

## Further contributions to the Ontario flora of lichens and allied fungi, with emphasis on the Great Lakes Basin

SAMUEL R. BRINKER<sup>1</sup>

**ABSTRACT.** – Noteworthy records of forty-three lichens and allied fungi are presented based on recent collections from Ontario, Canada. Three species, *Agonimia borysthenica*, *Arthonia subconveniens* (on *Ricasolia quercizans*) and *Lecanographa abscondita* are reported for the first time from North America. Eleven species, *Erythricium aurantiacum* (on *Physcia millegrana*), *Hypotrachyna showmanii*, *Leptogium arsenei*, *Opegrapha rupestris* (on *Bagliettoa*), *Pronectria tibellii* (on *Cladonia pocillum*), *Punctelia missouriensis*, *Thelidium zwackhii*, *Tremella imshaugiae* (on *Imshaugia aleurites*), *Verrucaria bryoctona*, *Vezeada schuyleriana* and *Vouauxiella lichenicola* (on *Lecanora*) are reported for the first time from Canada. Eleven species, *Absconditella sphagnum*, *Agonimia gelatinosa*, *Didymocyrtis xanthomendozae* (on *Xanthomendoza hasseana*), *Distopyrenis americana*, *Lichenochora obscuroides* (on *Phaeophyscia pusilloides* and *P. sciastra*), *Paranectria oropensis* (on *Lecanora* and *P. rubropulchra*), *Pertusaria sommerfeltii*, *Raesaenenia huuskonenii* (on *Bryoria fuscescens*), *Stereocaulon depreatultii*, *Thrombium epigaeum* and *Trichonectria rubefaciens* (on *Aspicilia*) are reported as new to Ontario. Details on 18 additional rare or otherwise rarely collected species new to various counties and districts of the province are also provided. These include: *Abrothallus microspermus* (on *Flavoparmelia caperata*), *Ahtiana aurescens*, *Athelia arachnoidea* (on *Physcia millegrana*), *Blennothallia crispa*, *Chaenothecopsis brevipes* (on *Inoderma byssaceum*), *C. rubescens* (on *I. byssaceum*), *Cladonia dimorphoclada*, *Corticifraga fuckelii* (on *Peltigera evansiana*), *Didymocyrtis cladoniicola* (on *Cladonia*), *Hypotrachyna revoluta*, *Lepra panyrga*, *Marchandiomyces corallinus* (on *Parmelia squarrosa* and *Physcia thomsoniana*), *Muellerella hospitans* (on *Bacidia rubella*), *Refractohilum peltigerae* (on *Peltigera evansiana*), *Reichlingia leopoldii*, *Sarcosagium campestre*, *Steinia geophana* and *Vezeada acicularis*.

**KEYWORDS.** – Appalachian-Great Lakes Region, biogeography, floristics, North America, range extensions, rare species.

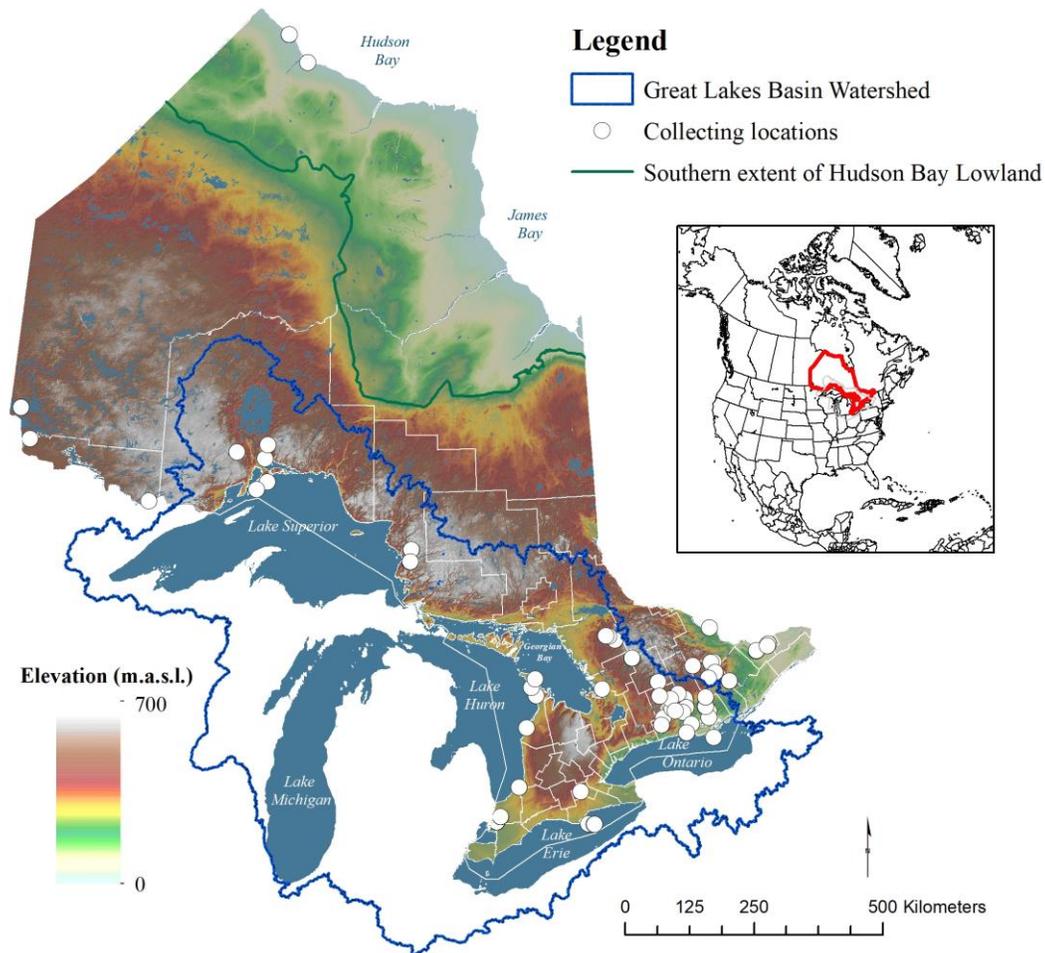
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### INTRODUCTION

Lichens and lichenicolous fungi continue to be added to the Ontario flora at a high rate (Brinker 2020). This paper continues a series of newly reported, rare, or notable range extensions for lichens and allied fungi from Ontario, Canada, with an emphasis on the Great Lakes Basin. The Great Lakes Basin is noted for containing the greatest diversity of species in Canada and is one of the most diverse ecoregions in North America (Comer et al. 2003). It contains the largest freshwater ecosystem in the world, storing 20% of the world's supply of surface freshwater and together they are among the world's 15 largest lakes. The Ontario Great Lakes Basin spans an area of 230,000 km<sup>2</sup>, extending from its southern limits at Lake Erie (42°N) north to its head waters, which originate north of Lake Nipigon (50°N). Ontario includes portions of all Great Lakes except Lake Michigan. The land that encompasses the Ontario Great Lakes Basin is about one-third of the province, part of the Ontario Shield and Mixedwood Plains terrestrial ecozones (Crins et al. 2009). In terms of lichen diversity, however, the region seems to be understudied as new species described

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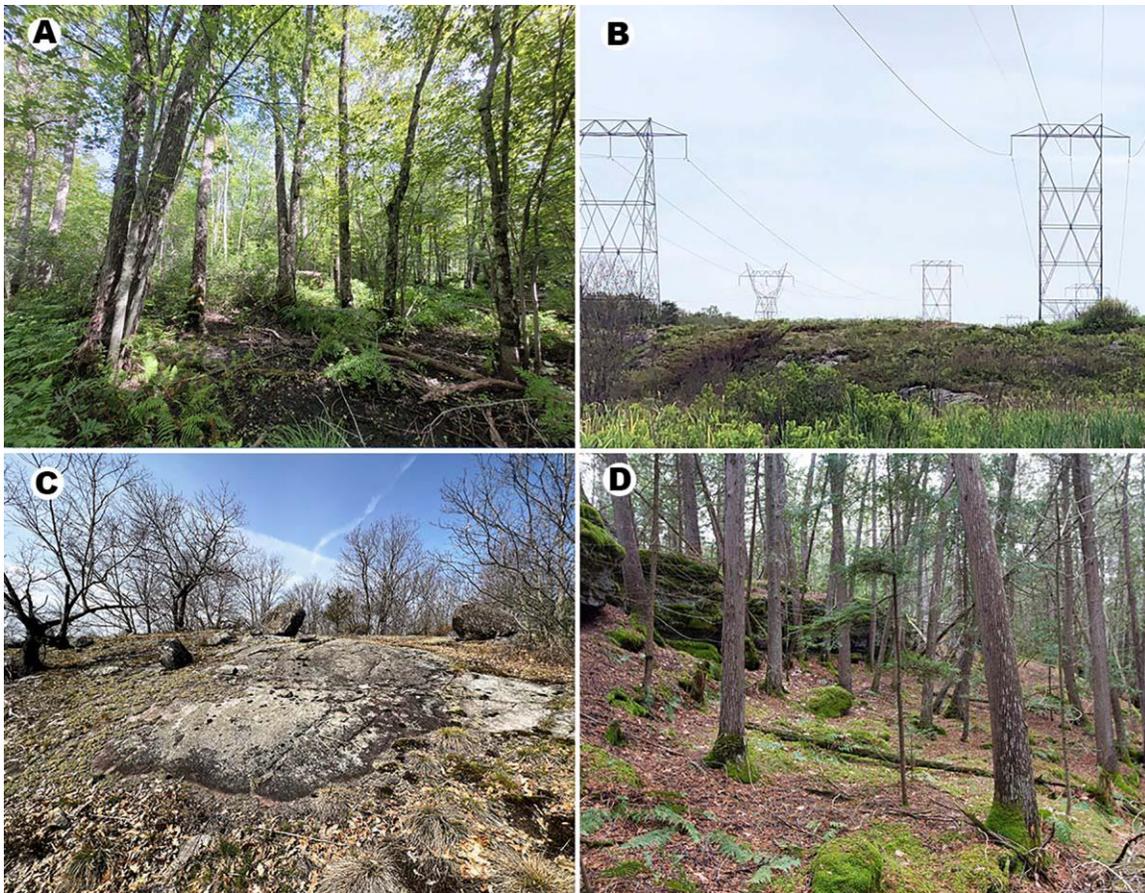
**Figure 1.** Collecting locations of the author within the Province of Ontario, Canada, cited in the text.

from the region (e.g., Henssen 1969) lack recent records, and new distributional records and range extensions continue to be found. Lichenological fieldwork in the province has steadily increased over the last decade though, a result of surveys of protected areas (Brodo et al. 2013, Lewis 2019, McMullin & Lendemer 2016), regional assessments (Brodo et al. 2021, Maloles et al. 2018, McMullin et al. 2018), field research (Allen & McMullin 2019, McMullin et al. 2016), focused conservation status assessments (COSEWIC 2015, 2016), and other discoveries of new species to science (Brinker et al. 2022, McMullin et al. 2020).

In this paper three species are reported as new to North America, eleven species are reported as new to Canada and eleven are reported as new to Ontario. A further eighteen rare or seldom collected species are also discussed. Most collections were made in the Great Lakes Basin during routine fieldwork by the author mainly during COVID-19 travel restrictions and review of personal specimen backlogs. With the present contribution, I hope to raise awareness of previously neglected species of lichens and allied fungi, and to encourage further fieldwork in the region. Notes on the ecology (including substrate preference), distribution, and status of the species are provided where possible.

## MATERIALS AND METHODS

The study material was collected during routine floristic surveys carried out mainly between the years 2019 and 2022 and mainly from the Great Lakes Basin of Ontario (Fig. 1). In addition to the major habitats examined in the previous paper by the author (Brinker 2020), several additional habitats were the



**Figure 2.** Representative photographs of four habitats evaluated during this study in the Ontario portion of the Great Lakes Basin in addition to those examined in Brinker (2020). **A**, deciduous swamps. **B**, electric power transmission corridors. **C**, acidic bedrock barrens. **D**, upland limestone coniferous forests.

focus of this work including: deciduous swamps, electric power transmission corridors, acidic bedrock barrens, and upland limestone coniferous forests (Fig. 2).

External morphology of dried specimens was studied with a dissecting microscope. Sections of the ascomata and thalli were made by hand using a razor blade, and then mounted in water. Anatomical studies of the thallus and ascomata were carried out using bright-field microscopy. Standard chemical spot tests and ultraviolet light followed Brodo et al. (2001). These include para-phenylenediamine dissolved in ethyl alcohol (PD), sodium hypochlorite (C), 10% potassium hydroxide (K), and Lugol's iodine (I). Thin-layer chromatography was conducted by James Lendemer in Solvents A or C following the methods outlined by Lendemer (2011a) and with Solvent C using the ratio of 200:30 toluene:glacial acetic acid.

Distribution maps were created using ESRI ArcMap 10.3.1 software and data used to generate these maps were obtained from the Consortium of North American Lichen Herbaria (CNALH), the herbarium of the Canadian Museum of Nature and relevant literature for each species where verified records exist. Attempts were made to remove records that appeared erroneous due to mistakes such as digitization errors or out of range/or likely misidentifications. Herbarium codes follow Index Herbariorum (Thiers 2022), and specimens were deposited in the following herbaria: Meise Botanic Garden (BR), Canadian Museum of Nature (CANL), Musée national d'histoire naturelle (LUX), New York Botanical Garden (NY), University of Oslo (O), Oregon State University (OSC), as well as the private herbarium of the author (hb. Brinker).

## RESULTS

A total of 43 species are reported from Ontario representing 38 genera. Non-lichenized and lichenicolous fungi account for 20 species of the total reported here. Three taxa are not on the most recent checklist of North American lichenized fungi biota (Esslinger 2021) and are herewith new or confirmed for North America: *Agonimia borysthenica*, *Arthonia subconveniens* and *Lecanographa abscondita*. The first published records from Canada for six lichens and five lichenicolous fungi include: *Erythricium aurantiacum*, *Hypotrachyna showmanii*, *Leptogium arsenei*, *Opegrapha rupestris*, *Pronectria tibellii*, *Punctelia missouriensis*, *Thelidium zwackhii*, *Tremella imshaugiae*, *Verrucaria bryoctona*, *Vezdaea schuylariana* and *Vouauxiella lichenicola*. A total of five lichens, five lichenicolous fungi and one non-lichenized fungus are new for the Province of Ontario: *Absconditella sphagnum*, *Agonimia gelatinosa*, *Didymocyrtis xanthomendozae*, *Distopyrenis americana*, *Lichenochora obscuroides*, *Paranectria oropensis*, *Pertusaria sommerfeltii*, *Raesaenenia huuskonenii*, *Stereocaulon depreaultii*, *Thrombium epigaeum* and *Trichonectria rubefaciens*. Notes on an additional nine lichens and nine lichenicolous fungi that are rare or otherwise seldom reported from Ontario are also provided: *Abrothallus microspermus*, *Ahtiana aurescens*, *Athelia arachnoidea*, *Blennothallia crispa*, *Chaenothecopsis brevipes*, *C. rubescens*, *Corticifraga fuckelii*, *Cladonia dimorphoclada*, *Didymocyrtis cladoniicola*, *Hypotrachyna revoluta*, *Lepra panyrga*, *Marchandiomyces corallinus*, *Muellerella hospitans*, *Refractohilum peltigeriae*, *Reichlingia leopoldii*, *Sarcosagium campestre*, *Steinia geophana* and *Vezdaea acicularis*.

The reports presented below are arranged alphabetically by genus and species in order of their relative significance: new to North America (\*\*\*) , new to Canada (\*\*), new to Ontario (\*), and additional noteworthy provincial/Great Lakes Basin collections. The notes presented for many species include details on the previously known North American distribution. Lichenicolous fungi are denoted by a dagger (†); nonlichenized fungi traditionally treated with lichens are denoted by a plus (+). Nomenclature follows Esslinger (2021).

### SPECIES NEW TO NORTH AMERICA

The following three species were not included in Esslinger (2021) and are newly reported to the North American lichen biota.

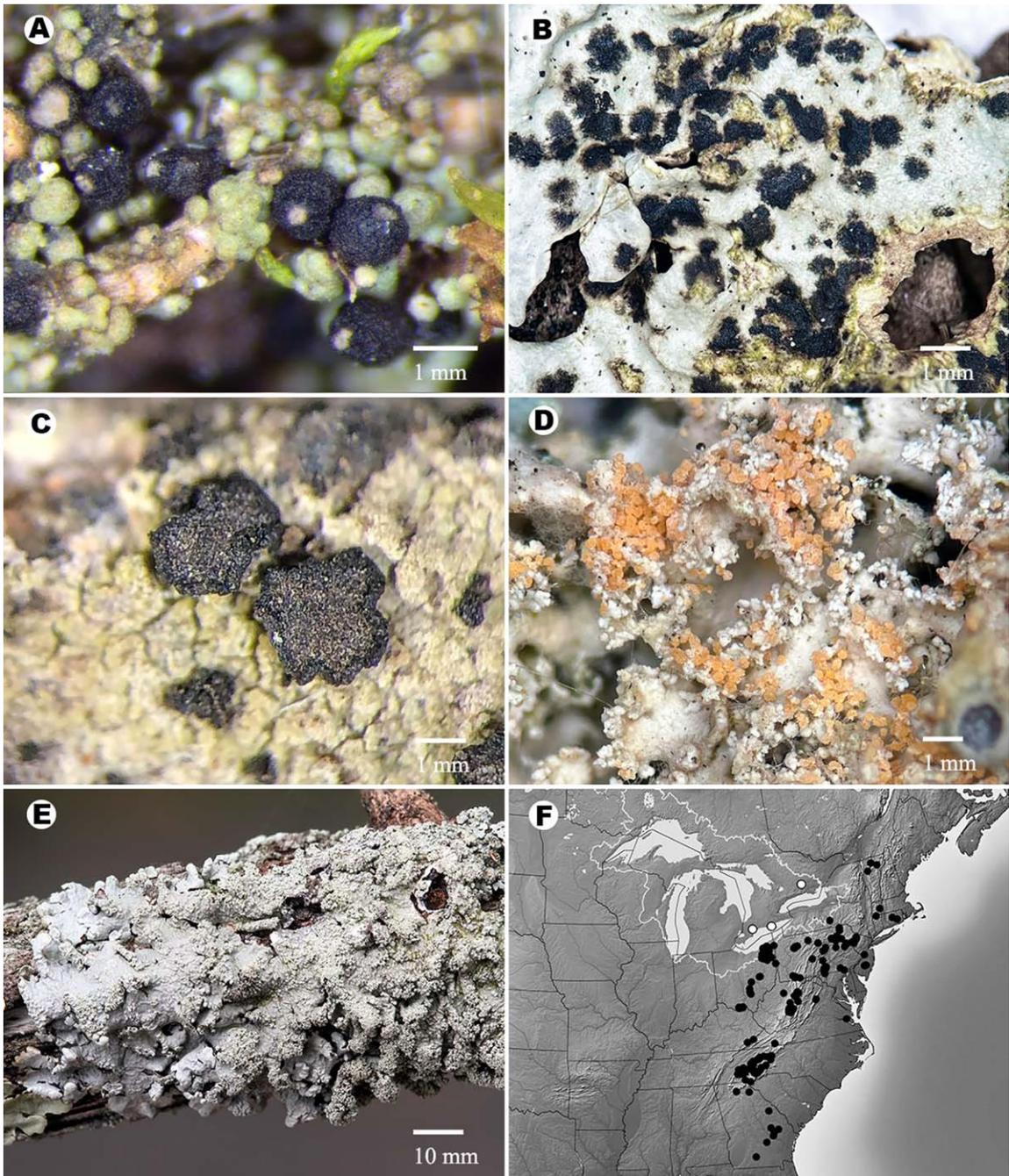
#### \*\*\**Agonimia borysthenica* L.V. Dymytrava, O. Breuss & S.Y. Kondr.

