

# Biodiversity and ecology of lichens of Kenai Fjords National Park, Alaska

Bruce McCune<sup>1\*</sup>, Ulf Arup<sup>2</sup>, Othmar Breuss<sup>3</sup>, Elisa Di Meglio<sup>1</sup>, Joseph Di Meglio<sup>1</sup>, Theodore L. Esslinger<sup>4</sup>, Jolanta Miadlikowska<sup>5</sup>, Amy E. Miller<sup>6</sup>, Roger Rosentreter<sup>7</sup>, Matthias Schultz<sup>8</sup>, John Sheard<sup>9</sup>, Tor Tønsberg<sup>10</sup> & James Walton<sup>6</sup>

## Article info

Received: 26 Oct. 2019  
Revision received: 2 Apr. 2020  
Accepted: 3 Apr. 2020  
Published: 29 Dec. 2020

## Associate Editor

Martin Kukwa

**Abstract.** We inventoried lichens in Kenai Fjords National Park in Alaska, USA. We assembled the known information on occurrence and ecology of lichens in this park by combining field, herbarium, and literature studies. Our results provide baseline data on lichen occurrence that may be used in resource condition assessments, vulnerability assessments, long-term ecological monitoring, and resource management. We report a total of 616 taxa of lichenized fungi from the Park, plus an additional five subspecies and three varieties, all of which are new additions to the National Park Service database for this park unit. An additional five species of nonlichenized lichenicolous fungi are reported here. Eight non-lichenized fungi that are traditionally treated with lichens are also included, most of these associated with bark of particular host species. Four taxa new to North America are reported here (*Arctomia delicatula* var. *acutior*, *Aspicilia dudinensis*, *Myriospora myochroa*, and *Ochrolechia bahusiensis*), along with 44 species new to Alaska. Numerous species have been confirmed using ITS barcoding sequences. Also several records assigned to the genus level are reported, many of those are likely new species.

**Key words:** biological inventory, Kenai Peninsula, lichenized fungi, North America

## Introduction

Lichens are a major component of the biodiversity and function of high latitude ecosystems. Lichens are highly sensitive to environmental conditions, including airborne contaminants, substrate chemistry, and climate (Root et al. 2014). Such attributes make them useful indicators of species richness (Bergamini et al. 2005) and air quality, including the estimation of critical loads (Geiser

& Neitlich 2007; Geiser et al. 2010). Although an ecologically important and conspicuous component of the vegetation in Alaska (e.g., Joly et al. 2003; Nelson et al. 2013, 2015), lichens are a poorly known component of Kenai Fjords National Park (KEFJ or ‘Kenai Fjords’). Located in the northern Gulf of Alaska, in western Prince William Sound, this park is managed by the National Park Service (NPS). Ecosystems in this region of south-central Alaska face an uncertain future of climate change effects, including effects on forest and riparian health (Werner et al. 2006; Ruess et al. 2009; Sherriff et al. 2011) and potential new resource development (Montgomery et al. 2003; Szumigala et al. 2010; Hite & Stone 2013). In Kenai Fjords, gold was discovered in 1918 in areas that would later become park land (Lanik et al. 2018). Mining activity, centered primarily on the Nuka Bay historic mining district, peaked in the 1930s (Richter 1970). The effects of mining are still felt today, and include both the mitigation of abandoned mines on park land, and the potential for future mineral development on non-federally owned lands (inholdings) within the park (Lanik et al. 2018). Documenting biodiversity is a first step in conserving biodiversity. This was the goal of this first comprehensive inventory of the lichens of Kenai Fjords.

<sup>1</sup> Department of Botany and Plant Pathology, Cordley 2082, Oregon State University, Corvallis, Oregon 97331 USA

<sup>2</sup> Botanical Museum, Lund University, Box 117, 221 00 Lund, Sweden

<sup>3</sup> Naturhistorisches Museum Wien, Botanische Abteilung, Burgring 7, A-1010 Austria

<sup>4</sup> North Dakota State University, Dept. of Biological Sciences #2715, PO Box 6050, Fargo, ND 58108 USA

<sup>5</sup> Duke University, Dept. of Biology, Box 90338, Durham, NC 27708 USA

<sup>6</sup> National Park Service, 240 W 5th Ave., Anchorage, Alaska 99501 USA

<sup>7</sup> Biological Sciences, Boise State University, Boise, Idaho 83725 USA

<sup>8</sup> Herbarium Hamburgense, Institute for Plant Science and Microbiology, University of Hamburg, Ohnhorststr. 18, D-22609 Hamburg, Germany

<sup>9</sup> Dept. of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, Saskatchewan S7N 5E2 Canada

<sup>10</sup> Department of Natural History, University Museum, University of Bergen, Allégt. 41, P.O. Box 7800, N-5020 Bergen, Norway

\* Corresponding author e-mail: [mccuneb@oregonstate.edu](mailto:mccuneb@oregonstate.edu)

Krog (1968) sampled intensively in southeast Alaska and extreme western Alaska. She reported many interesting finds from the Aleutian Islands and the Bering Strait region, but made relatively few collections near Kenai Fjords and apparently none within the Park. The nearby sites that she visited were Marathon Mountain, west of Seward (elevations 62–900 m) and Seward, on the east and west sides of Resurrection Bay and in the forested area behind Seward Sanatorium, near sea level (Krog 1968, p. 27). Some of Krog's collections from Alaska have not been accessioned or fully identified, but are stored in Oslo (O; E. Timdal pers. comm. 2016), so at present we cannot provide a full accounting of her specimens from near Seward. A partial database of her collections provided by Einar Timdal, however, shows 17 specimens from Marathon Mountain and 22 specimens from Seward, all macrolichens.

Walton et al. (2014) sampled epiphytic lichens in mature forest stands in Kenai Fjords National Park in 2012 and 2013 at 11, 0.38 ha plots (Appendix 2) using the standard Forest Inventory and Analysis protocol (USDA 2010). In addition, they collected specimens opportunistically in a range of other habitats and on other substrates. Their results have been summarized separately (92 lichen taxa; Walton et al. 2014), and the epiphyte data were included in studies of epiphytic lichen communities in relation to climate (Smith et al. 2017, 2020). We incorporated these plot records into our database and their findings are integrated with ours in this paper.

The most comprehensive studies of lichen diversity near Kenai Fjords National Park are McCune et al. (2018) from Katmai and Lake Clark National Parks, Spribille et al. (2010) from Klondike Gold Rush National Historic Park, and forthcoming studies from Glacier Bay National Park (Spribille et al. 2020). North and east of the study area Stehn et al. (2015) compiled a list of lichens of the Denali National Park region. In addition, Thomson (1984, 1997) included numerous records from the Kenai Peninsula, with some dots on his maps appearing near Seward. Farther south along the coast, Brodo and coauthors have critically examined numerous genera from Haida Gwaii in British Columbia (e.g., Brodo 1995, 2010; Brodo & Ahti 1996; Brodo & Santesson 1997).

We assembled a group of lichenologists to inventory lichens at Kenai Fjords National Park with the goals of (i) expanding the list of species known to occur in the park; (ii) compiling a reference collection of voucher specimens and associated habitat data; and (iii) compiling the associated geospatial data into a geodatabase.

Some of the results of this study have already been reported elsewhere (Fryday & Tønsberg 2015; Tønsberg 2016; Knudsen & Kocourková 2017; McCune 2018; McCune et al. 2019) and more are forthcoming. The purpose of the current publication is to present a comprehensive treatment of the lichens of Kenai Fjords National Park, bridging a gap in our knowledge of the lichen flora in south-central Alaska.

## Study area

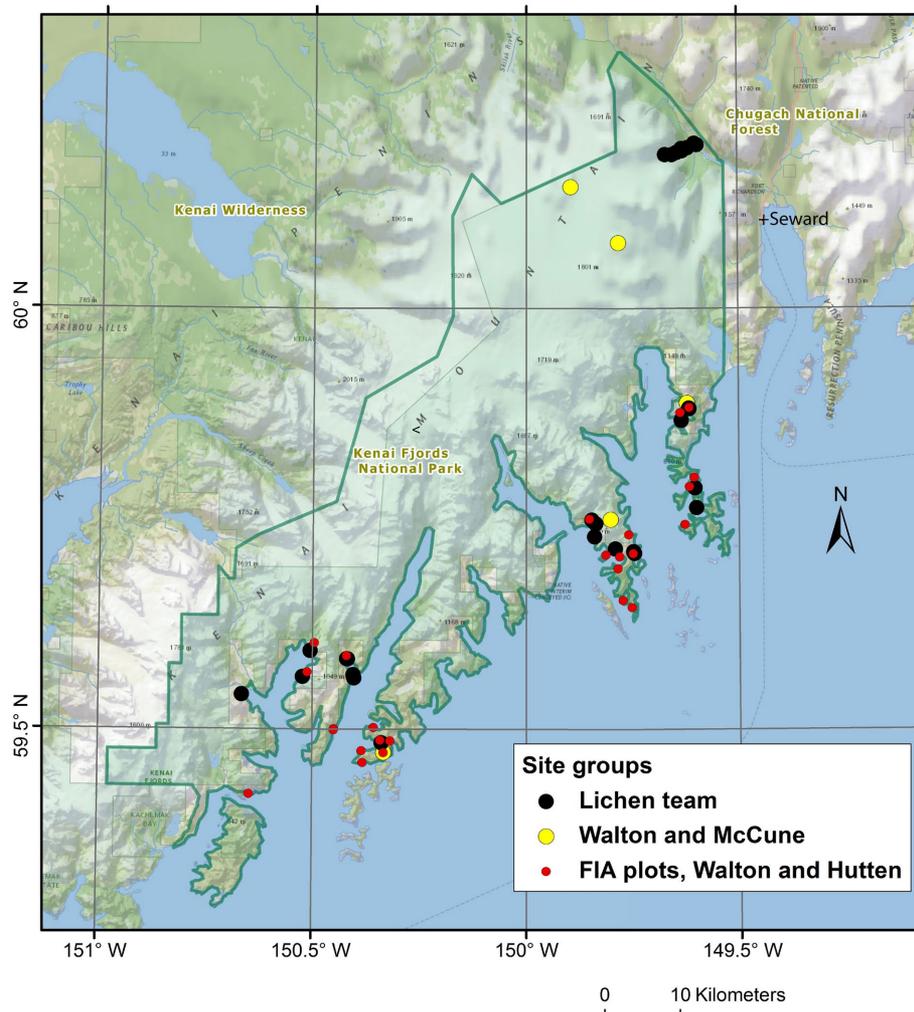
Kenai Fjords National Park (Fig. 1) was established in 1980 through the Alaska National Interest Land Conservation Act (ANILCA) for the purpose of maintaining 'unimpaired the scenic and environmental integrity of the Harding Icefield, its outflowing glaciers, and coastal fjords and islands in their natural state (ANILCA 1980). Situated on Alaska's Kenai Peninsula, the park spans an area reaching from Resurrection Bay in the northeast to the Grewingk-Yalik Glacier Complex in the southwest. The Kenai Mountains form the western boundary of the park, with elevations ranging from sea level to 1996 m.

The climate is subpolar oceanic (Köppen-Geiger climate zone *Cfc*; Peel et al. 2007), implying a temperate climate without a dry season and with a cold summer. Only one long-term weather station exists near the Park, in the town of Seward, near sea level. Mean annual temperature at Seward, Alaska is 2.2°C, and total annual precipitation is 1712 mm (Seward 8 NW, AK, elevation 125 m; 1981–2010; <https://www.ncdc.noaa.gov/cdo-web/datatools/normals>).

The bedrock of Kenai Fjords consists primarily of the Valdez Group, consisting of Upper Cretaceous sandstone, siltstone, shale and minor conglomerate (Lanik et al. 2018). Areas of pillow basalt interbed with clastic sedimentary rocks. The southern and western portion of the park includes the McHugh Complex, consisting late Jurassic to Early Cretaceous rock, including greywacke, conglomerate, basalt, chert, gabbro, ultraplutonic rocks (e.g., granite), and limestone (Lanik et al. 2018). Surficial rocks in the park are dominated by metamorphosed sedimentary and granitic rocks. Calcareous rocks are rare and inaccessible.

The park has experienced three major intervals of glacial expansion in the late Holocene. Glacial advances occurred 3,600 years BP, in 600 A.D., and during the Little Ice Age (1300–1850 A.D.; Calkin et al. 2001). As of 2005, glacier cover in the park was 2,074 km<sup>2</sup>, roughly 1,800 km<sup>2</sup> of which was taken up by the Harding Icefield (Loso et al. 2014).

Recent deglaciation has exposed large areas that have been colonized by tall shrubs, primarily Sitka alder (*Alnus viridis* ssp. *sinuata*) and willow (*Salix sitchensis*) (Boggs et al. 2008). Alpine tundra grows on the higher ice-free ridges, transitioning to ericaceous heaths and *Tsuga mertensiana* krummholz in the subalpine. Towering rock walls along the ocean are cut by steep chutes and fringed with mature Sitka spruce (*Picea sitchensis*) and/or mountain hemlock (*Tsuga mertensiana*), and tall shrubs. Steep-sided glacial valleys penetrate from the mountains to the sea. The cold, wet climate results in *Sphagnum* peatlands at the lower elevations, even on steep slopes underlain by compact till or bedrock. These peatlands cover roughly 1% of the park, but support multiple sedge species (*Carex* spp.), cottongrass (*Eriophorum* spp.), ericaceous shrubs, and woodlands of dwarf *Tsuga mertensiana* or *Picea sitchensis* (Boggs et al. 2008). Low-elevation floodplains and benches are likewise dominated by *P. sitchensis*, *T. mertensiana*, and shrubs, with pockets of balsam



**Figure 1.** Study area showing Kenai Fjords National Park and nearby areas. National Park Service lands are overlaid with light green. The town of Seward is indicated. Black dots indicate clusters of sites visited by the lichen team in 2015. Yellow dots indicate supplemental alpine and subalpine sites visited in 2016. FIA-style epiphytic lichen plots are shown with red dots.

poplar (*Populus balsamifera*) in some riparian areas. The 1964, the Great Alaska Earthquake (magnitude 9.2) resulted in 1.0–2.5 m of subsidence along the Kenai Fjords coastline, along with numerous landslides, widespread flooding and salt water incursion into previously forested areas (Lanik et al. 2018). Dead standing trees (‘ghost forests’) now occupy low-lying areas in the North and West Arm of Nuka Bay (Beauty Bay) and in McCarty Fjord (James Lagoon). Low-elevation mature and old-growth coniferous forest covers roughly 16% of the park, while tall shrubs, primarily alder, occupy roughly one quarter of the landscape (Boggs et al. 2008).

## Materials and methods

We evaluated existing collections by NPS personnel for Kenai Fjords and surroundings; identified habitat and taxon gaps in the data; and conducted field inventories to fill gaps. In addition, we reviewed the existing literature, and to the extent possible, the specimens supporting that literature.

Although Kenai Fjords National Park is close to the city of Anchorage, most of it is inaccessible except by seaworthy boats and helicopter. The area of the Park close

to the town of Seward probably has incidental collections by a number of lichenologists, though we have found only two of these by searching online collection databases. Near the town of Seward, only the Exit Glacier area is within the National Park. Indeed, that is the only area of the park that has frequent visitors.

We used subjective judgment to focus new surveys in areas where high diversity was expected. This method attempts to maximize rapid discovery of species diversity and is relatively cost-effective, but sacrifices park-level quantitative inference. Field observers and laboratory examiners included diverse taxonomic specialists in an effort to maximize the reliability and representativeness of important taxonomic groups. Data sources, including literature and new observations, are summarized in Table 1.

Our sampling design met the following criteria: (i) sampling occurred across an elevation gradient, from sea level to alpine, (ii) sampling occurred in a range of habitats, and (iii) voucher specimens were collected at each site, except for common macrolichens, unless precluded by low population size. Geologic maps, landcover maps and satellite imagery were used to identify accessible areas meeting those criteria.

**Table 1.** Lichen data sources for Kenai Fjords National Park. Numbers of collections include only those identified to species. Appendix 2 lists the number of collections by each collector in the park. No prior records existed in NPLichen and NPSpecies databases (Bennett & Wetmore 2005; IRMA 2017).

Source	Collections	Identified by	Notes
Lichen team, 2015 and 2016	1990	Group	Access database for all new observations transferred to NPS
NPS FIA-style plots and associated incidental observations	382	Walton, Hutten	NPS plot contributions to data set for Smith et al. (2017, 2019); includes primarily epiphytic macrolichens in 0.38 hectare circular plots.
NPS nunatak monitoring (Miller et al. 2006, App. 1)	24	T. Goward & C. Björk	Specimens entered in database, but not seen by us. Vouchers in ALA
Consortium of North American Lichen Herbaria (CNALH)	2	Barbara Lachelt	No prior records with 'Kenai Fjords' in the locality field; two records with 'Exit Glacier' (accessed July 2017)
Totals	2398		

We chose to try to maximize species discovery rates rather than using a fixed area, fixed time, or otherwise equal effort among sites. The tradeoff for that choice is that the rigorous statistical comparisons of diversity are then impossible, because diversity estimates and community statistics are strongly affected by sample area and effort (e.g., McCune & Grace 2002, p. 27). While corrections to equal effort can be attempted, they all require tenuous assumptions with unknown effects on the conclusions.

In 2015, sites at Kenai Fjords (Appendix 1) were visited by boat by McCune, Rosentreter, Schultz, Tønsberg, and Walton. In addition, the team explored the Exit Glacier area near Seward by foot. Each collector focused on particular groups of lichens. Other authors contributed by examining specimens within their specialty. In addition to the sites visited by this group, we include many collections made by Walton and Hutten as part of their preliminary survey of lichens and bryophytes in the Park (Walton et al. 2014).

**Locality information** – Detailed locality information is given for the group sites (Appendix 1) and for specimens of particular interest. Other locality data are available from the first author or the NPS Southwest Alaska Network office in Anchorage (Park abbreviations: Table 2).

**Abundance ratings** – Abundance ratings are based on our experience and limited sampling. Abundance ratings are necessarily subjective and not given when there is little basis for doing so. For example, a single occurrence of an inconspicuous species may represent an overlooked common species or a truly rare species. The more conspicuous a species, the easier it is to state an abundance.

Noteworthy collections are listed individually. When one specimen is cited, all specimens of that species are

cited, unless otherwise noted. When summarized verbally without citing individual specimens, we applied the following frequency classes:

- very common (> 40 collections)
- common (10–40 collections)
- occasional (3–9 collections)
- uncommon to rare (1–2 collections)

Supplemental data such as anatomical details are reported for collections where the additional information may be helpful in either confirming unusual records or where the observations conflict or augment existing descriptions.

Chemistry is reported when thin-layer chromatography (TLC) results were available and the information was considered significant by us, either in separating the species from its relatives, in validating the species report, or in supplementing the known information about a species. In general, TLC protocols followed methods of Culberson & Kristinsson (1970), Culberson (1972), and the later modification by Culberson & Johnson (1982). All three solvent systems were used (A, B' and C) in most cases by Tønsberg. McCune used B' and C for *Lecideaceae* s.l. and *Cladonia*, A and B' for *Umbilicaria*, and A and C for most other genera.

DNA sequences were obtained for selected critical specimens and for many collections in particular groups, especially *Lecideaceae*, *Teloschistaceae*, *Stereocaulon*, and *Umbilicaria*. Various protocols were followed, differing by laboratory, as described in previous publications by various authors of this paper (e.g., Arup et al. 2015; Miadlikowska et al. 2018; McCune et al. 2019).

In each case where we report DNA sequences, the following procedure was generally used (with some variations) to place our specimens into the context of existing sequences. After an initial comparison with existing sequences using BLASTn, we created an alignment containing our new sequences and relevant existing sequences and several outgroup sequences. Sequences were aligned with MAFFT in Geneious (Kearse et al. 2012) using default settings (Auto algorithm selection), then adjusted manually when necessary. We then constructed phylogenetic trees, initially with neighbor joining methods to help refine the selection of sequences, then realignment and maximum likelihood analysis with 500 or 1000 bootstrap runs with the PhyML plugin (Guindon et al. 2010) to Geneious. We used PhyML with default

**Table 2.** Abbreviations of commonly used references.

Abbreviation	Reference
FIA	Forest Inventory and Analysis, plots installed by James Walton and Martin Hutten in 2012
Katmai	Katmai National Park and Preserve
Kenai Fjords	Kenai Fjords National Park
Lake Clark	Lake Clark National Park and Preserve
NPLichen	Database of lichens in the U.S. national parks (www.nbii.gov/nplichen; NPLichen 2011)
NPS	National Park Service

settings and GTR model with optimizations for topology, length, and rate. We considered bootstrap values of 75% or better as a supported branch.

