareous influence, on rock. *C. Lewis* 3223 (CANL) S4?
- Evernia mesomorpha* Nyl. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on lignum twig. *C. Lewis* 2911 (CANL). S5
- Flavoplaca flavocitrina* (Nyl.) Arup, Frödén & Söchting [syn. *Caloplaca flavocitrina* (Nyl.) H. Olivier] - Doe Lake Trail, mixed woods with rock cliffs, growing on calcareous cliff. *C. Lewis* 2749b with *Lecanora dispersa* (CANL). SNR
- Flavoparmelia baltimorensis*** (Gyeln. & Föriß) Hale - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis* 3017 (CANL). S3
- Flavoparmelia caperata* (L.) Hale - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Ulmus americana*. *C. Lewis* 2644 (CANL). S5
- Fuscidea arboricola* Coppins & Tønsberg - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Acer* bark, with *Lecanora thysanophora*. *C. Lewis* 2941 (CANL). SNR
- Fuscopannaria praetermissa* (Nyl.) M. Jørg. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on thin soil in rock crevasse. *C. Lewis* 2683, 2750 (CANL). S4?

Graphis scripta (L.) Ach. - Tetsmine Trail, vernal pool with ash and button bush, on *Fraxinus* sp. trunk. *C. Lewis* 2628 (CANL); Arab Lake Trail, shaded rich valley with high humidity, growing on bark. *C. Lewis* 2597, 2599, 2600 (CANL); McNally Bay, low-lying, humid, shady rich forest growing on large yellow birch, with *Pyrenula pseudobufonia*. *C. Lewis* 3146 (CANL). S5

Gyalolechia flavovirescens (Wulfen) Søchting, Frödén & Arup (syn. *Caloplaca flavovirescens* (Wulfen) Dalla Torre & Sarnth.) - Doe Lake Trail, mixed woods with rock cliffs, growing on calcareous cliff. *C. Lewis* 2746 (CANL). S5

Gyalolechia flavorubescens (Hudson) Søchting, Frödén & Arup (syn. *Caloplaca flavorubescens* (Huds.) J.R. Laundon) - Doe Lake Trail, mixed woods with rock cliffs, growing on large *Fraxinus* trunk. *C. Lewis* 3018 (CANL). S4

Heterodermia hypoleuca (Ach.) Trevis. - Tetsmine Trail, old growth rich valley with deciduous tree mix, growing on large-diameter *Fraxinus americana* trunk. *C. Lewis* 2620 (CANL); Mature deciduous stand with low-lying ash-dominated area, growing on mossy *Fraxinus* sp. *C. Lewis* 2667 (CANL); McNally Bay, low-lying, humid, shady rich forest, growing on large *Fraxinus* trunk (fallen). *C. Lewis* 3156 (CANL); Dipper Bay, perched, low-lying, humid, vernal pool in Tetsmine loop area, growing on large *Fraxinus* trunk (fallen). *C. Lewis* 3158 (CANL). S2

Heterodermia hypoleuca is a large charismatic foliose species (Figure 13). Thalli can be seen growing on suitable trees from many meters away. The thick, appressed, robust lobes and scalloped fruiting bodies (apothecia) are texturally so unique that this species is visually quite distinct from other gray foliose lichens growing on the same tree trunk. It has been on the “national watch list” ever since 1998, when it was considered one of Canada’s rarest lichens (Goward et al. 1998). It was considered extirpated from Canada at that time. Recent surveys in southern Ontario (Lewis and Brinker 2017) resulted in the discovery of several extant populations of this species. Currently it is listed as a Group 1 Priority candidate species for assessment by COSEWIC (2018), which tracks species in Canada that are suspected of being at some risk of extinction or extirpation.

Lendemer (2009) indicated that this is a widespread species occurring on hardwoods throughout eastern North America. However, the distribution and abundance of records as indicated on the range map (Plate 15 from Lendemer 2009) suggest that, although the species is widespread, there are relatively few records ($n = 32$) in eastern North America. In Ontario, *Heterodermia hypoleuca* is limited to humid sites (shaded valleys, forested floodplains, vernal pools within a continuous forest) and grows on old, mature, deciduous trees that have thick spongy bark (e.g., *Fraxinus* spp.) (Lewis and Brinker 2017). There are very few known Ontario populations of *H. hypoleuca* ($n = 11$), with only eight new records having been documented within the last five years (Lewis, pers. obs.) (Figure 14). Two historical records were discovered for Ontario based on collections made over 100 years ago (Lewis and Brinker 2017; Wong and Brodo 1992). These two previous collections were made by Braddish Billings, Jr., and John Macoun from Prescott and Brighton, in 1861 and 1893, respectively (*Billings s.n.* CANL; *Macoun* 178, CANL). Numerous searches since that time have failed to relocate individuals and those populations are considered extirpated. In 2009, *H. hypoleuca* was found in Lanark County (*R. E. Lee* 933) (Rob Lee,



Figure 13. *Heterodermia hypoleuca* (Ach.) Trevis. (photo taken in the field without a scale bar).

pers. comm.), representing the first recorded population in Ontario in over 116 years, but it was not reported in the literature. These recent discoveries once again reconfirm the presence of *H. hypoleuca* in Ontario and Canada.

Heterodermia speciosa (Wulfen) Trevis. - Little Salmon Lake Loop, growing on moist shaded rock face. C. Lewis 2872 (CANL); Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on nutrient-rich shaded cliff. C. Lewis 2897 (CANL); Dedication Trail – Central, moss over rock, C. Lewis 3071 (CANL). S4S5

Hypocenomyce scalaris (Ach.) M. Choisy - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Pinus strobus* bark. C. Lewis 2914 (CANL). S5

Hypogymnia physodes (L.) Nyl. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on a twig. C. Lewis 2698 (CANL); Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Abies* twig. C. Lewis 2901 (CANL). S5

Imshaugia aleurites (Ach.) S.F. Mey. - Doe Lake Trail, mixed woods with rock cliffs, growing on lignum. C. Lewis 3035 (CANL). S5