#### FIGURE 3A.

This species was described from eastern Europe (Ukraine) by Dymytrava et al. (2011) and has since been reported from Switzerland, and several additional locations in the Ukraine (Dymytrava et al. 2012). As with several other members of the genus, *Agonimia borysthenica* is corticolous, growing among mosses and on mossy bark at the bases of old trees, particularly *Quercus* and *Fraxinus* in locally humid old-growth woodlands (Dymytrava et al. 2011, 2012). These new locations broaden the distribution of the species considerably to include eastern North America. It is noteworthy that the collections reported here were from mature, relatively undisturbed hardwood forest remnants.

Among the eight-spored corticolous species of *Agonimia*, *A. borysthenica* is distinctive in having a thick, granular, greenish grey thallus, very small, ovoid to pyriform, sessile to one-third immersed perithecia 0.7-0.25 mm in width, and muriform, ellipsoid ascospores 40–55(–75) × 18–24 µm (Breuss 2020, Dymytrava et al. 2011). Other corticolous members of the genus with eight-spored asci reported from North America include *A. allobata* (Stizenb.) P. James and *A. flabelliformis* Halda, Czarnota & Guzow-Krzemińska. *Agonimia allobata* is distinguished from *A. borysthenica* by narrower and smaller ascospores (30–35 × 10–15 µm; Orange & Purvis 2009). *Agonimia flabelliformis* differs in thallus morphology, having finger-like to coralloid aggregations of goniocysts, and smaller ascospores (20–45 × 12–20 µm; Waters & Lendemer 2019). One additional species with eight-spored asci is known from North America, *A. gelatinosa* (Ach.) M. Brand & Diederich, but differs in its ecology, growing over soil or moss on rock, or directly on rock, and has smaller ascospores (30–50 × 15–20 µm; Breuss 2020).

*Specimens examined.* – CANADA. ONTARIO. FRONTENAC CO.: 9 km NE of Plevna, 4.5 km W of Ompah, 800 m E of Mosque Lake, upland *Acer saccharum* – *Tilia americana* – *Populus tremuloides* deciduous forest on S-facing slope with siliceous rock outcrops, 12.ix.2020, corticolous on bark of *T. americana*, S.R. Brinker 8562 (CANL, hb. Brinker; conf. O. Breuss, by photographs). PRINCE EDWARD



**Figure 3.** Photographs and distribution map of lichens and allied fungi new to North America or Canada (white = newly reported Ontario records, black = previous collections). **A**, *Agonimia borysthenica* (Brinker 3344). **B**, *Arthonia* cf. *subconveniens* on *Ricasolia quercizans* (Brinker 8988). **C**, *Lecanographa abscondita* (Brinker 7873). **D**, *Erythricium aurantiacum* on *Physcia millegrana* (photo taken in situ, Brinker 8898). **E**, *Hypotrachyna showmanii* on twig of *Thuja occidentalis* (photo taken in situ, Brinker 9382). **F**, distribution of *H. showmanii* in North America.

CO.: St. Lawrence Islands National Park, NE side of Main Duck Island, Lake Ontario, old deciduous forest remnant adjacent to small vernal pool with *Ulmus americana*, *Quercus macrocarpa* and *Cornus sericea*, 24.ix.2013, on lower trunk of mossy *U. americana*, S.R. Brinker 3243B (NY).

\*\*\*†*Arthonia cf. subconveniens* Nyl.

FIGURE 3B.

*Arthonia subconveniens* is a lichenicolous fungus confined to *Lobaria* s.l. that produces conspicuous brownish to black, roundish ascomata on the infected host thallus (Wedin & Hafellner 1998). It has a hymenium that reacts I+ red and K/I+ blue, asci that are 22–30 × 14–17 µm, with (6–)8 ascospores, and ascospores that are hyaline, two-celled and 13–15 × 4 µm in size (Wedin & Hafellner 1998). The species was described from Brazil where it was lichenicolous on *Lobaria peltigera* (Delile) Vain. In a revision of lichenicolous members of *Arthonia* on Lobariaceae, Wedin and Hafellner (1998) found *A. ricasoliae* Müll. Arg., which was described from Australia from unidentified *Lobaria* species, to be conspecific with *A. subconveniens* being similar in all aspects to that species other than having slightly smaller ascospores. The material collected during this study was lichenicolous on *Ricasolia quercizans* (Michx.) Stizenb. (≡ *Lobaria quercizans* Michx.) with asci that were 25–32 × 10–13 µm, 6–8-spored, and the ascospores were two-celled, 10–13 × 2.5–4 µm in size.

While this material has slightly smaller ascospores than previously reported, it otherwise could not be separated morphologically from the published description of the type specimen, particularly when incorporating the broader concept of the species proposed by Wedin and Hafellner (1998) that includes *A. ricasoliae*. The collections cited below are tentatively assigned to *A. subconveniens* since no other similar taxa are known. According to a query of CNALH, this species was previously documented in North America from two specimens on *R. quercizans*, one identified by R.C. Harris from Ontario (*Lewis* 963, NY) and one from North Carolina (*Hollinger* 24006, NY). However, neither of these records has been published and thus the species has not been added to the North America checklist (Esslinger 2021). Therefore, it is reported here for the first time from North America. It is plausible that the material on *R. quercizans* represents an undescribed taxon since the species was described from a neotropical *Lobaria* host. More collections are clearly needed for taxonomic resolution. Hopefully this report will stimulate others to locate additional material from *R. quercizans*.

*Specimens examined.* – CANADA. ONTARIO. ALGOMA DIST.: 15 km N of Montreal Lake, 11 km SE of Elton, mature *Acer saccharum*-dominated hardwoods on N-facing slope, 27.vi.2023, lichenicolous on thallus of *Ricasolia quercizans* on bark of *A. saccharum*, S.R. Brinker 10011 (CANL). LENNOX & ADDINGTON CO.: 40 km ENE of Bancroft, 2 km NE of Trout Lake, mixed forest in sheltered valley with *Thuja occidentalis*, *Fraxinus nigra*, *Betula alleghaniensis* and *Abies balsamea*, 27.viii.2021, lichenicolous on thallus of *R. quercizans* on bark of *F. nigra*, S.R. Brinker 8988 & G. Cameron (NY, hb. Brinker).

\*\*\**Lecanographa abscondita* (Th. Fr.) Egea & Torrente

FIGURE 3C.

*Lecanographa abscondita* was previously known from arctic-alpine areas of Great Britain (Scotland), Finland, central Europe, Asia, and Greenland (Stenroos et al. 2016, Wolseley 2009). In these regions it is restricted to dry, sheltered rock overhangs on slightly calcareous rock (Flakus 2007, Wolseley 2009). Here, it had a similar ecology, where it grew on humid, sheltered, near-vertical faces of large boulders on north-facing talus slopes with other species with western and arctic-alpine affinities such as *Baeomyces placophyllus* Ach., *Arctoparmelia subcentrifuga* (Oxner) Hale, *Pannaria tavaresii*, P.M. Jørg. and *Scytinium gelatinosum* (With.) Otálora, P. M. Jørg. & Wedin (Brinker unpublished data). In addition to being the first collections documented from North America, the genus *Lecanographa* Egea & Torrente is reported for the first time from Ontario. *Lecanographa abscondita* can be differentiated from other temperate members of the genus found in the Northern Hemisphere by its ecology, C+ red thallus and four-celled, 5–7(–8) µm wide ascospores that become brown and ornamented with age (Wolseley 2009).

*Specimens examined.* – CANADA. ONTARIO. THUNDER BAY DIST.: Ruby Lake Provincial Park, Doghead Mountain, 3 km SE of Nipigon, 1.4 km NW of Ruby Lake, N-facing talus slope with scattered *Picea mariana* and *Betula papyrifera* surrounded by boreal forest, 23.vii.2019, saxicolous on partially sheltered talus boulders, S.R. Brinker 7873 (BR, CANL; det. D. Ertz); Kama Hills Conservation

Reserve, 22 km NE of Nipigon, 6 km W of Blair Lake, N-facing treed talus slope in mixed boreal forest with *B. papyrifera*, *Abies balsamea* and *P. mariana*, saxicolous on vertical talus boulder, 15.vi.2023, S.R. Brinker 9858 (hb. Brinker).

#### SPECIES NEW TO CANADA

As noted previously by Brinker (2020), it can be difficult to ascertain what constitutes a first report for Canada as there is no formal published checklist of Canadian lichens and allied fungi. However, based on a review of relevant published literature dealing with Canadian lichens and consulting the CNALH, the following six lichens and five lichenicolous fungi appear to represent either the first Canadian collections or first published records.

#### \*\*†*Erythricium aurantiacum* (Lasch) D. Hawksw. & A. Henrici

#### FIGURE 3D.

Recent insights derived from molecular sequence data have resulted in the generic placement of the teleomorph of *Marchandiomyces aurantiacus* (Lasch) Diederich & Etayo, *Marchandiobasidium aurantiacum* Diederich & Schultheis, in the genus *Erythricium* J. Erikss. & Hjortstam (Hawksworth & Henrici 2015). This species is rarely mentioned in North American literature, having first been reported from California (Diederich & Lawrey 2007, as *M. aurantiacum*) and more recently from Ohio (Curtis 2019).

*Erythricium aurantiacum* can be distinguished most easily from other similar basidiomycetous lichenicolous fungi by the pale orange rather than pastel pink to coral red bulbils on species of *Physcia* (Schreb.) Michx (Diederich et al. 2003, as *M. aurantiacum*). The specimen reported here was lichenicolous on *P. millegrana* Degel. This is the first report for Canada.

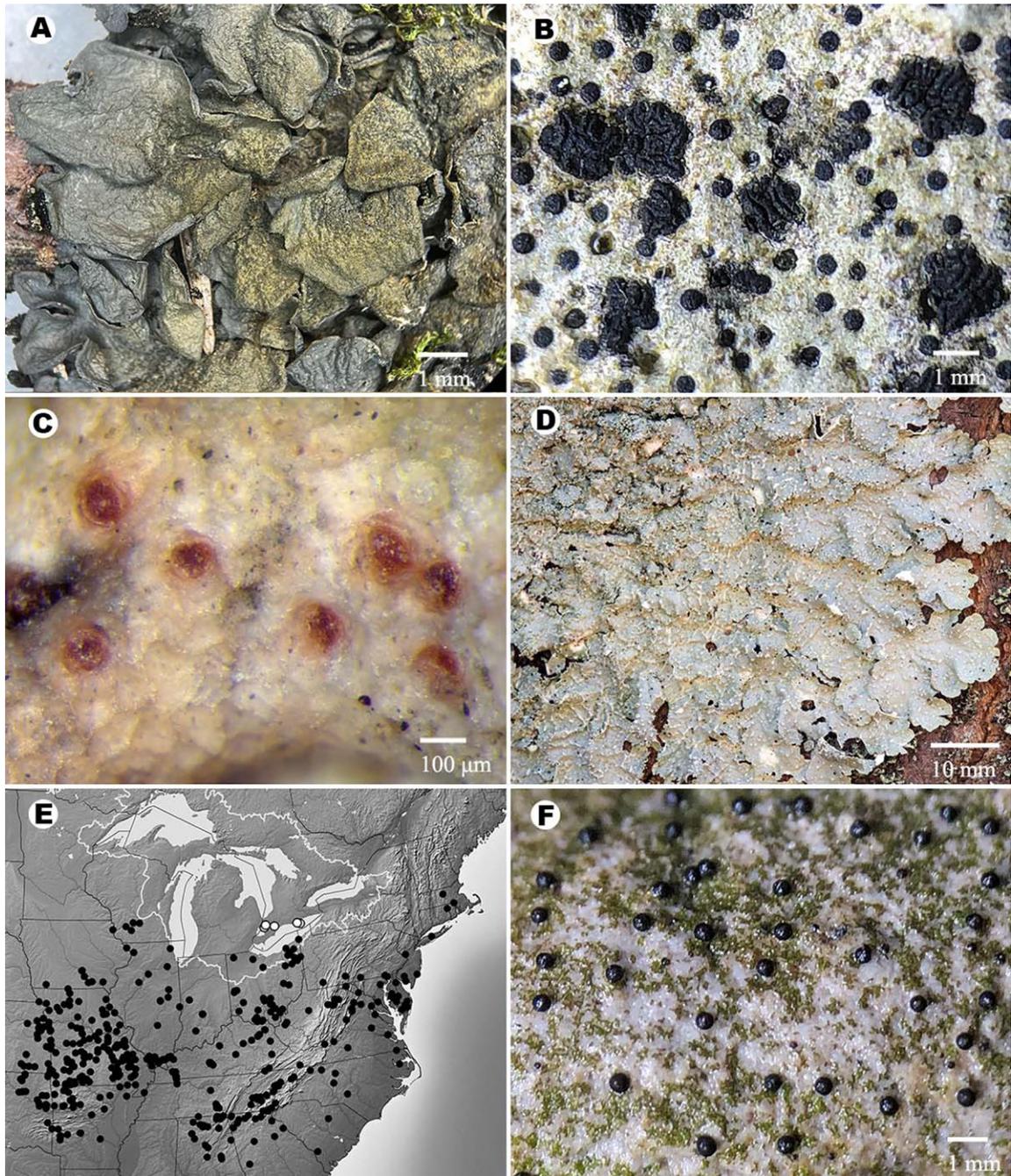
*Specimen examined.* – CANADA. ONTARIO. NORFOLK CO.: Long Point National Wildlife Area, N shore of Lake Erie, Squires Ridge, 13.5 km S of Turkey Point, *Quercus rubra* woodland on sandy ridgetop with *Q. muehlenbergii* and *Ostrya virginiana*, 22.vii.2021, lichenicolous on *Physcia millegrana* on bark of *Q. rubra*, S.R. Brinker 8898 (hb. Brinker).

#### \*\**Hypotrachyna showmanii* Hale

#### FIGURES 3E & 3F.

*Hypotrachyna showmanii* is an uncommon but widespread eastern North American endemic presently considered globally rare (NatureServe 2022). However, this status should be reviewed in light of these new records. As pointed out by Lendemer and Allen (2020) it has long been overlooked because it resembles other pustulose species and often grows intermixed as scattered thalli in corticolous communities crowded with numerous other blue-grey foliose lichen species. It was mentioned in a list of lichens for Ontario by Newmaster and Ragupathy (2012) without specimen citation and there seems to be no basis for its inclusion since no other specimens from the province are known to exist. The collections reported here are the first confirmed records from Canada.

It can be recognized by its blue-grey thallus with adnate lobes, maculate lobe tips and coarse, laminal pustules that initiate as small bumps in the upper cortex and inflate to become bubble-like to 0.1–0.5 mm in diameter with constricted bases, congregating into clusters which eventually break down into coarse shingle-like fragments (Lendemer & Allen 2020). In Ontario, the species is most likely to be confused with *Hypotrachyna revoluta* (Flot.) Hale or *H. afrorevoluta* (Krog & Swinscow) Krog & Swinscow, both recently reported for Ontario (Brinker 2020). *Hypotrachyna revoluta* can be distinguished from *H. showmanii* in producing farinose soredia which are mainly confined to lobe tips that are often elongate and ascending, whereas *H. showmanii* produces esorediate pustules over its entire thallus (Lendemer & Harris 2006). Like *H. showmanii*, *H. afrorevoluta* produces pustules but they break down becoming sorediate as they erode and flake off to reveal the black lower cortex, whereas pustules formed on *H. showmanii* are esorediate (though if crushed or pressed after collecting may appear sorediate) and do not flake off to reveal the lower cortex (Lendemer & Allen 2020). In addition, the lobe tips of *H. afrorevoluta* are emaculate and often revolute, whereas those of *H. showmanii* are maculate and not revolute (Hinds & Hinds 2007). Another pustulate species *H. showmanii* could be confused with in the study area is *Myelochroa aurulenta* (Tuck.) Elix & Hale. The latter differs in producing soredia that form from the breakdown the cortex or laminal pustules which eventually expose a yellow medullary pigment



**Figure 4.** Photographs and distribution map of lichens and allied fungi new to Canada (white = newly reported Ontario records, black = previous collections). **A**, thallus lobes of *Leptogium arsenei* (Brinker 5064A). **B**, *Opegrapha rupestris* on *Bagliettoa* sp. (Brinker 9304). **C**, *Pronectria fibellii* on *Cladonia pocillum* (Brinker 9204A). **D**, *Punctelia missouriensis* (photo taken in situ, Brinker 9696). **E**, distribution of *P. missouriensis* in North America. **F**, *Thelidium zwackhii* (photo taken in situ, Brinker 8746).

(Hinds & Hinds 2007), whereas the pustules formed on *H. showmanii* thalli do not erode to form soredia and the medulla is always white (Lendemer & Allen 2020).

*Specimens examined.* – **CANADA. ONTARIO.** MIDDLESEX CO.: 18 km W of West Lorne, 4.5 km S of Newbury, deciduous swamp with *Acer ×freemanii*, *Ulmus americana* and *Quercus bicolor*, 23.ix.2022, corticolous on bark of *A. ×freemanii*, S.R. Brinker 9589 (hb. Brinker). NORFOLK CO.: Backus Woods Natural Area, 4.5 km N of Port Rowan, 4 km SE of Walsingham, edge of young scrubby mixed woods, 29.i.2023, corticolous on *Picea glauca* twig, S.R. Brinker 9733 (CANL). PETERBOROUGH CO.: North River, 7.5 km NE of Havelock, lowland mixed hardwood forest with *Thuja occidentalis*, *Fraxinus pennsylvanica* and *Tsuga canadensis*, 07.vii.2022, corticolous on twigs of downed *T. occidentalis*, S.R. Brinker 9382 (NY, hb. Brinker; conf. J.C. Lendemer).

**\*\**Leptogium arsenei* Sierk**

**FIGURE 4A.**

*Leptogium arsenei* occurs primarily in western and central North America where it grows on rock or less frequently at the base of trees (Jørgensen & Nash 2004). The species is disjunct in Minnesota (Wetmore 2005) and has been reported as far east as Michigan (Fryday et al. 2001) and Wisconsin (Bennett & Wetmore 2004). The collections reported here were from the bark of *Thuja occidentalis* in mature stands of locally humid, cedar-dominated coniferous forest. These are the first published reports of *L. arsenei* from Canada.

This species can be recognized by its upper surface which is slate grey (to occasionally brownish grey), wrinkled, with laminal isidia that are initially granular and then becoming cylindrical, the lower surface lacking white hairs, and very thick lobes which are 200–350(–500) µm in cross section (Jørgensen & Nash 2004). In the Great Lakes Basin, it is most likely to be confused with *Leptogium cyanescens* (Rabenh.) Körber which is the most frequently encountered isidiate *Leptogium* (Ach.) Gray in the region (Brinker unpublished data) and elsewhere in North America (Brodo et al. 2001). *Leptogium cyanescens* can also be slate grey or more commonly blue grey, but its upper surface is smooth, lacking distinct wrinkles, and the lobes are thinner in cross section (35–100 µm; Jørgensen & Nash 2004).

*Specimens examined.* – **CANADA. ONTARIO.** RAINY RIVER DIST.: Quetico Provincial Park, 75 km SE of Atikokan, W end of portage between Emerald Lake and Plough Lake, old-growth forest with *Thuja occidentalis*, *Fraxinus nigra* and *Acer spicatum*, 18.viii.2016, corticolous on *A. spicatum*, S.R. Brinker 5261 (CANL, hb. Brinker). THUNDER BAY DIST.: Albert Lake Mesa Provincial Nature Reserve, 53 km WNW of Nipigon, S-side of Albert Lake, old-growth mixed boreal forest with *T. occidentalis*, *Abies balsamea*, *A. spicatum*, *Taxus canadensis* and *Betula papyrifera*, 16.vii.2016, corticolous on *T. occidentalis*, S.R. Brinker 5064A (NY).