The primary set of voucher specimens is housed at the NPS herbarium in Anchorage and in Fairbanks, Alaska (ALA), with portions of the collection housed at institutional herbaria of the authors while still under study (usually by the collector) or through loan agreements between institutions and the NPS. Individual collections were compiled in a Microsoft Access database that was then imported and archived into the NPS database. These data are available from the NPS on request.

For the most part, generic placement follows the most recent North American checklist (Esslinger 2019). Exceptions include cetrarioid lichens (Divakar et al. 2017) and cases where generic splits are not well supported by the data, insufficiently studied, or where authors have treated only some of the species from our region, making our species difficult to assign to genera in a consistent way. In these incomplete cases, we have retained a broader generic concept. Examples include *Aspicilia* and its segregates *Circinaria* and *Sagedia*, *Lecanora* and its segregates including *Glaucomaria*, *Lecanoropsis*, *Protoparmeliopsis*, and parts of *Teloschistaceae*. *Verrucaria* determinations are by Breuss unless otherwise noted.

In most cases, material identified only to genus or tentatively to genus is omitted from the following list. We do, however, include some relatively distinctive specimens that could not be assigned to species, hoping to improve the chance that they might be included in future treatments of the genus.

## Results and discussion

We recorded a total of 625 taxa of lichenized fungi from within or immediately adjacent to Kenai Fjords National Park (Table 3). This total includes 617 lichenized species, plus an additional five subspecies and three varieties. We did not attempt to represent nonlichenized, lichenicolous fungi, but recorded five of those. An additional eight species are apparently nonlichenized and nonlichenicolous,

**Table 3.** Symbols and number of taxa reported for different kinds of records.

Number of records	Symbol in list	Type of record
616	none	Lichenized, accepted name, accepted record from within or immediately adjacent to Kenai Fjords National Park
5	none	Additional subspecies where two or more from one species
3	none	Additional varieties where two or more from one species
5	†	Nonlichenized, lichenicolous species
8	††	Nonlichenized, nonlichenicolous species, but traditionally treated with lichens
2	?	Uncertain record
2	×	Name valid, but probably not at Kenai Fjords

but traditionally treated with lichens. Four records of lichens are questionable including historical reports where a formerly broad species concept has narrowed substantially, creating uncertainty for existing records from Kenai Fjords.

In addition to the reports from Kenai Fjords, we include in a separate section at the end of the list of taxa, supplemental information for 14 taxa from nearby Katmai and Lake Clark National Parks, beyond that provided by McCune et al. (2018).

One species, *Acarospora toensbergii*, was described from our collections in the study area as new (Knudsen & Kocourková 2017) and two, *Biatora troendelagica* and *Jamesiella scotica*, were reported as new to North America, in previous papers (Tønsberg 2016; Tønsberg & Printzen 2018).

## New to North America

*Arctomia delicatula* var. *acutior*  
*Aspicilia dudinensis*  
*Myriospora myochroa*  
*Ochrolechia bahusiensis*

## New to Alaska

Forty six species are new to Alaska, based on comparison of our results with an unpublished list for Alaska (Spribille et al. in prep.) and other recent publications not included in that compilation.

*Arthonia lapidicola*  
*Arthonia ruana*  
*Aspicilia bertii*  
*Aspicilia intermutans*  
*Aspicilia laevata*  
*Aspicilia simoënsis*  
*Bacidia friesiana*  
*Bacidia scopulicola*  
*Bacidina inundata*  
*Biatora nobilis*  
*Chaenothecopsis debilis*  
*Cliostomum tenerum*  
*Cryptodiscus gloeocapsa*  
*Cryptothele permiscens*  
*Ephebe multisporea*  
*Ephebe solida*  
*Fuscopannaria aurita*  
*Fuscopannaria cheiroloba*  
*Gyalideopsis muscicola*  
*Halecania viridescens*  
*Lecanora aitema*  
*Lecanora stanislai*  
*Lecidea sarcogynoides*  
*Micarea anterior*  
*Micarea botryoides*  
*Moelleropsis nebulosa*  
*Phaeophyscia pusilloides*  
*Porpidia hydrophila*  
*Psilolechia leprosa*

*Pyrenopsis haemalella*  
*Pyrenopsis phaeococca*  
*Pyrenopsis reducta*  
*Pyrenopsis sanguinea*  
*Racodium rupestre*  
*Rhizocarpon bolanderi*  
*Rhizocarpon cinereonigrum*  
*Rhizocarpon intersitum*  
*Rhizocarpon subpostumum*  
*Scytinium aquale*  
*Stenocybe pullatula*  
*Thelotrema petractoides*  
*Thelotrema suecicum*  
*Verrucaria dolosa*  
*Verrucaria floerkeana*

### Rare species in Alaska

Of the 64 lichen species currently listed as ‘rare’ by the Alaska Center for Conservation Science (AKNHP 2015), we found 20% (13) in Kenai Fjords National Park. The list clearly needs to be updated, based on much lichenological work in Alaska since the list was created. No federally listed lichens are present in Alaska, but we presume this reflects the difficulties of the federal listing process for lichens and our lack of information rather than the occurrence of rare lichens (Allen et al. 2019).

### Potential factors influencing lichen biodiversity

Compared to the interior side of the Kenai Peninsula and to Katmai and Lake Clark National Parks, Kenai Fjords has a distinctly oceanic climate and corresponding floristic composition. We recorded a lichen biota with a mix of arctic-alpine, boreal, and coastal elements. The Beringian element, which is evident on the Seward Peninsula and Aleutian Islands (e.g., Krog 1968; McCune 2008), was not found at Kenai Fjords.

Slope bogs with rock outcrops provide a distinctive habitat rich in lichen species. These support *Tsuga mertensiana*, ericaceous shrubs, and *Sphagnum* with boggy slopes and ledges. Moist organic mats are colonized by lichens such as *Dibaeis baeomyces* and many species of *Cladonia*.

Similar to Katmai and Lake Clark National Parks (McCune et al. 2018), alpine sites are species rich, but lack many genera or species associated with interior alpine sites, such as *Dactylina*, *Hypogymnia*, and *Rinodina*.

Nitrophilous species (e.g., *Caloplaca*, *Polycauliona*, and *Xanthoria*) were sparse and very local, presumably associated with manuring by birds and other animals. We also encountered very few calciphiles, owing to the predominantly acidic rocks.

Much of the park has been heavily glaciated; in fact, much of the mountain mass is covered by a continuous ice sheet. The ice is penetrated by a number of nunataks (isolated peaks or ridge surrounded by extensive persistent icefield). Although access to these is very difficult,

we did manage to sample two nunataks, as well as a few other subalpine and alpine sites. Whether or not these modern nunataks were ice free during the last glacial period is unknown. Vegetation sampling on modern nunataks (Miller et al. 2006) revealed a number of rare and disjunct vascular plant species. While that work listed a number of lichen species, it did not attempt a detailed inventory of lichens. In any event, we made an effort to include nunataks because of the possibility that they might be long-term refugia for alpine species. Given the uncertainties in the glacial history of the alpine sites and the small number that we visited, we cannot make firm conclusions regarding the biogeographic importance of nunataks, but we can say that numerous species were found at the alpine sites that were not recorded elsewhere, as described in the list of taxa.

### Annotated list of taxa

The following list of taxa is annotated by substrate, frequency of occurrence, taxonomic notes, and type of record (Table 3).

*Acarospora toensbergii* K. Knudsen & Kocourk. – Exit Glacier Campground, near Exit Glacier Creek, on rock marking path between campsites, *Tønsberg 45624* (holotype), *Schultz 16936*; near Harding Icefield Trail, ridge above Exit Glacier, alpine tundra with scattered low shrubs and metasedimentary outcrops, in rivulet on flushed boulders of metamorphic sedimentary rock, *Schultz 16928f* (HB). See Knudsen & Kocourková (2017).

†† *Agyrium rufum* (Pers.) Fr. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on decorate *Populus* twigs, *McCune 35957*.

*Alectoria nigricans* (Ach.) Nyl. – National Park Service weather station, McArthur Ridge, on alpine sod, *McCune 36984*; rocky alpine tundra northeast of Coleman Bay, on mineral soil, *Walton 19459*; Skilak nunatak within Harding Icefield, on rock, *McCune 36819*, on moss over rock, *McCune 36837b*, *36838*; on alpine sod, northwest slope, *McCune 36846*; Marathon Mt. (Krog 1968).

*Alectoria ochroleuca* (Hoffm.) A. Massal. – National Park Service weather station, McArthur Ridge, on soil, *Walton 19465*; Skilak nunatak within Harding Icefield, on moss over rock, *McCune 36837a*.

*Alectoria sarmentosa* (Ach.) Ach. – Common at low elevations on bark and wood of conifers, also on *Alnus*.

*Allantoparmelia almquistii* (Vainio) Essl. – National Park Service weather station, McArthur Ridge, on rock, *McCune 36953*, *36978*, *Walton 19461*.

*Allantoparmelia alpicola* (Th. Fr.) Essl. – National Park Service weather station, McArthur Ridge, on rock, *Walton 19476*; Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune 36824a*, *36823*, *36877*.

*Ameliella andreaeicola* Fryday & Coppins – Coleman Bay, above northeast end, off Aialik Bay, on thin layer of soil and on *Andreaea* on top of boulder, *Tønsberg 45483*; near Harding Icefield Trail, ridge above Exit Glacier, on *Andreaea* on boulder, *Tønsberg 45590*, *45572* (with *Tingiopsidium isidiatum*), *45571a*.

*Amygdalaria consentiens* (Nyl.) Hertel, Brodo & Mas. Inoue – Alpine lake system on Harris Peninsula, on rock, N-facing talus, *McCune 37000* (unusual in being the stictic acid

- chemotype and in having reddish-brown apothecia; TLC and determination by I. M. Brodo, 2016).
- Amygdalaria continua* Brodo & Hertel – East side of Harris Bay, steep chasm, on granite, *McCune* 36245.
- Amygdalaria elegantiior* (H. Magn.) Hertel & Brodo – Bear Glacier nunatak, on rock, *McCune* 36935; Harding Icefield Trail, lower slope, on rock, *McCune* 36479.
- Amygdalaria haidensis* Brodo & Hertel – East side of Harris Bay, steep chasm, on sheltered granite wall, *McCune* 36254.
- Amygdalaria panaeola* (Ach.) Hertel & Brodo – Harding Icefield Trail, lower slope, on rock, *McCune* 36480; National Park Service weather station, McArthur Ridge, on rock, *McCune* 36969; Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune* 36820.
- Amygdalaria pelobotryon* (Wahlenb.) Norman – Occasional on rock in mesic habitats, often on shorelines.
- Amygdalaria subdissentiens* (Nyl.) Mas. Inoue & Brodo – Alpine lake system on Harris Peninsula, on north-facing rock wall, *McCune* 37006.
- Arctomia delicatula* var. *acutior* (Nyl.) Henssen – Near mouth of creek at north end of James Lagoon, on *Salix alaxensis*, *Schultz* 16836, *Tønberg* 45337; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus*, *McCune* 35948; on sloping trunk of *Alnus incana*, *Tønberg* 44993; on *Alnus incana*, *Schultz* 16697a; north of Exit Glacier Visitor Center, on trunk of *Alnus* in *Populus* grove, *Tønberg* 45056 (with *Toensbergia leucococca*); west shore of Beauty Bay, on wood, *Rosentreter* 19031; Verdant Cove, north side at shoreline, on moss on sloping face of boulder, *Tønberg* 45447 (with *Gyalideopsis muscicola*). Ascospores needle-like, 51–63 × 3.5–4.5 µm, indistinctly 8-celled, no amyloid cap; proper exciple thin, composed of isodiametric cells; hymenium I+ blue. Specimens from (mossy) bark with olivaceous colour and ascospores not exceeding 5 µm in width are formally referred to var. *acutior*. The taxonomic status of this variety and distinction from the typical variety are based on rather subtle differences in thallus colour, ascospore size, and substrate preference (Henssen 1969).
- Arctoparmelia incurva* (Pers.) Hale – National Park Service weather station, McArthur Ridge, on rock, *McCune* 36967, *Walton* 19466.
- Arthonia* spp. – Numerous collections representing species other than those listed below are on loan to Curtis Björk. These collections are from bark of *Alnus*, *Elliottia*, *Oplopanax*, and *Picea*.
- Arthonia arthonioides* (Ach.) A. L. Sm. – Near pond at north end of Three Hole Bay off Aialik Bay, on *Alnus*, *Schultz* 16921c.
- Arthonia lapidicola* (Taylor) Branth & Rostrup – West shore of Beauty Bay, on noncalcareous metasedimentary rock, exposed, *Schultz* 16746a. Ascospores exclusively 2-celled, soleiform, 10–16 × 3.5–4.5 µm, asci broadly clavate, hymenium c. 35 µm high, upper hymenium and excipulum brownish, in KOH turning paler and dirty olive; photobiont chlorococcoid; morphology generally agreeing with published accounts (e.g., *McCune* 2017), though ascospores slightly narrower in this case. New to Alaska.
- Arthonia phaeobaea* (Norman) Norman – North arm of spit across James Lagoon, on rock, boulder on beach, *McCune* 36171, 36172, *Schultz* 16849b, 16847, 16846, 16851a.
- Arthonia ruana* A. Massal. – North of Harris Bay, near opening to Northwestern Lagoon, on *Alnus* bark, *McCune* 36214; North of Pilot Harbor on North Arm of Nuka Bay, on *Alnus* bark, *McCune* 36084.
- † *Arthrorhaphis aeruginosa* R. Sant. & Tønberg – Northeast end of Harris Bay, edge of estuary, on *Cladonia* growing on vertical, ± mossy wall of huge boulder, *Tønberg* 45412.
- Arthrorhaphis alpina* (Schaerer) R. Sant. – Coleman Bay, above northeast end, off Aialik Bay, on the underside of rock, *Rosentreter* 19196.
- Arthrorhaphis citrinella* (Ach.) Poelt – National Park Service weather station, McArthur Ridge, on alpine sod, *McCune* 36961; peninsula into Three Hole Bay off Aialik Bay, on bryophytes over rock, *McCune* 36337; Skilak nunatak within Harding Icefield, on *Placynthiella* and tundra sod, *McCune* 36908 (sterile, ID uncertain).
- Aspicilia aquatica* Körber s.l. – Bay on east side and south end of McCarty Fjord, on granite, coastal rocks, exposed, *Schultz* 16809; Crater Bay off of Harris Bay, on rock, streamside granite, *McCune* 36264; Harding Icefield Trail, lower slope, on shaded rock, *McCune* 36458a.
- Aspicilia bertii* A. Nordin, Tibell & Owe-Larss. – Coleman Bay, above northeast end, off Aialik Bay, on rock, *McCune* 36300a.
- Aspicilia cinerea* (L.) Körber s.l. – Northeast end of Harris Bay, edge of estuary, on rock, *McCune* 36242 (spermatia and ascospores not found).
- Aspicilia dudinensis* (H. Magn.) Oxner – North of Exit Glacier Visitor Center, on rock, semi-shaded boulder, *McCune* 36017. An ITS sequence (GenBank MN906265) places it with *A. dudinensis* from northern Sweden in phylogenetic analysis (T. Wheeler, unpubl. data). This rarely reported species, apparently new to North America, is included in keys by Foucard (2001, p. 81). He described it as follows: ‘Thallus pale to dark gray-brown (K ± yellow), to 10 cm, areolate (to 0.5 mm), very thin, fertile areoles to 0.3 mm thick. Apothecia to 0.5 mm, black with concave disc and dark gray edge. Exciple to 50 µm, I+ dark blue. Hymenium 65–80(–100) µm. Paraphyses moniliform. Spores 15–18 × 8.5–11 µm. On crystalline slate. Torne Lappmark, very rare. Can be recognized by the elevated apothecia with concave disc and with an edge at least on the outside thallus colored.’ Our sequenced specimen has a pale whitish gray thallus that is deeply cracked-areolate, with somewhat raised apothecia like low volcanoes with slightly concave slopes. Fertile areoles have 1–4 blackish disks with a grayish excipular rings. Cortex POL–, medulla POL+, epithecium olive, POL–; paraphyses moniliform, ascospores small for *Aspicilia*, 15–17.5 × 9.5–11 µm, pycnidia not found; TLC: stictic acid (minor).
- Aspicilia gibbosa* (Ach.) A. Nordin, S. Savić & Tibell – Near Harding Icefield Trail en route to high cliffs, on rock, *Rosentreter* 19239.
- Aspicilia* aff. *indissimilis* (H. Magn.) Räsänen – Exit Glacier Campground, near Exit Glacier Creek, on rock, river cobble, *McCune* 36431; north of Exit Glacier Visitor Center, on rock, shaded boulder in woods, *McCune* 36003. ITS sequences for both specimens (GenBank MN906277, MN906264) fell in phylogenetic tree in an unnamed clade near *A. indissimilis* (T. Wheeler, unpubl.).
- Aspicilia* aff. *intermutans* (Nyl.) Arnold – Exit Glacier Campground, near Exit Glacier Creek, on cobble, *McCune* 36432; ascospores too large for *A. cinerea*; spermatia not found; an ITS sequence for this specimen (GenBank MN906278) and for ‘*Aspicilia* cf. *intermutans*’ from Katmai National Park (34103, *McCune* et al. 2018), fell near *Aspicilia epiglypta* in phylogenetic analysis (T. Wheeler, unpubl.).
- Aspicilia laevata* (Ach.) Arnold – Crater Bay off of Harris Bay, on granite, upland, *McCune* 36268.