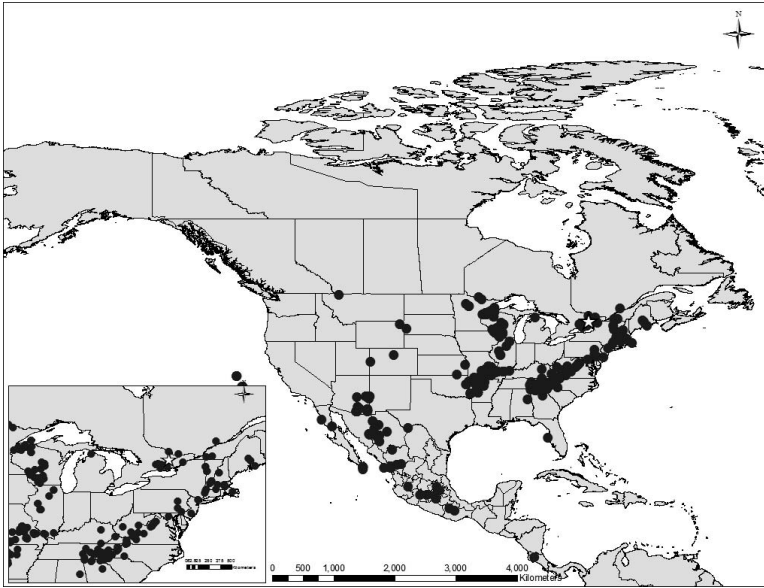


Figure 14. North and Central American range map of *Heterodermia hypoleuca* (Ach.) Trevis. Previous known locations, based on herbarium specimens, are indicated with black dots. The new collection is shown by the white star. Insert in the bottom left shows a close-up of Eastern North America. Data are from Consortium of North American Lichen Herbaria (2018).

Inoderma byssaceum (Weigel) Gray [syn. *Arthonia byssacea* (Weigel) Almq.] -

McNally Bay, low-lying, humid, shady rich forest, growing on large *Betula alleghaniensis*. C. Lewis 3149 (CANL). S1S2

Ionaspis lacustris (With.) Lutzoni - West of Slide Lake, on granite along stream. C. Lewis 3102 (CANL). SU

†*Julella fallaciosa* (Arnold) R.C. Harris - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on an *Acer* sp. C. Lewis 2645 (CANL); Slide Lake small loop, silver maple swamp, growing on a mature *Acer* sp. C. Lewis 2773 (CANL). SNR

Lasallia papulosa (Ach.) Llano - Doe Lake Trail, mixed woods with rock cliffs, growing on a granite boulder. C. Lewis 2758 (CANL). S5

Lathagrium undulatum (Flotow) Otálora, P. M. Jørg. & Wedin (syn. *Collema undulatum* var. *undulatum*) - Tetsmine Trail, marble outcrop opening in mixed forest, on calcareous rock. C. Lewis (pers. obs.). S4

Lecania croatica (Zahlbr.) Kotlov - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Acer* bark. C. Lewis 2942 (CANL). SNR

Lecania cyrtella (Ach.) Th. Fr. - Tetsmine Trail, vernal pool in deciduous forest, growing on flooded base of *Fraxinus* sp. C. Lewis 2650 (CANL). S4

Lecanora allophana Nyl. f. *sorediata* Nyl. - Labelle Lake, mixed *Acer* forest with

lakeshores and creeks, growing on large *Fraxinus* trunk. *C. Lewis 2906* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on large *Acer* trunk. *C. Lewis 2983* (CANL); Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Ulmus americana* trunk with *Caloplaca ulmorum* (Fink) Fink. *C. Lewis 2638* (CANL). SNR

Lecanora argentata (Ach.) Malme - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Acer* bark. *C. Lewis 2966* (CANL); West of Slide Lake, on calcareous rock face. *C. Lewis 3094* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on *Acer* bark. *C. Lewis 3038* (CANL). S3?

Lecanora argentea Oksner & Volkova - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite rock. *C. Lewis 2985* (CANL). SNR

Lecanora caesiorubella Ach. subsp. *caesiorubella* - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Thuja occidentalis* trunk. *C. Lewis 2687* (CANL). S4S5

Lecanora epanora (Ach.) Ach. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on metal-rich rock cliff. *C. Lewis 2895* (CANL). S1S3

This rare, yellowish, saxicolous lichen was only recently reported as new to Canada by Lewis and Brinker (2017). The record from Frontenac Provincial Park provides further insight into its distribution in North America, expanding its range from previously known records in Algonquin Provincial Park and Thunder Bay (Lewis and Brinker 2017).

Lecanora glabrata (Ach.) Malme - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Acer* sp. *C. Lewis 2702* (CANL). S4S5

Lecanora hybocarpa (Tuck.) Brodo - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Acer* sp. *C. Lewis 2701* (CANL); Slide Lake small loop, silver maple swamp, growing on a young *Acer* sp. *C. Lewis 2774* (CANL). S4S5

Lecanora layana Lendemer - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on young *Fraxinus* sp. with *Rinodina subminuta* H. Magn. and *Lecania croatica* (Zahlbr.) Kotlov. *C. Lewis 2648* (CANL); McNally Bay, low-lying, humid, shady rich forest, growing on *Fraxinus* trunk. *C. Lewis 3148* (CANL). SNR

Lecanora polytropa (Hoffm.) Rabenh. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite, growing with *Diploschistes muscorum*. *C. Lewis 2936* (CANL). S5

Lecanora pseudistera Nyl. - Calcareous lakeshore cliff (Doe Lake), growing on rock. *C. Lewis 2791* (CANL); Dedication Trail – Central, growing on rock. *C. Lewis 3072* (CANL). SU

Lecanora strobilina (Spreng.) Kieff. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, on lignum twig, *C. Lewis 2910* (CANL); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Carya* sp. bark. *C. Lewis 2923* (CANL). S4S5

Lecanora thysanophora Harris - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on a *Fraxinus* sp. trunk. *C.*

- Lewis 2704* (CANL); on rock. *C. Lewis 2707, 2678* (CANL) det. Brodo; NE near Devil Lake, inland forested rocky ridge growing on rock. *C. Lewis 2730* (CANL) det. Brodo. SNR
- Lecidea auriculata*** Th. Fr. *subsp. auriculata* - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2721* (CANL). S1S3
- Lecidea lapicida*** (Ach.) Ach. *var. lapicida* - West of Slide Lake, on granite. *C. Lewis 3098* (CANL). S1S3
- Lecidea tessellata* Flörke - Doe Lake Trail, mixed woods with rock cliffs, growing on calcareous-influenced rock, *C. Lewis 3009* (CANL). S4
- Lempholemma* sp. - Tetsmine Trail, vernal pool with ash and button bush, growing on the flooded base of a *Fraxinus* sp., *C. Lewis 2630* (HBG), *2631* (CANL), *2649* (CANL), *2629* (NY); McNally Bay, low-lying, humid, shady rich forest vernal pool, growing on flooded *Fraxinus* sp. tree base. *C. Lewis 3153* (HBG). SNR

The material collected during this study matches several previous collections made by the author in Ontario that have resulted in uncertain species-level identifications but have all been identified to the genus *Lempholemma* with confidence. It resembles a miniature *Leptogium* or *Collema* but the growth habit, photobiont (Nostocoid in clusters rather than in chains), apothecial structure and unicellular round ended spores separate this species from those taxa (Ellis 1981; Gilbert 2009). This potentially new species comes close in morphology to *Lemmopsis arnoldiana* (Hepp) Zahlbr., having a crustose-granular areolate thallus, numerous, dull red-orange, small (up to approximately 0.7 mm) apothecia, and eight, one-celled spores per ascus. The new species, however, has consistently slightly smaller spores and lightercolored apothecia and does not match the saxicolous growth habit preferred by *L. arnoldiana* (Gilbert 2009; Jørgensen 2007) but rather is corticolous. It is found growing on seasonally flooded tree bases. This species will be described in a future article.