**\*\*†*Opegrapha rupestris* Pers.**

**FIGURE 4B.**

Lichenicolous members of the genus *Opegrapha* Ach. are strongly host specific to single species or groups of closely related species (Vondrák & Kocourková 2008). *Opegrapha rupestris* forms single or small clusters of black, lirellate ascomata on species of *Bagliettoa* A. Massal. on calcareous rock (Coppins et al. 2021). It was not listed for Canada by Ertz et al. (2021) who recently published a list of lichenicolous *Opegrapha* confirmed from the country. Interestingly, Thomson (1997) mapped two records of *O. saxicola* Ach. from Newfoundland and Labrador and he considered *O. rupestris* to be a synonym of that species. However, neither Ertz et al. (2021) nor Diederich et al. (2018) included *O. saxicola* as a synonym of *O. rupestris*, and Thomson's (1997) description of the *O. saxicola* differs significantly in ecology and structure from *O. rupestris* (i.e., not lichenicolous, having a round to ellipsoid ascomata and larger spores). Therefore, the collections cited here appear to be the first confirmed reports from Canada.

Additional populations of *Opegrapha rupestris* in the Great Lakes Basin are likely to be found on dolomitic limestone outcrops with *Bagliettoa* spp., particularly along the Niagara Escarpment. In addition to its ecology, it can be identified by its four-celled ascospores measuring 14–22 × 5–8 µm, and K+ brownish red exciple (Coppins et al. 2021, Pentecost & James 2009).

*Specimens examined.* – **CANADA. ONTARIO.** HASTINGS CO.: 8.6 km SE of Tweed, 7 km N of Naphan, limestone outcrops in rich deciduous forest with *Acer saccharum*, *Ostrya virginiana* and *Tilia*

*americana*, 20.xi.2020, lichenicolous on *Bagliettoa* sp. on shaded limestone outcrop, S.R. Brinker 8685 (BR, hb. Brinker; det. D. Ertz). PETERBOROUGH CO.: Warsaw Caves Conservation Area, 12 km E of Lakefield, *Thuja occidentalis*-dominated coniferous forest with numerous moss-covered limestone boulders and outcrops, 16.xii.2021, lichenicolous on *Bagliettoa* sp. on shaded limestone outcrop, S.R. Brinker 9304 (hb. Brinker).

**\*\*†*Pronectria tibellii* Zhurb.**

**FIGURE 4C.**

This species was originally described from Alaska (Zhurbenko & Alstrup 2004) and its distribution in North America is still unclear with no other recent reports, though it has since been documented from Russia (Zhurbenko 2009). The genus is characterized by non-stromatic, immersed, pale yellow to orange or red perithecia that are KOH-, having two to eight-spored asci and smooth or ornamented, usually two-celled ascospores, and growing on lichenized fungi and algae (Rossman et al. 1999). *Pronectria tibellii* has a distinct ecology, occurring on the upper basal squamules and podetia of *Cladonia pocillum* (Ach.) O.J. Rich. and causing bleaching of the host thallus (Zhurbenko & Alstrup 2004). These are the first records from eastern North America.

The combination of its occurrence on the host thallus of *Cladonia*, its immersed, orange perithecia that are wider than 200 µm and its ornamented, two-celled ascospores less than 16 µm long distinguishes *Pronectria tibellii* from other superficially similar species (Khodosovtsev et al. 2012, Zhurbenko & Pino-Bodas 2017). *Ovicuculispora parmeliae* (Berk. & M.A. Curtis) Etayo also has orange perithecia and 2-celled ascospores although its perithecia are covered with a fine whitish pubescence and its asci produce ascospores of two kinds: macrospores that are 40–80 µm long and microspores that are 11–15 µm long (Etayo 2010). *Nectriopsis cladoniicola* M.S. Cole & D. Hawksw. can be readily distinguished by its superficial ascomata that are not immersed in the host thallus (Zhurbenko & Pino-Bodas 2017).

*Specimens examined.* – **CANADA. ONTARIO.** LAMBTON CO.: SE shore of Lake Huron, Pinery Provincial Park, 6 km S of Grand Bend, sandy *Juniperus virginiana* savanna with *Quercus velutina* and *Juniperus communis*, 4.xi.2021, lichenicolous on basal squamules of *Cladonia* sp. among mosses over sand, S.R. Brinker 9231A (CANL; conf. M. Zhurbenko from photographs). PETERBOROUGH CO.: Petroglyphs Provincial Park, 2 km N of Stony Lake, open marble barren with *Picea glauca*, *Prunus virginiana* and *Danthonia spicata* surrounded by upland mixed forest, 28.x.2021, lichenicolous on *Cladonia pocillum* basal squamules, S.R. Brinker 9204A (hb. Brinker).

**\*\**Punctelia missouriensis* Wilhelm & Ladd**

**FIGURES 4D & 4E.**

This species was described from Missouri and its distribution was thought to correspond with the Prairie Peninsula of the interior region of North America (Wilhelm & Ladd 1992). According to the authors, in that region it commonly occurred on the exposed trunks of old hardwoods, particularly oaks, or more rarely siliceous rock faces. More recent literature has since shown it is widespread in eastern North America with published records from New Jersey (Waters & Lendemer 2019), Ohio (Showman & Flenniken 2004) and Virginia (Hokinson et al. 2009). The populations reported here are among the northernmost occurrences of this species and the first records from Canada. It should be searched for elsewhere in the Carolinian Zone of southwestern Ontario where it appears to have been overlooked.

*Punctelia missouriensis* can be distinguished from the other six species of *Punctelia* found in the Great Lakes Basin by its pale brown lower surface and laminal, partially corticate, squamiform isidia often arising from pseudocyphellae, with typically fewer than ten per pseudocyphella and medulla containing lecanoric acid (Aptroot 2003, Lendemer & Noell 2018). The most frequently encountered *Punctelia* in the study area is *P. rudecta* (Ach.) Krog (S. Brinker unpublished data) which is also isidiate. It can readily be distinguished from *P. missouriensis* by its taller, branched, corticate isidia with brown tips that do not resemble coarse masses of soredia mounded in a soralium (Lendemer & Noell 2018). *Punctelia bolliana* (Müll. Arg.) Krog is infrequently encountered and has a pale undersurface, but its thallus is lobulate, lacking isidia, and often develops heavy wrinkles and folds on older thallus portions (Brodo et al. 2001, Lendemer & Hodkinson 2010). *Punctelia appalachensis* (W.L. Culb.) Krog is another lobulate species that occurs in the Great Lakes Basin; however, the lower surface of the thallus is distinctly black (Lendemer & Hodkinson 2010), and it is rare in Ontario (Brinker 2020, Lewis & Brinker 2017). Four other sorediate members of the genus occur in the region and could be confused with *P. missouriensis*. *Punctelia caseana*

Lendemer & B.P. Hodk. is widespread but it produces finer, ecorticate soredia not resembling isidia. *Punctelia perreticulata* (Räsänen) G. Wilh. & Ladd is very rare in Ontario (Brinker unpublished data), produces fine soredia, and the upper surface is scrobiculate with pruinose lobe tips (Lendemer & Hodkinson 2010). *Punctelia borreri* (Sm.) Krog is distinct in being the only corticolous sorediate species with a black undersurface. It appears to be extremely rare in Ontario and has not been collected recently (Wong & Brodo 1992). *Punctelia stictica* (Duby) Krog is also rare and differs in its ecology, being restricted primarily to stable rockfaces along Lake Superior and Lake Nipigon (Brinker 2020) and has a black undersurface and a medulla that contains gyrophoric acid (Aptroot 2003).

*Specimens examined.* – **CANADA. ONTARIO.** LAMBTON CO.: Reid Conservation Area 8.7 km N of Wallaceburg along North Sydenham River, upland deciduous forest with *Quercus rubra*, *Q. alba* and *Ostrya virginiana*, 10.xi.2022, corticolous on bark of mature downed *Q. rubra*, S.R. Brinker 9696 (CANL); McKellar Wildlife Area, 20 km NNE of Wallaceburg, 14.5 km W of Oil Springs, lowland deciduous forest on clay plain with *Acer ×freemanii* with *Quercus* spp., 11.xi.2022, corticolous on bark of *A. ×freemanii*, S.R. Brinker 9699 (CANL). MIDDLESEX CO.: 60 km SW of London, 17.5 km NE of Thamesville, deciduous swamp with *A. ×freemanii*, *Ulmus americana* and *Cephalanthus occidentalis*, 9.xi.2022, corticolous on bark of *A. ×freemanii*, S.R. Brinker 9690 (hb. Brinker). NORFOLK CO.: Lake Erie, Long Point National Wildlife Area, Gravelly Bay, 24 km SE of Turkey Point, interdunal wet swales with *Larix laricina* and *Thuja occidentalis*, 20.vii.2021, corticolous on *L. laricina*, S.R. Brinker 8868 (CANL, hb. Brinker); Backus Woods Natural Area, 12 km W of Turkey Point, 4 km N of Port Rowan, successional woods with occasional openings in *Juglans nigra* and mixed conifer plantation, 28.ix.2022, corticolous on twig of *Picea glauca*, S.R. Brinker 9598 (CANL).

**\*\**Thelidium zwackhii* (Hepp) A. Massal.**

**FIGURE 4F.**

*Thelidium zwackhii* is a widespread pyrenocarpous lichen found throughout portions of the central and eastern United States (Brodo 2016). In the Great Lakes Basin, it has been reported from Illinois (Hyerczyk 2005), Michigan (Harris 2015), New York (Harris 2004) and Ohio (Curtis 2019). It is an early colonizer of base-rich rocks and pebbles often in humid situations where it tends to be short-lived (Orange 2013). In the study area, it was found on limestone pebbles on exposed soil at the base of a large, upturned tree in a mature forest, and a shelving limestone outcrop in a coniferous forest along a river. A query of CNALH revealed one unpublished collection made by Irwin Brodo in 1997 from Ottawa (Brodo 29223, NY) though it was not included for the region by Brodo et al. (2021). Therefore, the species is reported here for the first time from Canada.

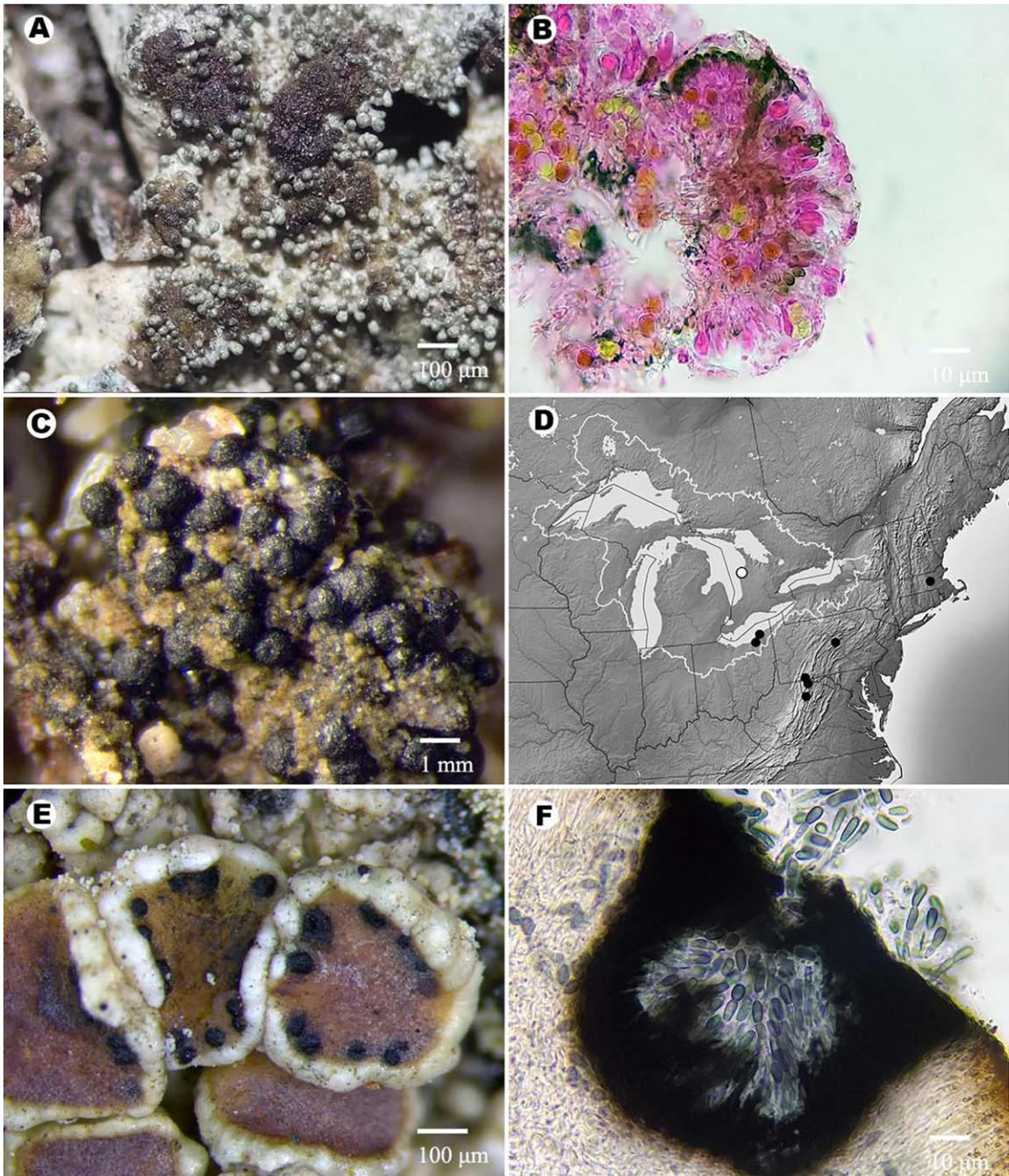
*Thelidium zwackhii* can be recognized by its small, superficial perithecia (0.1–0.3 mm in diameter) that lack an involucrellum and do not form pits in the rock surface, and its four-celled ascospores (Orange 2013). Several additional species of *Thelidium* occur in Ontario that could be confused with this species. *Thelidium papulare* (Fr.) Arnold also has superficial perithecia but can be distinguished by the presence of a well-developed involucrellum and larger perithecia (0.4–0.8 mm; Brodo 2016). *Thelidium minutulum* Körb. also has superficial perithecia but can be differentiated from *T. zwackhii* by its two-celled ascospores (Brodo 2016). Both *T. fontigenum* A. Massal. and *T. decipiens* (Nyl.) Krempelh. are different from *T. zwackhii* macroscopically in having immersed perithecia that form distinct pits on the rock surface (Orange 2013). *Thelidium decipiens* has two-celled ascospores and *T. fontigenum* has four-celled ascospores (Brodo 2016, Orange 2013).

*Specimens examined.* – **CANADA. ONTARIO.** HASTINGS CO.: Callaghan’s Rapids Conservation Area, Crowe River, 4 km S of Marmora, shelving limestone outcrop with scattered *Juniperus communis*, 19.x.2021, saxicolous on limestone fragment, S.R. Brinker 9160 (CANL). PETERBOROUGH CO.: Mark S. Burnham Provincial Park, E side of Peterborough, mature forest with *Tsuga canadensis* and *Acer saccharum*, 4.v.2021, saxicolous on limestone pebbles, S.R. Brinker 8746 with C. Cooke (hb. Brinker).

**\*\**Tremella imshaugiae* Diederich, Coppins, R. C. Harris, Millanes & Wedin**

**FIGURES 5A & 5B.**

This recently described taxon is so far known from only two collections, including the type that was collected in Scotland (Diederich et al. 2020). It forms convex, gelatinous, amber-coloured basidiomata



**Figure 5.** Photographs and distribution map of lichens and allied fungi new to Canada (white = newly reported Ontario records, black = previous collections). **A**, *Tremella imshaugiae* with small amber coloured basidiomata on *Imshaugia aleurites* (Brinker 9178). **B**, *T. imshaugiae* in Phloxine with basidia (Brinker 9178). **C**, *Verrucaria bryoctona* (Brinker 9096). **D**, distribution of *V. bryoctona* in eastern North America. **E**, *Vouauxiella lichenicola* on apothecia of *Lecanora* (Brinker 5271). **F**, section through *V. lichenicola* pycnidia (Brinker 5271).

on the thallus of *Imshaugia aleurites* (Ach.) S. F. Meyer (Diederich et al. 2020). The distribution is still unclear, with only one other North American collection from Maine. The collection reported here is the first from Canada and the Great Lakes Basin.

*Tremella imshaugiae* is characterized by having two to four-celled, mainly longitudinally septate basidia averaging  $15.5\text{--}21.5 \times 13\text{--}16.5 \mu\text{m}$ , and relatively large, subspherical basidiospores measuring  $6.5\text{--}9 \times 6.5\text{--}8.5 \mu\text{m}$  (Diederich et al. 2020). It is the only non-gall forming species of *Tremella* restricted to *I. aleurites* to be expected in Ontario and therefore is not likely to be confused with other lichenicolous species of *Tremella*, all of which occur on other hosts (i.e., *T. candelariellae* Diederich & Etayo, *T. everniae* Diederich, *T. cetrariicola* Diederich & Coppins and *T. hypogymniae* Diederich & M. S. Christ).

*Specimen examined.* – **CANADA. ONTARIO.** PARRY SOUND DIST.: 16 km W of Algonquin Park, 6 km E of Lake Bernard, small *Larix laricina* and *Picea mariana* treed peatland surrounded by upland mixed forest, 20.x.2021, lichenicolous on *Imshaugia aleurites* on conifer twigs, S.R. Brinker 9178 (CANL; conf. P. Diederich, from photographs).

**\*\**Verrucaria bryoctona* (Th. Fr.) Orange**

**FIGURES 5C & 5D.**

*Verrucaria bryoctona* is an inconspicuous pioneer of base-rich soil, often growing among and over bryophytes in open habitats such as dunes or other disturbance-maintained or transient habitats (Orange 1991). It is widespread in Europe and has been reported from North America from West Virginia by Breuss (2002). During the present study it was collected from a sheltered, stable sand dune adjacent to Lake Huron. This is the first report from Canada and the first terricolous *Verrucaria* species confirmed to occur in Ontario.

The species can be identified by its terricolous habit, thallus which is composed of tiny, unpigmented grey-green goniocysts, semi-immersed black perithecia 0.1–0.3 mm wide and lacking an involucrellum (Fig. 5C), and simple or rarely up to four-celled (when overmature), ellipsoid ascospores  $19\text{--}26 \times 6\text{--}7 \mu\text{m}$  frequently with small gelatinous appendages (Orange 1991, Orange et al. 2009).