- Aspicilia simoënsis* Räsänen – Harding Icefield Trail, lower slope, on rock, *McCune 36482* (mature apothecia and spermatia not found; thallus granular sorediate). An ITS sequence places the specimen with *A. simoënsis* in phylogenetic analysis (T. Wheeler, unpubl.).
- Aspilidea myrinii* (Fr.) Hafellner. – Bay on east side and south end of McCarty Fjord, on exposed coastal granite, *Schultz 16813*. Thallus pale grayish-cream, K<sup>+</sup> red needles, epihymenium olivaceous, HCl<sup>+</sup> greenish, ascospores 19–23 × 11–12 µm, apothecia black, immersed, eventually fusing and up to 2 mm, disc then roughened.
- Athallia holocarpa* (Hoffmann) Arup, Frödén & Søchting – Northeast end of Harris Bay, edge of estuary, on rock, *McCune 36228*.
- Athallia pyracea* (Ach.) Arup, Frödén & Søchting – North arm of spit across James Lagoon, on *Picea* twig, *McCune 36160*.
- Bacidia arceutina* (Ach.) Arnold – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana*, *Schultz 16698a* (with *Stenocybe pullatula*).
- Bacidia circumspecta* (Nyl. ex Vainio) Malme – Near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36146*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35977c*.
- Bacidia friesiana* (Hepp) Körber – Near mouth of creek at north end of James Lagoon, on bark, *Rosentreter 19090* (det. McCune); west shore of Beauty Bay, on *Sambucus* in beach meadow, *Tønsberg 45096* (det. Ekman & Tønsberg).
- Bacidia scopulicola* (Nyl.) A. L. Sm. – West shore of Beauty Bay, on noncalcareous metasedimentary rock, steep, shaded, *Schultz 16747*.
- Bacidia subincompta* (Nyl.) Arnold – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus*, *McCune 35952, 35946*; *Schultz 16713*.
- Bacidia* sp. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35977a*. Apothecia reddish-brown to dark brown, emerging from a brown-black gelatinous crust; exciple edge orange brown, radiate, section POL–; epihymenium orange brown, K– or darkening; hypothecium hyaline to faintly brownish; paraphyses sparingly branched; ascospores strongly sigmoid, 7–8-septate, 34–35 × 2.5 µm, spiraled in the ascus; growing with *Stenocybe pullatula* and *Bacidia circumspecta*. The ascospores are much like those of *Scoliciosporum umbrinum* (McCune 2017), but the deep reddish-brown pigments in the apothecia are unlike that species.
- Bacidina inundata* (Fr.) Vězda – North of Pilot Harbor on North Arm of Nuka Bay, on creekside rock, *McCune 36089a*.
- Baeomyces rufus* (Hudson) Rebert. Occasional on moss and soil over rock, stabilized sand, and alpine sod, *Tønsberg 45408, McCune 36995*. TLC: stictic acid with satellites; in one case with *Arthrorhaphis aeruginosa*.
- Bellemeria alpina* (Sommerf.) Clauzade & Cl. Roux – Exit Glacier Campground, near Exit Glacier Creek, on rock, river cobbles, *McCune 36426*; near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36376*.
- Bellemeria cinereorufescens* (Ach.) Clauzade & Cl. Roux – Skilak nunatak within Harding Icefield, on rock, dry talus slope, *McCune 36879*.
- Bellemeria subsorediza* (Lyngé) R. Sant. – Bear Glacier nunatak, on rock, *McCune 36930*; near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36406, Tønsberg 45566, 45570* (TLC: norstictic (major) and conorstictic acids, probable zeorin); Skilak nunatak within Harding Icefield, on rock on ridge, *McCune 36903*.
- Biatora alaskana* Printzen & Tønsberg – West shore of Beauty Bay, on bryophytes on *Alnus*, *McCune 36047* (ITS sequence, GenBank MN906267); near mouth of creek at north end of James Lagoon, on moss on *Salix alaxensis*, *Schultz 16838*. The ITS sequence for *McCune 36047* differs in two and three positions from the two existing sequences for this taxon in GenBank (KF650957, KF650958).
- Biatora albohyalina* (Nyl.) Bagl. & Carestia – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Salix*, *Tønsberg 45020b* (with *Caloplaca atro-sanguinea*); on trunks of *Alnus incana*, *Tønsberg 44926* (pycnidia present but no apothecia; conidia to 56 × 2 µm). North of Exit Glacier Visitor Center, on *Salix*, *Tønsberg 45035, 45036*; on base of *Oplopanax horridus*, *Tønsberg 45041*.
- Biatora beckhausii* (Körber) Tuck. – Near mouth of creek at north end of James Lagoon, on wood, exposed snag, *Schultz 16820*. Thallus whitish; apothecia blackish, strongly convex, exciple distinct below, epihymenium dirty grayish brown, C–; spores needle-like, septate, ~16 × 1.5–2 µm; subhymenium very thick, hyaline; algal cells large.
- Biatora efflorescens* (Hedl.) Räsänen – Occasional on *Alnus* and *Picea*. TLC: argopsin (major), norargopsin.
- Biatora ementiens* (Nyl.) Printzen – Skilak nunatak, on alpine sod in damp depression, *McCune 36854*. The ITS sequence of this blue-gray sterile crust (GenBank MN906282) differed in 12 positions from sequence of *Kanz & Printzen 5440* (BG) (GenBank KF650962). These two specimens comprised a clade with 100% bootstrap support with no supported sister relationships (McCune, maximum likelihood analysis).
- Biatora flavopunctata* (Tønsberg) Hinteregger & Printzen – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus viridis*, *Tønsberg 45608*.
- Biatora hypophaea* Printzen & Tønsberg – Near North Arm Nuka Bay Public Use Cabin, on twigs on *Picea sitchensis* at forest edge, *Tønsberg 45182*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 44958*; north of Exit Glacier Visitor Center, on trunk of *Alnus*, *Tønsberg 45059*. TLC: argopsin.
- Biatora kodiakensis* Printzen & Tønsberg – Common on wood and bark or moss over those substrates.
- Biatora meiocarpa* (Nyl.) Arnold – Near Harding Icefield Trail, ridge above Exit Glacier, on soil in snowbed, *Tønsberg 45579*. TLC: nil; thallus greyish white, apothecia brown; some paraphyses tips strongly thickened; uppermost excipular hyphae with isodiametric cells; ascospores 0–1-septate, 9.5–14.5 × 2.5–5 µm.
- Biatora meiocarpa* var. *tacomensis* (Printzen & Tønsberg) Printzen & Tønsberg – West of Resurrection River and north of Exit Glacier Road, on *Populus balsamifera*, mossy mid trunk, on bark but also creeping onto epiphytic mosses, *Schultz 16959* (ascospores simple, ellipsoid, 11.5–14 × 4–5.5 µm, paraphyses tips distinctly widened, excipular hyphae lumina widened); near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus balsamifera*, *Schultz 16714*.
- Biatora nobilis* Printzen & Tønsberg – Near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36139a*; west shore of Beauty Bay, on *Picea* twig, *McCune 36041*.
- Biatora pallens* (Kullhem) Printzen – West of Resurrection River and north of Exit Glacier Road, on trunk of dead *Alnus incana*, *Tønsberg 45667b*, on live *Alnus*, *Tønsberg 45638a*. Apothecia minute (to 0.2 mm diam.), pale, pruinose, aggregated; ascospores 3-septate, 12–16 × 2–3 µm.

- Biatora rufidula* (Graewe) S. Ekman & Printzen – North arm of spit across James Lagoon, on moss at base of *Picea sitchensis* on exposed knob for the most part surrounded by sea, *Tønsberg 45371*.
- Biatora subduplex* (Nyl.) Printzen – North arm of spit across James Lagoon, on branch of *Picea sitchensis* on exposed knob, *Tønsberg 45357*; peninsula into Three Hole Bay off Aialik Bay, on *Tsuga*, *McCune 36348*; west of Resurrection River and north of Exit Glacier Road, on *Populus* bark, *McCune 36488*, *Schultz 16958d*.
- Biatora toensbergii* Holien & Printzen – Occasional on *Alnus* bark, less often on *Salix*. TLC: argopsin.
- Biatora troendelagica* Holien & Printzen – Peninsula into Three Hole Bay off Aialik Bay, on wood, twig of dwarf *Tsuga mertensiana*, *Tønsberg 45500*; Verdant Cove, north side at shoreline, on wood, snag of *Picea sitchensis*, *Tønsberg 45452*. TLC: divaricatic acid. Recently reported as new to North America (Tønsberg & Printzen 2018).
- Biatora vacciniicola* (Tønsberg) Printzen – Occasional on *Alnus*, less often on *Picea*, floodplains. TLC: gyrophoric acid.
- Biatora vernalis* (L.) Fr. – Peninsula into Three Hole Bay off Aialik Bay, on decaying moss, *Schultz 16914b*. Apothecial section pale throughout, excipular hyphae elongated with  $\pm$  cylindrical hyphae; ascospores simple to 4-celled, narrowly fusiform,  $19.5\text{--}29.5 \times 3.5\text{--}6 \mu\text{m}$ .
- Biatora* sp. 1 – Verdant Cove, north side at shoreline, on bryophytes over rock, *McCune 36281*. The apothecia are similar in appearance to *Mycobilimbia*, including apothecia with a strongly constricted base. Although the ITS sequence (GenBank MN906273) places it in *Biatora*, and a supported sister relationship to a supported clade with *B. chrysantha* and *B. vernalis*, morphologically the specimen does not match those species. The anatomical structure is, however, similar to *B. vernalis* (C. Printzen, pers. comm. 2017). A specimen nearly identical in morphology and anatomy is also known from western Montana (see more detailed description in McCune 2017, vol. 2, p. 80).
- Biatora* sp. 2 – North of Pilot Harbor on North Arm of Nuka Bay, on shoreline rock, *McCune 36068*. The ITS sequence (GenBank MN906269) for this specimen falls in the supported main clade for *Biatora*, but had no supported relationships with other taxa in that clade (McCune, maximum likelihood analysis). The specimen has the general appearance of a *Lecidea* or *Carbonea*, with a dark pigmentation of the apothecia that is unusual for *Biatora*: The apothecia are black with margin soon turned under, and the thallus is thin, gray, and areolate. The upper hymenium is blue green; exciple blue green black throughout with pigment in dense spots; hypothecium dark brown; spores simple,  $12.5\text{--}15 \times 3 \mu\text{m}$ ; apothecial section POL–; hymenium I+ deep blue, medulla I–, exciple I–, tholus I+ blue.
- Biatoridium delitescens* (Arnold) Hafellner – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus*, *Schultz 16712*. Scarce, few strongly convex, seemingly immarginate, pale apothecia among *Fuscopannaria*, asci clavate with gelatinous cap, polysporous, ascospores small, spheroid.
- Bryobilimbia diapensiae* (Th. Fr.) Fryday, Printzen & S. Ekman – Skilak nunatak within Harding Icefield, on dead bryophytes, *McCune 36851*.
- Bryobilimbia hypnorum* (Th. Fr.) Fryday, Printzen & S. Ekman – Near Harding Icefield Trail, ridge above Exit Glacier, on moss over rock, *Schultz 16932b*.
- Bryocaulon divergens* (Ach.) Kärnefelt – National Park Service weather station, McArthur Ridge, on soil and alpine sod, *McCune 36965*, *Walton 19449*.
- Bryoria americana* (Mot.) Holien – Common on bark and wood, mainly of conifers. Most specimens are P+ but some anomalous collections are P–. Both P+ and P– specimens fell in the same strongly supported clade (ITS sequences for P+ specimen *McCune 36048*, and for P– specimens *McCune 36357* and *36135*; GenBank MN906268, MN906275, MN906270) (McCune, maximum likelihood analysis). We include *Alectoria sepiacea* Motyka here, based on Krog collections. The type (O) of that species is from Marathon Mountain near Seward (Brodo & Hawksworth 1977).
- Bryoria bicolor* (Ehrh.) Brodo & D. Hawksw. – Occasional on bark, rock, or moss over bark or rock.
- × *Bryoria capillaris* (Ach.) Brodo & D. Hawksw. Apparently *B. capillaris* s.str. does not occur in North America (Velmala et al. 2014). We refer North American specimens of *B. capillaris* to *B. pseudofuscescens*, as explained under that species.
- Bryoria cervinula* Mot. ex Brodo & D. Hawksw. – Bear Cove, on *Picea sitchensis* branch, *Walton 18261*; Crater Bay North, on *Picea sitchensis* branch, *Walton 18032*. Spot tests for both were K–, KC–, P+ orange-red.
- Bryoria fuscescens* (Gyelnik) Brodo & D. Hawksw. – FIA plot, Square Bay North, on *Picea sitchensis* bole, *Walton 18000*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Schultz 16687*, *Rosentreter 19005*, *19007*; near mouth of creek at north end of James Lagoon, *Rosentreter 19098*.
- Bryoria glabra* (Mot.) Brodo & D. Hawksw. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35966*, *35967*.
- Bryoria pseudofuscescens* (Gyelnik) Brodo & D. Hawksw. – Alectorialic acid chemotype: near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Picea* twigs, *Rosentreter 19016*; west shore of Beauty Bay, on *Picea* bark, *McCune 36049*. According to phylogenetic reconstructions (Velmala et al. 2014) the American *B. capillaris* separates from European *B. capillaris*, with the former reassigned to *B. pikei*. The data of Velmala et al. (2014) show that North American *B. pikei* (including American ‘*B. capillaris*’, *B. pseudofuscescens*, and *B. friabilis*) could all be treated as the same species, showing almost no variation with a 3-locus data set, yet a new species, *B. inactiva*, was described within that clade. A different view that is supported by the data (but not taken by those authors) is that all four belong to a single species, and that the chemotypes might be given taxonomic rank below the species level (e.g., varieties). Here we apply the oldest epithet at the species level among this group of species, *B. pseudofuscescens*, considering *B. friabilis*, *B. pikei*, and American *B. capillaris* to be synonyms. The norstictic acid chemotype normally associated with *B. pseudofuscescens* was not found.
- Bryoria tenuis* (E. Dahl) Brodo & D. Hawksw. – Near mouth of creek at north end of James Lagoon, on wood, conifer snag, *McCune 36134*; west shore of Beauty Bay, on the ground, *Rosentreter 19044*. Assignment of these collections to *B. tenuis* was based purely on morphology. Other specimens with anomalous appearance were sequenced and appear not to belong to *B. tenuis* s.str. (see under *Bryoria* sp. 1 and sp. 2).
- Bryoria trichodes* (Michaux) Brodo & D. Hawksw. – Bear Cove, on *Picea sitchensis* branch, *Walton 18265*.
- Bryoria* sp. 1 (undescribed, section Divaricatae) – North end of Harris Bay, near opening to Northwestern Lagoon, on

- wood, *Picea* snag, *McCune* 36219. The ITS sequence for this collection (GenBank MN906272) falls in a supported clade with ‘*Bryoria* sp.’ from the Komi Peninsula in Russia (HQ402693; Myllys et al. 2011).
- Bryoria* sp. 2** (undescribed, section *Divaricatae*) – West shore of Beauty Bay, on *Picea*, *McCune* 36039, 36058. The ITS sequence for 36039 (GenBank MN906266) forms a supported clade with the combination of ‘*B.* sp. 1 and *B.* sp. 2’ sensu Myllys et al. (2016) applied to a group of six specimens, all from Alaska and British Columbia. Although the ITS sequence for *McCune* 36039 was closest with BLASTn to *Bryoria fruticulosa*, Wang 04-23206 from China (DQ007036; not included in Myllys et al. 2016 but see Wang et al. 2017), the Chinese specimen fell outside the *B. sp1/sp2* clade. Clearly section *Divaricatae* is genetically heterogeneous and geographically widespread. It is under more study by Leena Myllys.
- Buellia aethalea*** (Ach.) Th. Fr. s.l. – Near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune* 36405. Spores not found.
- Buellia coniops*** (Wahlenb.) Th. Fr. (= *Amandinea coniops* (Wahlenb.) M. Choisy ex Scheid. & H. Mayrhofer) – Crater Bay off of Harris Bay, on streamside granite, *McCune* 36262; seashore rocks 1–3 m above high tide line, *Tønsberg* 45444; east side of Harris Bay, steep chasm, on boulder just above high tide line, *McCune* 36252; northeast end of Harris Bay, edge of estuary, on rock, *McCune* 36241; north arm of spit across James Lagoon, on metasedimentary rock, *Schultz* 16852.
- Buellia disciformis*** (Fr.) Mudd – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg* 44980 (TLC: atranorin, trace of unknown), with *Myrionora albidula*; west of Resurrection River and north of Exit Glacier Road, on trunks of *Alnus incana* in swamp, *Tønsberg* 45638a (TLC: atranorin).
- Buellia erubescens*** Arnold – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Schultz* 16692.
- Buellia griseovirens*** (Turner & Borrer ex Sm.) Almb. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg* 44981; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on horizontal face of trunk of leaning *Alnus*, *Tønsberg* 45006; north of Exit Glacier Visitor Center, on trunk of *Alnus* in *Populus*, *Tønsberg* 45051; west of Resurrection River and north of Exit Glacier Road, on trunks of *Alnus incana* in swamp, *Tønsberg* 45648a. TLC: atranorin, norstictic acid.
- Bunodophoron melanocarpum*** (Sw.) Wedin – Near North Arm Nuka Bay Public Use Cabin, on *Picea*, at base of old spruce, shaded, *Schultz* 16805.
- †† ***Caliciopsis calicioides*** (Ell. & Ev.) Fitzp. – West of Resurrection River and north of Exit Glacier Road, on bark, *Populus*, *McCune* 36489.
- Calicium glaucellum*** Ach. – Near mouth of creek at north end of James Lagoon, on wood, conifer snag, *McCune* 36154; west shore of Beauty Bay, on snag, *McCune* 36038, *Schultz* 16757.
- Caloplaca atrosanguinea*** (G. Merr.) Lamb – Common on bark of *Alnus*, *Populus*, and *Salix*.
- Caloplaca borealis*** (Vainio) Poelt – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Tønsberg* 44961; north of Pilot Harbor on North Arm of Nuka Bay, on *Alnus*, *Tønsberg* 45129, 45150.
- Caloplaca exsecuta*** (Nyl.) Dalla Torre & Sarnth. – Exit Glacier Campground, near Exit Glacier Creek, on cobbles, *McCune* 36427.
- Caloplaca litoricola*** Brodo – Bay on east side and south end of McCarty Fjord, on creekside rock, *McCune* 36114; north of Pilot Harbor on North Arm of Nuka Bay, on shoreline rock, *McCune* 36067, *Schultz* 16769; Verdant Cove, north side at shoreline, on rock, splash zone just above high tide line, *McCune* 36285.
- Caloplaca nivalis*** (Körber) Th. Fr. – Harding Icefield Trail, lower slope, on moss over rock, *McCune* 36460.
- Caloplaca sorocarpa*** (Vainio) Zahlbr. – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus viridis*, *Tønsberg* 45612; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Tønsberg* 44960, 44913, 45014; south of Exit Glacier Visitor Center, on *Alnus*, *Tønsberg* 45632; west of Resurrection River and north of Exit Glacier Road, on dead trunk of *Alnus*, *Tønsberg* 56784.
- Caloplaca tornoënsis*** H. Magn. – Harding Icefield Trail, on moss over rock, *Tønsberg* 45574, 45582.
- Calvitimela armeniaca*** (DC.) Hafellner – Skilak nunatak within Harding Icefield, on dry talus, *McCune* 36825. Confirmed with ITS sequence (GenBank MN906274), but spot tests unusual: cortex K+ orange, P–; medulla K–, P–.
- Calvitimela melaleuca*** (Sommerf.) R. Sant. – Skilak nunatak within Harding Icefield, on rock, damp depression, *McCune* 36870. Ascospores not seen but the ITS sequence (GenBank MN906284) fell in a supported clade with three other specimens of *C. melaleuca* (KR303640, KR303641, KR303642) (McCune, maximum likelihood analysis). Note, however, that ITS sequences of *C. melaleuca* specimens fell in two supported clades, as found by Bendiksby et al. (2015).
- Candelariella canadensis*** H. Magn. – Near Harding Icefield Trail, ridge above Exit Glacier, on moss and detritus over rock, *McCune* 36366.
- Candelariella* sp.** – North arm of spit across James Lagoon, on wood, exposed snag of *Picea sitchensis*, *Tønsberg* 45389 in part.
- Carbonea vorticosa*** (Flörke) Hertel – Near pond at north end of Three Hole Bay off Aialik Bay, on shoreline boulders, *McCune* 36352.
- Carbonea* sp. 1** – East side of Harris Bay, steep chasm, on rock, sheltered granite wall, *McCune* 36253. Distinct thallus, beige, areolate; epitecium bluegreen black, K–; exciple very dark, blue green black, K–; hypothecium dark violet brown, K+ violet (strong); thallus spot tests negative but UV+ weakly whitish; medulla I–; ascospores narrowly ellipsoid, 13–14 × 3.2–4.2 µm.
- Carbonea* sp. 2** – National Park Service weather station, McArthur Ridge, apparently parasitizing the parasitic lichen *Miriquidica instrata* (*McCune* 36988a) on rock, talus in small ravine, *McCune* 36988b. Apothecia black, exciple edge green black, dark brown within; ascospores 11.5–12 × 5–5.5 µm.
- Catapyrenium daedaleum*** (Kremp.) Stein – Near Harding Icefield Trail, ridge above Exit Glacier, on soil over vertical rock outcrop, *Walton* 19579.
- Catillaria chalybeia*** (Borrer) A. Massal. – North arm of spit across James Lagoon, on rock, boulder on beach, *McCune* 36169, *Schultz* 16849c.
- Catillaria* sp.** – Bay on east side and south end of McCarty Fjord, rocky granitic shoreline boulders, parasitic (?) on juvenile *Pyrenopsis*, *Schultz* 16814, 16815b. Apothecia 0.08–0.12(–0.16) mm, black, hymenium ~35 µm high,