***Lempholemma cladodes* (Tuck.) Zahlbr. - Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3210* (CANL). SNR

This is the first published record of this species in Canada. Previous unpublished discoveries of this species were made by Elisabeth Lay during the Tuckerman workshop in 2008 on the Bruce Peninsula in Bruce Peninsula National Park and by Irwin Brodo in 2010 from Algonquin Provincial Park. Lay's record was not published in Brodo et al. (2013) and so it is documented here together with the Frontenac and Algonquin Provincial Park records. Lay's collection was found growing at a site called Halfway Log Dump on Georgian Bay in a *Thuja*-dominated forest over Silurian dolomite with numerous boulders and escarpments on the shore. Lay's collection was determined by M. Schultz, a cyanolichen expert, and has been deposited at the New York Botanical Garden (NY) (*Lay 08-0316*). Brodo's collection was discovered in the Barron Canyon, along the Barron River (*Brodo 32724*) and is deposited in the Canadian Museum of Nature Lichen Herbarium (CANL). It was found growing on talus and a south-facing overhanging grotto above the river. The collection from this study matches very well with the descriptions in Jørgensen (2007) and

Gilbert et al. (2009). My specimen contains *Nostoc* and has swollen lobe apices with globular cup-shaped hormocystangia, forming squamulose to microfruticose patches on a well-lit calcareous stone.

Lempholemma polyanthes (Bernh.) Malme - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy calcareous boulders in shaded forest. *C. Lewis 2593* (CANL). S2S3

Lepra amara (Ach.) Hafellner [syn. *Pertusaria amara* (Ach.) Nyl.] - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on moss over *Fraxinus* sp. *C. Lewis 2695* (CANL). S4S5

Lepraria caesiella R.C. Harris - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Pinus strobus* bark. *C. Lewis 2913* (CANL) det. Brodo. S4S5

Lepraria disjuncta Lendemer - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis 3055* (CANL). SNR

Lepraria elobata Tønsberg - Big Salmon Lake, growing on *Pinus strobus* trunk. *C. Lewis 3092* (NY) det. Lendemer; Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on rock cliff. *C. Lewis 2709* (CANL) det. Brodo. S4?

Lepraria humida Slav.-Bayr. & Orange - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis 3058* (CANL) Brodo! SNR

Lepraria membranacea (Dicks.) Vain. - Doe Lake Trail, mixed woods with rock cliffs, growing on large *Pinus strobus* in humid valley, *C. Lewis 3008* (CANL) det. Niels Van Miltenburg; West of Slide Lake, on *Pinus strobus* trunk. *C. Lewis 3099* (NY) det. Lendemer; Nippising District, Algonquin Provincial Park, below Barron Canyon walking trail, on *Thuja occidentalis*, 8 Aug 2010. *C. Lewis 450* (NY) det. Lendemer. S2S3

There are very few published records of this species for Canada (Lendemer 2013). It has previously been discovered in Québec and Ontario (Freebury 2011; Lendemer 2013). The lack of records for this species may be due to collector bias and because TLC is required to separate this species from similar *finkii*-like placodioid *Lepraria* species (Lendemer 2013).

Lepraria neglecta (Nyl.) Erichsen - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite rock. *C. Lewis 2927* (CANL); Big Salmon Lake, growing on mossy rock. *C. Lewis 3090* (NY) (psoromic acid chemotype; det. Lendemer); Dedication Trail – Central, growing on rock. *C. Lewis 3070* (CANL) det. Brodo. S4S5

Lepraria normandinoidea Lendemer & R. C. Harris - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on moist cliff. *C. Lewis 2614* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on shaded cliff. *C. Lewis 3036* (CANL). SNR

Lepraria s. lat. - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis 3056* (CANL) det. Brodo. SNR

This species fits in the *Lepraria ecorticata* (J. R. Laundon) Kukwa group but as mentioned in Lendemer and Hodkinson (2013), *L. ecorticata* has been tentatively excluded from North American lists (Esslinger 2018). More

taxonomic work is needed to understand *Lepraria* s. lat. that have aggregate thalli and produce usnic acid (Lendemer 2013).

**Leprocaulon adhaerens* (K. Knudsen, Elix & Lendemer) Lendemer & Hodk. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on acidic rock. *C. Lewis 2676* (CANL) det. Brodo. SNR

This is the first published discovery of this species in Ontario. This species was collected in Québec in 2009 and 2011 in Gatineau Park by Dr. James Lendemer and Dr. Irwin Brodo, respectively (Freebury 2011). The distinctive lead-gray or bluish-green granules, found attached to mosses and other lichens, are often overlooked and as such this species may be under-collected (Knudsen et al. 2007).

Leptoplaca cirrochroa (Ach.) Arup, Frödén & Søchting [syn. *Caloplaca cirrochroa* (Ach.) Th. Fr.] - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2713* (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3203* (CANL). S1S2

Leptogium acadense J. W. Hinds, F. L. Anderson & Lendemer - Doe Lake Trail, mixed woods with rock cliffs, growing on mossy cliff. *C. Lewis 2745* (CANL). SNR

Leptogium cyanescens (Rabenh.) Körb. - Tetsmine Trail, mature deciduous stand with low-lying forest dominated by *Fraxinus* sp., growing over moss. *C. Lewis 2661* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on large *Fraxinus* trunk. *C. Lewis 3023* (CANL). S5

Leptogium rivulare Tuck. - Tetsmine Trail, vernal pool with ash and button bush, growing on the flooded base of a *Fraxinus* sp. *C. Lewis 2626, 2652* (CANL). McNally Bay, Tetsmine loop, growing on flooded base of a *Fraxinus* tree. *C. Lewis 3141* (CANL) S3

†*Leptorhaphis epidermidis* (Ach.) Th. Fr. - Arab Lake Trail, shaded rich valley with high humidity, growing on *Betula* sp. *C. Lewis 2598a* (CANL). S4

Lobaria pulmonaria (L.) Hoffm. - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on shaded rock face. *C. Lewis 2664* (CANL); Little Salmon Lake Loop, growing on moist shaded rock face. *C. Lewis 2870* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock cliff. *C. Lewis 2956* (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3217* (CANL). S4