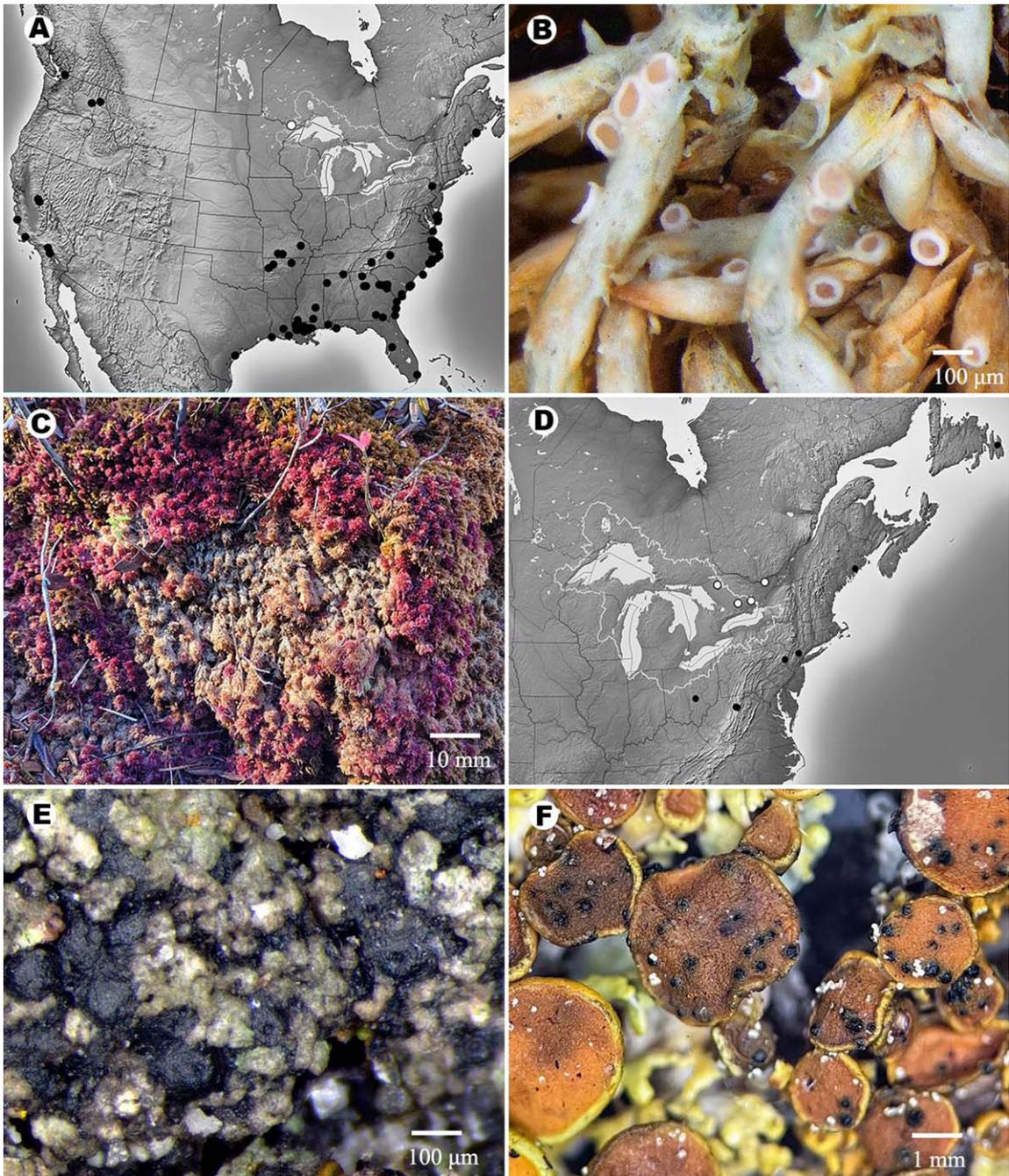
*Specimen examined.* – **CANADA. ONTARIO.** BRUCE CO.: Inverhuron Provincial Park, E shore of Lake Huron, 5 km S of Baie Du Doré, open sand dune with scattered *Pinus sylvestris*, *Juniperus communis* and *Sporobolus rigidus* var. *magnus*, 16.ix.2021, among sparse bryophyte cover over calcareous sand, S.R. Brinker 9096 (CANL).

**\*\**Veizdaea schuyleriana* Lendemer**

*Veizdaea schuyleriana* was described from Pennsylvania, U.S.A by Lendemer (2011b). It has since been reported from Ohio (Curtis 2019), and a search of CNALH (accessed 03, December 2021) revealed additional collections from Kansas and New Jersey. Favoured habitats for members of the genus tend to be shaded rock walls and logs, as well as heavy-metal contaminated soils and other substrates including plant debris, moribund bryophytes and lichens (Coppins 1981, Gilbert 1980). *Veizdaea* species are ephemeral, with suitably mature material best obtained during cool, wet months when ascocarps develop (Gilbert 1980). Therefore, surveys should be timed appropriately to not overlook members of the genus. The collection reported here was made from disturbed soil at the edge of mixed woods under an electric power transmission corridor. The apothecia were visible as small gelatinous pale dots when fresh but are hardly discernable in the dry material.

*Veizdaea schuyleriana* can be identified by its sessile apothecia, eight-spored asci with abundant loose paraphyses not entwining individual asci, and simple ascospores  $14\text{--}18 \times 8.4\text{--}11 \mu\text{m}$  (Lendemer 2011b). Two other *Veizdaea* species have been reported from Ontario: *V. leprosa* (P. James) Vězda and *V. acicularis* Coppins (Brodo 2001, Brodo et al. 2013). *Veizdaea leprosa* differs from *V. schuyleriana* in having stipitate rather than sessile apothecia and narrower ascospores ( $2.5\text{--}4 \mu\text{m}$  wide; Lendemer 2011b). *Veizdaea acicularis* is readily differentiated by its acicular eight to 12-celled ascospores measuring  $60\text{--}85 \times 2\text{--}2.5 \mu\text{m}$  (Coppins 1981). Members of this genus are extremely inconspicuous and easily overlooked, so more records and species should be expected.

*Specimen examined.* – **CANADA. ONTARIO.** CITY OF OTTAWA: 13 km S of Ottawa River, 10 km SSW of Orleans, along cleared electric transmission corridor through mixed woods, 8.ix.2021, terricolous on soil at edge of mixed woods, S.R. Brinker 9139 (CANL).



**Figure 6.** Photographs and distribution maps of lichens and allied fungi new to Ontario (white = newly reported Ontario records, black = previous collections). **A**, distribution of *Vouauxiella lichenicola* in North America. **B**, *Absconditella sphagnum* on *Sphagnum fuscum* (Brinker 9197). **C**, *Sphagnum fuscum* colonized by *A. sphagnum* bleaching surface of moss cushion. **D**, distribution of *A. sphagnum* in North America. **E**, *Agonimia gelatinosa* (Brinker 8548). **F**, *Didymocyrtis xanthomendozae* on apothecia of *Xanthomendoza hasseana* (Brinker 9414).

**\*\*†*Vouauxiella lichenicola* (Lindsay) Petr. & Sydow**

**FIGURES 5E, 5F & 6A.**

*Vouauxiella lichenicola* is a lichenicolous coelomycete that is common and widespread in temperate regions of North America with reports ranging from South Carolina south to Florida and west to California (Diederich 2003). It forms pycnidia between the disc and margin of host apothecia of various members of the genus *Lecanora* Ach. (Fig. 5E). This is the first report from Canada (Fig. 6A).

This species can be recognized by its ecology, and its simple, catenate, smooth to verruculose, bluish green conidia arising in chains (Fig. 5F), measuring  $6-9 \times 3-3.5(-4) \mu\text{m}$  (Czyżewska & Kukwa 2009, Diederich 2004c). The conidia of material studied here matched well with published descriptions, ranging in size from  $6.6-8.1 \times 3.5-3.9 \mu\text{m}$ . *Vouauxiella verrucosa* (Vouaux) Petr. & Syd. is very similar with comparably sized pycnidia and conidia. However, its conidia have a coarse wart-like ornamentation (Hawksworth 1976). It has not been reported from Canada but could be easily confused with *V. lichenicola*.

*Specimen examined.* – **CANADA. ONTARIO. RAINY RIVER DIST.:** Quetico Provincial Park, 75 km SE of Atikokan, S shore of Emerald Lake near NE end, conifer woods with overstorey of *Pinus resinosa* and understorey of scattered *Thuja occidentalis*, 19.viii.2016, lichenicolous on apothecia of *Lecanora* sp. on twigs of *T. occidentalis*, S.R. Brinker 5271 with Perry Scott (CANL, hb. Brinker).

**SPECIES NEW TO ONTARIO**

The following five lichens, five lichenicolous fungi and one non-lichenized fungus were not included in the first published Ontario lichen checklist (Newmaster et al. 1998) or other more recent relevant Ontario published literature. There is a more recent list of lichens produced by Newmaster and Ragupathy (2012). However, the basis of the additional records not mentioned in Newmaster et al. (1998) are not provided or supported with any documentation. Several of the following species were listed by those authors but without supporting citations of vouchers.

**\**Absconditella sphagnum* Vězda & Poelt**

**FIGURES 6B, 6C & 6D.**

*Absconditella sphagnum* is an ephemeral lichen that occurs on *Sphagnum* (Fig. 6B) in peat bogs or more rarely on other bryophytes or lignum adjacent to its preferred habitat (Czarnota & Kukwa 2008). It produces pale, whitish or cream-coloured, concave apothecia that appear pinkish when wet, and often gives the surface of moss cushions a moribund look (Fig. 6C). It has been reported from scattered locations in eastern North America including Maine (Seaward et al. 2017), New York (Harris 2004) and Pennsylvania (Lendemer 2012). The records published here extend the range of *A. sphagnum* east to the Great Lakes Basin (Fig. 6D) where it was found on *S. fuscum* in *Chamaedaphne calyculata* dominated peatlands. This species will likely turn out to be more widespread and common with additional, suitably timed, searches of peatlands elsewhere in the region conducted during cool, wet months.

Two other species in the genus, *A. lignicola* Vězda & Pišút and *A. trivialis* (Willey ex Tuck.) Vězda have been reported from Ontario (Brinker 2020, McMullin et al. 2015). Both have four-celled ascospores and occur on either lignum (*A. lignicola*) or on mosses over heavy-metal contaminated soil or rock (*A. trivialis*) (Coppins 2009). *Absconditella sphagnum* can be readily differentiated from these two species based on its ecology and two-celled ascospores. *Coenogonium pineti* (Ach.) Lücking & Lumbsch is similar in appearance with pale apothecia growing over bryophytes, but that species differs from *A. sphagnum* in having a trentepohlioid (vs. chlorococcoid) photobiont and I- hymenium (vs. I+ blue) (McCune 2017).

*Specimens examined.* – **CANADA. ONTARIO. CITY OF OTTAWA:** Mer Bleue Bog, 7.5 km S of Orleans, *Chamaedaphne calyculata* – dominated peatland with scattered *Larix laricina*, 27.xii.2021, on *Sphagnum*, S.R. Brinker 9315 (CANL). **LENNOX & ADDINGTON CO.:** Puzzle Lake Provincial Park, 34 km N of Napanee, 5 km E of Sheffield Long Lake, *C. calyculata* – dominated peatland with scattered *Pinus strobus*, 28.iv.2022, on *Sphagnum*, S.R. Brinker 9325 (CANL). **PARRY SOUND DIST.:** Eagle Lake Bog, 6.3 km SW of South River, 4 km E of Eagle Lake, *C. calyculata* – dominated peatland with scattered *L. laricina* and *Picea mariana*, 24.x.2021, on *S. fuscum*, S.R. Brinker 9197 (CANL, hb Brinker). **PETERBOROUGH CO.:** Petroglyphs Provincial Park, 2 km N of Stony Lake, ericaceous shrub peatland with *C. calyculata*, *Rhododendron groenlandicum* and scattered *P. strobus*, 28.x.2021, on *S. fuscum*, S.R. Brinker 9201 (CANL, hb Brinker).

**\**Agonimia gelatinosa* (Ach.) Brand & Diederich**

**FIGURE 6E.**

*Agonimia gelatinosa* is a widespread arctic to boreal-montane species in North America, occurring on mosses or soil in calcareous habitats (Thomson 1997, as *Polyblastia gelatinosa* (Ach.) Th. Fr.). It occurs locally beyond that region south to the Great Lakes Basin, with reports from Michigan (Harris 2015), New York (Harris 2004) and Ohio (Curtis 2019). It was listed from Ontario by Newmaster and Ragupathy (2012), but without supporting citations. These are the first confirmed records for the province.

During the present study, *A. gelatinosa* was collected from alvars and marble barrens on shallow calcareous soil. In addition to its ecology, it can be differentiated from other members of the genus by the dark-brown granular thallus composed of small, fully-attached goniospores, superficial, globose perithecia 0.3–0.5 mm in diameter, eight-spored asci, and muriform ascospores 30–50 × 15–20 μm with 15–30 cells (Breuss 2020, Hafellner 2014, Orange & Purvis 2009). It can be separated from *Polyblastia* by the two or three-layered exciple, lack of an involucrellum and consistently colourless ascospores (Orange & Purvis 2009).

*Specimens examined.* – **CANADA. ONTARIO.** BRUCE CO.: E shore of Lake Huron, Greenough Harbour, 5 km W of Stokes Bay, low shrubland alvar with *Juniperus horizontalis*, *Schizachyrium scoparium* and *Carex crawei*, 16.ix.2021, over mosses on seasonally flooded limestone pavement, *S.R. Brinker 9093* (CANL). CITY OF OTTAWA: Stony Swamp off Old Richmond Rd., 3.5 km S of Bells Corners, seasonally wet sandstone flatrock intergrading into open mixed woodland with *Juniperus communis*, *Quercus rubra* and *Pinus banksiana*, 10.x.2021, over mosses on sandstone, *S.R. Brinker 9145* (CANL). FRONTENAC CO.: Mountain Chute Station along Madawaska River, 18.5 km SW of Calabogie, open mixed woods with low rolling rock outcrops with *Pinus banksiana*, *Betula papyrifera* and *Populus tremuloides*, 28.viii.2020, terricolous on shallow calcareous soil, *S.R. Brinker 8548* (CANL, hb. Brinker). HASTINGS CO.: 6.6 km E of Myrehall, 2.6 km SW of Mud Lake, edge of alvar grassland, 20.ix.2020, terricolous on shallow xero-hydric calcareous soil over limestone, *S.R. Brinker 8696* (hb. Brinker). RENFREW CO.: Centennial Lake Provincial Park, north shore of Black Donald Lake, 23 km WSE of Calabogie, S-facing deciduous woods with *Quercus rubra* and *Ostrya virginiana*, 2.ix.2021, on mosses and detritus over shallow calcareous soil, *S.R. Brinker 9036* (NY).

**\*†*Didymocyrtis xanthomendozae* (Diederich & Freebury) Diederich & Freebury**

**FIGURE 6F.**

*Didymocyrtis xanthomendozae* is a lichenicolous coelomycete on *Xanthomendoza hasseana* (Räsänen) Søchting, Kärnefelt & S.Y. Kondr. and *X. montana* (L. Lindblom) Søchting, Kärnefelt & S.Y. Kondr. (Lawrey et al. 2012, as *Phoma xanthomendozae* Diederich & Freebury). It has been reported from scattered locations in North America including Québec and Saskatchewan in Canada (Lawrey et al. 2012), as well as from California and Idaho in the United States (Haldeman 2019). These are the first reports from Ontario and the first for the Great Lakes Basin.

The species produces conidiomata, or more rarely ascomata, that are immersed in the host apothecia (rarely in the host thallus), which cause dark red to brown discolorations as infected parts of the host die (Ertz et al. 2015, Lawrey et al. 2012). The species can be separated from other members of the genus based on its host specificity; pycnidia, which are 140–160 μm in diameter; conidiogenous cells, which line the inner wall of the pycnidial cavity and are hyaline, smooth-walled, and measure 5–10 × 2.5–3.5 μm; and ellipsoid, hyaline, (1–)2-guttulate conidia, which arise singly, measuring (4.5–)5.6–7.1(–8.6) × (2.9–)3.3–4.3(–4.6) μm (Lawrey et al. 2012, as *P. xanthomendozae*). If produced, ascospores are pale-brown and two-celled, measuring 11–13 × 6–7 μm (Ertz et al. 2015).

*Specimens examined.* – **CANADA. ONTARIO.** FRONTENAC CO.: 9.8 km SSW of Plevna, 1.3 km N of Kashwakamak Lake, upland hardwood forest with *Acer saccharum*, *Tilia americana* and *Abies balsamea*, 30.v.2022, lichenicolous on apothecia of *Xanthomendoza hasseana* on fallen twig, *S.R. Brinker 9371* & *G. Cameron* (hb. Brinker). LANARK CO.: Silver Lake Provincial Park, E side of Silver Lake, 26 km W of Perth, upland mixed forest with *A. saccharum*, *Tsuga canadensis*, *T. americana* and *A. balsamea*, 3.xi.2022, lichenicolous on apothecia of *X. hasseana* on *T. americana*, *S.R. Brinker 9655* (CANL). LENNOX & ADDINGTON CO.: Mount Moriah Conservation Reserve, 22.5 km NNE of Madoc, rocky deciduous hardwood forest in valley with *A. saccharum*, *Ostrya virginiana* and *T. americana*, 16.vi.2022, lichenicolous on apothecia of *X. hasseana* on fallen twig, *S.R. Brinker 9414* (CANL). RENFREW CO.: Westmeath Provincial Park, W of Sandpoint, 15 km SE of Pembroke, shoreline with scattered *Quercus*

*rubra*, *Fraxinus pennsylvanica* and *Q. macrocarpa*, 23.viii.2022, lichenicolous on apothecia of *X. hasseana* on twigs, S.R. Brinker 9535 (CANL).

\*+*Distopyrenis americana* Aptroot

FIGURE 7A.

*Distopyrenis americana* is a non-lichenized pyrenocarpous species that has routinely been studied by lichenologists. It has an Appalachian–Great Lakes distribution in North America (Tripp & Lendemer 2020) and these appear to be the first published reports for Ontario. A CNALH search (accessed 26, November 2021) turned up two unpublished records from the City of Ottawa made in 2011 by J. Lendemer and I. Brodo, though it was not included for the region by Brodo et al. (2021). Therefore, the species is reported here for the first time from Ontario. The species can be recognized by its ecology, restricted to the smooth bark and branches of *Betula alleghaniensis*, and its black, semi-immersed, round to slightly elongated perithecia and brown, two-celled polarilocular spores (Harris 1995).

*Specimens examined.* – CANADA. ONTARIO. BRANT CO.: App’s Mills Conservation Area, 8.5 km W of Brantford, lowland deciduous forest along Whitemans Creek, 31.xii.2021, corticolous on *Betula alleghaniensis*, S.R. Brinker 9316 (hb. Brinker). LENNOX & ADDINGTON CO.: Black River, 20 km N of Actinolite, lowland mixed forest with *Acer rubrum*, *Abies balsamea* and *B. alleghaniensis*, 14.v.2022, corticolous on *B. alleghaniensis*, S.R. Brinker 9395 (CANL). PETERBOROUGH CO.: Brookwood Conservation Area, 9 km N of Norwood, 8 km E of Warsaw, mixed lowland forest with *A. balsamea*, *Populus tremuloides*, *A. rubrum* and *Fraxinus nigra*, 20.vii.2020, corticolous on bark of *B. alleghaniensis*, S.R. Brinker 8490 (CANL); Otonabee Region Agreement Forest, 4 km S of Stoney Lake and E of White Lake, mixed swamp surrounded by upland woods with *Ulmus americana*, *Thuja occidentalis*, *F. nigra* and *A. balsamea*, 31.xii.2020, corticolous on *B. alleghaniensis*, S.R. Brinker 8500 (CANL); Crowe River Conservation Reserve, 15 km E of Apsley, mixed swamp in valley with *F. nigra*, *T. occidentalis* and *A. balsamea*, 29.v.2022, corticolous on *B. alleghaniensis*, S.R. Brinker 9362 (CANL).

\*†*Lichenochora obscuroides* (Linds.) Triebel & Rambold

FIGURES 7B & 7C.

*Lichenochora obscuroides* appears to be scattered but widespread in North America having previously been reported from Arizona, British Columbia, Michigan, New York, and North Carolina (Goward et al. 1994, as *L. thallina* (Cooke) Hafellner; Diederich 2003, Hafellner et al. 2002, Lendemer et al. 2013). Elsewhere it is widely distributed in Europe from Scandinavia to the Mediterranean where it can be common (von Brackel 2008). It is a gall inducing lichenicolous ascomycete occurring on members of the Physciaceae, and the host of the type specimen is *Phaeophyscia orbicularis* (Necker) Moberg (Hafellner 2019). The specimens cited here were collected on *P. pusilloides* (Zahlbr.) Essl. and *P. sciastra* (Ach.) Moberg and are the first reports from Ontario.