- hypothecium pale, paraphyses branched, apical cell distinctly widened and with brown pigmented cap, ascospores 8 in ascus, 2-celled,  $7\text{--}8.5 \times 2.5\text{--}3 \mu\text{m}$ .
- Catinaria atropurpurea** (Schaerer) Vězda & Poelt – West of Resurrection River and north of Exit Glacier Road, on *Populus balsamifera*, mid trunk, *Schultz 16958c*. Ascospores 8 in ascus, 2-celled, proper exciple blackish, pale inside, disc blackish red, hypothecium pale brown, hymenium not interspersed; paraphyses with brown cap.
- Cetraria aculeata** (Schreber) Fr. – National Park Service weather station, McArthur Ridge, on alpine sod, *McCune 36986*; northwest Lagoon Beach, on sand in full sun, *Walton 18124*.
- Cetraria commixta** (Nyl.) Th. Fr. – Coleman Bay, above northeast end, off Aialik Bay, on granite, *McCune 36297*. Conidia  $5\text{--}7 \times 1 \mu\text{m}$ , bottle shaped; elongate pycnidia sparse.
- Cetraria delisei** (Bory ex Schaerer) Nyl. – Skilak nunatak within Harding Icefield, on alpine sod, seepy, below snow patch, *McCune 36853*; NPS weather station, McArthur Ridge, shaded base of rock outcrop, *Walton 19473*.
- Cetraria ericetorum** subsp. *reticulata* (Räsänen) Kärnefelt – Near Harding Icefield Trail, ridge above Exit Glacier, on soil, *Schultz 16923b*; Coleman Bay, on boulder, *Walton 18248* (medulla P+ orange); northwest Lagoon Beach, on sand, *Walton 18129* (medulla P–).
- Cetraria islandica** subsp. *crispiformis* (Räsänen) Kärnefelt – Occasional on soil, sea level to alpine tundra.
- Cetraria islandica** (L.) Ach. subsp. *islandica* – Alpine lake system on Harris Peninsula, on soil, *Walton 19427*; near Harding Icefield Trail, ridge above Exit Glacier, on soil, *Schultz 16923c*; peninsula into Three Hole Bay off Aialik Bay, on soil, *Rosentreter 19212*; Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36863*.
- Cetraria muricata** (Ach.) Eckfeldt – Marathon Mountain (Krog 1968).
- Cetraria kamezatica** Savicz – National Park Service weather station, McArthur Ridge, on moss over soil, *Walton 19458*; Skilak nunatak within Harding Icefield, on soil, *Walton 19422*.
- Cetraria laevigata** Rass. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36445*.
- Cetraria nigricans** Nyl. – Occasional on soil, subalpine to alpine.
- Cetraria pinastri** (Scop.) Gray – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus* bark, *Rosentreter 19002*.
- Chaenotheca furfuracea** (L.) Tibell – Crater Bay South, on soil, hollow in roots and rocks, *Walton 18057*.
- †† **Chaenothecopsis debilis** (Turner & Borrer ex Sm.) Tibell – Crater Bay North, on *Picea* branch, *Hutten 16040*.
- Chrysothrix chrysophthalma** (P. James) P. James & J. R. Laundon – Near pond at north end of Three Hole Bay off Aialik Bay, on wood inside hollow trunk of *Picea sitchensis*, *Tønsberg 45529*; west shore of Beauty Bay, on trunk of *Picea sitchensis*, *Tønsberg 45073*.
- Cladonia albonigra** Brodo & Ahti – On *Tsuga* branch, FIA plot Square Bay South, *Walton 18009*; west shore of Beauty Bay, on moss over rock, *Rosentreter 19027*. Not tested with TLC but the bases of the podetia are somewhat melanotic and the thallus is UV+, and thus presumably with the cryptochlorocephalic acid group.
- Cladonia amaurocraea** (Flörke) Schaerer – Crater Bay South, on moss over boulder, *Walton 18076*; NPS weather station, McArthur Ridge, on soil, *Walton 19491, 19419*; northwest Lagoon Beach, full sun, mesic, on mineral soil over sand, *Walton 18122*; Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36867*.
- Cladonia arbuscula** (Wallr.) Flotow – Occasional on soil, rock, and alpine sod. *McCune 36897*. TLC: usnic and fumarprotocetraric acids.
- Cladonia bacillaris** Genth. – South of Exit Glacier Visitor Center, on soil, *Rosentreter 19291* (thallus P–, K–, UV–, mostly simple podetia with red apothecia). This taxon is often treated as a subspecies of *C. macilenta*, but the two have quite different distributions in the Pacific Northwest. Keeping them as separate species facilitates tracking differences in distribution and abundance. In the Pacific Northwest, *Cladonia macilenta* is largely restricted to coastal areas, while *C. bacillaris* s.str. has a much wider distribution, including continental climates, but is relatively rare in the coastal Pacific Northwest (Goward 1999 as *C. macilenta* chemotypes, *McCune & Geiser 2009*). Distributional differences between chemotypes are also present in Finland (*Stenroos et al. 2016*).
- Cladonia bellidiflora** (Ach.) Schaerer – Common on soil over rock, soil, alpine sod, and *Picea* trunks. The squamatic acid chemotype is most frequent, while the thamnolic acid chemotype (e.g., *Walton 17876*) is relatively rare.
- Cladonia borealis** S. Stenroos – Exit Glacier Campground, near Exit Glacier Creek, in moss over mineral soil, *Walton 19379, 19399, Schultz 16945e*; NPS weather station, McArthur Ridge, on soil on vertical N-facing rock outcrop, *Walton 19446*.
- Cladonia carneola** (Fr.) Fr. – Occasional on bark, wood, and soil. In one specimen on rotten log. *Tønsberg 45382* hosted a lichenicolous fungus, possibly *Lichenosticta alcicornaria* (see *Diederich 1996, p. 68*).
- Cladonia chlorophaea** (Flörke ex Sommerf.) Sprengel – Occasional on soil and bark.
- Cladonia ciliata** Stirton var. *ciliata* – Coleman Bay, above northeast end, off Aialik Bay, on rock, top of boulder, *McCune 36311*; Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36857*.
- Cladonia ciliata** var. *tenuis* (Flörke) Ahti – Alpine lake system on Harris Peninsula, on soil, *Walton 19429*. Thallus KC+ yellow, P+ yellow to orange, main stem < 1 mm, branching in twos.
- Cladonia coccifera** (L.) Willd. – Crater Bay South, on moss over rock, *Walton 18055*; Skilak nunatak within Harding Icefield, on alpine sod, northwest slope, *McCune 36850*. TLC: usnic acid, zeorin, and unknown terpenoid; northwest Lagoon Beach, on soil over sand, *Walton 18120*. TLC: usnic and isousnic acids and zeorin; podetia with detachable microsquamules.
- Cladonia coniocraea** (Flörke) Spreng. (including *C. ochlochlora* Flörke morphotypes) – Common on bark and wood.
- Cladonia cornuta** (L.) Hoffm. – FIA plot, North Arm Nuka Bay, on conifer bark, *Walton 17881* (P+ orange red, K–; small collection and weird growth form, with cups, possibly *C. cornuta* subsp. *groenlandica* (Å. E. Dahl) Ahti); NPS weather station, McArthur Ridge, on sheltered base of rock outcrop, *Walton 19472*; west shore of Beauty Bay, on soil, *Walton 19500*.
- Cladonia crispata** (Ach.) Flotow var. *crispata* – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Walton 19508*; N end of Harris Bay, near opening to Northwestern Lagoon, on soil, *Walton 19505*; NPS weather station, McArthur Ridge, on soil and moss, *Walton 19453, 19470*; northwest Lagoon Beach, on sand, *Walton 18121*.

- Cladonia crispata* var. *cetrariiformis* (Delise) Vainio – Skilak nunatak within Harding Icefield, on soil, pocket on top of boulder, *McCune 36809*.
- Cladonia ecmocyna* Leighton – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36438*, *Rosentreter 19282*; near Harding Icefield Trail, ridge above Exit Glacier, on moist mineral soil, *Walton 19516*; rocky alpine tundra northeast of Coleman Bay, on soil, *Walton 19478*.
- Cladonia fimbriata* (L.) Fr. – Occasional on bark, wood, and organic matter.
- Cladonia gracilis* subsp. *gracilis* (L.) Willd. – Peninsula into Three Hole Bay off Aialik Bay, on soil, *Rosentreter 19214*. Not differentiated or ambivalent as to subspecies: Exit Glacier Campground, near Exit Glacier Creek, on soil, *Rosentreter 19277*; N end of Harris Bay, near opening to Northwestern Lagoon, on organic matter, *Rosentreter 19148*; Skilak nunatak within Harding Icefield, on alpine sod and soil in rock crevice, northwest slope, *McCune 36893*, *36849*.
- Cladonia gracilis* subsp. *turbinata* (Ach.) Ahti – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Walton 19509*, *Walton 19387*.
- Cladonia gracilis* subsp. *vulnerata* Ahti – FIA plot at Fire Cove, on forest floor, *Walton 19084*; northwest Lagoon Beach, on soil, *Walton 18113*.
- Cladonia kanewskii* Oxner – Occasional on soil and moss over rock. Alpine lake system on Harris Peninsula, on soil near lakeshore, *Walton 19475*; near Harding Icefield Trail, ridge above Exit Glacier, on soil and moss over rock, *McCune 36389* (TLC: usnic acid only); near Harding Icefield Trail, ridge above Exit Glacier, on soil, *Walton 19385*; peninsula into Three Hole Bay off Aialik Bay, on soil, *McCune 36332*, *36339*, *Rosentreter 19215*; rocky alpine tundra northeast of Coleman Bay, on soil, *Walton 19428*. The podetia are P–, including the tips.
- Cladonia luteoalba* Wheldon & A. Wilson – Near Harding Icefield Trail en route to high cliffs, on soil in the alpine, *Tønsberg 45557* (TLC: usnic acid, zeorin, possibly fatty acid(s), unidentified terpenoids); Wosnesenski Glacier nunatak, on soil, *Walton 19622*.
- Cladonia macroceras* (Delise) Hav. – Near Harding Icefield Trail, ridge above Exit Glacier, on soil and moss over rock, *McCune 36388*. This specimen had podetia with melanotic bases; medulla P+ orange, UV–, K+ brown (TLC: fumarprotocetraric and protocetraric acids).
- Cladonia macrophyllodes* Nyl. – Harding Icefield Trail, lower slope, on soil, *McCune 36456*.
- Cladonia maxima* (Asah.) Ahti – Crater Bay North, on boulder, *Walton 18040*; Crater Bay South, on boulder, *Walton 18056*; Exit Glacier Campground, near Exit Glacier Creek, on soil, *Schultz 16945a*, *Rosentreter 19275*; NPS weather station, McArthur Ridge, on N-facing sheltered nook of rock outcrop, *Walton 19424*.
- Cladonia mitis* Sandst. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36441*, *36444* (TLC: usnic acid only; rangiformic acid is often present in *C. mitis* but can be absent or difficult to detect, see Goward 1999, Stenroos et al. 2016); on ground, *Walton 19493* (no TLC data). Piercey-Normore et al. (2010) recommended *C. mitis* to be treated as *C. arbuscula* subsp. *mitis*, and this is often followed; however, we kept *C. arbuscula* and *C. mitis* at the species level to facilitate tracking differences in distribution and abundance for these difficult taxa. Furthermore, the phylogenies shown by Piercey-Normore et al. (2010) showed reciprocal monophyly of *C. mitis* and *C. arbuscula* with ITS data, but the pattern loses support with the addition of beta tubulin sequences. Pending more data on the problem, it seems prudent to keep tracking these two at the species level.
- Cladonia norvegica* Tønsberg & Holien – N end of Harris Bay, near opening to Northwestern Lagoon, on organic matter, *Rosentreter 19147*.
- Cladonia* cf. *novochlorophaea* (Sipman) Ahti & Brodo – Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36858*. This specimen is *C. pyxidata*-like, having broad cups and coarse propagules, but is UV+ and with very short cups and unusual chemistry (homosekikaic acid only) suggesting *C. novochlorophaea*. The ITS sequence (GenBank MN906283), though short, indicates no strong affinity to any species in GenBank and fell outside the clade of *C. novochlorophaea*.
- Cladonia phyllophora* Hoffm. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36436a*, *Schultz 16945b*, *Rosentreter 19283*; NPS weather station, McArthur Ridge, on N-facing vertical moss mat over rock, *Walton 19430*; northwest Lagoon Beach, full sun, on sand, *Walton 18128*.
- Cladonia pleurota* (Flörke) Schaerer – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Rosentreter 19280*, *19284*.
- Cladonia pyxidata* (L.) Hoffm. – FIA plot on Three Hole Bay, on soil, *Walton 18231*; near Harding Icefield Trail, *Rosentreter 19251*, *Walton 19397*; Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36862* (TLC: fumarprotocetraric acid).
- Cladonia rangiferina* (L.) F. H. Wigg. – Common on soil.
- Cladonia scabriuscula* (Delise) Nyl. – West of Resurrection River and north of Exit Glacier Road, on soil, *Rosentreter 19301*, *Walton 19417*; west shore of Beauty Bay, on moss over rock, *Rosentreter 19029*.
- Cladonia singularis* S. Hammer – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36443*.
- Cladonia squamosa* Hoffm. – Common on *Picea* trunks, snags, rotten wood, moss over rock, and less often on soil. All UV+ chemotype.
- Cladonia stellaris* (Opiz) Pouzar & Vězda – National Park Service weather station, McArthur Ridge, on soil, *Walton 19469*. Presence of this species illustrates a biogeographic contrast with Haida Gwaii, where many species of more continental climates, such as *C. amaurocraea*, *C. mitis*, and *C. stellaris* were absent (Brodo & Ahti 1996), while others such as *C. cariosa*, *C. cenotea*, and *C. deformis*, were not found at either Haida Gwaii or Kenai Fjords. All of these species are present in Katmai National Park (McCune et al. 2018).
- Cladonia straminea* (Sommerf.) Flörke – Northeast end of Harris Bay, edge of estuary, on moss on boulder on rocky beach, *Tønsberg 45416*, *45420*. TLC: usnic, didymic, and squamatic acids, unidentified pigment.
- Cladonia stricta* (Nyl.) Nyl. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36442*, *Walton 19404*, *19391*; Skilak nunatak within Harding Icefield, on alpine sod, *McCune 36872*, *36916*.
- Cladonia stygia* (Fr.) Ruoss – National Park Service weather station, McArthur Ridge, on soil and at base of rock outcrop, *Walton 19447*, *19467*.
- Cladonia subfurcata* (Nyl.) Arnold – Skilak nunatak within Harding Icefield, on alpine sod, northwest slope, *McCune 36911*.

- Cladonia sulphurina* (Michaux) Fr. – Exit Glacier Campground, near Exit Glacier Creek, on ground, *Walton 19507*; N end of Harris Bay, near opening to Northwestern Lagoon, on soil and organic matter, *Rosentreter 19146*, *Walton 19506*; west shore of Beauty Bay, on wood, *Rosentreter 19058*.
- Cladonia umbricola* Tønsberg & Ahti – Occasional on bark and wood.
- Cladonia uncialis* (L.) F. H. Wigg. – Common on soil, rock, moss over rock, and alpine sod. *McCune 36390* (TLC: usnic and squamatic acids); *McCune 36890* (TLC: usnic acid only).
- Cladonia verruculosa* (Vainio) Ahti – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36436b*; NPS weather station, McArthur Ridge, on soil, *Walton 19471*; northwest Lagoon Beach, on soil, *Walton 18114*; west shore of Beauty Bay, on rotten wood, *Rosentreter 19060*.
- Cladonia verticillata* (Hoffm.) Schaerer – Alpine lake system on Harris Peninsula, on soil, *Walton 19432*; Exit Glacier Campground, near Exit Glacier Creek, on soil, *Rosentreter 19279*.
- Cladonia* sp. – Bear Glacier nunatak, on moss over rock in snowmelt stream, *McCune 36931*. This specimen, from an unusual semi-aquatic habitat, consisted only of squamules that were tightly imbricate, suberect, P+ orange, and UV–. The ITS sequence, while short (GenBank MN906285) indicates affinity with *C. verticillata/macrophylloides* group (R. Pino Bodas, pers. comm. 2017).
- Cliostomum leprosum* (Räsänen) Holien & Tønsberg – Near pond at north end of Three Hole Bay off Aialik Bay, on wood inside hollow trunk of *Picea sitchensis*, *Tønsberg 45529*. TLC: atranorin, caperatic acid.
- Cliostomum tenerum* (Nyl.) Coppins & S. Ekman – East side of Harris Bay, steep chasm, on granite wall, *McCune 36255*, *Tønsberg 45432*. TLC: atranorin, usnic acid, zeorin, terpenoids, stictic acid, unidentified pigment.
- Coccotrema pocillarium* (Cumm.) Brodo – Occasional on bark and wood, *Alnus* and *Picea*, in two cases on rock. We expected to find *C. maritimum* Brodo on rock but did not. In addition to substrate, that species differs from *C. pocillarium* in being esorediate.
- Collema fecundum* Degel. (syn: *Blennothallia fecunda* (Degel.) Otálora, P. M. Jørg. & Wedin) – East side of Harris Bay, steep chasm, on granite, boulders little above high tide, *Schultz*; northeast end of Harris Bay, edge of estuary, on granite, *Rosentreter 19150*; near pond at north end of Three Hole Bay off Aialik Bay, on shoreline boulders, *McCune 36354*, *Rosentreter 19223*, *Schultz 16918a*; north of Pilot Harbor on North Arm of Nuka Bay, on rock, just above high tide, *Walton 19545*, *Schultz 16782*.
- Collema furfuraceum* (Arnold) Du Rietz – Exit Glacier Campground, near Exit Glacier Creek, on *Populus balsamifera*, *McCune 36450*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus balsamifera*, *Schultz 16703*.
- Collema subparvum* Degel. – North of Exit Glacier Visitor Center, on metasedimentary rock, on steep, moist, rock face, *Schultz 16744a, b*. This material was split into *a* and *b* based on differences in size and pruinosity, with *b* somewhat pruinose and thus similar to *Scytinium fragile*.
- Collemopsidium foveolatum* (A. L. Sm.) F. Mohr – North arm of spit across James Lagoon, on barnacles, flushed by sea water, *Schultz 16841*.
- † *Corticifraga fuckelii* (Rehm) D. Hawksw. & R. Sant. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, parasitic on *Nephroma parile* on *Alnus incana*, *Schultz 16695b*.
- Cryptodiscus* cf. *gloeocapsa* (Nitschke ex Arnold) Baloch, Gilenstam & Wedin – North end of Harris Bay, near opening to Northwestern Lagoon, on moss between root branches of fallen *Picea*, *Tønsberg 45398*.
- Cryptothele granuliforme* (Nyl.) Henssen – Harding Icefield Trail, lower slope, on rock, *McCune 36470*; peninsula into Three Hole Bay off Aialik Bay, on granite, steep, relatively exposed boulder, *Schultz 16916a*.
- Cryptothele permiscens* (Nyl.) Th. Fr. – Northeast end of Harris Bay, edge of estuary, on granite, north side of large exposed granitic boulder, *Schultz 16877*; north of Pilot Harbor on North Arm of Nuka Bay, on noncalcareous metasedimentary shoreline rock, *Schultz 16780* p.p.
- Cystocoleus ebeneus* (Dillwyn) Thwaites – Northeast end of Harris Bay, edge of estuary, on moss over rock, *Rosentreter 19156*; west shore of Beauty Bay, on *Picea*, shaded mid trunk, *Schultz 16763*.
- Dactylina ramulosa* (Hook.) Tuck. – Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36855*, *Walton 19437*.
- † *Dactylospora* sp. – Site Lake, on *Pertusaria* cf. *panyrga*, *Hutten 16235b*; near Harding Icefield Trail, ridge above Exit Glacier, on soil in snowbed, *Tønsberg 45581*; with numerous small apothecia; ascospores brown, 3–5-septate to submuriform, 15–19 × 5–7.5 µm.
- Dendriscosticta wrightii* (Tuck.) B. Moncada & Lücking – West shore of Beauty Bay, on *Picea* trunk, *Schultz 16767*, *Tønsberg 45121* (det. J. Di Meglio 2019). One specimen was sequenced (*Tønsberg 45121*, GenBank MN954400). This dendriscocauloid cyanomorph (free-living) occurred with *Sticta fuliginosa* s.l., *Nephroma bellum*, and *N. parile*.
- Dermatocarpon* cf. *intestiniforme* (Körber) Hasse – Massive vertical cliff plunging into ocean, within salt spray zone, Camera Cliff, 59.8762°N, 149.6378°W, *Hutten 16354* (det. McCune 2017). In the Fennoscandian and Finnish checklists (Santesson et al. 2004, Stenroos et al. 2016) this name is considered a synonym of *D. minutum* var. *complicatum* (Lightf.) Th. Fr. The material cited here does not appear to belong to *D. minutum*, so an appropriate name may not be available; in any case, study of the North American records of *D. intestiniforme* is needed. Lower cortex thick, paraplectenchymatous, columnar; upper cortex similar but thinner; medulla with long hyphae; ascospores mostly non-septate, some thinly 1-septate, 15.5–20 × 7.8–10 µm.
- Dermatocarpon rivulorum* (Arnold) Dalla Torre & Sarnth. – Near Harding Icefield Trail en route to high cliffs, in an alpine stream, *Rosentreter 19241* (large thalli often > 2 cm), *Rosentreter 19242*, *Walton 19580* (small thalli 2–4 mm); ridge above Exit Glacier, on rock in stream, *McCune 36384*, *Walton 19501*. Although similar in appearance to *D. meio-phyllizum* Vainio, our ITS sequence of 36384 (GenBank MN906276) was identical to that of a specimen of *D. rivulorum* from Sweden (AF333166). Unlike on the ITS tree in Fontaine et al. (2012), however, we found *D. rivulorum* to be polyphyletic (McCune, maximum likelihood analysis).
- Dibaeis baeomyces* (L. f.) Rambold & Hertel – Occasional on soil, humus, dead moss, and other organic matter.
- Diploschistes muscorum* (Scop.) R. Sant. – Coleman Bay, northeast end, off Aialik Bay, on organic matter, *Rosentreter 19194*.
- Diploschistes scruposus* (Schreber) Norman – Coleman Bay, northeast end, off Aialik Bay, on somewhat shaded granite