Lobaria pulmonaria (L.) Hoffm., a large green macrolichen, is a relatively conspicuous epiphytic lichen that can often exceed 20–30 cm in lobe length (Brodo et al. 2001). It is widely spread across North America and can be found from coast to coast (Brodo et al. 2001). It is the most widely distributed and common *Lobaria* sp. in North America and is found inhabiting boreal, temperate, mountainous, and coastal habitats of the world (Brodo et al. 2001; Jüriado and Liira 2010), where it grows on trees, mossy rocks, and wood in mature forests, usually in the shade and/or areas of high humidity (Brodo et al. 2001; Hinds and Hinds 2007). In Russia it is known to utilize 28 species of trees as a host and is reported from 17 in Finland and Estonia (Jüriado and Liira 2009). Categorized as a cyanolichen, it has a cyanobacterium as its secondary

photosynthetic partner (i.e., in the cephalodia). *Lobaria pulmonaria* is typically restricted to substrates with high to neutral pH and high-water retention capacity (Jüriado and Liira 2009). Typically, this limits *L. pulmonaria* to deciduous tree species, such as ash (*Fraxinus* spp.) and maple (*Acer* spp.) (Richardson and Cameron 2004), but it has also been observed on mossy rocks and coniferous trees, specifically eastern white cedar (*Thuja occidentalis* L.) (Brodo et al. 2001).

Lobaria quercizans Michx. - Tetsmine Trail, old-growth rich valley with deciduous tree mix, growing on mossy cliff face. *C. Lewis* 2625 (CANL); Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis* 2795 (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis* 3218 (CANL). S4

Melanelixia subaurifera (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch -Slide Lake small loop, silver maple swamp, growing on young *Acer* sp. trunk. *C. Lewis* 2771 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock. *C. Lewis* 2971 (CANL). S5

Micarea cfr. *meleana* (Nyl.) Hedl. - Doe Lake Trail, mixed woods with rock cliffs, growing on a rotting log. *C. Lewis* 3007 (CANL).

Montanelia disjuncta (Erichsen) Divakar, A. Crespo, Wedin & Essl. [syn. *Melanelia disjuncta* (Erichsen) Essl.] - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite. *C. Lewis* 2989 (CANL). S4

Montanelia sorediata (Ach.) Divakar, A. Crespo, Wedin & Essl. [syn. *Melanelia sorediata* (Ach.) Goward & Ahti] - Doe Lake Trail, mixed woods with rock cliffs, growing on granite boulder. *C. Lewis* 2752 (CANL). S5

†*Mycocalicium subtile* (Pers.) Szatala - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on lignum. *C. Lewis* 2690, 2811, 2812, 2813 (CANL). SNR

Myelochroa aurulenta (Tuck.) Elix & Hale -Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Ostrya virginiana*. *C. Lewis* 2647 (CANL); Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis* 2788 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite cliff. *C. Lewis* 2953 (CANL). S5

Myelochroa galbina (Ach.) Elix & Hale - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on fallen canopy branch. (pers. comm.). S4S5

Myelochroa obessa (Ach.) Elix & Hale - Calcareous lakeshore cliff (Doe Lake), growing on rock. *C. Lewis* 2785 (CANL). SNR

Myriolecis albescens (Hoffm.) Śliwa, Zhao Xin & Lumbsch [syn. *Lecanora albescens* (Hoffm.) Flörke] - Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis* 3214 (CANL).SU

Myriolecis carlottiana (Lewis & Śliwa) Śliwa, Zhao Xin & Lumbsch (syn. *Lecanora carlottiana* Lewis & Śliwa) - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2727 (CANL). S1S3?

Myriolecis crenulata (Hooker) Śliwa, Zhao Xin & Lumbsch (syn. *Lecanora crenulata* Hook.) - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2718 (CANL); Birch Lake Shore, growing on sunny calcareous cliff. *C. Lewis* 3202 (CANL). S1S2

Myriolecis dispersa (Pers.) Śliwa, Zhao Xin & Lumbsch [syn. *Lecanora dispersa*

- (Pers.) Sommerf.] - Doe Lake Trail, mixed woods with rock cliffs, growing on calcareous cliff. *C. Lewis 2749a* (CANL). S5
- Myriolecis fugiens* (Nyl.) Śliwa, Zhao Xin & Lumbsch (syn. *Lecanora fugiens* Nyl.) - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on siliceous rock. *C. Lewis 2998* (CANL). SNR
- Myriolecis sambuci* (Pers.) Clem. (syn. *Lecanora sambuci* (Pers.) Nyl.) - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana* twigs. *C. Lewis 2994* (CANL). SNR
- Myriolecis semipallida* (H. Magn.) Śliwa, Zhao Xin & Lumbsch (syn. *Lecanora semipallida* H. Magn.) - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2714* (CANL). SNR
- Nephroma helveticum* Ach. subsp. *helveticum* - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2587* (CANL). S4S5
- Nephroma parile* (Ach.) Ach. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on mossy rock. *C. Lewis 2967* (CANL). S4S5
- Ochrolechia androgyna* (Hoffm.) Arnold - Calcareous lakeshore cliff (Doe Lake), growing on rock. *C. Lewis 2775* (CANL). S4
- Ochrolechia arborea* (Kreyer) Almb. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on bark. *C. Lewis 2909* (CANL). S4S5
- Ochrolechia trochophora*** (Vain.) Oshio **var. *trochophora*** - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2590* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on a rock cliff. *C. Lewis 2960* (CANL). S2S3
- Parmelia squarrosa* Hale - McNally Bay, low-lying, humid, shady rich forest, growing on *Fraxinus* trunk, *C. Lewis 3147* (CANL); Dipper Bay, perched, low-lying, humid, vernal pool in Tetsmine loop area, growing on *Fraxinus* trunk. *C. Lewis 3160* (CANL). S5
- Parmelia sulcata* Taylor - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Abies* trunk, *C. Lewis 2908* (CANL); Arab Lake Parking Lot, growing on *Acer* bark. *C. Lewis 3085* (CANL). S5
- Parmeliopsis ambigua* (Wulfen) Nyl. - Dedication Trail – Central, growing on *Juniperus*. *C. Lewis 3077* (CANL). S5
- Parmotrema crinitum*** (Ach.) M. Choisy - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2588* (CANL); McNally Bay, low-lying, humid, shady rich forest, growing on large *Fraxinus* trunk (fallen). *C. Lewis 3157* (CANL). S3
- Peltigera aphthosa* (L.) Willd. - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on mossy rock face. *C. Lewis 2665* (CANL). S5
- Peltigera canina* (L.) Willd. - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy tree trunk. *C. Lewis 2595* (CANL). S5
- Peltigera elisabethae* Gyeln. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on mossy cliff face. *C. Lewis 2613* (CANL); Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis 2783* (CANL) S5
- Peltigera evansiana* Gyeln. - Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis 2782* (CANL). S4
- Peltigera horizontalis* (Huds.) Baumg. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on mossy cliff face. *C. Lewis 2937* (CANL). S5