In addition to its host preference, this species can be recognized by its immersed perithecia measuring 180–240 µm in diameter and its hyaline, two-celled ascospores measuring 15–18 × 5–7 µm (Hawksworth et al. 2010). *Lichenochora obscuroides* is most likely to be confused with *Pyrenidium aggregatum* K. Knudsen & Kocourk. which also forms perithecia in convex galls on thalli of *Phaeophyscia*. However, that species it is most often found on *P. rubropulchra* (Degel.) Essl. and has dark-brown, four-celled ascospores (Knudsen & Kocourková 2010).

*Specimens examined.* – CANADA. ONTARIO. HASTINGS CO.: Beaver Creek, 11 km E of Cordova Lake, 10 km S of Marmora, along rocky section of river through upland mixed forest with *Tsuga canadensis*, *Thuja occidentalis*, *Acer saccharum* and *Betula alleghaniensis*, 19.x.2021, lichenicolous on thallus of *Phaeophyscia sciastra* on rock, S.R. Brinker 9163 (CANL, hb. Brinker). PETERBOROUGH CO.: Warsaw Caves Conservation Area 12 km E of Lakefield, 7 km S of White Lake, upland *T. occidentalis*-dominated coniferous forest with extensive shaded limestone outcrops, 7.i.2023, lichenicolous on *P. pusilloides* on *Tilia americana*, S.R. Brinker 9722 (CANL).

\*†*Paranectria oropensis* (Ces. ex Rabenh.) D. Hawksw. & Piroz.

FIGURE 7D.

North American reports of *Paranectria oropensis* are scant and widespread, from British Columbia, Massachusetts, Mexico, Minnesota, and Québec (Cole & Hawksworth 2001, Diederich 2003, Driscoll et al. 2016, Hafellner et al. 2002). Elsewhere it is known from Asia and Europe where it occurs on a wide variety of usually corticolous host lichens in diverse habitats including urban environments (Ertz

2004a, Hafellner & Obermayer 2009). The reports cited here, which are the first for Ontario, were from intact mature hardwood forests. The species is characterized by eight-spored asci and hyaline, muriform ascospores  $(22-25-32(-36) \times (9-11-14(-15) \mu\text{m})$  with five to eight transverse septa and one to two longitudinal septa, and appendages up to  $12 \mu\text{m}$  long. Mature ascospores of studied material measured  $27.2-30 \times 10.3-12.1 \mu\text{m}$ , and the infected portion of the host thalli were bleached.

*Specimens examined.* – **CANADA. ONTARIO.** HALIBURTON CO.: Oxtongue River – Ragged Falls Provincial Park, 25 km ENE of Hunstville, 1.5 km N of Oxtongue Lake, upland deciduous forest with *Acer saccharum*, *Betula alleghaniensis*, *Prunus serotina* and *Abies balsamea*, 9.i.2023, lichenicolous on *Phaeophyscia rubropulchra* on *A. saccharum*, S.R. Brinker 9727 (CANL). PARRY SOUND DIST.: Mikisew Provincial Park, 11 km E of South River, 2 km W of Deer Lake, deciduous forest with *A. saccharum*, *Fraxinus nigra*, *B. alleghaniensis* and *A. balsamea*, 23.x.2021, lichenicolous on *Lecanora* sp. on *Populus tremuloides*, S.R. Brinker 9187 (CANL, hb. Brinker).

**\**Pertusaria sommerfeltii* (Flörke ex Sommerf.) Fr.**

**FIGURE 7E.**

*Pertusaria sommerfeltii* is a circumboreal species that in North America ranges through montane regions of the west from Alaska south to Colorado, the Sonoran Desert Region of Arizona and New Mexico, and in the east, occurs in portions of the Acadian Forest Region and the Great Lakes Basin (Dibben 1980). Typical substrates include various hardwoods and shrubs (Dibben 1980, Thomson 1997) although collections from the Southwest are from the conifer *Abies lasiocarpa* (Lumbsch et al. 1999). The collection reported here occurred in a mature mixed boreal forest on the bark of *Populus balsamifera*. This species was included in several unpublished Ontario lists (e.g., Newmaster & Ragupathy 2012) presumably based on a single mapped location in Thomson (1997) from Lake Superior. However, this collection was from Isle Royale in adjacent Michigan, U.S.A., as reported by Dibben (1980). Therefore, the collection reported here represents the first from Ontario.

*Pertusaria sommerfeltii* can be differentiated from other members of the genus by its occurrence on hardwoods, the thin, smooth, white or greyish thallus, numerous, dispersed, flattened or poriform ascomata with one to four black ostioles, a KOH+ red-violet epihymenium, broadly cylindrical asci with an ocular chamber that are eight-spored, ellipsoid ascospores measuring  $20-36 \times 12-24 \mu\text{m}$ , and chemically by the production of 2,7-dichlorolichexanthone, stictic acid, and constictic acid (Brodo 2016, Dibben 1980, Thomson 1997). *Megaspora verrucosa* is superficially similar to *P. sommerfeltii* though it can be distinguished by the absence of secondary metabolites, KOH- epihymenium, and its clavate or cylindrical-clavate asci (Dibben 1980, Lumbsch et al. 1999).

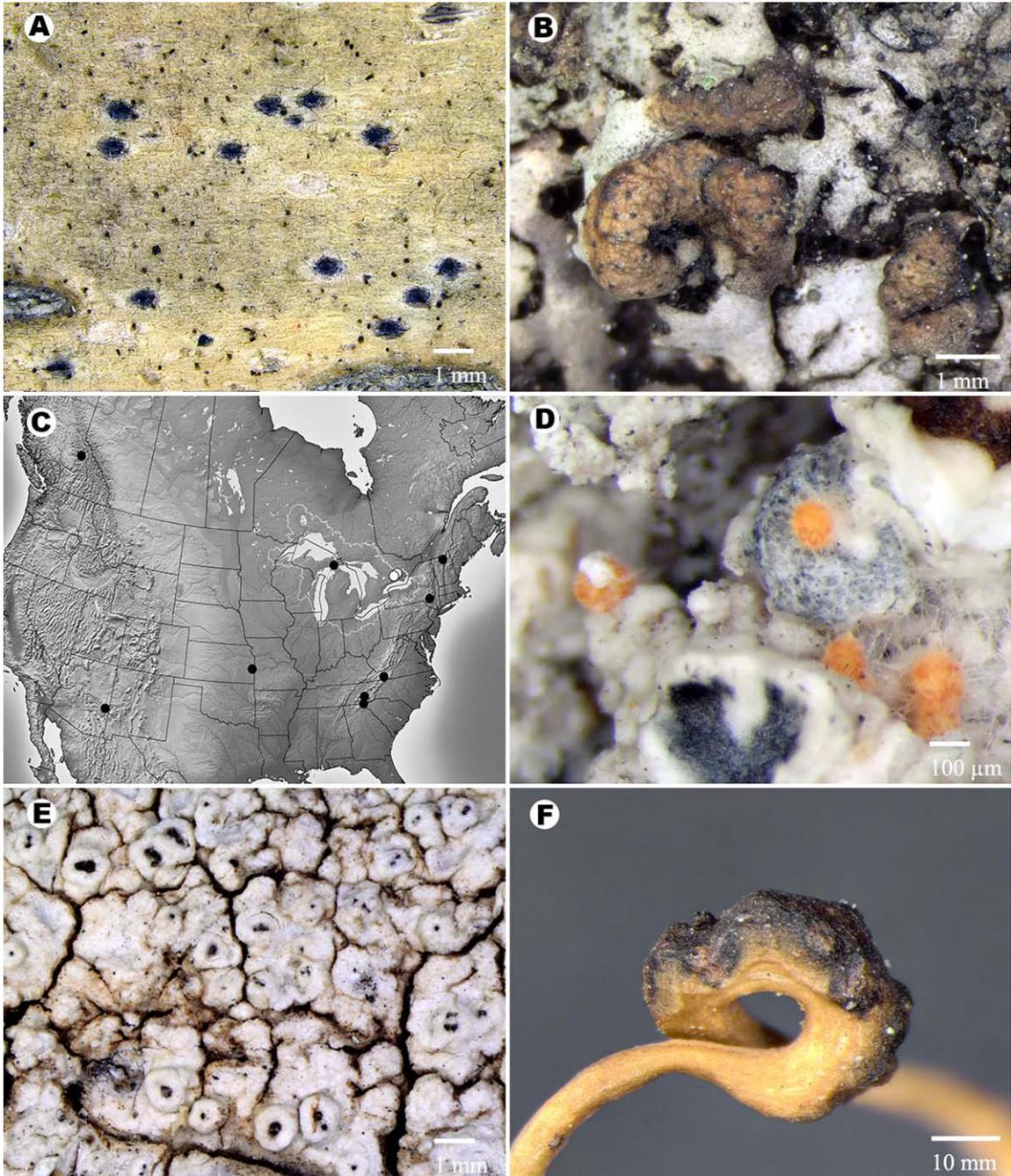
*Specimen examined.* – **CANADA. ONTARIO.** KENORA DIST.: W bank of Goose Creek, 7.6 km from Hudson Bay coast, 15 km E-SE of Fort Severn, mature mixed forest along small river with *Picea glauca* and *Populus balsamifera*, 24.vi.2014, corticolous on *P. balsamifera*, S.R. Brinker 3697I (hb. Brinker).

**\*†*Raesaenenia huuskonenii* (Räsänen) D. Hawksw., Boluda & H. Lindgr.**

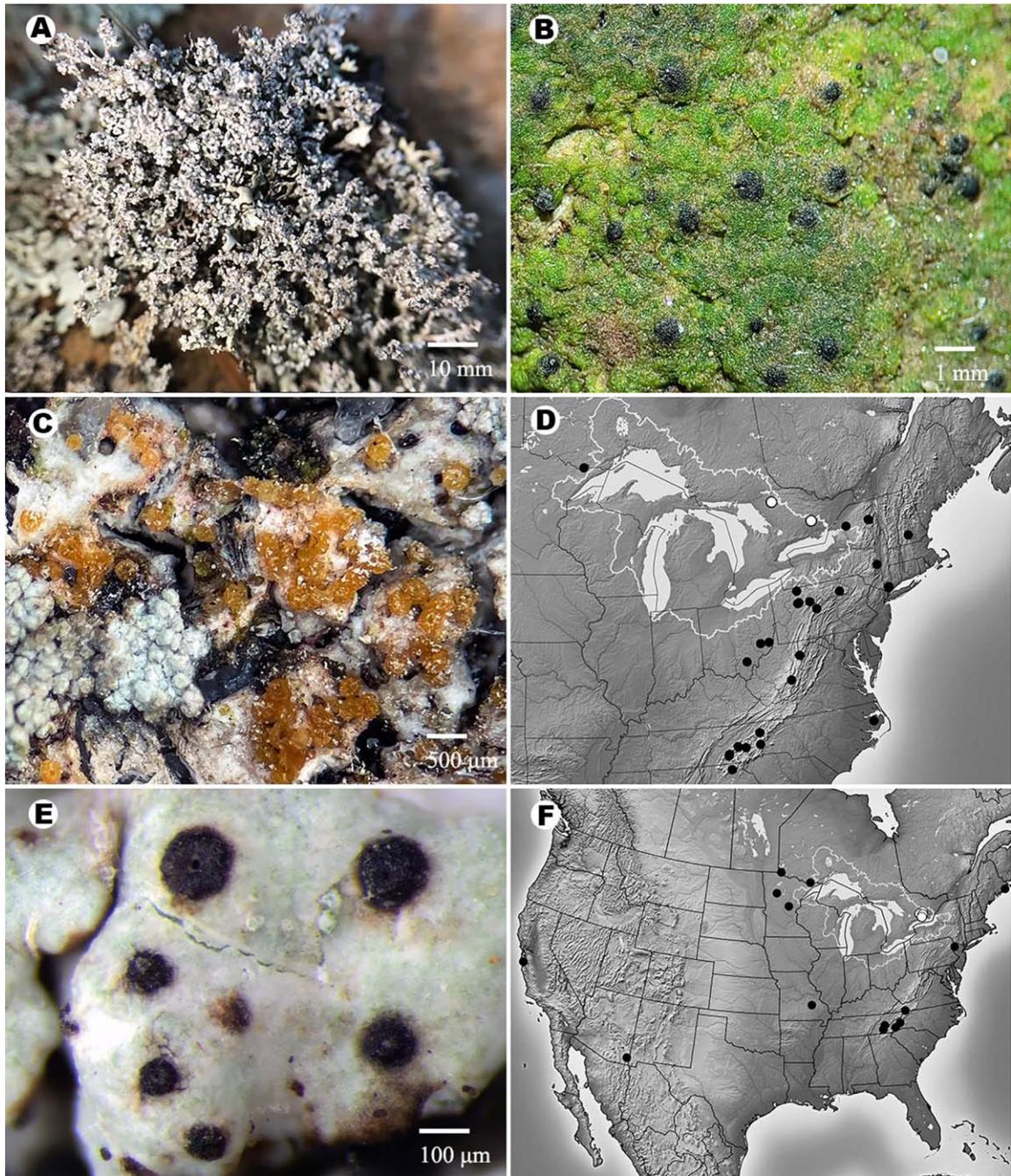
**FIGURE 7F.**

This species has been reported mainly from montane regions of North America including Alaska, British Columbia, North Carolina, and Oregon (Goward & Ahti 1992, as *Phacopsis huuskonenii* Räsänen; Lindgren et al. 2015; Thomson & Ahti 1994, as *P. huuskonenii*; Zhurbenko & Laursen 2003, as *P. huuskonenii*). It was recently reported from the Great Lakes Basin in adjacent Minnesota, U.S.A. by Gockman et al. (2020). The specimens cited here are the first reports for Ontario. *Raesaenenia huuskonenii* is an obligate lichenicolous ascomycete on members of the genus *Bryoria* (Lindgren et al. 2015) and can be identified by its ecology, aggregated ascomata appearing as one elongated ascoma, dark brown hypothecium which is I-, and narrowly ellipsoid ascospores with thickened ends that measure  $13-17(-19) \times 3-4 \mu\text{m}$  (Triebel et al. 1995, as *P. huuskonenii*).

*Specimens examined.* – **CANADA. ONTARIO.** THUNDER BAY DIST.: Kama Cliffs Conservation Reserve, 9 km NNE of Kama Bay Lake Superior, 24 km NE of Nipigon, small talus slope below cliff in mixed boreal forest with *Picea mariana*, *Betula papyrifera* and *Abies balsamea*, 9.viii.2018, lichenicolous on *Bryoria fuscescens* on twigs of *P. mariana*, S.R. Brinker 7114 (hb. Brinker); Lake Superior National Marine Conservation Area, N shore of Lake Superior, interior of Lamb Island, humid coastal mixed boreal forest with *B. papyrifera*, *A. balsamea* and *Sorbus decora*, 20.vii.2019, lichenicolous on *Bryoria* sp. on bark of *B. papyrifera*, S.R. Brinker 7790 (CANL).



**Figure 7.** Photographs and distribution map of lichens and allied fungi new to Ontario (white = newly reported Ontario records, black = previous collections). **A**, *Distopyrenis americana* on bark of *Betula alleghaniensis* (Brinker 8500). **B**, *Lichenochora obscuroides* on *Phaeophyscia sciastra* (Brinker 9163). **C**, distribution of *L. obscuroides* in North America. **D**, *Paranectria oropensis* on *Lecanora* (Brinker 9187). **E**, *Pertusaria sommerfeltii* (Brinker 3697I). **F**, *Raesaenenia huuskonenii* on *Bryoria fuscescens* (Brinker 7114).



**Figure 8.** Photographs and distribution maps of lichens and allied fungi new to Ontario or otherwise rarely reported from Ontario (white = newly reported Ontario records, black = previous collections). **A**, *Stereocaulon depreaultii* (photo taken in situ, Brinker 6780). **B**, *Thrombium epigaeum* (photo taken in situ, Brinker 9162). **C**, *Trichonectria rubefaciens* on *Aspicillia* (Brinker 9189). **D**, distribution of *T. rubefaciens* in North America. **E**, *Abrothallus microspermus* on *Flavoparmelia caperata* (Brinker 8962). **F**, distribution of *A. microspermus* in North America.

**\**Stereocaulon depreaultii* Delise ex Nyl.**

**FIGURE 8A.**

*Stereocaulon depreaultii* was described from Newfoundland, and based on the few available specimens, appears to have a disjunct eastern North American and eastern Asian distribution according to Lamb (1977). It was reported by Goward et al. (1998) as rare in Canada based on collections from Newfoundland, and tentatively from Nova Scotia based on an undated specimen from the 19<sup>th</sup> century. A search of CNALH (13 December 2021) shows two additional collections from Whiteface Mountain in New York State and from Lake Superior in Minnesota, both determined by I.M. Lamb, although later she cast doubt on North American records outside of Newfoundland (Lamb 1977). It was also mentioned in a list of Ontario lichens by Newmaster and Ragupathy (2012), but no supporting specimens or documentation could be found to determine its inclusion. The specimen cited here is the first confirmed record for Ontario. Habitat descriptions include “rock surface” and “exposed granite summit” suggesting an affinity for arctic-alpine-like habitats. The material collected during this study was from exposed volcanic rock on the coast of Lake Superior and occurred with other interesting disjunct arctic-alpine species.

This species can be characterized by its suberect, 2–3 cm tall thallus that is K+ pale yellow (atranorin) and produces of lobaric acid, moderately to very dense cushions of cylindrical, caespitose pseudopodetia completely lacking tomentum, numerous phyllocladia mostly flat, grain-like, or warty to spherical or compound warty, usually 0.1–0.2 mm in diameter and mainly present in the upper parts of the pseudopodetia, and numerous sessile, spherical grey-brown botryose cephalodia (Huang & Wei 2006).

*Specimen examined.* – **CANADA. ONTARIO. THUNDER BAY DIST.:** Lake Superior National Marine Conservation Area, E shore of Macoun Island, 62 km S of Nipigon, exposed rocky coastline with splash pools and low rockfaces with *Primula mistassinica*, *Campanula rotundifolia* and *Pinguicula vulgaris*, 24.vii.2018, over volcanic rock, *S.R. Brinker 6780* (OSU; det. B. McCune).

**\**Thrombium epigaeum* (Pers.) Wallr.**

**FIGURE 8B.**

*Thrombium epigaeum* is a widespread but easily overlooked ephemeral species that occurs infrequently throughout North America from New Brunswick and New England west to California, and north to Alaska and the Northwest Territories (Brodo et al. 2001, Thomson 1997). It forms a thin, continuous, grey green to greenish-brown crust with immersed perithecia over exposed, stable soils (Orange 2013; Fig. 8B). The species differs from other terricolous pyrenocarpous lichens in the region by the combination of the lack of an involucrellum, and the presence of colourless, simple ascospores and persistent paraphyses (Brodo et al. 2001, Purvis & Orange 2009). The specimen reported here was found on compacted shallow loamy soil over limestone bedrock.

*Thrombium epigaeum* has been included in various unpublished Ontario lists (e.g., Newmaster & Ragupathy 2012) presumably based on a single specimen collected in 1973 from East Pen Island (*Kershaw s.n.*, CANL 98623) bordering Ontario in Hudson Bay, but which is a part of the Territory of Nunavut. Therefore, the collection reported here represents the first collection from.

*Specimen examined.* – **CANADA. ONTARIO. HASTINGS CO.:** Callaghan’s Rapids Conservation Area, Crowe River, 3.5 km S of Marmora, mixed rocky woods with *Quercus macrocarpa*, *Juniperus communis* and *Thuja occidentalis*, 19.x.2021. terricolous on shallow soil, *S.R. Brinker 9162* (CANL, hb. Brinker).