- face, *Schultz 16904c*; east side of Harris Bay, steep chasm, on granite, shaded, seeping wet rock face, *Schultz 16882*.
- Endocarpon pusillum*** Hedwig – Camera Cliff, on moist, thin organic material, *Hutten 16354*.
- Ephebe hispidula*** (Ach.) Horw. – Crater Bay off of Harris Bay, on moss over rock, *Rosentreter 19170*.
- Ephebe lanata*** (L.) Vainio – Common on rock, shorelines, submerged, periodically inundated, or in seepage. Although this species is normally associated with freshwater seepage and bodies of water, some of the sites regularly receive saltwater spray.
- Ephebe multispora*** (Å. E. Dahl) Henssen – Coleman Bay, above northeast end, off Aialik Bay, on granite, flushed or sprayed, steep and exposed rock face in, *Schultz 16910*; near Harding Icefield Trail, ridge above Exit Glacier, on metasedimentary rock, at base of steep south face, *Schultz 16935c*. In both specimens thallus was decumbent to ascending, very fine branching, threads at tip 16–17 µm thick, pycnidia 30–33 µm.
- Ephebe solida*** Bornet – Coleman Bay, above northeast end, off Aialik Bay, on granite, flushed or sprayed, ± exposed rock face in creek, *Schultz 16906* (fertile, main branches rather thick, straight with short side branches, 105–160 µm thick, tips often with whorl of short branchlets); Crater Bay off of Harris Bay, on granite, steep rock face, *Schultz 16892* (branches thick with distinct supporting tissue at the base); Harding Icefield Trail, lower slope, on metasedimentary rock, moist boulders, *Schultz 16955*; peninsula into Three Hole Bay off Aialik Bay, on rock, *Rosentreter 19205*.
- Euopsis granatina*** (Sommerf.) Nyl. – Exit Glacier Campground, near Exit Glacier Creek, on metasedimentary cobbles, *Schultz 16941*; Harding Icefield Trail, lower slope, on metasedimentary rock, low, relatively exposed boulders, *Schultz 16953*; northeast end of Harris Bay, edge of estuary, on rock, north side of large exposed granitic boulder, *Schultz 16876a*; Skilak nunatak within Harding Icefield, on lichens on rock, outcrop knob, *McCune 36874*.
- Euopsis pulvinata*** (Schaerer) Nyl. – Near Harding Icefield Trail, ridge above Exit Glacier, on soil among moss, *Schultz 16926*.
- Frutidella caesioatra*** (Schaerer) Kalb – Occasional on soil over rock, *Andreaea* and dead moss over rock.
- Frutidella pullata*** (Norman) Schmall – Occasional on bark of *Alnus*, at low elevations. TLC: sphaerophorin.
- Fuscidea intercincta*** (Nyl.) Poelt – Occasional on rock, low to high elevations.
- Fuscidea mollis*** (Wahlenb.) V. Wirth & Vězda – National Park Service weather station, McArthur Ridge, on rock, *McCune 36942, 36943*.
- Fuscidea muskeg*** Tønsberg & Zahradníková – North end of Harris Bay, near opening to Northwestern Lagoon, on twigs of mostly young *Picea sitchensis*, *Tønsberg 45396*; near pond at north end of Three Hole Bay off Aialik Bay, *Tønsberg 45542*; peninsula into Three Hole Bay off Aialik Bay, on twigs of dwarf *Tsuga mertensiana*, *Tønsberg 45497, 45508*. These specimens were included in material studied by Zahradníková (2017) and Spribille et al. (2020) in describing the species.
- Fuscidea pusilla*** Tønsberg – Common on bark of *Alnus*, less often on *Salix*, *Tsuga*, and *Picea*. TLC: divaricatic acid.
- Fuscidea thomsonii*** Brodo & Wirth – Bay on east side and south end of McCarty Fjord, on creekside rock, *McCune 36116*; northeast end of Harris Bay, edge of estuary, on rock, *McCune 36234*; Verdant Cove, north side at shoreline, on rock, *McCune 36277b*.
- Fuscopannaria* cf. *ahlneri*** (P. M. Jørg.) P. M. Jørg. – Near mouth of creek at north end of James Lagoon, on *Alnus*, *Tønsberg 45302*; on *Salix*, *Schultz 16832*; near North Arm Nuka Bay Public Use Cabin, on *Picea* twig, *McCune 36107, Schultz 16797*. This species is difficult to differentiate from *F. alaskana* in the usual sterile condition so these identifications are tentative.
- Fuscopannaria alaskana*** P. M. Jørg. & Tønsberg – Headland between two arms of Coleman Bay, on moss on seashore boulder, *Tønsberg 45494*; near mouth of creek at north end of James Lagoon, on *Salix*, *Tønsberg 45338*; on *Picea* branch, *Walton 17935*.
- Fuscopannaria aurita*** P. M. Jørg. – Near Harding Icefield Trail, ridge above Exit Glacier, on moss and detritus over rock, *McCune 36367b, 36368*.
- Fuscopannaria cheiroloba*** (Müll. Arg.) P. M. Jørg. – East side of Harris Bay, steep chasm, on granite, steep, relatively exposed, wet rock face, *Schultz 16887*; marginal lobes enlarged, pale grayish brown.
- × ***Fuscopannaria confusa*** (P. M. Jørg.) P. M. Jørg. – Specimens from Kenai Fjords originally identified as this were all reassigned to other *Fuscopannaria* species after ITS sequences (M. Schultz, unpubl.) fell outside the well supported clade containing the many sequences of Norwegian *F. confusa* in GenBank.
- Fuscopannaria convexa*** P. M. Jørg. – Locally common on *Populus* bark in Exit Glacier Campground and floodplain of Resurrection River and Exit Glacier Creek; Verdant Cove, north side at shoreline, on granite, shaded edge of steep rock face, *Schultz 16897*.
- Fuscopannaria laceratula*** (Hue) P. M. Jørg. – Headland between two arms of Coleman Bay, on moss on metasedimentary rock, *Schultz 16912b*; on trunk of *Picea sitchensis*, *Tønsberg 45495*; near North Arm Nuka Bay Public Use Cabin, on *Picea*, *Schultz 16895*; on *Alnus* bole, *Walton 17874*; Verdant Cove, north side at shoreline, on rock, *McCune 36284, Schultz 16895*; Bear Cove, on *Picea sitchensis* branches, *Walton 18254*.
- Fuscopannaria leucostictoides*** (Ohlsson) P. M. Jørg. – East side of Harris Bay, steep chasm, on moss over rock, *Rosentreter 19162*; near mouth of creek at north end of James Lagoon, on *Salix* bark, *Rosentreter 19120*; west of Resurrection River and north of Exit Glacier Road, on *Populus balsamifera*, mid trunk, *Schultz 16960*.
- Fuscopannaria mediterranea*** (Tav.) P. M. Jørg. – North of Exit Glacier Visitor Center, on *Populus balsamifera*, *Schultz 16739*.
- Fuscopannaria praetermissa*** (Nyl.) P. M. Jørg. – Headland between two arms of Coleman Bay, on moss, *Rosentreter 19200*.
- Fuscopannaria ramulina*** P. M. Jørg. & Tønsberg – Near mouth of creek at north end of James Lagoon, on *Salix alaxensis*, *Schultz 16833a, 16835b, 16834, Tønsberg 45316, 45339, 45325, McCune 36145*.
- Fuscopannaria* sp.** – Near Harding Icefield Trail, ridge above Exit Glacier, on metasedimentary rock (sand-filled crevices), *Schultz 16935a*; Kenai Peninsula, site ‘Lake\_20120829’, Partial shade by *Picea sitchensis* – *Tsuga mertensiana* forest, lakeside boulder, above high water mark, *Hutten and Walton 16245*. The material belongs to the *F. praetermissa* group, but seems to represent a yet undescribed taxon having small lobes, not widened towards the tip, but becoming delicately incised resulting in short ± cylindrical, radiating lobules.

- Like *F. praetermissa* the margins become conspicuously whitish, terpenoid crystals perhaps present, but material was probably not yet old enough to show it clearly.
- Graphis scripta** (L.) Ach. – Occasional on *Alnus* bark.
- Gyalectaria diluta** (Björk et al.) Schmitt et al. – Near North Arm Nuka Bay Public Use Cabin, on conk on snag of *Picea sitchensis*, *Tønsberg 45221*; near pond at north end of Three Hole Bay off Aialik Bay, *Tønsberg 45541*; west shore of Beauty Bay, on *Alnus viridis*, *Tønsberg 45086*.
- Gyalideopsis epicorticis** (Funk) Lücking & Buck – Near North Arm Nuka Bay Public Use Cabin, on shaded *Picea* twigs at creek, *Schultz 16786*, *Tønsberg 45192*; west shore of Beauty Bay, on *Alnus viridis* just above beach, *Tønsberg 45083*; near pond at north end of Three Hole Bay off Aialik Bay, on *Picea* twigs, *Schultz 16919a*.
- Gyalideopsis muscicola** P. James & Vězda – Headland between two arms of Coleman Bay, on moss on upper side of flat boulder on seashore rocks, *Tønsberg 45492*; North Arm Nuka Bay Public Use Cabin, on twigs of *Picea sitchensis*, *Tønsberg 45203a*; Verdant Cove, north side at shoreline, on moss on sloping face of boulder, *Tønsberg 45446* (fertile); northeast end of Harris Bay, edge of estuary, on moss on granite, north side of large exposed boulder, *Schultz 16873*.
- Gyalideopsis piceicola** (Nyl.) Vězda – Occasional on *Picea* twigs, once on *Sambucus*, at low elevation.
- Halecania viridescens** Coppins & P. James – North arm of spit across James Lagoon, on moss at base of *Picea sitchensis*, *Tønsberg 45365*, *45372*, *45376*, *45377*. TLC: argopsin, usually with gracilentia unknown.
- Hydropunctaria maura** (Wahlenb.) C. Keller, Gueidan & Thüs s.l. – Common on shoreline rock by ocean. Host to *Verrucaria epimaura*. One of the newly segregated species may be involved (*H. orae* Orange or *H. aractina* (Wahlenb.) Orange, see Orange 2012); no molecular study has been done yet on North American specimens.
- Hydropunctaria scabra** (Vězda) C. Keller, Gueidan & Thüs – Bay on east side and south end of McCarty Fjord, on granite, coastal rocks flushed by fresh water, relatively exposed, *Schultz 16810*; north of Pilot Harbor on North Arm of Nuka Bay, on shoreline rocks, moist quartz vein, *Schultz 16778*; on noncalcareous metasedimentary rock, flushed pebbles, *Schultz 16776* (ascospores 14.5–16.5(17.5) × 7–8.5 µm, thallus with black basal layer).
- Hypogymnia apinnata** Goward & McCune – Common on bark and wood of both conifers and hardwoods.
- Hypogymnia bitteri** (Lyngé) Ahti – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on bark, *Alnus*, *McCune 35961*, *35999*.
- Hypogymnia canadensis** Goward & McCune – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35960*, *Rosentreter 19008*. An ITS sequence of *McCune 35960* (GenBank MN906261) was identical to two other *H. canadensis* from the Kenai Peninsula, Alaska, outside the Park (Tonsina Creek, old floodplain *Picea* forest, *McCune 30702*, OSC, GenBank MN906263; Primrose Creek, open *Picea* forest, *McCune 30720*, GenBank MG692821).
- Hypogymnia duplicata** (Ach.) Rassad. – Fire Cove FIA plot, on conifer branches, *Walton 18150*, *19083*; plot TSME\_002, 59.46070°N 150.38243°W, *Tsuga mertensiana* woodland and open sloping peatland above high tide line, on *Picea sitchensis* branch, *Walton 17987*; previously reported from KEFJ by Walton et al. (2014).
- Hypogymnia enteromorpha** (Ach.) Nyl. – North end of Harris Bay, near opening to Northwestern Lagoon, on *Picea*, *McCune 36185*, *36218*.
- Hypogymnia hultenii** (Degel.) Krog – Common on conifers, less often on hardwoods and shrubs.
- Hypogymnia lophyrea** (Ach.) Krog – Common on conifers, less often on hardwoods and shrubs; previously reported from KEFJ by Walton et al. (2014).
- Hypogymnia occidentalis** L. Pike – Near North Arm Nuka Bay Public Use Cabin, on wood, beach log, *McCune 36103*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35983*, *Rosentreter 18990*, *19000*, *19009*, *19010*.
- Hypogymnia oceanica** Goward – North end of Harris Bay, near opening to Northwestern Lagoon, on bark, *Rosentreter 19140*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35973*; west shore of Beauty Bay, on bark, *Rosentreter 19049*.
- Hypogymnia physodes** (L.) Nyl. – Occasional on both hardwoods and conifers.
- Hypogymnia tubulosa** (Schaerer) Hav. – Occasional on both hardwoods and conifers.
- Hypogymnia vittata** (Ach.) Parrique – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus* bark, *Rosentreter 18992*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus* bark, *Rosentreter 18991*; west shore of Beauty Bay, on *Picea* bark, *McCune 36051*, *36056*, *Rosentreter 19054*.
- Imadophila ericetorum** (L.) Zahlbr. – Occasional on rotting wood and organic matter.
- Ionaspis lacustris** (With.) Lutzoni – Coleman Bay, northeast end, off Aialik Bay, on rock, *McCune 36301*; north of Pilot Harbor on North Arm of Nuka Bay, on creekside rock, *McCune 36089b*. It proved difficult to assign many *Ionaspis* and *Hymenelia* specimens to species, either on morphological or molecular basis. See McCune et al. (2018) for a summary of the problem.
- Ionaspis lavata** H. Magn. – Coleman Bay, above northeast end, off Aialik Bay, on rock in creek bed, *McCune 36313b*, *Schultz 16908b* (rose, with gray brown *Ionaspis odora*); Crater Bay off of Harris Bay, on streamside granite, *McCune 36258*.
- Ionaspis odora** (Ach.) Th. Fr. ex Stein – Coleman Bay, above northeast end, off Aialik Bay, on rock in creek, *McCune 36313a* (but K+ violet hymenium not seen); *Schultz 16908a* (with *Trentepohlia*, hymenium c. 80 µm high, epihymenium pale, N–); Crater Bay off of Harris Bay, on streamside granite, *McCune 36259* (morph with cream-colored thallus); alpine lake system on Harris Peninsula, on rock, submerged in small lake, *McCune 37009* (gray morph; see McCune et al. (2018) for placement in phylogenetic tree based on ITS sequence).
- Ionaspis suaveolens** (Fr.) Th. Fr. ex Stein – Near Harding Icefield Trail, ridge above Exit Glacier, on metasedimentary rock, on flushed boulders, *Schultz 16928b*.
- Jamesiella anastomosans** (P. James & Vězda) Lücking, Sérus. & Vězda – North arm of spit across James Lagoon, on moss at base of *Picea sitchensis*, *Tønsberg 45364*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana*, *Tønsberg 44946*, *45652b*, *45676*; west shore of Beauty Bay, on twigs of *Picea sitchensis*, *Tønsberg 45109*; near North Arm Nuka Bay Public Use Cabin, on trunk of old *Picea*, shaded, *Schultz 16796a*; near

- pond at north end of Three Hole Bay off Aialik Bay, on *Picea* twigs, *Schultz 16919e*.
- Jamesiella scotica*** (P. James) Lücking, Sérus. & Vězda – Coleman Bay, on moss (*Paraleucobryum longifolium*), *Tønsberg 45475* (with *Arthrorhaphis aeruginosa* and *Massalongia carnosa*, first reported in North America by Tønsberg (2016) on the basis of this specimen); near Harding Icefield Trail, ridge above Exit Glacier, on *Massalongia*, *Rosentreter 19246*.
- Jamesiella* sp.** – Near mouth of creek at north end of James Lagoon, on driftwood on upper beach; *Tønsberg 45287*. Similar to *Jamesiella scotica*, but hyphophores colourless; possibly a form of *J. anastomosans*.
- Japewia subaurifera*** Muhr & Tønsberg – Common on *Alnus*, also on *Salix* and *Picea*.
- Japewia tornöensis*** (Nyl.) Tønsberg – Common on *Alnus*, *Picea*, and *Tsuga*.
- Koerberiella umbonata*** T. Wheeler ined. – Exit Glacier Campground, near Exit Glacier Creek, on cobbles, *McCune 36422*, *36423*. The species differs from *Koerberiella wimmeriana* and *Bellemeria* species by the conspicuously umbonate apothecia. The thallus is C+ red; ascospores were not found.
- Lecanactis abietina*** (Ach.) Körber – West shore of Beauty Bay, on trunk of *Picea sitchensis*, *Tønsberg 45071* (TLC of thallus with pycnidia: lecanoric acid).
- Lecanora aitema*** (Ach.) Hepp – West shore of Beauty Bay, on *Sambucus* on beach meadow, *Tønsberg 45097*; floodplain of Resurrection River, on *Alnus*, *Tønsberg 44917*, *44956*; north of Pilot Harbor on North Arm of Nuka Bay, on *Alnus* bark, *Tønsberg 44133* (all det. Arup 2018).
- Lecanora* cf. *cenisia*** Ach. – East side of Harris Bay, steep chasm, on deeply shaded rock facing overhang, *Tønsberg 45427* (det. Arup 2018; TLC by Tønsberg: atranorin and gangaleoidin).
- Lecanora chloroleprosa*** (Vainio) H. Magn. – Harding Icefield Trail, lower slope, on rock, *McCune 36469* (ITS sequence GenBank: MN906279).
- Lecanora excludens*** Malme (syn. *L. septentrionalis* H. Magn. according to Brodo et al. 2019) – Occasional on bark of *Alnus* and *Salix*; north of Exit Glacier Visitor Center, *Tønsberg 45033*, *45053*; west of Resurrection River and north of Exit Glacier Road, on trunks of dead *Alnus incana*, *Tønsberg 45678*; all det. U. Arup. This species was recently reported for North America from Alaska, Idaho, and Oregon (Brodo et al. 2019). That *L. excludens* and *L. septentrionalis* seem to be the same species is here supported by comparing the ITS sequence with Genbank accession MK541647 of *L. excludens* from Norway with sequences of *L. septentrionalis* from both Norway and Alaska that are all identical or near identical. Anatomically, samples from Norway and Alaska also appear very similar. Typical are the small K-soluble crystals in the epithecium and amphithecium. The abundance of crystals does vary in both structures but they are usually present to some extent. The ecology in Alaska and Scandinavia seems also to be the same, growing on *Alnus* (but also *Salix* in Alaska) at the base of mountains.
- Lecanora expallens*** Ach. – East side of Harris Bay, on huge, somewhat overhanging cliff in steep chasm, *Tønsberg 45428* (TLC: usnic and thiophanic acids, unidentified xanthone (trace), zeorin, terpenoids (traces), atranorin (trace); north arm of spit across James Lagoon, on bark in shaded cavity in soil bank, *Tønsberg 45347* (TLC: usnic and thiophanic acids, ?zeorin); north of Pilot Harbor on North Arm of Nuka Bay, on overhanging rock, *Tønsberg 45164* (TLC: usnic and thiophanic acids, expallens-unknown sensu Tønsberg (1992), zeorin, and terpenoids); west shore of Beauty Bay, on trunk of *Picea sitchensis*, *Tønsberg 45072* (TLC: usnic and thiophanic acids, expallens-unknown, ?zeorin).
- Lecanora intricata*** (Ach.) Ach. – Crater Bay off of Harris Bay, on streamside granite, *McCune 36267*.
- Lecanora leptacina*** Sommerf. – Coleman Bay, above northeast end, off Aialik Bay, on soil and *Andreaea* on top of boulder, *Tønsberg 45481* (disk blackish with whitish pruina, TLC: usnic acid (major), isousnic acid, zeorin, traces of terpenoids); near Harding Icefield Trail, ridge above Exit Glacier, on moss over rock, *Tønsberg 45571c*, *45573*, *45575a*; near NPS weather station, McArthur Ridge, on crustose lichens and *Andreaea* over talus in small ravine, *McCune 36990a* (ITS sequence: GenBank MN906287). This rarely reported, mainly far northern species has recently been found in the Oregon Cascade Range on the shore of a montane lake (Lane Co., Waldo Lake, peninsula on northwest shore, on lichens on volcanic rock, *McCune 36192b*).
- Lecanora muralis*** (Schreber) Rabenh. – FIA plot Peat\_1\_20120829, on rock, *Hutten 16203*; Verdant Cove, north side at shoreline, on rock, *McCune 36283*.
- Lecanora polytropa*** (Hoffm.) Rabenh. – Occasional on rock, near sea level to alpine.
- Lecanora pringlei*** (Tuck.) Lamb – East side of Harris Bay, steep chasm, on slightly overhanging rock wall, *Tønsberg 45433*.
- Lecanora pulicaris*** (Pers.) Ach. – Near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36151*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 45024* (det. Arup 2018); west of Resurrection River and north of Exit Glacier Road, on trunks of dead *Alnus incana*, *Tønsberg 45686* (det. Arup 2018).
- Lecanora rugosella*** Zahlbr. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35979*, *35982*.
- Lecanora salicicola*** H. Magn. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35993*. This occurrence of a species that normally is absent in hyperoceanic climates reflects the increasing tendency of boreal and montane species to approach the coast farther north; see also comments under *Cladonia stellaris*.
- Lecanora stanislai*** Guzow-Krzem., Łubek, Malíček & Kukwa – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus viridis*, *Tønsberg 45611* (ver. M. Kukwa 2019); near mouth of creek at north end of James Lagoon, on *Salix* in *Salix alaskana* – *Alnus* thicket, *Tønsberg 45321*. This recently described species (Guzow-Krzemińska et al. 2017) has a very thin leprose thallus and contains usnic acid and zeorin. The second specimen is unusual as the soralia seem to be delimited. However, this one is quite young and the delimited soralia can be caused by the structure of bark.
- Lecanora sulphurea*** (Hoffm.) Ach. – North of Pilot Harbor on North Arm of Nuka Bay, on rock just above high tide line, *McCune 36071*.
- Lecanora symmicta*** (Ach.) Ach. – North end of Harris Bay, near opening to Northwestern Lagoon, on *Alnus* bark, *McCune 36215*; near mouth of creek at north end of James Lagoon, on *Alnus* twigs, *Schultz 16823*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35991*, *35992*, *Schultz 16691*.
- Lecanora* sp.** (*L. symmicta* group) – Near mouth of creek at north end of James Lagoon, on wood, conifer snag, *McCune 36136*. ITS sequence GenBank: MN906271. TLC: usnic acid (trace), unknown xanthone. The specimen has black lecidine to marginless apothecia and a cream-colored thallus,