- Peltigera lepidophora* (Nyl. ex Vain.) Bitter - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on mossy cliff. *C. Lewis 2616* (CANL). S4
- Peltigera leucophlebia* (Nyl.) Gyeln. - NE near Devil Lake, inland forested rocky ridge, growing on soil. *C. Lewis 2734* (CANL). S4
- Peltigera neckeri* Hepp ex Müll. Arg. - Calcareous lakeshore cliff (Doe Lake), growing on a mossy rock. *C. Lewis 2796* (CANL); Tetsmine Trail, old-growth rich valley with deciduous tree mix, growing on a mossy cliff. *C. Lewis 2618* (CANL). S5
- Peltigera praetextata* (Flörke ex Sommerf.) Zopf - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on tree bases. *C. Lewis 2691, 2699* (CANL); McNally Bay, Tetsmine loop, growing on mossy rock. *C. Lewis 3142* (CANL), *3143* (CANL). S5
- Peltigera rufescens* (Weiss) Humb. - Tetsmine Trail, marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis 2659* (CANL). S5
- Pertusaria macounii* (I. M. Lamb) Dibben - Arab Lake Trail, shaded rich valley with high humidity, growing on *Betula alleghaniensis* trunk. *C. Lewis 2596* (CANL). S4
- †*Phaeocalicium curtisii* (Tuck.) Tibell - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Rhus typhina*. *C. Lewis 2705* (CANL). S5
- †*Phaeocalicium polyporaenum* (Nyl.) Tibell - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Trametes versicolor*. *C. Lewis 2615* (CANL). S4?
- Phaeophyscia adiastola* (Essl.) Essl. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite cliff. *C. Lewis 2952* (CANL). S4
- Phaeophyscia ciliata* (Hoffm.) Moberg - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana* twigs. *C. Lewis 2980, 2993* (CANL). S2S3
- Phaeophyscia decolor* (Kashiw.) Essl. - Dedication Trail – Central, growing on granite. *C. Lewis 3073* (CANL). SU
- Phaeophyscia hirsuta* (Mereschk.) Essl. - Arab Lake Parking Lot, growing on *Acer* trunk. *C. Lewis 3087* (CANL). S2S3
- Phaeophyscia hispidula* (Ach.) Essl. subsp. *hispidula* - Doe Lake Trail, mixed woods with rock cliffs, growing on mossy cliff. *C. Lewis 2744* (CANL). S4
- Phaeophyscia kairamoi* (Vain.) Moberg - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on large *Acer* trunk. *C. Lewis 2981* (CANL). S3S4
- Phaeophyscia pusilloides* (Zahlbr.) Essl. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Prunus* sp. *C. Lewis 2646* (CANL). S5
- Phaeophyscia rubropulchra* (Degel.) Essl. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Fraxinus* sp. *C. Lewis 2693* (CANL). S5
- Phaeophyscia squarrosa* Kashiw. - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on mossy rock face. *C. Lewis 2669, 2670* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on mossy cliff. *C. Lewis 2751* (CANL); Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis 2780* (CANL). S2S3
- Phlyctis petraea* R.C. Harris, Muscavitch, Ladd & Lendemer. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on acidic

- rock. *C. Lewis* 2677 (CANL); NE near Devil Lake, inland forested rocky ridge, growing on rock. *C. Lewis* 2729 (CANL). SNR
- Phlyctis speirea* G. Merr. - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on mossy *Fraxinus* sp. *C. Lewis* 2668 (CANL); Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Thuja occidentalis* trunk. *C. Lewis* 2681 (CANL). SNR
- Physcia adscendens* (Fr.) H. Olivier - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, on *Fraxinus* sp. *C. Lewis* 2692 (CANL). S5
- Physcia aipolia* (Ehrh. ex Humb.) Fűrnr. var. *aipolia* - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on young *Tilia americana*, *C. Lewis* 2976 (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on young *Fraxinus*. *C. Lewis* 3014 (CANL). S5
- Physcia americana* G. Merr. - Tetsmine Trail, old-growth rich valley with deciduous tree mix, on old *Fraxinus* sp. trunk. *C. Lewis* 2619 (CANL); Doe Lake Trail, mixed woods with rock cliffs on granite rock. *C. Lewis* 2762, 2763, 2781 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Fraxinus* trunk. *C. Lewis* 2962 (CANL); McNally Bay, low-lying, humid, shady rich forest growing on large yellow birch. *C. Lewis* 3145 (CANL); Birch Lake, growing on sunny calcareous boulder along the shoreline, fertile. *C. Lewis* 3227 (CANL) Esslinger! S2S3
- Physcia caesia* (Hoffm.) Fűrnr. - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis* 3044 (CANL). S4S5
- Physcia millegrana* Degel. - NE near Devil Lake, inland forested rocky ridge, growing on twigs. *C. Lewis* 2737 (CANL). S5
- Physcia stellaris* (L.) Nyl. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana* twigs. *C. Lewis* 2996 (CANL). S5
- Physcia thomsoniana* Essl. - Doe Lake Trail, mixed woods with rock cliffs, growing on granite boulder. *C. Lewis* 2753 (CANL); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite. *C. Lewis* 2931 (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Carya* sp. bark. *C. Lewis* 2943 (CANL). SNR
- Physciella melanchra* (Hue) Essl. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, on *Ostrya virginiana* trunk. *C. Lewis* 2617 (CANL). S4?
- Physconia detera* (Nyl.) Poelt - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Acer* sp. *C. Lewis* 2641 (CANL); Slide Lake Large Loop, granite ridge with sparse *Quercus*/*Pinus* mix, growing on *Fraxinus* sp. *C. Lewis* 2801 (CANL). S5
- Physconia grumosa* Esslinger - McNally Bay, low-lying, humid, shady rich forest, growing on *Fraxinus* trunk. *C. Lewis* 3151 (CANL). S2S3
- Physconia leucoleiptes* (Tuck.) Essl. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Fraxinus* bark. *C. Lewis* 2970 (CANL); McNally Bay, low-lying, humid, shady rich forest, growing on *Fraxinus* trunk. *C. Lewis* 3150 (CANL). S4
- Physconia subpallida* Essl. - Slide Lake Loop, north slope near wetland, growing on *Fraxinus* sp. trunk. *C. Lewis* 2798 (CANL). S2S3
- Placidium squamulosum* (Ach.) Breuss - Tetsmine Trail marble outcrop opening