**\*†*Trichonectria rubefaciens* (Ellis & Everh.) Diederich & Schroers**

**FIGURES 8C & 8D.**

This lichenicolous ascomycete appears to have an Appalachian-Great Lakes distribution in North America with reports from North Carolina (Lendemer et al. 2016, Tripp & Lendemer 2020, as *Nectriopsis rubefaciens* (Ellis & Everh.) M.S. Cole & D. Hawksw.), Pennsylvania (Harris & Lendemer 2006, as *N. rubefaciens*), Virginia (Hodkinson et al. 2009, as *N. rubefaciens*) and a single collection from the Boundary Waters region of Minnesota (Cole & Hawksworth 2001, as *N. rubefaciens*). The collections reported here seem to be the first for the Great Lakes Basin (Fig. 8D). In eastern North America it occurs on members of the genus *Aspicilia* A. Massal. (Tripp & Lendemer 2020).

*Trichonectria rubefaciens* can be identified by its superficial, dark orange to reddish-orange perithecia, 80–160 µm in diameter with straight, colorless, thin hairs around the ostiolar region, eight-

spored asci and two-celled, ellipsoid, colourless ascospores that are 14–18 × 2.5–3 µm in size (Ihlen & Wedin 2008). In addition, the infected host thallus becomes necrotic in the region of the *Trichonectria* infection.

*Specimens examined.* – **CANADA. ONTARIO. LENNOX & ADDINGTON CO.:** Mount Moriah Conservation Reserve, 22.5 km NNE of Madoc, upland rocky deciduous woods with *Acer saccharum*, *Tilia americana* and *Ostrya virginiana*, 15.vi.2022, lichenicolous on *Aspicilia* sp. on granite boulder, S.R. Brinker 9398 (CANL). **PARRY SOUND DIST.:** Miskew Provincial Park, 11 km E of South River, 2 km W of Deer Lake, deciduous forest with *A. saccharum*, *Fraxinus nigra*, *Betula alleghaniensis* and *Abies balsamea*, 23.x.2021, lichenicolous on *Aspicilia* sp. on granite boulder, S.R. Brinker 9189 (CANL, hb. Brinker).

#### ADDITIONAL INTERESTING OR SIGNIFICANT RECORDS

This section includes nine lichens and nine lichenicolous fungi that are included in the first published Ontario lichen checklist (Newmaster et al. 1998) or appear in more recent published literature but have rarely been reported from the province or are known from historic records.

#### †*Abrothallus microspermus* Tul.

#### FIGURES 8E & 8F.

This lichenicolous ascomycete is often reported from *Flavoparmelia caperata* (L.) Hale and other parmelioid genera including *Flavopunctelia* (Krog) Hale and *Punctelia* Krog (Lendemer 2008, Hawksworth et al. 2010, Triebel et al. 1991). In North America, it has been reported from Arizona (Triebel et al. 1991, as *Vouauxiomyces truncatus* (B.de Lesd.) Dyko & D.Hawksw.), California (Diederich 2003), Maine (Diederich 2003), Minnesota (Cole & Hawksworth 2001), North Carolina (Lendemer 2008, as *V. truncatus*) Pennsylvania (Harris & Lendemer 2006, as *V. truncatus*), Tennessee (Lendemer et al. 2013) and Virginia (Diederich 2003). It was previously known from a single Ontario collection from the Lake of the Woods region in the northwestern part of the province (Lewis & Brinker 2017). The additional records reported here add to our understanding of its distribution in the province.

*Abrothallus microspermus* can be distinguished by its host preference and brownish ascospores ranging in size from (9–)11–13.5(–14) × (3–)4.5–5.5–6 µm (Hawksworth et al. 2010). The collections reported here represent the anamorphic stage, lichenicolous on *F. caperata*, and appear to be first for the Great Lakes Basin (Fig. 8F). The anamorph can be identified based on its host preference and hyaline, unbranched, simple conidia that measure 6.5–7.5(–8) × 4–5(–5.5) µm (Hawksworth et al. 2010). The name of the asexual (conidia producing) anamorph *Vouauxiomyces truncatus* has been synonymized with *A. microspermus*.

*Specimens examined.* – **CANADA. ONTARIO. HASTINGS CO.:** 13.5 km N of Marmora, 2.5 km SE of Thomson Lake, NCC Beaver Creek area of interest, deciduous swamp with *Acer ×freemanii* and *Fraxinus* spp., 16.viii.2021, lichenicolous on *Flavoparmelia caperata* on bark of *F. pennsylvanica*, S.R. Brinker 8962 & *C. Terwissen* (CANL). **NORTHUMBERLAND CO.:** Crowe River Bridge Conservation Area, 13 km SW of Madoc, open mixed woods with limestone outcrops along river with *Juniperus virginiana*, *Thuja occidentalis*, and *Quercus macrocarpa*, 9.ix.2020, lichenicolous on *F. caperata* on *J. virginiana*, S.R. Brinker 8366 (hb. Brinker). **PETERBOROUGH:** Warsaw Caves Conservation Area 12 km E of Lakefield, 7 km S of White Lake, upland *T. occidentalis*-dominated coniferous forest with extensive shaded limestone outcrops, 7.i.2023, lichenicolous on *F. caperata* on branch of *T. occidentalis*, S.R. Brinker 9723 (hb. Brinker).

#### *Ahtiana aurescens* (Tuck.) Thell & Randlane

*Ahtiana aurescens* is an enigmatic foliose lichen of mature, humid coniferous forests that is endemic to eastern North America (Thell et al. 1995, Wetmore 2002, as *Cetraria aurescens* Tuck.). It has declined throughout much of its range, which extends from the Boundary Waters Wilderness of Ontario and Minnesota east through the Upper Great Lakes Basin to New Brunswick and Nova Scotia, and as well as high elevation forests of the southern Appalachians (Thell et al. 1995, Tripp & Lendemer 2020). The species was recently reported from southern boreal forests of the Lake Superior and Lake of the Woods region by Brinker (2020), which still appear to be relative strongholds for the species in Canada. Elsewhere

in Ontario, it was previously known only from several historical records in the Nipissing District (Thell et al. 1995). The collections cited here are noteworthy, being made from undisturbed, mature conifer swamp habitat and are the first and only modern records from southern Ontario (Wong & Brodo 1992).

*Specimens examined.* – **CANADA. ONTARIO.** HASTINGS CO.: Conroys Marsh Conservation Reserve, 10 km S of Combermere, conifer swamp with *Thuja occidentalis*, *Abies balsamea* and *Picea glauca*, 22.vii.2022, corticolous on twig of *T. occidentalis*, S.R. Brinker 9445 (CANL). FRONTENAC CO.: Shawenog Lake area, 10 km E of Upper Mazinaw Lake, 8 km SW of Plevna, open conifer swamp with *T. occidentalis*, *A. balsamea* and *Betula alleghaniensis*, 14.viii.2021, corticolous on twig of *A. balsamea*, S.R. Brinker 8862 (CANL).

#### †*Athelia arachnoidea* (Berk.) Jülich

#### FIGURE 9A.

*Athelia arachnoidea* is a lichenicolous basidiomycete that forms extensive cobweb-like networks of white hyphae and brown sclerotia up to one millimeter in diameter, creating large circular necrotic zones on a wide variety of crustose and foliose lichens (Motiejūnaitė & Jucevičienė 2005). Basidia are rarely produced and contain two to four basidiospores measuring  $5\text{--}9\text{--}(12) \times 2.5\text{--}7 \mu\text{m}$  (Diederich 2004a, Hawksworth et al. 2010). In Europe, this species is considered a common pathogen of epiphytic lichens, playing an important role in regulating lichen population size and community dynamics by creating gaps in otherwise closed corticolous lichen communities and clearing new patches for colonization (Motiejūnaitė & Jucevičienė 2005). There are several reports from scattered locations in North America including Arizona, Massachusetts, Pennsylvania, and Washington (Diederich 2003, Jülich 1972). Three Ontario collections were reported by Jülich (1972) including two from Simcoe County made in 1956 and one from York County made in 1950. The specimen examined for this study lacked basidiomata but was conspicuously covered with brown sclerotia and was parasitizing *Physcia millegrana* Degel.

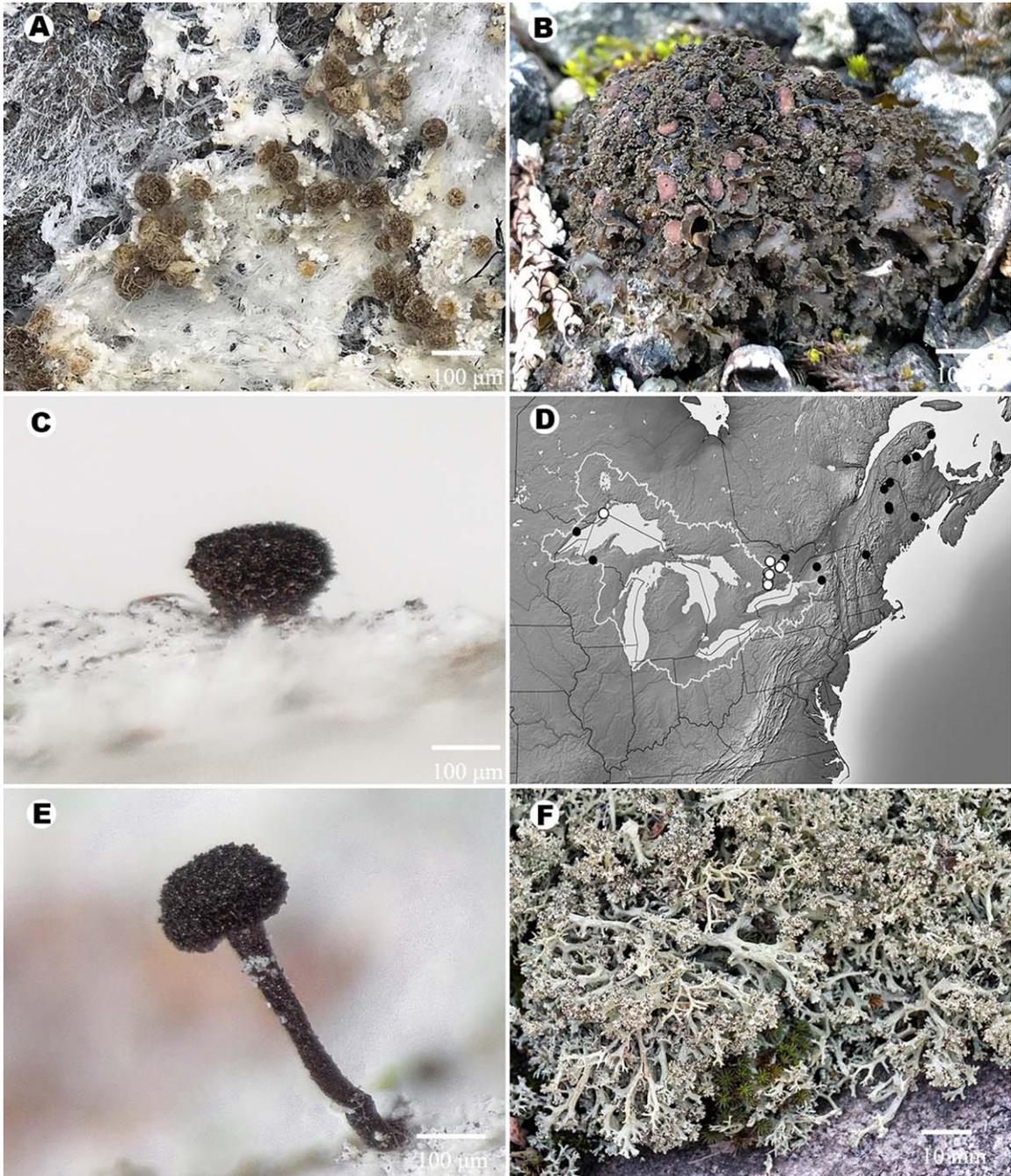
*Specimen examined.* – **CANADA. ONTARIO.** PETERBOROUGH CO.: Squirrel Creek Conservation Area S of Wallace Point Rd. along Otonabee River, deciduous floodplain forest with *Acer ×freemanii*, *Fraxinus pennsylvanica* and *Ulmus americana*, 28.ii.2019, lichenicolous on *Physcia millegrana* on *A. ×freemanii*, S.R. Brinker 7394 (hb. Brinker).

#### *Blennothallia crispa* (Hudson) Otálora, P. M. Jørg. And Wedin

#### FIGURE 9B.

*Blennothallia* Trevis. is a small, primarily temperate genus comprised of four species found to be distinct from *Collema* s.str. in a molecular phylogenetic study of Collemataceae (Otálora et al. 2014). The genus is characterized by the partially paraplectenchymatous thallus anatomy, corresponding to the *C. crispum*-group which was distinguished by Degelius (1954). *Blennothallia crispa* occurs on moist calcareous soil and rock and has a very widespread North American distribution where it is apparently most common in the West (Brodo et al. 2001, as *C. crispum* (Hudson) Weber ex F.H. Wigg.), with scattered occurrences in the Arctic and Great Lakes Basin (Thomson 1984, as *C. crispum*). The collections cited below are the first modern records from Ontario and were found in open areas with seasonally wet limestone pavement often supporting remnant alvar vegetation, and in one other instance from marble flatrock.

*Blennothallia crispa* can be identified by its numerous, rounded or ear-like, overlapping, flat to concave lobes with scale-like isidia that can resemble smaller lobes (Fig. 9B), sessile apothecia often with a constricted base, and four-celled to rarely submuriform ascospores that are  $(17\text{--})26\text{--}34\text{--}(47) \times (8.5\text{--})13\text{--}15\text{--}(18) \mu\text{m}$  in size (Cannon et al. 2020a, Degelius 1954, Schultz et al. 2004, as *C. crispum*). It is differentiated from members of *Leptogium* and *Scytinium* by its more olivaceous to black thallus and absence of a true cortex, whereas the thallus of *Leptogium* and *Scytinium* (Ach.) Gray species are more typically deep-reddish brown to slate grey and possess a proper cortex (Cannon et al. 2020a). Foliose members of *Lempholemma* Körber found in Ontario (i.e., *L. polyanthes* (Bernh.) Malme and *L. chalazanum* (Ach.) B. de Lesd.) have a similar anatomy and share the same *Nostoc* photobiont as *B. crispa*, but they have immersed ascomata and simple ascospores (Schultz et al. 2004).



**Figure 9.** Photographs and distribution map of lichens and allied fungi rarely reported from Ontario. **A**, *Athelia arachnoidea* on *Physcia millegrana* (Brinker 7394). **B**, *Blennothallia crispa* (photo taken in situ, Brinker 8719). **C**, *Chaenothecopsis brevipes* (Brinker 9014). **D**, distribution of *C. brevipes* in North America (white = newly reported Ontario records, black = previous collections). **E**, *Chaenothecopsis rubescens* Brinker (8563A). **F**, *Cladonia dimorphoclada*, (photo taken in situ Brinker 9334).

*Specimens examined.* – **CANADA. ONTARIO.** HASTINGS CO.: 8.7 km SE of Tweed, 7 km N of Naphan, treed alvar with scattered *Quercus macrocarpa*, *Juniperus virginiana* and *J. communis*, 20.xi.2020, over shallow calcareous soil over limestone pavement, *S.R. Brinker 8691* (CANL, hb. Brinker); 2.5 km E of Mount Zion, 1.5 km W of Trent River, edge of abandoned limestone quarry and young *J. virginiana* coniferous woods, 17.xii.2020, over limestone, *S.R. Brinker 8719* (CANL, hb. Brinker). LENNOX & ADDINGTON CO.: 7 km NE of Tamworth, 1 km E of Murphy Lake, exposed marble flatrock with scattered *J. communis* and *Quercus macrocarpa*, 28.iv.2022, over marble flatrock, *S.R. Brinker 9330* (hb. Brinker) NORTHUMBERLAND CO.: Trent River, 7.5 km N of Campbellford, open limestone pavement of former river channel, 6.iv.2019, among bryophytes over limestone pavement, *S.R. Brinker 7427* (CANL). PRINCE EDWARD CO.: S side of Army Reserve Rd. just W of Charwell Point Rd, scrubby *J. virginiana* alvar woodland, 9.v.2013, over seasonally wet fractured limestone bedrock, *S.R. Brinker 2843B* (CANL; det. F. Anderson).

†*Chaenothecopsis brevipes* Tibell

FIGURES 9C & 9D.

*Chaenothecopsis brevipes* has an Appalachian-Great Lakes distribution in North America having been reported from Maine, Minnesota, New Brunswick, New Hampshire, New York, North Carolina, Nova Scotia, Québec, and Vermont (Gockman et al. 2020; Harris 2004; Selva 1988, 2014, 2016). A single previously published record exists from Ontario from Lanark County (Selva 2010). Its range is restricted to the distribution of its host lichen, *Inoderma byssaceum* (Weigel) Gray which is an uncommon northern temperate to southern boreal species in North America (Lendemer et al. 2013, as *Arthonia byssacea* (Weigel) Almq.) that occurs on the bark of old tree trunks in locally humid, mature forests (Frisch et al. 2015). In Ontario, *I. byssaceum* has been reported to occur on *Acer saccharum*, *Betula alleghaniensis*, *Quercus macrocarpa* and *Thuja occidentalis* in mature hardwood forests (Brinker 2020, Wong & Brodo 1992). Collections of *C. brevipes* from the Great Lakes Basin have so far been restricted to host thalli found growing on *T. occidentalis*, and here that phorophyte range is expanded to include *Populus balsamifera*.

The species can be recognized by its association with *Inoderma byssaceum*, short-stalked, 0.1–0.2 mm tall, black, epruinose capitula, and two-celled ellipsoid, brown ascospores (Selva 2014). The only other short-stalked *Chaenothecopsis* species associated with lichens with a *Trentepohlia* photobiont in Ontario is *C. australis* Tibell recently reported by Brinker (2020). It can be distinguished from *C. brevipes* by its simple ascospores (Selva 2014).

*Specimens examined.* – **CANADA. ONTARIO.** FRONTENAC CO.: 9 km NE of Plevna, 4.5 km W of Ompah, 800 m E of Mosque Lake, mature mixed swamp with *Thuja occidentalis*, *Fraxinus nigra* and *Abies balsamea*, 12.ix.2020, lichenicolous on *Inoderma byssaceum* on *T. occidentalis*, *S.R. Brinker 8563B* (CANL, hb. Brinker); Shawenog Lake area, 10 km E of Upper Mazinaw Lake, 8 km SW of Plevna, open coniferous swamp with *T. occidentalis*, *Betula alleghaniensis*, *A. balsamea* and *Acer spicatum* surrounded by upland deciduous forest, 14.vii.2021, lichenicolous on *I. byssaceum* on *T. occidentalis*, *S.R. Brinker 8861* & *G. Cameron* (CANL). HASTINGS CO.: 40 km S of Bancroft, 1.5 km S of Tangamong Lake, conifer swamp with *T. occidentalis*, *A. balsamea*, *Picea mariana* and *Ulmus americana*, 6.v.2019, lichenicolous on *I. byssaceum* on *T. occidentalis*, *S.R. Brinker 7459B* (CANL, hb. Brinker); Conroys Marsh Conservation Reserve, 10 km S of Combermere, conifer swamp with *T. occidentalis*, *A. balsamea* and *P. glauca*, 22.vii.2022, lichenicolous on *I. byssaceum* on *T. occidentalis*, *S.R. Brinker 9459* (CANL). PETERBOROUGH CO.: Brookwood Conservation Area, 9 km N of Norwood, 8 km E of Warsaw, mixed lowland forest with *A. balsamea*, *Populus tremuloides*, *Acer rubrum* and *F. nigra*, 20.vii.2020, lichenicolous on *I. byssaceum* on *T. occidentalis*, *S.R. Brinker 8488* (CANL, hb. Brinker); Birdsall Wildlife Area, 7.5 km E of Lang, 2 km N of Rice Lake, *T. occidentalis* conifer swamp, 8.iv.2021, lichenicolous on *I. byssaceum* on *T. occidentalis*, *S.R. Brinker 8726* (hb. Brinker); 14 km S of Gooderham, 2.5 km NW of Catchacoma Lake, conifer swamp with *T. occidentalis*, *A. balsamea*, *F. nigra* and *B. alleghaniensis*, 1.ix.2021, lichenicolous on *I. byssaceum* on *P. balsamifera*, *S.R. Brinker 9014* (CANL). THUNDER BAY DIST.: Sleeping Giant Provincial Park, Gardner Lake Trail area N of Otter Lake, old-growth mixed boreal forest with *T. occidentalis*, *B. papyrifera* and *P. balsamifera*, 7.ix.2019, lichenicolous on *I. byssaceum* on bark of *T. occidentalis*, *S.R. Brinker 8103B* (CANL).