**Table 4.** Names and chemotypes within *Lepraria neglecta* sensu Lendemer (2013) for Kenai Fjords. See the annotated list entry for *L. alpina* for our rationale for continuing to recognize names within *L. neglecta* group. As there are more and more examples of *Lepraria* species that are similar in chemistry and morphology (e.g., *L. incana* in Europe and *L. pacifica* in North America), but do not belong to the same species, we consider the taxon names to be provisional assignments to species based on lichen substances.

Taxon	Diagnostic substances	Representative specimens and notes
<i>Lepraria neglecta</i> -type, granules with pseudocortex and with no or only few projecting hyphae		
<i>Lepraria alpina</i>	atranorin, porphyritic acid, ± fatty acids	Near Harding Icefield Trail en route to high cliffs, on moss, <i>Rosentreter</i> 19244; alpine lake system on Harris Peninsula, on granitic rock, <i>McCune</i> 36994, 36999
<i>Lepraria neglecta</i> s.str.	alectorialic acid + 2–3 satellites probably including barbatolic acid	Not found at Kenai Fjords
<i>Lepraria neglecta</i> s.l. (morphologically different from <i>L. caesioalba</i> , but with similar chemistry)	atranorin, fumarprotocetraric acid and fatty acid (in some specimens identified as angardianic/roccellic acid)	Common on moss and soil over rock; Crater Bay off of Harris Bay, on moss over rock, <i>Rosentreter</i> 19166; north of Pilot Harbor on North Arm of Nuka Bay, on moss on steep coastal rock just above rocky beach, <i>Tønsberg</i> 45128; Coleman Bay, above northeast end, off Aialik Bay, on soil rich in humus on top of boulder on seashore rocks above high tide line <i>Tønsberg</i> 45474, over moss on sloping face on top of boulder near creek, <i>Tønsberg</i> 45480, on thin layer of soil and <i>Andreaea</i> on top of boulder, <i>Tønsberg</i> 45482a
<i>Lepraria svalbardensis</i>	atranorin (major), stictic acid (major) + satellites, angardianic/roccellic acid	Coleman Bay, above northeast end, off Aialik Bay, steep, cascading creek, on moss on rock with a thin layer of soil near creek, <i>Tønsberg</i> 45479
Thallus not of <i>L. neglecta</i> type, granules without a pseudocortex and often with projecting hyphae		
<i>Lepraria</i> aff. <i>borealis</i>	atranorin, jackinic/rangiformic acid	Near mouth of creek at north end of James Lagoon, over moss, lichens and bark on <i>Salix</i> , <i>Tønsberg</i> 45344; chemistry is that of <i>L. borealis</i> , which has been said to have a morphology of the <i>neglecta</i> type (Lohtander 1994)
<i>Lepraria</i> aff. <i>caesioalba</i> I	atranorin, fumarprotocetraric acid, angardianic/roccellic acid, ± unidentified fatty acid (trace)	West shore of Beauty Bay, on trunk of <i>Picea sitchensis</i> just inland from beach meadow, <i>Tønsberg</i> 45124; Crater Bay off of Harris Bay, on slightly overhanging rock wall just uphill from rocky beach, <i>Tønsberg</i> 45441
<i>Lepraria</i> aff. <i>caesioalba</i> II	atranorin, fumarprotocetraric acid, fatty acid (probably jackinic/rangiformic acid)	Northeast end of Harris Bay, edge of estuary, over moss on steep, somewhat overhanging face of boulder on rocky beach, <i>Tønsberg</i> 45419, 45422
<i>Lepraria</i> unnamed	atranorin, stictic acid + satellites including norstictic acid, angardianic/roccellic acid	Near Harding Icefield Trail, ridge above Exit Glacier, terricolous on sun-exposed overhang along trail, <i>Tønsberg</i> 45560a, b
<i>Lepraria</i> unnamed	psoromic acid + satellite, porphyritic acid	North of Exit Glacier Visitor Center, <i>Alnus</i> – <i>Populus</i> forest, lower slopes with scattered shady noncalcareous metasedimentary boulders and outcrops, over moss on overhanging rock wall, <i>Tønsberg</i> 45062

ascospores 12–16 × 4.4–5.3 µm; epihymenium granular, POL+. Phylogenetic reconstruction by Arup (unpubl.) showed that this specimen belongs to the *symmicta* clade, perhaps even in a narrow sense. However, this group is not well understood and more taxa may be present within it. Closest to the sequence of this specimen are two sequences from GenBank named *L. confusa*, one from North America (GU480093) and one from Scotland (GU480120), but these are not *L. confusa* in a strict sense.

***Lecanora zosteræ*** (Ach.) Nyl. – Near mouth of creek at north end of James Lagoon, on wood, exposed snag, *Schultz* 16819.

***Lecidea atrobrunnea*** (Lam. & DC.) Schaerer – Skilak nunatak within Harding Icefield, on rock on ridge, *McCune* 36902 (TLC: 2'-*O*-methylperlatolic acid). Although abundant in much of western North America, the species appears to be rather rare in the study area.

***Lecidea lactea*** Flörke ex Schaerer – Exit Glacier Campground, near Exit Glacier Creek, on river cobbles, *McCune* 36419; Skilak nunatak within Harding Icefield, on rock on ridge, *McCune* 36909 (but exciple I– (LM) and medulla I+ weak violet (DM)).

***Lecidea lapicida*** (Ach.) Ach. – Occasional on rock, sea level to alpine.

***Lecidea* cf. *melaphanoides*** Nyl. – Ridge above Exit Glacier, on flushed boulders, metasedimentary rock, *Schultz* 16928e. Identification uncertain: thallus areolate, distinctly epilithic, medulla I–, K–, C–, apothecia black, disc not umbonate, proper margin thin, black, dark reddish-brown even in thin sections, hypothecium reddish-brown, extending downwards as stipe, epihymenium grayish brown, paraphyses conglutinated, terminal cells only slightly widened, not moniliform, K–; asci *Lecidea* type (or similar), not *Teloschistes* type, ascospores 8 in ascus, ellipsoid, 10–13.5 × 5–6 µm, sometimes somewhat bean-shaped, not halonate.

***Lecidea plana*** (J. Lahm) Nyl. – Bear Glacier nunatak, on rock, *McCune* 36922 (TLC: planaic or confluent acid).

***Lecidea praenubila*** Nyl. – Exit Glacier Campground, near Exit Glacier Creek, on river cobble, *McCune* 36420, 36433; near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune* 36371; north of Exit Glacier Visitor Center, on rock, *McCune* 36009. TLC: stictic acid.

***Lecidea praetermissa*** Tønsberg – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg* 44928.

***Lecidea protabacina*** Nyl. – Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune* 36831b, 36880 (TLC: stictic acid).

- Lecidea roseotincta*** Coppins & Tønsberg – Occasional on *Alnus* and *Salix* bark.
- Lecidea sarcogynoides*** Körber – Skilak nunatak within Harding Icefield, on rock on ridge, *McCune 36904, 36905* (McCune 2017). Apparently rare in North America; previously reported from southeastern Canada and Pennsylvania by McMullin and Lendemer (2013); see range map in Hertel (2006) and description and key in McCune (2017, p. 353).
- Lecidea* sp.** – Bear Glacier nunatak, on rock, *McCune 36923*. Thallus glossy dark brown, with norstictic acid; apothecia black, lecideine; epithecium green black, hypothecium hyaline, inner exciple I–, ascospores  $\sim 9 \times 3.5 \mu\text{m}$ . Similar material was also found in Lake Clark National Park (McCune et al. 2018, as *Lecidea* sp.), but we have still not found an appropriate name for it.
- Lecidella etaeochroma*** (Ach.) Hazsl. – North of Pilot Harbor on North Arm of Nuka Bay, on *Alnus* bark, *McCune 36087* (ascospores not found, poor condition); west shore of Beauty Bay, on *Alnus* bark, *McCune 36044* (ascospores not found, poor condition).
- Lecidella* spp.** – Numerous corticolous specimens generally with atranorin and xanthones, including both fertile esorediate and sorediate material; their identity needs more study.
- Lecidoma demissum*** (Rutstr.) Gotth. Schneider & Hertel – Harding Icefield Trail en route to high cliffs, on organic soil, *Rosentreter 19231, Tønsberg 45556*; near Harding Icefield Trail, ridge above Exit Glacier, on soil over rock, *McCune 36378*; Skilak nunatak within Harding Icefield, on soil, *McCune 36808, 36884*.
- Leciophysma saximontanum*** (T. Sprib., P. M. Jørg. & M. Schultz) P. M. Jørg., Wedin & S. Ekman – On *Populus balsamifera*, mid trunk; north of Exit Glacier Visitor Center, *Schultz 16732*; north of Exit Glacier Visitor Center, *Schultz 16731b*; west of Resurrection River and north of Exit Glacier Road, *Schultz 16958b*.
- Lepra dactylina*** (Ach.) Hafellner – Occasional on organic matter, mosses, soil over rock, and alpine sod.
- Lepra ophthalmiza*** (Nyl.) Hafellner – Common on both hardwoods and conifers, including both strains I and II (the strains with different fatty acid profiles; numerous specimens with TLC by Tønsberg).
- Lepra panyrga*** (Ach.) Hafellner – FIA plot Lake\_20120829, on moss, *Hutten 16235a* (thallus UV+ white, C–, P–, K– or slightly brownish, KC– or weak).
- Lepraria albicans*** (Th. Fr.) Lendemer & Hodkinson – Harding Icefield Trail, lower slope, on rock, *McCune 36463* (Lamb chemotype III).
- Lepraria alpina*** (de Lesd.) Tretiach & Baruffo – Part of *Lepraria neglecta* complex, see Table 4. Using ITS marker Lendemer (2013a, b) took a broad view of *Lepraria neglecta*, including considerable morphological, ecological, biogeographical, and chemical variation, including *L. alpina*, *L. borealis*, *L. caesioalba*, *L. neglecta* s.str., *L. svalbardensis*, and several unnamed chemotypes. Although Lendemer’s (2013b) data showed that a 1:1 correspondence between chemotypes and species is untenable in the *L. neglecta* group, it is clear that the chemotypes are phylogenetically structured: many supported clades are pure or nearly pure in chemotype (Lendemer 2013b, Fig. 4). Given the apparent diversity in both morphology and chemistry, as well as strong phylogenetic structure in this group, we prefer to continue to track both chemotypes and morphotypes in North America, pending systematic study with more molecular markers.
- Lepraria* aff. *borealis*** Loht. & Tønsberg – Part of *Lepraria neglecta* s.l., see Table 4.
- Lepraria* aff. *caesioalba*** (B. de Lesd.) J. R. Laundon – Part of *Lepraria neglecta* s.l., see Table 4. Occasional on rock and bark as well as on mosses or soil over those substrates.
- Lepraria eburnea*** J. R. Laundon – Near pond at north end of Three Hole Bay off Aialik Bay, on wood inside hollow trunk of *Tsuga*, *Tønsberg 45532*, on bark on rim of cavity formed by hollow trunk of *Tsuga*, *Tønsberg 45533* (TLC: alectorialic acid with satellite, protocetraric acid).
- Lepraria elobata*** Tønsberg – East side of Harris Bay, steep chasm, on deeply shaded rock facing overhang, *Tønsberg 45425*; north arm of spit across James Lagoon, on hanging roots in shaded cavity in soil bank, *Tønsberg 45346* (TLC of both: atranorin, zeorin, stictic acid with satellites).
- Lepraria finkii*** (Hue) R. C. Harris – Crater Bay off of Harris Bay, on moss on vertical, deeply shaded face of boulder, *Tønsberg 45438*; north arm of spit across James Lagoon, on shaded root of *Picea sitchensis*, *Tønsberg 45351*; on soil, *Tønsberg 45350* (TLC of both: atranorin, stictic acid with satellites, zeorin).
- Lepraria rigidula*** (B. de Lesd.) Tønsberg – West shore of Beauty Bay, on trunk of *Picea sitchensis*, *Tønsberg 45123*. TLC: atranorin, nephrosteranic (major), unidentified fatty acids.
- Lepraria svalbardensis*** Tønsberg – Part of *Lepraria neglecta* s.l., see Table 4.
- Lepraria torii*** Pérez-Ortega & T. Sprib. – Near pond at north end of Three Hole Bay off Aialik Bay, on wood inside hollow trunk of *Tsuga*, *Tønsberg 45531a*; Verdant Cove, hill above, on bark of root in cavity under *Tsuga*, *Tønsberg 45462*; west shore of Beauty Bay, on bark in shallow cavity at base of *Picea*, *Tønsberg 45075*.
- Lepraria vouauxii*** (Hue) R. C. Harris – Near Harding Icefield Trail, ridge above Exit Glacier, on moss and detritus under overhang, *Tønsberg 45589* (TLC: six substances including pannaric acid-6-methylester, 4-oxypannaric acid-6-methylester); west shore of Beauty Bay, on moss on overhanging schistose rock wall on seashore, *Tønsberg 45069* (TLC: pannaric acid-6-methylester, 4-oxypannaric acid-6-methylester, unidentified dibenzofurane).
- Leptogidium contortum*** (Henssen) T. Sprib. & Muggia – Near North Arm Nuka Bay Public Use Cabin, on *Picea*, on mid trunk of old spruce, *Schultz 16800, 16801b*.
- Leptogium* cf. *burnetiae*** C. W. Dodge – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunk of *Populus tremuloides*, *Tønsberg 45019a* (GenBank MN906301); on *Populus balsamifera*, *Schultz 16702a*. The ITS sequence fell in a supported clade with specimens named *L. burnetiae*, *L. hirsutum*, and *L. compactum*, but the sequence is not a close match with any other sequences in GenBank.
- Leptogium compactum*** D. F. Stone, F. Anderson & J. W. Hinds – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus*, *McCune 35944* (det. D. Stone 2016), *Rosentreter 19015*.
- Leptogium cookii*** D. F. Stone & Lendemer – Near mouth of creek at north end of James Lagoon, on *Salix*, *Tønsberg 45342* (ITS sequence, GenBank MN906302). The name for this will change soon because type of *L. cookii*, as given in Stone et al. (2016), was mistaken and resulted in *L. cookii* being a synonym of *L. saturninum*. The species concept as described for *L. cookii* will receive a new name (D. Stone, pers. comm. 2020).
- Leptogium saturninum*** (Dickson) Nyl. – Exit Glacier Campground, near Exit Glacier Creek, on *Populus balsamifera*, *McCune 36449* (*L. saturninum* s.str., det. Stone 2016); *Rosentreter 19268*; near mouth of creek at north end of