- in mixed forest, growing on calcareous soil. *C. Lewis 2653* (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3208* (CANL). S3?
- Placynthium asperellum* (Ach.) Trevis. - Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3201* (CANL). S4?
- Placynthium flabellusum*** (Tuck.) Zahlbr. - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2717* (CANL). SH
- Placynthium nigrum* (Huds.) Gray - Tetsmine Trail, marble outcrop opening in mixed forest, on calcareous rock. *C. Lewis 2660* (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3206* (CANL). S5
- Placynthiella uliginosa*** (Schrad.) Coppins & P. James - Dedication Trail - Central, growing on soil. *C. Lewis 3075, 3076*; Dedication Trail - West, growing on soil. *C. Lewis 3082* (CANL). S2
- Porpidia albocaerulescens* (Wulfen) Hertel & Knoph - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on boulder in the forest. *C. Lewis 2706* (CANL). S4S5
- Porpidia tuberculosa*** (Sm.) Hertel & Knoph - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite cliff. *C. Lewis 2954* (CANL); West of Slide Lake, on granite. *C. Lewis 3101* (CANL). S1S2
- Protoblastenia rupestris* (Scop.) J. Steiner - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2724* (CANL). S5
- Protoparmelia hypotremella* Herk, Spier & V. Wirth. - Slide Lake small loop, silver maple swamp, growing on *Abies*. *C. Lewis 2770* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on dead pine twigs, with *Sphintrina anglica*. *C. Lewis 3006* (CANL). SNR
- Psilolechia lucida* (Ach.) M. Choisy - Little Salmon Lake Loop, growing on moist shaded rock face. *C. Lewis 2871* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on talus cliff. *C. Lewis 2959* (CANL). S4
- Psora pseudorussellii*** Timdal - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2725* (CANL); Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis 2716* (CANL); NE near Devil Lake, inland forested rocky ridge, growing on rock. *C. Lewis 2733* (CANL). S2S3
- Punctelia appalachensis*** (W. L. Culb.) Krog - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2585* (CANL). S1?
- Punctelia bolliana* (Müll. Arg.) Krog - Dipper Bay, perched, low-lying, humid, vernal pool in Tetsmine loop area, growing on large *Fraxinus* trunk (fallen). *C. Lewis 3159* (CANL). S4S5
- Punctelia caseana* Lendemer & Hodkinson - Dedication Trail (west), growing on *Fraxinus* trunk. *C. Lewis 3084* (CANL). S4
- Punctelia rudecta* (Ach.) Krog - Tetsmine Trail, mixed forest with cliffs and open oak ridges, on *Ulmus* trunk. *C. Lewis 2643* (CANL); Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on *Fraxinus*. *C. Lewis 2700* (CANL). Slide Lake Large Loop, granite ridge with sparse *Quercus*/*Pinus* mix, on *Fraxinus*. *C. Lewis 2800* (CANL). S5
- Pyrenula pseudobufonia* (Rehm) R.C. Harris - Tetsmine Trail, old-growth rich valley with deciduous tree mix, on *Fagus americana* trunk. *C. Lewis 2622* (CANL). S4
- Pyrenopsis* cfr. *polycocca* (Nyl.) Tuck. - Big Salmon Lake Trail, mixed forest

with rich humid valleys, growing on granite rock in water runoff area. *C. Lewis 2946* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis 3060* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on granite in sun. *C. Lewis 3013* (HBG); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite rock in water runoff area. *C. Lewis 2924* (HBG). SNR

Pyrenopsis is a poorly understood genus, probably because of the lack of mature, fruiting material available for examination. Therefore, identification of most North American material is questionable (Brodo et al. 2001; Jørgensen 2007). These four collections are all fertile and found growing in the described habitat for this species, but the variability suggests some taxonomic work is still required for this group.

Pyxine soredata (Ach.) Mont. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on *Ulmus* trunk. *C. Lewis 2642* (CANL). S5

Ramalina farinacea (L.) Ach. - Calcareous lakeshore cliff (Doe Lake), growing on rock face. *C. Lewis 2789* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock cliff. *C. Lewis 2947* (CANL). S3?

Ramalina intermedia (Delise ex Nyl.) Nyl. - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2591* (CANL); Calcareous lakeshore cliff (Doe Lake), growing on shaded rock face. *C. Lewis 2787* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock cliff. *C. Lewis 2977* (CANL). S5

Ramalina labiosorediata Gasparyan, Sipman & Lücking [= *Ramalina pollinaria* sensu N. Am. auct., non (Westr.) Ach.] - Tetsmine Trail, mature deciduous stand with low-lying area dominated by *Fraxinus* sp., growing on shaded rock face. *C. Lewis 2663* (CANL); Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2592* (CANL); Birch Lake, growing on sunny calcareous rock wall along the shoreline, on shaded rock. *C. Lewis 3230* (CANL). S3?

Rhizocarpon grande (Flörke ex Flot.) Arnold - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite. *C. Lewis 2920, 2921, 2922* (CANL); Dedication Trail—West, growing on granite. *C. Lewis 3079* (CANL). S4S5

Rhizocarpon infernulum (Nyl.) Lyngé - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite. *C. Lewis 2986* (CANL). SNR

Rhizocarpon lavatum (Fr.) Hazsl. - NE near Devil Lake, inland forested rocky ridge, on rock, *C. Lewis 2741* (CANL); West of Slide Lake, on granite along stream. *C. Lewis 3103* (CANL). S1S2

Rhizocarpon lecanorinum Anders - Dedication Trail—West, growing on exposed granite rock. *C. Lewis 3078* (CANL). S4

Rhizocarpon rubescens Th. Fr. (fide Fryday) - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite rock. *C. Lewis 2987* (CANL); West of Slide Lake, on granite rock. *C. Lewis 3097* (CANL). S4

Rhizocarpon timaldali Ihlen & Fryday - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on granite rock. *C. Lewis 2988* (CANL). SNR

Rhizoplaca opiniconensis (Brodo) Leavitt, Zhao Xin & Lumbsch (syn. *Lecanora opiniconensis* Brodo) - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on rock cliff, *C. Lewis 2907* (CANL); Big Clear Lake, mixed

Acer forest with lakeshores and creeks, growing on granite rock. *C. Lewis* 2916 (CANL). S3

The type locality for this species is located on Lake Opinicon, Ontario (Brodo 1986). The coordinates of that collection site are located a mere 10 kilometers east of Frontenac Provincial Park.