†*Chaenothecopsis rubescens* Vain.

FIGURE 9E.

In North America *Chaenothecopsis rubescens* is mainly restricted to oceanic regions of the Acadian Forest, the Appalachian Mountains, the Ozark Highlands, and montane areas of the Northwest (Harris & Ladd 2005, Selva 2014, 2016). It occurs rarely in the Great Lakes Basin having been previously reported from Michigan (Tibell 1975). Although not explicitly reported as occurring in Ontario in the published literature, mention of *C. rubescens* was made in an unpublished report by Selva and Lee (2005) from the Snye Road northern white cedar stand in Lanark County. The collections cited here represent the first published records for Ontario and add to its known range in the province.

The species is characterized by its epruinose apothecia that are K+ red, its simple, brown ascospores measuring 5.5–9 × 2.5–3.5 μm, and the association with *Trentepohlia*, or *Trentepohlia*-associated lichens, namely *Inoderma byssaceum* (Selva 2014). The specimens cited here were lichenicolous on *I. byssaceum* on *Thuja occidentalis* in mature conifer swamp habitat.

*Specimens examined.* – CANADA. ONTARIO. FRONTENAC CO.: 9 km NE of Plevna, 4.5 km W of Ompah, 800 metres E of Mosque Lake, mature mixed swamp with *Thuja occidentalis*, *Fraxinus nigra* and *Abies balsamea*, 12.ix.2020, lichenicolous on *Inoderma byssaceum* on *T. occidentalis*, S.R. Brinker 8563A (CANL, hb. Brinker). HASTINGS CO.: Conroys Marsh Conservation Reserve, 10 km S of Combermere, conifer swamp with *T. occidentalis*, *A. balsamea* and *P. glauca*, 22.vii.2022, lichenicolous on *I. byssaceum* on *T. occidentalis*, S.R. Brinker 9469 (hb. Brinker).

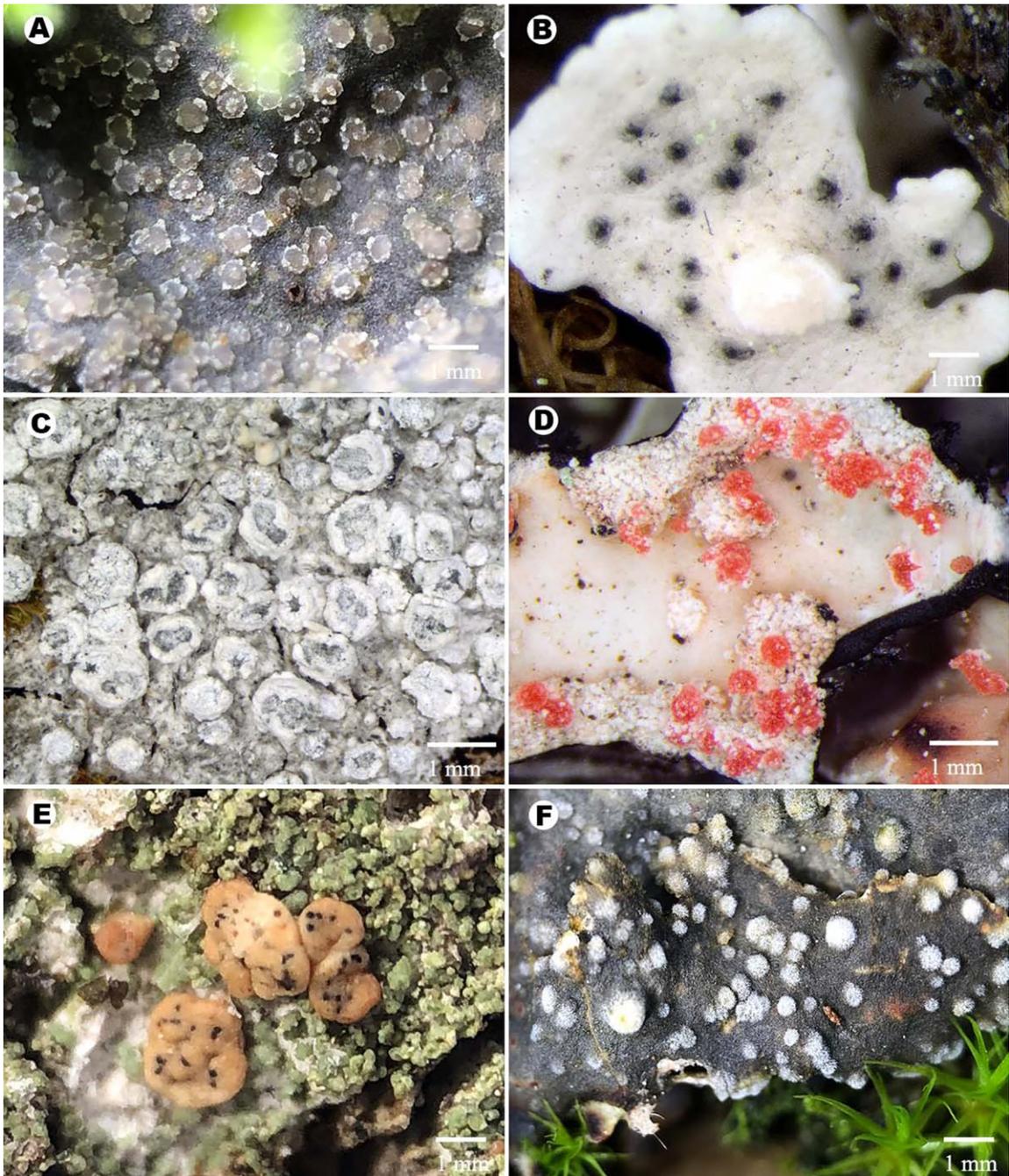
*Cladonia dimorphoclada* Robbins

FIGURE 9F.

*Cladonia dimorphoclada* is widely distributed in eastern North America from Maine south to Florida and west to Wisconsin, Missouri and Arkansas (Ahti 1973). Throughout the region it occurs on exposed or partly shaded acidic sandy soil (Brodo et al. 2001). Previous reports of the species from Ontario are from Frontenac County (Wong & Brodo 1973, as *C. caroliniana* Tuck.) and the Melon Lake area of Lennox and Addington County (Wong & Brodo 1990). The records reported here extend its range northward to the Lake Huron Basin where the species appears to be rare and restricted to southern portions of exposed Precambrian granitic outcrops.

The cushion-forming tendency of the species with its prostrate, yellow-green (usnic acid) irregularly-branched, corticate podetia make it recognizable in the field along with its chemistry (KC+ yellow, UV-) (Lendemer & Noell 2018). The inner podetial walls (stereome) are composed of long cartilaginous strands or cords (Hinds & Hinds 2007). In the study area, the only other species of *Cladonia* likely to be confused with *C. dimorphoclada* is *C. uncialis* (L.) F. H. Wigg. *Cladonia uncialis* differs in having erect, more richly branched and inflated podetia that have abundant white maculae near the tips, inner podetial walls that are solid and smooth and sometimes pruinose, and in its chemistry, often producing squamatic acid (UV+ blue-white) in addition to usnic acid (Brodo et al. 2001, Lendemer & Noell 2018).

*Specimens examined.* – CANADA. ONTARIO. LENNOX & ADDINGTON CO.: Puzzle Lake Provincial Park, N shore of Puzzle Lake, 500 metres E of Gull Lake, open granitic rock outcrop above shoreline bordering edge of upland mixed rocky woods with *Pinus strobus* and *Quercus alba*, 10.x.2019, on shallow soil over bedrock, S.R. Brinker 8267 & H. Pacheco (CANL); Sheffield Conservation Area E of Mellon Lake, 9.5 km S of Kaladar, S-facing granitic outcrop with scattered *Juniperus communis*, *Q. rubra* and *Deschampsia flexuosa*, 5.v.2022, terricolous over bare granitic bedrock, S.R. Brinker 9334 (NY, hb. Brinker; conf. J.C. Lendemer). MUSKOKA DIST.: Six Mile Channel along White Falls Rd. W of Big Chute, granite barren with *P. strobus*, *Q. rubra* and *J. communis*, 19.x.2019, terricolous on bare granitic ridge, S.R. Brinker 8285 (CANL). PETERBOROUGH CO.: 24 km N of Havelock, 2 km E of Connor Bay, Kashabog Lake, extensive granitic outcrop with scattered *P. strobus* and *Q. rubra*, 6.v.2022, S.R. Brinker 9337 (hb. Brinker).



**Figure 10.** Photographs of lichens and allied fungi rarely reported from Ontario. **A**, *Corticifraga fuckelii* on *Peltigera* (photo taken in situ, Brinker 8863). **B**, *Didymocyrtis cladoniicola* on *Cladonia squamules* (Brinker 9231B). **C**, *Lepra panyrga* (Brinker 3564). **D**, *Marchandiomyces corallinus* on *Parmelia* (Brinker 9176). **E**, *Muellerella hospitans* on *Bacidia rubella* (photo taken in situ, Brinker 7392A). **F**, *Refractohilum peltigerae* on *Peltigera* (photo taken in situ, Brinker 8564).

†*Corticifraga fuckelii* (Rehm) D. Hawksw. & R. Sant.

FIGURE 10A.

There are few North America reports of this species, suggesting it is either rare or overlooked, and they are mainly from cool-temperate and montane regions. Reports exist from Alberta (Goffinet 1994), British Columbia (Goward & Ahti 1992, Noble et al. 1987, as *Phragmonevia fuckelii* Rehm), Nunavut (Alstrup 2004), and a single record has been published from Mexico (Ertz 2004b). A CNALH search (accessed 01, December 2020) revealed several additional specimens from Québec, Pennsylvania, and Vermont. In Ontario, this species was known only from a single historical collection made in Simcoe County in 1953 (Hawksworth & Santesson 1990). The collections reported here are the first modern records from the Great Lakes Basin. *Corticifraga fuckelii* can be identified by its restriction to host thalli of *Peltigera*, nearly colourless to pale to brown, immersed, immarginate ascomata that are 0.2–0.5 mm in diameter, interascal filaments with a colourless end cell, a K/I–hymenium and asci, and two-celled, smooth ascospores, that measure 12–16 × 4–6 µm (Hawksworth 1980, as *P. fuckelii*; Ilhen & Wedin 2008).

*Specimens examined.* – CANADA. ONTARIO. FRONTENAC CO.: Shawenegog Lake area, 10 km E of Upper Mazinaw Lake, 8 km SW of Plevna, open coniferous swamp with *Thuja occidentalis*, *Betula alleghaniensis*, *Abies balsamea* and *Acer spicatum* surrounded by upland deciduous forest, 14.vii.2021, lichenicolous on thallus of *Peltigera evansiana* on mossy log, S.R. Brinker 8863 & G. Cameron (hb. Brinker). LENNOX & ADDINGTON CO.: Mount Moriah Conservation Reserve, 22.5 km NNE of Madoc, upland rocky deciduous forest with *Acer saccharum*, *Tilia americana* and *Ostrya virginiana*, 14.vii.2022, lichenicolous on *P. evansiana* on mossy rock outcrop, S.R. Brinker 9397 (CANL).

†*Didymocyrtis cladoniicola* (Diederich, Kocourk. & Etayo) Ertz & Diederich

FIGURE 10B.

*Didymocyrtis cladoniicola* is a lichenicolous coelomycete that was described from Minnesota (Diederich et al. 2007, as *Phoma cladoniicola* Diederich, Kocourk. & Etayo) and has subsequently been reported from Alabama (England et al. 2019) but appears to be widespread in eastern North America based on collections in CNALH (21 December 2021). It was previously reported from one location in Ontario by Brodo et al. (2013). The collections reported here are additional records from new areas of the province.

The species produces tiny black immersed pycnidia on host thalli (Fig. 10B), causing bleaching of the infected hosts, which include members of many genera such as *Cladonia*, *Ramalina*, *Squamarina* and various Parmeliaceae (Ertz et al. 2015). It can be recognized by its host selection, immersed pyriform pycnidia measuring (40–)50–100(–140) µm in diameter and hyaline, ellipsoid conidia measuring (3.8–)4.7–5.9(–7.3) × (2.0–)2.4–3.0(–3.5) µm with a guttule near each apex (Diederich et al. 2007). Another species, *D. foliaceiphila* (Diederich, Kocourk. & Etayo) Ertz & Diederich is also known to infect *Cladonia* species has not been reported from Ontario, though it has been collected nearby in Québec (CNALH 2021) and should be looked for. It can be distinguished from *D. cladoniicola* by the conidia which are more narrowly ellipsoid, measuring (5–)6–7(–7.5) × 2–2.5(–3) µm (Hawksworth et al. 2010). The collections reported here were found growing on the upper surface of the basal squamules of *Cladonia*.

*Specimens examined.* – CANADA. ONTARIO. LAMBTON CO.: SE shore of Lake Huron, Pinery Provincial Park, 6 km S of Grand Bend, sandy *Juniperus virginiana* savanna with *Quercus velutina* and *Juniperus communis*, 4.xi.2021, lichenicolous on basal squamules of *Cladonia* sp. among mosses over sand, S.R. Brinker 9231B. PETERBOROUGH CO.: Warsaw Caves Conservation Area, 14 km NW of Norwood, 9.5 km S of Stony Lake, upland *Pinus strobus*, *Thuja occidentalis* and *Abies balsamea* coniferous forest with small openings of Ordovician limestone outcrops, 16.xii.2021, lichenicolous on basal squamules of *Cladonia* sp. on lignum, S.R. Brinker 9204B (CANL); Crowe River Swamp Conservation Reserve, 15 km E of Apsley, lowland mixed forest with *Fraxinus nigra*, *T. occidentalis* and *A. balsamea*, 29.vi.2022, lichenicolous on basal squamules of *Cladonia* sp. on decaying log, S.R. Brinker 9364 (CANL).

*Hypotrachyna revoluta* (Flörke) Hale

Collections of *Hypotrachyna revoluta* from numerous sites in boreal and temperate eastern North America were recently reported by Brinker (2020) (which included the first collections for Ontario) and Lendemer and Allen (2020). Additional records from the Lake Ontario and Lake Erie Basin are provided here. Although considered a locally common species in the southern and central Appalachians, and oceanic areas of the Acadian Forest Region (Lendemer & Allen 2020), it appears to be rare or absent from much of

Ontario (Brinker unpublished data). The collections cited here are noteworthy as the species was not reported from southern Ontario by Wong and Brodo (1992) and thus extend the range of *H. revoluta* in the province south to the Carolinian Zone.

The species can be recognized by its short, ascending secondary lobes, sparse rhizines, and large, subterminal soralia (Lendemer & Allen 2020). It resembles *H. afrorevoluta* (Krog & Swinscow) Krog & Swinscow, which was recently reported for Ontario by Brinker (2020). The latter, however, produces larger thalli and laminal pustules that become erose and usually erode patches of the upper layers of the thallus to reveal the black lower cortex (Lendemer & Allen 2020).

*Specimens examined.* – **CANADA. ONTARIO. MIDDLESEX CO.:** 60 km SW of London, 17.5 km NE of Thamesville, deciduous swamp with *Acer ×freemanii*, *Ulmus americana* and *Cephalanthus occidentalis*, 9.xi.2022, corticolous on bark of fallen *A. ×freemanii*, S.R. Brinker 9685 (hb, Brinker). **NORFOLK CO.:** Backus Woods Natural Area, 12 km W of Turkey Point, 4 km N of Port Rowan, successional thicket with scattered *Juglans nigra* canopy and conifers, 24.ix.2022, corticolous on twigs of *Picea glauca* S.R. Brinker 9596 (hb, Brinker). **NORTHUMBERLAND CO.:** N shore of Lake Ontario, Presqu'île Provincial Park, 4 km S of Brighton, treed sand dune with *Juniperus virginiana*, *Populus deltoides*, *Thuja occidentalis* and *J. communis*, 20.x.2020, corticolous on downed *P. deltoides*, S.R. Brinker 8636 (CANL, hb, Brinker). **PETERBOROUGH CO.:** Crowe River Conservation Reserve 5.5 km ENE of Lasswade, mature mixed swamp with *A. ×freemanii*, *T. occidentalis*, *Fraxinus pennsylvanica*, *Abies balsamea* and *Betula alleghaniensis*, 28.ix.2022, corticolous on twigs of *A. balsamea*, S.R. Brinker 9610 with *A. Smith*, (hb, Brinker).

#### ***Lepra panyrga* (Ach.) Hafellner**

#### **FIGURE 10C.**

*Lepra panyrga* is a circumpolar arctic-alpine species that grows over soil or less frequently on rocks, occurring in North America from Alaska east to Newfoundland and locally south in alpine zones of New England and the Rocky Mountains (Brodo et al. 2001, as *Pertusaria panyrga* (Ach.) Mass.). It was previously known in Ontario from a single collection from Cape Henrietta Maria on James Bay (Dibben 1980, as *P. panyrga*). The record cited below is only the second from the study area where it was collected from maritime tundra on Hudson Bay. It is recognizable by its isidiate to warty thallus with apothecia that are dark, sunken, and covered with grey pruina bordered by a lacerate margin, ascospores that are one per ascus, 90–200 × 35–80 µm, and the absence of positive spot tests (McCune 2017).

*Specimen examined.* – **CANADA. ONTARIO. KENORA DIST.:** Niskibi Cape, 53 km NW of Fort Severn, 8.3 km E of Niskibi River, 8 km S of Hudson Bay coast, tundra ridge with *Rhododendron lapponicum*, *Vaccinium vitis-idaea* and *Empetrum nigrum*, 22.vi.2014, S.R. Brinker 3564 (hb, Brinker).

#### **†*Marchandiomyces corallinus* (Roberge) Diederich & D. Hawksw.**

#### **FIGURE 10D.**

This lichenicolous basidiomycete occurs on a wide variety of host lichens and produces abundant pink to orangish-red convex to subglobose sclerotia that are 100–300 µm in diameter (Hawksworth 1979, as *Illosporium corallinum* Roberge; Molina et al. 2005). The sclerotia erupt through the upper cortex of the host, sometimes appearing superficial (Hawksworth 1979). It is widespread in eastern North America with reports from the southern Appalachians and Ozarks north to Minnesota and Maine (Cole & Hawksworth 2001, Diederich 2003). It was previously reported from Ontario from the Halfway Log Dump area of the Upper Bruce Peninsula (Brodo et al. 2013) and was also recently reported nearby in Aylmer, Québec (Brodo et al. 2021). The additional collections reported here suggest the species is likely more common and widespread in Ontario than current records indicate.