- James Lagoon, on *Salix* bark, *Rosentreter* 19101; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus balsamifera*, *Schultz* 16702b; on *Alnus* bark, *Rosentreter* 18994; west of Resurrection River and north of Exit Glacier Road, on *Populus* bark, *Rosentreter* 19306; on *Alnus* bark, *Rosentreter* 19305. As shown by Stone et al. (2016) and confirmed by us, *L. saturninum* is polyphyletic, even after four new species were segregated, leaving two main clades of *L. saturninum*. The specimen we sequenced (*Schultz* 16702b) falls in the clade with the Scottish epitype (Stone et al. 2016, p. 415) and is presumed to be *L. saturninum* s.str.
- † **Lichenodiplis** sp. – Skilak nunatak within Harding Icefield, on saxicolous lichen (gray unknown crust), dry talus slope, *McCune* 36881.
- Lichenomphalia umbellifera** (L.: Fr.) Redhead, Lutzoni, Moncalvo & Vilgalys – Crater Bay South, on moderately decayed wood, *Walton* 18072; FIA plot at Chance Cove, on decayed wood, *Walton* 19065.
- Lichinodium ahlneri** Henssen – Near North Arm Nuka Bay Public Use Cabin, on *Picea* twig, *McCune* 36109, *Rosentreter* 19076, *Schultz* 16785, 16799, *Tønsberg* 45197; near pond at north end of Three Hole Bay off Aialik Bay, on *Picea* twigs, *Schultz* 16919c.
- Lichinodium canadense** Henssen – Crater Bay off of Harris Bay, on dead moss near creek just uphill from rocky beach, *Tønsberg* 45439; peninsula into Three Hole Bay off Aialik Bay, on twigs of dwarf *Tsuga mertensiana*, *Tønsberg* 45507a.
- Lichinodium sirosiphoideum** Nyl. – West shore of Beauty Bay, on noncalcareous metasedimentary rock, *Schultz* 16762, on *Picea*, shaded mid trunk, *Schultz* 16765.
- Lobaria anomala** (Brodo & Ahti) T. Sprib. & McCune – Occasional on bark and wood, both hardwoods and conifers.
- Lobaria hallii** (Tuck.) Zahlbr. – Occasional, mainly on *Populus*, also on *Alnus* and *Salix*.
- Lobaria linita** (Ach.) Rabenh. – Common on mossy rock, alpine sod, and tree trunks, from sea level to alpine.
- Lobaria oregana** (Tuck.) Müll. Arg. – Occasional on bark and wood, both hardwoods and conifers.
- Lobaria pulmonaria** (L.) Hoffm. – Occasional on bark and wood, both hardwoods and conifers.
- Lobaria scrobiculata** (Scop.) DC. – Occasional on bark and wood, both hardwoods and conifers. Krog (1968) discussed variation in the spot tests. P– specimens are identified in her collections as ‘*Lobaria alaskana*’, apparently an unpublished name. She concluded that ‘because of the chemical instability of this species, no attempt has been made to separate the different chemical strains.’
- Lopadium disciforme** (Flotow) Kull. – Occasional on conifer bark.
- Lopadium pezizoideum** (Ach.) Körber – FIA plot Lake\_20120829, on thin mineral soil, *Hutten* 16234; Skilak nunatak within Harding Icefield, on moss over rock, *McCune* 36836; Verdant Cove, north side at shoreline, on moss on trunk of *Picea sitchensis*, *Tønsberg* 45453.
- Loxospora elatina** (Ach.) A. Massal. – Hill above Verdant Cove, on trunk of *Tsuga* in old-growth forest, *Tønsberg* 45461. TLC: thamnolic acid, ?elatinic acid (trace).
- Loxosporopsis corallifera** Brodo, Henssen & Imshaug – Common on both hardwoods and conifers near sea level.
- Massalongia carnosia** (Dickson) Körber – Occasional on moss over rock.
- Mastodia tessellata** (Hook. f. & Harv.) Hook. f. & Harv. – Bay on east side and south end of McCarty Fjord, on shoreline granite outcrop, *McCune* 36130b, *Schultz* 16818; near pond at north end of Three Hole Bay off Aialik Bay, on seaside rock, *Rosentreter* 19227; north arm of spit across James Lagoon, on boulder on tidal flat, *McCune* 36175b, *Schultz* 16853 (GenBank MN952977), *Tønsberg* 45383.
- Megalaria brodoana** S. Ekman & Tønsberg – Bay on east side and south end of McCarty Fjord, on *Alnus* just above rocky beach, *Tønsberg* 45268b (fertile, but juvenile, no asci or spores); near pond at north end of Three Hole Bay off Aialik Bay, *Tønsberg* 45521, 45537; peninsula into Three Hole Bay off Aialik Bay, on twigs of dwarf *Tsuga mertensiana*, *Tønsberg* 45504a (sterile).
- Megalospora** aff. **tuberculosa** (Fée) Sipman – Near pond at north end of Three Hole Bay off Aialik Bay, on *Alnus*, *Tønsberg* 45517.
- Melanelia agnata** (Nyl.) Thell – Exit Glacier Campground, near Exit Glacier Creek, on river cobble, *McCune* 36430 (det. Esslinger 2016).
- Melanelia hepatizon** (Ach.) Thell – Occasional at high elevations, mainly on rock, also on alpine sod.
- Melanohalea exasperatula** (De Not.) O. Blanco et al. – North arm of spit across James Lagoon, on *Vaccinium* twigs, *Walton* 19541; north arm of spit across James Lagoon, on hardwood bark, *Walton* 19551.
- Melanohalea multispora** (A. Schneider) O. Blanco et al. – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus* bark, *Rosentreter* 19271; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana* twigs, *Schultz* 16690; west of Resurrection River and north of Exit Glacier Road, on *Alnus*, *Schultz* 16962a.
- Melanohalea olivacea** (L.) O. Blanco et al. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on hardwood bark, *Walton* 19553 (det. Esslinger 2016).
- Micarea anterior** (Nyl.) Hedl. – West of Resurrection River and north of Exit Glacier Road, on hard wood of snag, *Schultz* 16961.
- Micarea botryoides** (Nyl.) Coppins – Near pond at north end of Three Hole Bay off Aialik Bay, on bark, sheltered *Tsuga* base, *McCune* 36355; on wood inside hollow trunk of *Tsuga*, *Tønsberg* 45531b (*M.* aff. *botryoides*; sterile, with stalked, branched pycnidia; pycnidial wall K+ brown, not K+ green as in typical *M. botryoides*).
- Micarea cinerea** (Schaeerer) Hedl. – Near North Arm Nuka Bay Public Use Cabin, on trunk of *Picea sitchensis*, *Tønsberg* 45188, 45208; on *Alnus* *Tønsberg* 45235; north of Pilot Harbor on North Arm of Nuka Bay, on *Alnus viridis*, *Tønsberg* 45145. TLC: gyrophoric acid (major), 5-*O*-methylhiassic acid (submajor), lecanoric acid (trace), or with gyrophoric acid as the only major substance.
- Micarea denigrata** (Fr.) Hedl. – Near pond at north end of Three Hole Bay off Aialik Bay, on wood, base of conifer snag, *McCune* 36358; north of Pilot Harbor on North Arm of Nuka Bay, on wood, soft conifer snag, *McCune* 36091; west shore of Beauty Bay, on beach log, *McCune* 36029 (with pycnidia only).
- Micarea incrassata** Hedl. – National Park Service weather station, McArthur Ridge, on alpine sod, *McCune* 36959, 36962.
- Micarea lignaria** (Ach.) Hedl. – North of Pilot Harbor on North Arm of Nuka Bay, on shoreline rocks, *Schultz* 16777 (ascospores fusiform (2)4–6-celled, hypothecium pale, epihymenium blue green, hymenium C–); north of Pilot Harbor on North Arm of Nuka Bay, on overhanging rock facing sea, *Tønsberg* 45165 (TLC: argopsin; ascospores 4–7-septate, 19–26 × 5 µm).

- Micarea misella* (Nyl.) Hedl. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus* wood, *McCune* 35955.
- Micarea peliocarpa* (Anzi) Coppins & R. Sant. – Occasional on bark and rotten wood. In one case, *Tønsberg* 45147. TLC showed gyrophoric (major) and possibly 5-*O*-methylhiassic acids; apothecia greyish brown and many ascospores too large for typical *M. peliocarpa*: (16)19–25 × 4–4.5 µm. This material requires more study.
- Micarea prasina* Fr. s.l. – North of Pilot Harbor on North Arm of Nuka Bay, on *Alnus viridis*, *Tønsberg* 45146.
- Micarea prasinella* (Jatta) I. M. Lamb – Near pond at north end of Three Hole Bay off Aialik Bay, on mossy root, *Tønsberg* 45526 (TLC: gyrophoric (major) and lecanoric acids); northwest Lagoon Beach, on decorticate *Picea sitchensis* branch, *Walton* 16111.
- Micarea synotheoides* (Nyl.) Coppins – West of Resurrection River and north of Exit Glacier Road, on trunks of *Alnus incana* in swamp, *Tønsberg* 45638a, b.
- Micarea turfosa* (A. Massal.) Du Rietz – Peninsula into Three Hole Bay off Aialik Bay, slope bog with scattered *Tsuga mertensiana* and granitic outcrops, on decaying moss, *Schultz* 16914d.
- Micarea xanthonica* Coppins & Tønsberg – Near pond at north end of Three Hole Bay off Aialik Bay, on bark, rotten base of *Thuja*, *McCune* 36362.
- Miriquidica atrofulva* (Sommerf.) A. J. Schwab & Rambold – North of Exit Glacier Visitor Center, on rock, semi-shaded boulder, *McCune* 36008 (TLC: stictic acid); Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune* 36821.
- Miriquidica gyrizans* Fryday – National Park Service weather station, McArthur Ridge, on rock, talus in small ravine, *McCune* 36989, 36990b; near Harding Icefield Trail, ridge above Exit Glacier, on rock, stones in flat area with late snow, *McCune* 36369 (TLC: miriquidic acid). This distinctive, recently described species has an umbonate to gyrose disk and K+ magenta exciple (Spribile et al. 2020).
- Miriquidica instrata* (Nyl.) Hertel & Rambold – Near Harding Icefield Trail, ridge above Exit Glacier, on *Lecidea* on rock, *McCune* 36373 (thallus S+ violet (see Alphanthary & McCune 2013), TLC: nil), *McCune* 36404 (sterile); *McCune* 36409b; NPS weather station, McArthur Ridge, on rock, talus in small ravine, *McCune* 36988a; Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune* 36882.
- Miriquidica nigroleprosa* (Vainio) Hertel & Rambold – Coleman Bay, northeast end, off Aialik Bay, on rock, *McCune* 36308.
- Miriquidica subplumbea* (Anzi) Cl. Roux – Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune* 36831b, 36883.
- Moelleropsis nebulosa* (Hoffm.) Gyeln. – Crater Bay off of Harris Bay, on moss on granite, steep mossy rock face, *Schultz* 16888 (thallus corticate, cellular inside; photobiont *Nostoc*).
- Montanelia panniformis* (Nyl.) Divakar et al. – Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune* 36375.
- Montanelia soreliata* (Oxner) Divakar et al. – Harding Icefield Trail, lower slope, on rock, *McCune* 36459, *Walton* 19561; Harding Icefield Trail en route to high cliffs, on vertical face of outcrop, *Walton* 19537.
- Mycobilimbia epixanthoides* (Nyl.) Vitik. et al. – Near Harding Icefield Trail, ridge above Exit Glacier, on moss and detritus on ± overhanging face of boulder, *Tønsberg* 45588 (leprose, richly fertile; thallus C–).
- Mycobilimbia tetramera* (De Not.) Vitik., Ahti, Kuusinen, Lommi & T. Ulvinen – Near Harding Icefield Trail, ridge above Exit Glacier, on ground in snowbed, *Tønsberg* 45580 (TLC: nil; ascospores 3-septate, 14–18 × 5–5.5 µm); near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus* base, *McCune* 35953; north of Exit Glacier Visitor Center, on moss at base of *Populus tremuloides*, *Tønsberg* 45040; west shore of Beauty Bay, on organic matter, *Rosentreter* 19034.
- Mycoblastus affinis* (Schaerer) Schauer – Occasional on wood, moss over rock, and bark, both conifers and hardwoods.
- Mycoblastus caesius* (Coppins & P. James) Tønsberg – Common, mainly on *Alnus*, also on *Picea*. TLC of many specimens: perlatolic acid.
- Mycoblastus sanguinarius* (L.) Norman – Common on bark, wood, moss over rock, and detritus.
- Myochroidea rufofusca* (Anzi) Printzen, T. Sprib. & Tønsberg – Near Harding Icefield Trail, ridge above Exit Glacier, on twig, ericaceous shrub, *McCune* 36410, *Tønsberg* 45585 (TLC: various xanthenes).
- Myriolecis dispersa* group – Exit Glacier Campground, near Exit Glacier Creek, on cyanobacteria and *Tingiopsidium* on rock, *McCune* 36428; northeast end of Harris Bay, edge of estuary, on side of large exposed granitic boulder, *Schultz* 16870a.
- Myriolecis* cf. *contractula* (Nyl.) Śliwa, Zhao Xin & Lumbsch – Crater Bay off of Harris Bay, on seashore rocks 1–3 m above high tide line, *Tønsberg* 45443 (TLC: gyrophoric, unidentified xanthenes); forming small, rounded, slightly lobate, richly fertile patches to a few mm diam. on the thallus of *Buellia (Amandinea) coniops*.
- Myriolecis* sp. (*Lecanora* sp. 5 of Brodo 2010) – North arm of spit across James Lagoon, on rock influenced by sea spray, *McCune* 36170, *Schultz* 16842, 16850.
- Myrionora albidula* (Willey) R. C. Harris – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana*, *Tønsberg* 44980, 44999; west of Resurrection River and north of Exit Glacier Road, on *Alnus incana*, *Tønsberg* 45635, 45647b, 45660c (TLC: five fatty acids (strain I); thallus distinctly zoned).
- Myriospora myochroa* (M. Westb.) K. Knudsen & Arcadia – West shore of Beauty Bay, on exposed noncalcareous metasedimentary rock, steep, flushed or sprayed boulders directly on beach, *Schultz* 16749a. The species occurred with *Lecanora fugiens*, thus salt influence seems clear. Similar in morphology to *M. smaragdula*, *M. myochroa* was separated from that species as in the key couplets in Westberg et al. (2011) and Purvis et al. (2018, p. 110). New to North America, previously known from coastal Fennoscandia and U.K.
- Myriospora smaragdula* (Wahlenb. ex Ach.) Nägeli ex Uloth – Headland between two arms of Coleman Bay, on rock, damp metasedimentary cliffs, *McCune* 36323; north of Pilot Harbor on North Arm of Nuka Bay, on shoreline rock above high tide line, *McCune* 36082.
- †† *Naetrocymbe punctiformis* (Schrank) R. C. Harris – Near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune* 36147; west shore of Beauty Bay, on *Alnus* bark, *McCune* 36043 (both det. Breuss 2016).
- Nephroma arcticum* (L.) Torss. – Near Harding Icefield Trail en route to high cliffs, on tundra soil, *Rosentreter* 19234; near Harding Icefield Trail, ridge above Exit Glacier, on ground, *Walton* 19496; Marathon Mt. (Krog 1968).
- Nephroma bellum* (Sprengel) Tuck. – Occasional on both hardwoods and conifers.

- Nephroma expallidum* (Nyl.) Nyl. – Marathon Mt. (Krog 1968); Wosnesenski Glacier nunatak, *Walton 19621*.
- Nephroma helveticum* Ach. – Occasional on both hardwoods and conifers.
- Nephroma isidiosum* (Nyl.) Gyelnik – Occasional on bark of *Salix* and *Alnus*.
- Nephroma laevigatum* (Nyl.) Nyl. – Seward (Krog 1968).
- Nephroma parile* (Ach.) Ach. – Common on both hardwoods and conifers.
- Nephroma resupinatum* (L.) Ach. – Occasional on *Salix*, *Picea*, and rotten wood.
- Nephromopsis chlorophylla* (Willd.) Divakar, Crespo & Lumbsch (= *Cetraria chlorophylla*) – Occasional on conifer and *Alnus* twigs, wood and bark.
- Nephromopsis cucullata* (Bellardi) Divakar, Crespo & Lumbsch (= *Cetraria cucullata*) – Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36865*.
- Nephromopsis nivalis* (L.) Divakar, Crespo & Lumbsch (= *Cetraria nivalis*) – Skilak nunatak within Harding Icefield, on alpine sod, northwest slope, *McCune 36898*.
- Ochrolechia alaskana* (Verseghy) Kukwa – Skilak nunatak within Harding Icefield, on moss over rock, dry talus, *McCune 36833*.
- Ochrolechia androgyna* (Hoffm.) Arnold – North arm of spit across James Lagoon, on trunk of *Picea sitchensis*, *Tønsberg 45360b* (TLC: gyrophoric (major), lecanoric, and fatty acids).
- Ochrolechia bahusiensis* H. Magn. – Hill above Verdant Cove, on trunk of huge *Picea* in old-growth forest, *Tønsberg 45459* (TLC: gyrophoric (major), lecanoric, and 2–3 fatty acids (in the murolic acid complex). Thallus white, very thin; apparently new to North America.
- Ochrolechia cooperi* T. Sprib. – Near pond at north end of Three Hole Bay off Aialik Bay, on trunk of *Tsuga mertensiana*, *Tønsberg 45528a* (TLC: gyrophoric (major) and lecanoric acids; one apothecium, but not very well developed); on base of *Picea sitchensis*, *Tønsberg 45534* (TLC: gyrophoric (major) and lecanoric acids); peninsula into Three Hole Bay off Aialik Bay, on trunk of *Tsuga mertensiana*, *Tønsberg 45512* (this specimen also cited by Spribille et al. (2020); TLC: gyrophoric (major) and lecanoric acids; isidiate, sterile), *Tønsberg 45513*. The recently described species is distinctive in having coralloid isidia (Spribille et al. 2020).
- Ochrolechia frigida* (Sw.) Lynge – Occasional at high elevations on soil, organic matter, rock, and other lichens.
- Ochrolechia juvenalis* Brodo – North end of Harris Bay, near opening to Northwestern Lagoon, on twigs of mostly young *Picea sitchensis*, *Tønsberg 45394* (TLC: gyrophoric (major) and variolaric (possible trace) acids); near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36138*; west of Resurrection River and north of Exit Glacier Road, on *Picea* bark, *Rosentreter 19297*.
- Ochrolechia* cf. *laevigata* (Räsänen) Verseghy ex Brodo – Near mouth of creek at north end of James Lagoon, on *Salix* in *Salix-Alnus* thicket, *Tønsberg 45309* (TLC: gyrophoric acid); near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Tønsberg 44989a* (TLC: gyrophoric acid).
- Ochrolechia mahuensis* Räsänen – Occasional on *Alnus* and *Picea*. TLC of all specimens by Tønsberg: gyrophoric acid (major) with lecanoric acid.
- Ochrolechia oregonensis* H. Magn. – Common on bark and wood, both conifers and hardwoods.
- Ochrolechia subplicans* subsp. *hultenii* (Erichsen) Brodo – Northeast end of Harris Bay, edge of estuary, on rock, *McCune 36229*; NPS weather station, McArthur Ridge, on rock, *McCune 36945*; north of Pilot Harbor on North Arm of Nuka Bay, on rock just above high tide line, *McCune 36072*, *36073*; north side of Verdant Cove, on shoreline granite, *McCune 36270*, *Tønsberg 45445a* (TLC: gyrophoric and variolaric acids, and an unknown, probably alectoronic acid). Although our observations along the Pacific coast generally agree with Brodo's (1988) conclusion that subsp. *hultenii* occurs on coastal rocks while subsp. *subplicans* typically occurs on well-elevated ridges along the coast south to Oregon, we found only subsp. *hultenii* in Kenai Fjords, and in both habitats.
- Ochrolechia szatalaënsis* Vers. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Tønsberg 45008*, *45010* (TLC: variolaric acid).
- Ochrolechia tartarea* (L.) A. Massal. – Northeast end of Harris Bay, edge of estuary, on rock, *McCune 36232*.
- Ochrolechia xanthostoma* (Sommerf.) K. Schmitz & Lumbsch – Fairly common on various substrates, including *Alnus* bark, *Salix* bark, *Picea* branches and trunks, decayed or hard decorticate wood, tree bases, shoreline rock above high tide line.
- Ochrolechia* sp. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 44936* (TLC: gyrophoric, lecanoric and variolaric acids); near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on sloping trunk of *Alnus incana* in floodplain, *Tønsberg 44989c* (TLC: gyrophoric (major), lecanoric (tr.), and variolaric acids, atranorin (tr.). This material is sterile and sorediate. It has the same chemistry as *O. alaskana* and *O. aegea*, but these are terricolous (rarely saxicolous) and saxicolous, respectively, according to Kukwa (2011) and accepted by Brodo (2016), but Kukwa (2011, p. 32) cited a corticolous specimen of 'O. androgyna D' from Norway as *O. alaskana*. The specimens from Kenai Fjords may represent the sorediate counterpart of *O. juvenalis*, a corticolous species with variolaric acid, or they may be a new species. The ITS sequence for *Tønsberg 44936* (GenBank MN906300) supports the hypothesis that it may be the sorediate counterpart to *O. juvenalis*, but that species is represented by only one sequence in GenBank.
- Ophioparma ventosa* (L.) Norman – National Park Service weather station, McArthur Ridge, on rock, *McCune 36949*.
- Orphniospora moriopsis* (A. Massal.) D. Hawksw. – Skilak nunatak within Harding Icefield, on rock on ridge, *McCune 36907*; on dry talus, *McCune 36830*.
- Palicella schizochromatica* (Pérez-Ort., T. Sprib. & Printzen) Rodr. Flakus & Printzen – North end of Harris Bay, near opening to Northwestern Lagoon, on *Alnus* bark, *McCune 36216*; near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36140*, *36141*.
- Parmelia hygrophila* Goward & Ahti – Northeast end of Harris Bay, edge of estuary, on boulder, *Walton 19542*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35965*, *35998*; on *Picea*, *Rosentreter 19022*; on *Populus*, *Rosentreter 18985*; west shore of Beauty Bay, on *Picea* twig, *McCune 36062*.
- Parmelia omphalodes* (L.) Ach. – National Park Service weather station, McArthur Ridge, on sheltered rock, *McCune 36981*, *Walton 19455*; Skilak nunatak within Harding Icefield, on lichens over rock, dry talus, *McCune 36816*.
- Parmelia pseudosulcata* Gyelnik – Occasional on bark and wood of conifers.