Rhizoplaca subdiscrepans (Nyl.) R. Sant. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite rock. *C. Lewis* 2915 (CANL); Doe Lake Trail, mixed woods with rock cliffs on granite shore. *C. Lewis* 2756, 2755 (CANL). S4

Rhizoplaca weberi (Ryan) Leavitt, Zhao Xin & Lumbsch (syn. *Lecanora weberi* Ryan) - Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis* 3054 (CANL) det. Brodo. SNR

Rinodina destituta (Nyl.) Zahlbr. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rock. *C. Lewis* 2686 (CANL). SNR

Rinodina subminuta H. Magn. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana* twigs, growing with *Scoliosporum chlorococcum* (Stenh.) Vězda. *C. Lewis* 2940, 2995 (CANL). S5

Rinodina tephraspis (Tuck.) Herre - West of Slide Lake, on granite. *C. Lewis* 3100 (CANL). S4

Rusavskia elegans (Link) S. Y. Kondr. & Kärnefelt (syn. *Xanthoria elegans* (Link) Th. Fr.) - Clear Lake large lakeshore cliff, south-facing rock cliff with some calcareous influence, on rock. *C. Lewis* 3222, 3224 (CANL).

Rusavskia soredata (Vainio) S. Y. Kondr. & Kärnefelt (syn. *Xanthoria soredata* (Vain.) Poelt) - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2715, 2726 (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis* 3211 (CANL). S4

Sarcogyne privigna (Ach.) A. Massal. - Devil Lake, marble cliff on shoreline growing on rock. *C. Lewis* 2720 (CANL). SU

Sarcogyne regularis Körb. - Devil Lake, marble cliff on shoreline, growing on rock. *C. Lewis* 2719 (CANL). S5

+*Sarea difformis* (Fr.) Fr. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Pinus* resin. *C. Lewis* 2903 (CANL). SNR

+*Sarea resiniae* (Fr.) Kuntze - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Pinus* resin. *C. Lewis* 2902 (CANL). SNR

Sclerophora nivea (Hoffm.) Tibell - Doe Lake Trail, mixed woods with rock cliffs, growing on large *Quercus*. *C. Lewis* 3042 (CANL). SU

This is the third published record of this species in Ontario. Tibell (1975) first found this species in Renfrew, Ontario; Crowe (1994) published the second record in Ontario from Thunder Bay. Another collection was discovered in Algonquin Provincial Park (*C. Lewis* 138 CANL) but was not previously published. This yellow-cream stalked caliciod is unmistakable despite being less than a centimeter tall.

Scyrtinium dactylinum (Tuck.) Otálora, P. M. Jørg. & Wedin (syn. *Leptogium dactylinum* Tuck.) - Doe Lake Trail, mixed woods with rock cliffs, growing on a calcareous cliff. *C. Lewis* 2748 (CANL). S3

- Scytinium lichenoides* (L.) Otálora, P. M. Jørg. & Wedin [syn. *Leptogium lichenoides* (L.) Zahlbr.] - Tetsmine trail; marble outcrop opening in mixed forest, growing on calcareous soil. *C. Lewis 2655* (CANL). S5
- Scytinium schraderi* (Bernh.) Otálora, P.M. Jørg. & Wedin - Birch Lake, growing on sunny calcareous boulder along the shoreline with *Psorotichia schaeferi* (A. Massal.) Arnold, on calcareous rock in sun. *C. Lewis 3235* (CANL) SNR

This species has recently been reported as new to Ontario in another publication by the author (Brodo et al. in prep). Until recently it was only known from western North America (2018; Anderson and Neily 2014). It differs from other small sub-fruticose *Scytinium* in having distinctly wrinkled and furrowed branches, more closely resembling sub-fruticose forms of *Leptogium lichenoides*. *Scytinium plicatile* can be variable with some forms resembling *S. schraderi*, but when the internal structure of the lobes is examined, *S. schraderi* has a regular cortex and loose central portions of the lobes, whereas *S. plicatile* has a pseudocortex and dense internal parts (see Figure 12 in Jørgensen 1994).

- Scytinium subtile* (Schrader) Otálora, P. M. Jørg. & Wedin (syn. *Leptogium subtile* (Schrad.) Torss.) - Tetsmine Trail, flooded ash in vernal pool in deciduous forest, growing on *Fraxinus* sp. tree base. *C. Lewis 2651* (CANL). S3?
- Scytinium tenuissimum* (Dickson) Otálora, P. M. Jørg. & Wedin (syn. *Leptogium tenuissimum* (Dicks.) Körb) - Calcareous lakeshore cliff (Doe Lake), growing on soil. *C. Lewis 2790* (CANL). S4?
- Scytinium teretiusculum* (Wallr.) Otálora, P. M. Jørg. & Wedin (syn. *Leptogium teretiusculum* (Wallr.) Arnold) - Tetsmine Trail, mature deciduous stand with low-lying ash-dominated area, growing on *Fraxinus* sp. tree base. *C. Lewis 2673* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on large *Fraxinus* trunk. *C. Lewis 3024* (CANL). S4?
- Sphinctrina anglica* Nyl. Slide Lake small loop, silver maple swamp, growing on *Protoparmelia hypotremella*. *C. Lewis 2770* (CANL). S3
- Stenocybe pullatula* (Ach.) Stein - Slide Lake small loop, silver maple swamp, growing on *Alnus*. *C. Lewis 2765* (CANL). SU
- Stereocaulon dactylophyllum* Flörke - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on thin soil over rock. *C. Lewis 3002* (CANL). S4
- Stereocaulon saxatile* H. Magn. - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on rock. *C. Lewis 2935* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on thin soil over rock. *C. Lewis 2999* (CANL). S5
- Stereocaulon tomentosum* Fr. - Doe Lake Trail, mixed woods with rock cliffs, growing on thin soil over rock. *C. Lewis 3039* (CANL). S4S5
- Sticta beauvoisii* Delise - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2583* (CANL). S1?
- Trapelia placodioides* Coppins & P. James - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on rock. *C. Lewis 2710* (CANL). S5