*Specimens examined.* – **CANADA. ONTARIO. ALGOMA DIST.:** Montreal River Harbour area, Lake Superior Provincial Park addition, coniferous forest with *Picea glauca*, *Pinus strobus* and *Thuja occidentalis*, 27.vi.2023, lichenicolous on *Parmelia sulcata* on conifer twigs, S.R. Brinker 10015 & C. Robillard (CANL). **LENNOX & ADDINGTON CO.:** Mount Moriah Conservation Reserve, 22.5 km NNE of Madoc, upland rocky deciduous woods with *Quercus rubra*, *Q. alba* and *Acer saccharum*, 15.vi.2022, lichenicolous on *Physcia thomsoniana* on granite boulder, S.R. Brinker 9418 (CANL). **NORFOLK CO.:** Backus Woods Natural Area, 5 km SE of Walsingham, 4 km N of Port Rowan, lowland deciduous woods

along creek in valley with *Alnus glutinosa* and *A. ×freemanii*, 29.i.2023, lichenicolous on *P. millegrana* on bark of *A. ×freemanii*, S.R. Brinker 9730 (CANL). PARRY SOUND DIST.: 16 km W of Algonquin Park, 6 km E of Lake Bernard, small *Larix laricina* and *Picea mariana* treed peatland surrounded by upland mixed forest, 21.x.2021, lichenicolous on *Parmelia squarrosa* on twigs of *L. laricina*, S.R. Brinker 9176 (hb. Brinker). PETERBOROUGH CO.: Darling Wildlife Area, 12 km N of Bewdley, 9 km S of Peterborough, deciduous swamp with *A. ×freemanii*, *Fraxinus pennsylvanica* and *Betula alleghaniensis*, 8.xii.2022, lichenicolous on *Parmelia* sp. on bark of *A. ×freemanii*, S.R. Brinker 9708 (CANL).

†***Muellerella hospitans* Stizenb.**

**FIGURE 10E.**

This species appears to be rare or overlooked in North America with previous reports from Alaska and Minnesota (Cole & Hawksworth 2001, Spribille et al. 2010). In Ontario, there is one previous record from the Upper Bruce Peninsula (Brodo et al. 2013). *Muellerella hospitans* is confined to the apothecia of several species of *Bacidia* and *Biatora* (Cole & Hawksworth 2001, Hawksworth et al. 2010) and can be recognized by the ascospores immersed in the host hymenium, and simple, ellipsoid to subglobose ascospores measuring  $2.5\text{--}3.5(-4) \times (1.5\text{--})2\text{--}2.5$  (Hawksworth et al. 2010). These are the only other reports of the species from Ontario which have so far been restricted to *Bacidia rubella* (Hoffm.) A. Massal.

*Specimens examined.* – **CANADA. ONTARIO.** FRONTENAC CO.: Murphys Point Provincial Park, 13.5 km S of Perth, W of Big Rideau Lake, deciduous swamp with *Fraxinus pennsylvanica* in rocky deciduous forest, 28.iv.2023, lichenicolous on *Bacidia rubella* on *F. pennsylvanica*, S.R. Brinker 9751 (CANL). KENORA DIST.: S shore of Shoal Lake, Elmo Point, 55 km SW of Kenora, lowland deciduous forest with *Acer negundo*, *F. nigra* and *Quercus macrocarpa*, 21.vi.2023, lichenicolous on *B. rubella* apothecia on *F. pennsylvanica*, S.R. Brinker 9946 (CANL). PETERBOROUGH CO.: Squirrel Creek Conservation Area S of Wallace Point Rd. along Otonabee River, deciduous floodplain forest with *Acer ×freemanii*, *F. pennsylvanica* and *Ulmus americana*, 28.ii.2019, lichenicolous on *B. rubella* apothecia on *F. pennsylvanica*, S.R. Brinker 7392A (hb. Brinker); Peterborough County Forest 11.5 km N of Norwood, 6 km W of Round Lake, upland hardwood forest with *Acer saccharum*, *Fraxinus americana* and *Tilia americana*, 4.xi.2022, lichenicolous on *B. rubella* apothecia on *Q. macrocarpa*, S.R. Brinker 9665 (hb. Brinker). RAINY RIVER DIST. Lake of the Woods, Snake Island, 64 km NW of Emo, rich lowland deciduous forest with *F. pennsylvanica*, *U. americana* and *A. negundo*, 17.vi.2023, lichenicolous on *B. rubella* apothecia on *F. pennsylvanica*, S.R. Brinker 9889 (CANL).

†***Refractohilum peltigerae* (Keissler) D. Hawksw.**

**FIGURE 10F.**

This peltigericolous hyphomycete is apparently either very rare or overlooked in North America, with reports from British Columbia (Alstrup & Cole 1998, Goward & Ahti 1992, Noble et al. 1987) and a single report from Ontario (Brodo et al. 2013). Given the lack of published records, the North American distribution is still too poorly known to map. It is a conidial hyphomycete confined to species of *Peltigera* Willd. (Hawksworth 1977). The collections reported here were from humid, productive forests with a cedar component where it grew on the thallus lobes of *Peltigera evansiana* Gyelnik.

*Refractohilum peltigerae* can be identified by its occurrence on *Peltigera*, the formation of reddish-brown gall-like swellings 0.5–5.0 mm wide on the host thallus, and simple, obpyriform to cymbiform hyaline conidia that measure  $15\text{--}25 \times 6\text{--}9 \mu\text{m}$  and are produced on exposed conidiophores that appear as tiny whitish hairs over the surface of the galls (Hawksworth 1977, 1980; Ilhen & Wedin 2008). It is most likely to be confused with *Hawksworthiana peltigericola* (D. Hawksw.) U. Braun, a species inducing similar galls with tiny whitish hairs on *Peltigera*. *Refractohilum peltigerae* can be distinguished by its production of annelidic conidiogenous cells, consistently aseptate conidia with a smaller length:width ratio, and longer and narrower conidiophores (Diederich 2004b).

*Specimens examined.* – **CANADA. ONTARIO.** BRUCE CO.: W side of Georgian Bay, Dyer's Bay, 28 km SE of Tobermory, *Populus tremuloides* – *Thuja occidentalis* – *Betula papyrifera* mixed upland forest over Silurian dolomite with local outcrops, 14.ix.2021, lichenicolous on *Peltigera* sp. on mossy limestone bedrock, S.R. Brinker 9072 (CANL). FRONTENAC CO.: 9 km NE of Plevna, 4.5 km W of Ompah, 800 m E of Mosque Lake, mature mixed swamp with *T. occidentalis*, *Fraxinus nigra* and *Abies balsamea*, 12.ix.2020, lichenicolous on thallus of *P. evansiana* on mossy log, S.R. Brinker 8564 (CANL).

hb. Brinker; conf. D. Hawksworth from photographs); Shawenegog Lake area, 10 km E of Upper Mazinaw Lake, 8 km SW of Plevna, open coniferous swamp with *T. occidentalis*, *Betula alleghaniensis*, *A. balsamea* and *Acer spicatum* surrounded by upland deciduous forest, 14.vii.2021, lichenicolous on *P. evansiana* on mossy log, S.R. Brinker 8859 (hb. Brinker).

#### ***Reichlingia leopoldii* Diederich & Scheid.**

#### **FIGURE 11A.**

This species was recently collected for the first time in North America from Ontario in Sleeping Giant Provincial Park in the Thunder Bay District (McMullin et al. in prep.) and is not currently on the North America checklist (Esslinger 2021). Until now, its range included portions of Austria, Germany, Great Britain, Lithuania, Luxembourg, Netherlands, Poland, Slovakia and Switzerland (Aptroot 2010, Diederich & Scheidegger 1996, Kukwa 2004, Malíček et al 2014, Motiejūnaitė & Andersson 2003) where it occurs on bark in old-growth forests or on dry calcareous rock walls and underhangs or in crevices. These additional records expand the distributional range of the species significantly to include eastern North America and suggest it may not have been searched for where suitable habitat exists outside its previously understood range. The collections reported here, which include both saxicolous and corticolous material, are noteworthy in that they were from locally humid cedar-dominated woods in a forested valley with extensive limestone exposures, and a coastal forest adjacent to Lake Huron.

*Reichlingia leopoldii* was originally described as a lichenicolous fungus on an unidentified trentepohlioid-containing lichen (Diederich & Scheidegger 1996) though is now treated as a lichenized hyphomycete (e.g., Cannon et al. 2020b). It can be identified by the grey-olive to grey-blue, loosely felt-like thallus with a distinct zonate margin lacking apothecia, dark brown sporodochia occurring in large irregular patches, with multicellular, branched, verrucose conidia constricted at the septa, and a chemistry of 2'-O-methylperlatolic acid and perlatolic acid (Cannon et al. 2020b, Diederich & Scheidegger 1996). The felt-like, blue-green thallus resembles species of *Lepraria* but is distinctive in producing brown conidia on the thallus surface and in having a trentepohlioid photobiont, in addition to its chemistry.

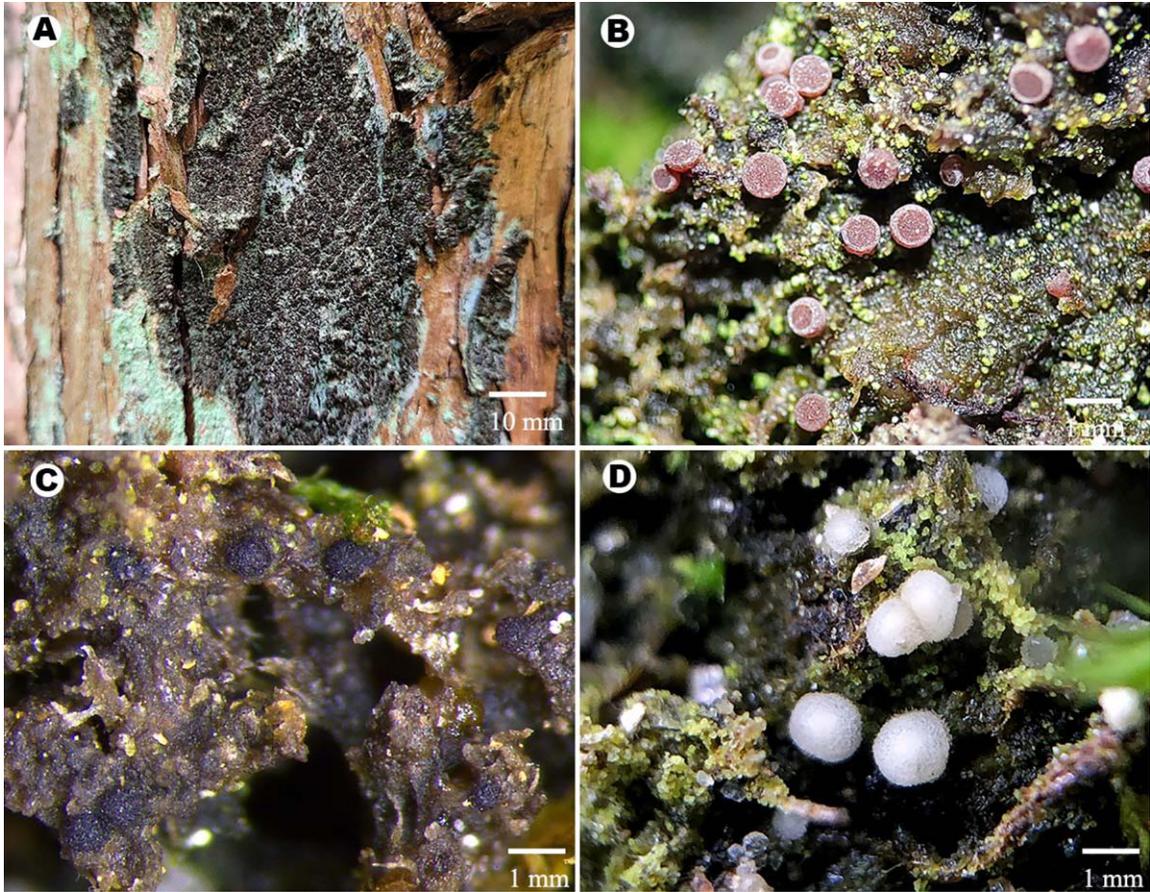
*Specimens examined.* – **CANADA. ONTARIO.** BRUCE CO.: E shore of Lake Huron, 2.5 km S of Pike Bay, coniferous forest with *Thuja occidentalis*, *Abies balsamea* and *Populus tremuloides*, 15.ix.2021, corticolous on *T. occidentalis*, S.R. Brinker 9081 (CANL, hb. Brinker). PETERBOROUGH CO.: Warsaw Caves Conservation Area off Limestone Plains Trail, 12 km E of Lakefield, *T. occidentalis*-dominated coniferous forest with numerous moss-covered limestone boulders and outcrops, 5.v.2020, saxicolous on limestone and overgrowing *Lepraria finkii*, S.R. Brinker 8374 (hb. Brinker, LUX; conf. P. Diederich).

#### ***Sarcosagium campestre* (Fr.) Poetsch & Schiedem.**

#### **FIGURE 11B.**

*Sarcosagium campestre* is widespread but likely overlooked throughout its North American range, with scattered collections from Alaska, Illinois, Massachusetts, New Brunswick, New Jersey, and Québec (Thomson 1997). In Ontario, the taxon was formerly known from Renfrew County where it was collected on soil over moss in 1986 at Black Donald Lake (Wong & Brodo 1990). The collections reported here are new for their respective regions in the province. It is an ephemeral species of disturbance-maintained habitat appearing during suitably mild and moist conditions on base-rich or acidic consolidated soil and mosses often contaminated with lead or zinc (Cuny et al. 2004, Plantlife 2012), or less frequently on wood, bones, and antlers (Thomson 1997). Its preference for substrates that accumulate heavy metals coupled with the ephemeral nature presumably contributes to the scarcity of collections.

During the present study *Sarcosagium campestre* was found while searching around galvanized electric transmission pylons known for their development of zinc-rich soil (e.g., Buck et al. 1999). The presence of a characteristic lichen flora on metal-enriched soils under electric transmission lines in the Ottawa region was first documented by Brodo (2001) who discovered *Vezdaea leprosa* (P. James) Vězda, *V. acicularis* Coppins and *Steinia geophana* (Nyl.) Stein. *Sarcosagium campestre* can be added to the heavy-metal tolerant lichen community that spontaneously develops in response to elevated levels of zinc in the soil under galvanized metal electric transmission towers. The habitat has hardly been explored in the province, warranting further assessment. The record from Ottawa appears to be new to that region (Brodo et al. 2021).



**Figure 11.** Photographs of lichens rarely reported from Ontario. **A**, *Reichlingia leopoldii* on bark of *Thuja occidentalis* (photo taken in situ, Brinker 9081). **B**, *Sarcosagium campestre* (Brinker 9142). **C**, *Steinia geophana* (Brinker 9297). **D**, *Vezdaea acicularis* (photo taken in situ, Brinker 8583).

*Sarcosagium campestre* can be recognized by its thin, gelatinous, greenish thallus granules when wet, pale red-brown 0.1–0.3 mm diameter apothecia which are translucent when wet, its I+ blue hymenium and hypothecium and polysporous asci which produce simple or occasionally two-celled ellipsoid ascospores that measure 5–8 × 2–2.3 μm (Brodo et al. 2001, Gilbert & Purvis 2009).

*Specimens examined.* – **CANADA. ONTARIO. CITY OF OTTAWA.**: Stony Swamp off Old Richmond Rd., 3.5 km S of Bells Corners, exposed sandstone flatrock under electric transmission line with *Juniperus communis*, *Frangula alnus*, *Solidago nemoralis*, *Fragaria virginiana* and *Danthonia spicata*, 10.x.2021, on moss over sandstone flatrock, S.R. Brinker 9142 (CANL, NY, hb. Brinker). **PETERBOROUGH CO.**: 9.5 km SW of Havelock N of Norwood, successional old-field along esker under electric transmission line, 19.x.2021, on moss over sand under galvanized pylon, S.R. Brinker 9170 (CANL).

***Steinia geophana* (Nyl.) Stein**

**FIGURE 11C.**

*Steinia geophana* is widespread in North America with records from temperate regions of the East (e.g., Buck et al. 1999, Curtis 2019, Fryday et al. 2001) and scattered records in central and western regions including Arizona (Hafellner 2004), British Columbia (Otto & Ahti 1967), Colorado and South Dakota (McCune 2017). It occurs ephemerally on periodically damp, disturbed soil, decaying wood, vegetation, or over mosses, often polluted by heavy metals (Fletcher et al. 2009). It is very inconspicuous and known in the study area from a single report under a galvanized metal electric transmission pylon (Brodo 2001). The

additional specimens cited below are the only other collections from the province and were similarly found under galvanized towers, two of which were through extensive gneissic rock outcrops.

The species is readily distinguished by its tiny, black, stalked ascomata, multisporous asci with 12 to 16 simple, globose ascospores that measure 5–7  $\mu\text{m}$  in diameter (Hafellner 2004, McCune 2017). Additional records should be expected in the Great Lakes Basin with further searching of similar habitat.

*Specimens examined.* – **CANADA. ONTARIO.** FRONTENAC CO.: Kaladar Jack Pine Barrens Conservation Reserve, along Trans Canada Highway, 7.5 km SW of Kaladar, open acidic rock barren under electric transmission corridor, 14.xi.2021, on mosses under galvanized pylon over bedrock, *S.R. Brinker* 9297 (CANL, hb. Brinker). LENNOX & ADDINGTON CO.: 17 km N of Actinolite, 6 km S of Lingham Lake, exposed granite under electric transmission corridor, 14.vii.2022, on mosses and detritus under galvanized pylon over bedrock, *S.R. Brinker* 9391 (CANL). PETERBOROUGH CO.: Peterborough County Forest 16 km N of Norwood, 7.5 km E of White Lake, open meadow with scattered limestone boulders under managed electric transmission corridor through upland mixed forest, 04.xi.2022, on mosses under galvanized pylon, *S.R. Brinker* 9664 (CANL).

### *Veizdaea acicularis* Coppins

### FIGURE 11D.

This species may be uncommon but is more likely overlooked throughout its North American range which currently includes portions of Alaska, Maine, North Carolina, and Québec, and mainly from substrates contaminated with heavy metals, particularly lead and zinc (Brodo 2001, Buck et al. 1999, Medeiros et al. 2014, Zhurbenko & Laursen 2003). Species of *Veizdaea* are easily unnoticed due to their small size and seasonal development of apothecia which are short lived (Gilbert 1980).

*Veizdaea acicularis* was previously reported from Ontario from a single locality on the Bruce Peninsula where material was collected from upturned soil at the base of a fallen tree (Brodo et al. 2013). Collections of *V. acicularis* during the present study were made from three additional regions of the province and were from compacted sand along a trail through a treed gneissic outcrop and overgrowing mosses under galvanized metal electric transmission pylons. It is the only North America species of *Veizdaea* with multi-celled, needle-like ascospores (Lendemer 2011b).

*Specimens examined.* – **CANADA. ONTARIO. CITY OF OTTAWA:** Anderson Rd., 13 km S of Ottawa River, 10 km SSW of Orleans, moist sandy meadow underneath electric transmission corridor, 13.xi.2021, on mosses, *S.R. Brinker* 9295 (CANL). FRONTENAC CO.: Kaladar Jack Pine Barrens Conservation Reserve, 13 km W of Sheffield Long Lake, 7.5 km NE of Kaladar, extensive ridge and valley gneiss outcrops with upland mixed woods and open barrens and lowland palustrine wetlands, 14.xi.2021, on mosses under electric transmission pylon over bedrock, *S.R. Brinker* 9296 (CANL). LENNOX & ADDINGTON CO.: 17 km N of Actinolite, 6 km S of Lingham Lake, exposed granite under galvanized metal pylon, 14.vii.2022, over moribund bryophytes over bedrock, *S.R. Brinker* 9390 (hb. Brinker). PETERBOROUGH CO.: Kawartha Highlands Provincial Park, 15 km N of Buckhorn, 1.5 km NW of Tamarack Lake, open deciduous woods on granite ridge with *Quercus rubra* and *Acer rubrum*, 27.ix.2020, on compacted acidic sand along trail, *S.R. Brinker* 8583 (CANL, hb. Brinker).

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