- Trapeliopsis flexuosa* (Fr.) Coppins & P. James - Doe Lake Trail, mixed woods with rock cliffs, growing on lignum. *C. Lewis 3040* (CANL). S4S5
- Trapeliopsis granulosa* (Hoffm.) Lumbsch - Doe Lake Trail, mixed woods with rock cliffs, growing on soil. *C. Lewis 3012* (CANL). S5
- Umbilicaria deusta* (L.) Baumg. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on granite boulder. *C. Lewis 2635* (CANL). S5
- Umbilicaria mammulata* (Ach.) Tuck. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on cliff. *C. Lewis 2949* (CANL); West of Slide Lake, on rock face, *C. Lewis 3095* (CANL). S5
- Umbilicaria muehlenbergii* (Ach.) Tuck. - Tetsmine Trail, mixed forest with cliffs and open oak ridges, growing on cliff. *C. Lewis 2636* (CANL). S4S5
- Umbilicaria vellea* (L.) Hoffm. - Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on acidic rock. *C. Lewis 2680* (CANL); Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on cliff. *C. Lewis 2950* (CANL). S4
- Usnocetraria oakesiana* (Tuck.) M.J. Lai & C.J. Wei - Tetsmine Trail, mature deciduous forest stand with low-lying area dominated by *Fraxinus* sp., growing on shaded rock face. *C. Lewis 2662* (CANL). S4
- Usnea hirta* (L.) F. H. Wigg. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on *Abies* twig. *C. Lewis 2900* (CANL). S5
- Vahlia leucophaea* (Vahl) M. Jørg. - Arab Lake Trail, shaded rich valley with high humidity, growing on mossy cliff face. *C. Lewis 2589, 2777* (CANL.); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on shaded cliff. *C. Lewis 2932* (CANL); Birch Lake shoreline, growing on sunny calcareous cliff face. *C. Lewis 3212, 3213* (CANL). S4
- ***Verrucaria* cfr. *trabalis* Nyl. - Tetsmine Trail, vernal pool with ash and button bush on the flooded base of a *Fraxinus* sp. *C. Lewis 2632* (CANL). SNR

Corticolous *Verrucaria* are relatively rare in North America (Lendemer and Breuss 2009). This represents the first published discovery of a corticolous *Verrucaria* species in Canada. This specimen was found growing in the inundation zone (between the seasonally high and low water marks) on deciduous tree bases in a vernal pool, alongside other semi-aquatic lichen (i.e., *Lecania cyrtella*, *Leptogium rivulare*, and *Lempholemma* sp.). *Verrucaria thujae* Lendemer & Breuss, described from Michigan, USA, is similar in having a continuous thallus, but *V. thugae* has a pale exciple and grows on *Thuja occidentalis* (Lendemer and Breuss 2009). It is only known from the type location so perhaps there is some substrate and morphological variation; more study is required. *Verrucaria litorea* and *V. quercina* have similar spore measurements of 20–30 × 10–14 µm vs 24–28 × 11–13 µm, respectively (Lendemer and Breuss 2009), compared to the smaller spores (18–20 × 8–10 µm) of this material. This new discovery also lacks an involucrellum, which those two species possess (Lendemer and Breuss 2009). Two more species of corticolous *Verrucaria* have been discovered in Europe and Asia that come close in character to this new material; *V. breussii* (Diederich and Van den Boom 2011) from Spain and *V. juglandis* (Gasparyan and Aptroot 2016) from Armenia. *Verrucaria juglandis* has a dark brown, areolate, more roughened areolate thallus that does not match well with the thin, relatively continuous thallus in this new material; both European species have larger spores.

Verrucaria trabalis Nyl. is currently only known from northern Europe (Finland and Russia), where it was found growing on inundated wood (Pykälä et al. 2012). *Verrucaria trabalis* also has a thin, continuous green thallus with immersed or partly covered perithecia and spores that measure $15\text{--}23 \times 7\text{--}10 \mu\text{m}$ (Pykälä et al. 2012), which match well with this new discovery.

Verrucaria nigrescens Pers. - West of Slide Lake, on granite, *C. Lewis 3105* (CANL). S5

Viridothelium virens (Tuck. ex Michener) Lücking, M. P. Nelsen & Aptroot (syn. *Trypethelium virens* Tuck. ex Michener) - Tetsmine Trail, old-growth rich valley with deciduous tree mix, growing on *Fagus americana* trunk. *C. Lewis 2623* (CANL). S3

Willeya diffractella (Nyl.) Müll. Arg. [syn. *Staurothele diffractella* (Nyl.) Tuck.] - Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on shaded rock face. *C. Lewis 2930* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on rock. *C. Lewis 3005* (CANL). SU

Xanthocarpia feracissima (H. Magn.) Frödén, Arup & Søchting (syn. *Caloplaca feracissima* H. Magn.) - Slide Lake Loop, Calcareous lakeshore cliff (Doe Lake), growing on rock. *C. Lewis 2792* (CANL). S5

Xanthomendoza fallax (Hepp ex Arn.) Søchting, Kärnefelt & S. Kondr. - Labelle Lake, mixed *Acer* forest with lakeshores and creeks, growing on red cedar (*Juniperus virginiana*) twig. *C. Lewis 2904* (CANL). SNR

Xanthomendoza ulophyllodes (Räsänen) Søchting, Kärnefelt & S. Kondr. - Calcareous lakeshore cliff (Doe Lake), growing on mossy rock. *C. Lewis 2793* (CANL). S4

Xanthomendoza hasseana (Räsänen) Søchting, Kärnefelt & S. Kondr. - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on *Tilia americana* twigs. *C. Lewis 2939* (CANL); Doe Lake Trail, mixed woods with rock cliffs, growing on *Tilia americana*. *C. Lewis 3030* (CANL). S5

Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale - Big Salmon Lake Trail, mixed forest with rich humid valleys, growing on rock. *C. Lewis 2972, 2990* (CANL); Dedication Trail – Central, on granite, *C. Lewis 3067* (CANL); Dedication Trail – West, growing on granite. *C. Lewis 3080* (CANL). S4S5

Xanthoparmelia cumberlandia (Gyeln.) Hale - Dedication Trail – Central, on granite, *C. Lewis 3068* (CANL); West of Slide Lake, on granite. *C. Lewis 3096* (CANL). S5

Xanthoparmelia plittii (Gyelnk) Hale - Slide Lake Large Loop, granite ridge top with sparse *Quercus/Pinus* mix, growing on granite. *C. Lewis 2799* (CANL); Calcareous lakeshore cliff (Doe Lake), growing on granite. *C. Lewis 2779* (CANL). S4S5

Xanthoparmelia viriduloumbrina (Gyelnik) Lendemer - Doe Lake Trail, mixed woods with rock cliffs, growing on granite. *C. Lewis 2757* (CANL); Gibson Lake Trail, deciduous forest, vernal pool with marble and granite cliffs, growing on acidic rock. *C. Lewis 2708* (CANL); Big Clear Lake, mixed *Acer* forest with lakeshores and creeks, growing on granite rock, *C. Lewis 2925* (CANL); Dedication Trail – West, growing on granite. *C. Lewis 3081* (CANL). SU

Unknown #1 - Devil Lake shoreline, south-facing rock cliff adjacent to the

shore, growing on acidic vertical rock face. *C. Lewis 3226* (NY; CANL). SNR

This small, dark brown, closely appressed, lobulate species has circular patches of soredia forming on its upper surface, as well as a few located along the margin. At first glance it looks like a smudge or discoloration of the rock surface, but closer inspection reveals minute rosette-forming thalli with a lobate margin. It does not match any currently described species. It somewhat resembles a species from the *Acarospora* genus. More collections of this species are needed for taxonomic work.