- Parmelia saxatilis* (L.) Ach. – Common on bark, wood, and rock.
- Parmelia squarrosa* Hale – West shore of Beauty Bay, on bark, *Rosentreter 19057*.
- Parmelia sulcata* Taylor – FIA plot at Square Bay South, in litterfall, *Walton 18013*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35988*; west shore of Beauty Bay, on bark, *Rosentreter 19055*.
- Parmeliella parvula* P. M. Jørg. – Near mouth of creek at north end of James Lagoon, on *Salix*, *Tønsberg 45336*; near North Arm Nuka Bay Public Use Cabin, on *Picea* twigs and trunk, *Schultz 16788, 16798, Tønsberg 45199, 45206*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 44953*; west shore of Beauty Bay, on *Picea*, *Schultz 16761*.
- Parmeliella triptophylla* (Ach.) Müll. Arg. – Occasional on rock, moss over rock, and *Populus* bark, from sea level to alpine.
- Parmeliopsis ambigua* (Wulfen) Nyl. – West of Resurrection River and north of Exit Glacier Road, on bark, *Walton 19407*.
- Parmeliopsis hyperopta* (Ach.) Arnold – Occasional on bark and wood of both conifers and hardwoods.
- Peltigera aphthosa* (L.) Willd. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Rosentreter 19270*; near Harding Icefield Trail, ridge above Exit Glacier, on soil, *Walton 19403*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on soil, *Rosentreter 18989*; Skilak nunatak within Harding Icefield, on soil in rock crevice, northwest slope, *McCune 36892*.
- Peltigera britannica* (Gyelnik) Holt.-Hartw. & Tønsberg – Common on soil, moss, rotten wood, and mossy rock, including both the chloromorph, free-living cyanomorph, and composite thalli.
- Peltigera collina* (Ach.) Schrader – Common on tree, shrubs, and mossy rock.
- Peltigera didactyla* (With.) J. R. Laundon – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Walton 19512*; near Harding Icefield Trail en route to high cliffs, on soil, *Rosentreter 19238*; south of Exit Glacier Visitor Center, on soil, *Rosentreter 19293*.
- Peltigera extenuata* (Vainio) Lojka – Occasional on mossy rock and soil.
- Peltigera hymenina* (Ach.) Delise – Crater Bay South, on moss over boulder, *Walton 18071*.
- Peltigera kristinssonii* Vitik. – North of Exit Glacier Visitor Center, on semi-shaded boulder, *McCune 36012, 36013*.
- Peltigera lepidophora* (Nyl. ex Vainio) Bitter – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Walton 19381*; Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36859*.
- Peltigera leucophlebia* (Nyl.) Gyelnik – Occasional on moss over rock, soil, and tree bases.
- Peltigera malacea* (Ach.) Funck – Occasional on moss over rock, near sea level to alpine.
- Peltigera membranacea* (Ach.) Nyl. – Occasional on mineral soil and organic matter.
- Peltigera neopolydactyla* (Gyelnik) Gyelnik s.l. – Occasional on forest floor, humic soil, moss over wood, tree bases.
- ? *Peltigera polydactylon* (Neck.) Hoffm. – Reported by Krog (1968) from Marathon Mt. and Seward, but because of the broad species concept at that time, the material must be re-examined.
- Peltigera ponojensis* Gyelnik – Near Harding Icefield Trail en route to high cliffs, on moss on rock outcrop, *Walton 19382*; west shore of Beauty Bay, on moss, *Rosentreter 19026*.
- Peltigera praetextata* (Flörke ex Sommerf.) Zopf – Occasional on soil, moss, and alpine sod, near sea level to alpine.
- Peltigera rufescens* (Weiss) Humb. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *Walton 19383, Rosentreter 19269*.
- Peltigera scabrosa* Th. Fr. – Near Harding Icefield Trail, ridge above Exit Glacier, on soil, *Walton 19393, Walton 19418, Schultz 16923a*; near North Arm Nuka Bay Public Use Cabin, on shaded rotten log, *McCune 36104* (but rhizines long and simple); Skilak nunatak within Harding Icefield, on moss over soil, *Walton 19436, 19587*; hill above Verdant Cove, on base of *Tsuga*, *McCune 36287*.
- Peltigera venosa* (L.) Hoffm. – Near Harding Icefield Trail en route to high cliffs, on soil of trailcut, *Walton 19411*; near Harding Icefield Trail, ridge above Exit Glacier, on vertical layer of humus over schistose rock, *Tønsberg 45591*.
- Pertusaria alaskensis* Erichsen – Near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36407* (sterile).
- Pertusaria* aff. *alpina* Hepp ex Ahles – Coleman Bay, northeast end, off Aialik Bay, on *Alnus viridis* hanging over seashore rocks, *Tønsberg 45471*. TLC: two pigments (probably xanthones); cortex and medulla C–; section of apothecia K–; at least some asci with 8 ascospores; ascospores ± uniseriate with thick, double wall; asci with < 8 ascospores: (40)62–68 × 33–44 µm).
- Pertusaria borealis* Erichsen s.l. – Common on bark and wood, mainly on hardwoods. Some specimens have thalli that are distinctly zoned; according to Dibben (1980) the thallus margin is unzoned in *P. borealis* s.str. This complex needs revision by molecular methods. At least three species may be present in this complex. TLC: fumarprotocetraric acid and satellites.
- Pertusaria carneopallida* (Nyl.) Anzi – Coleman Bay, above northeast end, off Aialik Bay, on *Alnus* with flaking bark, *Tønsberg 45478*; Exit Glacier Campground, near Exit Glacier Creek, on *Alnus viridis*, *Tønsberg 45614*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 44920* (in part), *44939*.
- Pertusaria geminipara* (Th. Fr.) C. Knight ex Brodo – Near Harding Icefield Trail, ridge above Exit Glacier, on soil over rock, *McCune 36380*.
- Pertusaria glaucomela* (Tuck.) Nyl. – Occasional on bark of both hardwoods and conifers. TLC: with or without gyrophoric acid.
- Pertusaria mccroryae* C. R. Björk, Goward & T. Sprib. – Near mouth of creek at north end of James Lagoon, on *Salix* in *Salix alaskana-Alnus* thicket, *Tønsberg 45329*. TLC: gyrophoric and stictic acids; near North Arm Nuka Bay Public Use Cabin, on conk on snag of *Picea sitchensis*, *Tønsberg 45227, 45230*.
- Pertusaria pupillaris* (Nyl.) Th. Fr. – Near mouth of creek at north end of James Lagoon, on *Salix* in *Salix alaskana-Alnus* thicket, *Tønsberg 45308, 45313* (sterile); peninsula into Three Hole Bay off Aialik Bay, on twigs of dwarf *Tsuga mertensiana*, *Tønsberg 45503*; hill above Verdant Cove, on bark at base of *Elliptia pyroliflora* in old forest, *Tønsberg 45457*.
- Pertusaria sommerfeltii* (Flörke ex Sommerf.) Fr. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus* bark and wood, *McCune 35947, 35950*,

- 35954; on trunks of *Alnus* on floodplain, *Tønberg 45015*; north of Exit Glacier Visitor Center, on bark, *Populus*, *McCune 36024b*, *Tønberg 45026*, *45034*; west of Resurrection River and north of Exit Glacier Road, on *Populus balsamifera* bark, *McCune 36484*.
- Pertusaria subambigens*** Dibben – North arm of spit across James Lagoon, on *Picea* twig, *McCune 36161*.
- Pertusaria suboculata*** Brodo & Dibben – Alpine lake system on Harris Peninsula, on dead plants in snow accumulation area, *McCune 36997*; NPS weather station, McArthur Ridge, on plant detritus, *McCune 36960*; near pond at north end of Three Hole Bay off Aialik Bay, on base of *Elliottia pyroliflora*, *Tønberg 45527a*, *45498*; hill above Verdant Cove, on bark at base of *Elliottia pyroliflora* in old forest, *Tønberg 45455*. Similar to *P. glaucomela* but with trace to minor amounts of fumarprotocetraric acid and with medulla of thalline margin of apothecia P+ orange.
- †† ***Phaeocalicium populneum*** (Brond. ex Duby) A. F. W. Schmidt – Exit Glacier Campground, near Exit Glacier Creek, on *Populus* twig, *McCune 36453*.
- Phaeophyscia decolor*** (Kashiw.) Essl. – Near Harding Icefield Trail en route to high cliffs, on vertical face of rock outcrop, *Walton 19540*; north of Exit Glacier Visitor Center, on top of mossy boulder, *Schultz 16736b*; south of Exit Glacier Visitor Center, on rock, *Rosentreter 19286a*.
- Phaeophyscia pusilloides*** (Zahlbr.) Essl. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on rock, *Walton 19552*.
- Phaeophyscia sciastra*** (Ach.) Moberg – Harding Icefield Trail en route to high cliffs, on vertical face of rock outcrop, *Walton 19540*.
- Phaeorrhiza nimbosa*** (Fr.) H. Mayrh. & Poelt – Near Harding Icefield Trail en route to high cliffs, on tundra soil, *Rosentreter 19243*.
- Phylliscum demangeonii*** (Moug. & Mont.) Nyl. – Occasional on rock, sheltered or exposed.
- Phylliscum tenue*** Henssen – Near Harding Icefield Trail, ridge above glacier, *Schultz 16933*. The Kenai material matches samples from Oregon (*Schultz 16422*, *16423*). Previously reported from Alaska by Thomson and Ahti (1994). The thallus is small squamulose and thus intermediate between typical *Phylliscum* and *Pyrenopsis*. The presence of true paraphyses and asci with rounded tips suggest that *Phylliscum tenue* is closer to *Pyrenopsis* (as are perhaps all members of the *Phylliscum macrosporum* group).
- Physcia alnophila*** (Vainio) Lohtander et al. – Occasional on hardwoods at low elevations.
- Physcia caesia*** (Hoffm.) Förmr. – Common on rock, including near shoreline.
- Physcia dubia*** (Hoffm.) Lettau – Verdant Cove, north side at shoreline, on rock, *McCune 36277a* (very small but lower cortex distinctly prosoplectenchymatous, medulla K–, labriform soralia sparse and not on all thalli).
- Physconia grumosa*** Kashiw. & Poelt – West of Resurrection River and north of Exit Glacier Road, on *Populus* bark, *McCune 36491b*.
- Physconia perisidiosa*** (Erichsen) Moberg – Occasional on *Populus* bark. Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, *Walton 19564*; north of Exit Glacier Visitor Center, *McCune 36026* (ITS sequence KY990721, see Esslinger et al. 2017); west of Resurrection River and north of Exit Glacier Road, *McCune 36491a* (ITS sequence KY990722, see Esslinger et al. 2017).
- Piccolia ochrophora*** (Nyl.) Hafellner – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunk of *Alnus incana*, *Tønberg 45021a* (with *Buellia griseovirens*). This species is very widespread, being known from western North America south and east to Florida, with most North American records from the Great Plains (numerous records by C. Morse in KANU). Most species in the genus are tropical. Given that distribution, this occurrence in a cold oceanic climate is quite surprising and deserves more study.
- Pilophorus acicularis*** (Ach.) Th. Fr. – Occasional on rock at low elevations. *Tønberg 45246* (TLC: atranorin, zeorin, and porphyritic acid); *Tønberg 45450* (TLC: atranorin, zeorin, unknown in Rf classes A7 B'7 C7, unknown A2 B'2 C2). Both cited specimens were verified as *P. acicularis* with DNA sequences by R. Pino-Bodas (pers. comm., 2018).
- Pilophorus clavatus*** Th. Fr. – Occasional on rock at low elevations, often shaded. Confirmed with ITS sequence by R. Pino-Bodas (pers. comm.) of *McCune 36289*.
- Pilophorus nigricaulis*** Satô – Common on rock, near sea level to alpine, often in areas of snow accumulation. Confirmed with ITS sequences by R. Pino-Bodas of *McCune 37004* and *36251* and *Tønberg 45418* (R. Pino-Bodas, pers. comm.).
- Pilophorus vegae*** Krog – East side of Harris Bay, steep chasm, on granite, *Tønberg 45429*, confirmed with DNA sequence by R. Pino-Bodas (pers. comm., 2018).
- Pilophorus* sp.** – Northeast end of Harris Bay, edge of estuary, on rock, *Tønberg 45418* (in part, with *P. nigricaulis*). This forthcoming species is similar in many ways to *P. nigricaulis* and occurs with it in some of the same habitats (R. Pino-Bodas, unpubl.).
- Pilcopopsis cribellans*** (Nyl.) Räsänen – Headland between two arms of Coleman Bay, on vertical wall of boulder facing sea, *Tønberg 45485a*; spit across James Lagoon, on loose rocks on sloping dune face, *Schultz 16858*, *Tønberg 45392*, *45393*.
- Pilcopopsis gelida*** (L.) Lindsay s.l. – Northwest Lagoon Beach, on rock, *Hutten 16166*; spit across James Lagoon, on metasedimentary rock, *Schultz 16859*.
- Pilcopopsis lambii*** Hertel & V. Wirth – Common on rock at low elevations. TLC: 5-*O*-methylhiassic (major), gyrophoric, and lecanoric (trace) acids.
- Placynthiella icmalea*** (Ach.) Coppins & P. James – Near mouth of creek at north end of James Lagoon, on driftwood on upper part of beach, *Tønberg 45287* (TLC: gyrophoric and 5-*O*-methylhiassic acids).
- Placynthiella* sp.** – Near mouth of creek at north end of James Lagoon, on driftwood on upper part of beach, *Tønberg 45287* (TLC: gyrophoric acid with satellites); *Tønberg 45277* (TLC: nil). This sorediate species is not *P. dasaea* but could not be assigned to a known species.
- Placynthium asperellum*** (Ach.) Trevisan – Exit Glacier Campground, near Exit Glacier Creek, on cobbles, *Schultz 16936a*, *16942b*; near Harding Icefield Trail, ridge above Exit Glacier, on vertical metasedimentary rock, on flushed boulders, *Schultz 16927b*, *16928a*.
- Placynthium flabelliforme*** (Tuck.) Zahlbr. – Near Harding Icefield Trail, ridge above Exit Glacier, on metasedimentary rock, *Schultz 16931*.
- Platismatia glauca*** (L.) Culb. & C. Culb. – Common on bark and wood, both hardwoods and conifers.
- Platismatia herrei*** (Imshaug) Culb. & C. Culb. – Occasional on *Picea* bark.
- Platismatia lacunosa*** (Ach.) Culb. & C. Culb. – Common on bark and wood, less often on rock, sea level to subalpine.

- Platismatia norvegica* (Lyngé) Culb. & C. Culb. – Common on bark and wood, usually on conifers.
- Polycauliona candelaria* (L.) Frödén, Arup & Söchting (= *Xanthoria candelaria*) – Occasional on bark and wood in locally nutrient enriched habitats.
- Polycauliona* spp. – North arm of spit across James Lagoon, on wood, exposed snag of *Picea sitchensis*, *Tønsberg 45389*. The material consists of two probably undescribed species. One sample is like *Walton 18670* from Katmai National Park (McCune et al. 2018) and is morphologically very similar to *Athallia holocarpa*. It grows on wood but belongs in *Polycauliona*. The second part of *Tønsberg 45389* has a bright yellow thallus similar to *Candelariella* and is similar to specimens from Haida Gwaii, B. C. (*Brodo 29931*, CANL) and from Oregon (Douglas Co., dune area by Carter Lake, on driftwood, *McCune 22426*).
- Polychidium dendriscum* (Nyl.) Henssen – West shore of Beauty Bay, on bark of *Alnus viridis* just above beach, *Tønsberg 45087*.
- Polychidium muscicola* (Sw.) Gray – Occasional on moss over rock.
- Porina* sp. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønsberg 44932*.
- Porocyphus coccodes* (Flot.) Körb. – Near pond at north end of Three Hole Bay off Aialik Bay, exposed shoreline boulders, metasedimentary rock, *Schultz 16918c*.
- Porpidia carlottiana* Gowan – East side of Harris Bay, steep chasm, on granite by creek, *McCune 36248* (TLC: 2'-*O*-methylsuperphyllinic and glaucophaeic acids); near pond at north end of Three Hole Bay off Aialik Bay, on rock near creek, *McCune 36364* (TLC: 2'-*O*-methylsuperphyllinic acid).
- Porpidia contraponenda* (Arnold) Knoph & Hertel – Peninsula into Three Hole Bay off Aialik Bay, on granite, *McCune 36327* (TLC: methyl 2'-*O*-methylmicrophyllinate); west shore of Beauty Bay, on shaded rock, *McCune 36065* (uncertain ID; TLC: nil).
- Porpidia crustulata* (Ach.) Hertel & Knoph – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on cobble, *McCune 36001* (TLC: nil), *36000b*.
- Porpidia flavocaerulescens* (Hornem.) Hertel & A. J. Schwab – Bay on east side and south end of McCarty Fjord, on granite boulder, *McCune 36129* (TLC: nil); NPS weather station, McArthur Ridge, on rock, *McCune 36944*; Skilak nunatak within Harding Icefield, on dry talus, *McCune 36827b*.
- Porpidia hydrophila* (Fr.) Hertel & A. J. Schwab – Coleman Bay, above northeast end, off Aialik Bay, on submerged metal-rich rock in creek, *Schultz 16909* (uncertain ID); *Rosentreter 19197* (det. Schultz).
- Porpidia ochrolemma* (Vainio) Brodo & R. Sant. – East side of Harris Bay, steep chasm, on granite by creek, *McCune 36247* (TLC: nil).
- Porpidia soredizodes* (Lamy ex Nyl.) J. R. Laundon – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on rock, cobble, *McCune 36000c*.
- Porpidia thomsonii* Gowan – Common on rock, near sea level to alpine; TLC: stictic acid or nil.
- Porpidia tuberculosa* (Sm.) Hertel & Knoph – Coleman Bay, above northeast end, off Aialik Bay, on rock in creek bed, *McCune 36312* (TLC: atranorin, confluent and 2'-*O*-methylmicrophyllinic acids); Exit Glacier Campground, near Exit Glacier Creek, on river cobble, *McCune 36446* (TLC: confluent acid).
- Protomicarea limosa* (Ach.) Hafellner – Occasional on soil or organic debris, low elevations to alpine.
- Protopannaria pezizoides* (Weber) P. M. Jørg. & S. Ekman – Common on soil over rock, detritus, moss over mineral soil, or moss over rock or wood.
- Protoparmelia badia* (Hoffm.) Hafellner – Rocky alpine tundra northeast of Coleman Bay, on rock, *McCune 37015*.
- Protoparmelia ochrococca* (Nyl.) P. M. Jørg, Rambold & Hertel – West of Resurrection River and north of Exit Glacier Road, on trunks of dead *Alnus incana*, *Tønsberg 45652c*, *45666*; west shore of Beauty Bay, on shaded trunk of *Picea sitchensis*, *Tønsberg 45114*.
- Protothelenella* sp. – Peninsula into Three Hole Bay off Aialik Bay, slope bog with scattered *Tsuga mertensiana* and granitic outcrops, on debris, *Schultz 16914c*.
- Pseudophebe minuscula* (Nyl. ex Arnold) Brodo & D. Hawksw. – National Park Service weather station, McArthur Ridge, on rock, *McCune 36940*; spit across James Lagoon, on metasedimentary rock, *Schultz 16860*.
- Pseudophebe pubescens* (L.) M. Choisy – Rocky alpine tundra northeast of Coleman Bay, on rock, *Walton 19483*; Skilak nunatak within Harding Icefield, on rock, *McCune 36818*.
- Pseudocyphellaria citrina* (Gyeln.) Lücking, Moncada & S. Stenroos – Near mouth of creek at north end of James Lagoon, on *Salix* bark, *McCune 36153*, *36155*, *Tønsberg 45306*, *45324*, *Walton 17958*; North Arm Nuka Bay Public Use Cabin, on trunk of old *Picea*, *Schultz 16792*. This species is the most common representative of the *P. crocata* group both in western North America and coastal southern Alaska. Former collections of *P. crocata* were reassigned based on the key in Lücking et al. (2017).
- Pseudocyphellaria mallota* (Tuck.) H. Magn. – Near North Arm Nuka Bay Public Use Cabin, on twigs of *Picea sitchensis* on bank of dry riverbed, *Tønsberg 45203b*.
- Psilolechia leprosa* Coppins & Purvis – West shore of Beauty Bay, on overhanging schistose rock wall on seashore, *Tønsberg 45064* (TLC: gyrophoric and porphyritic acids, unidentified terpenoid; richly fertile); *Schultz 16748*. New to Alaska.
- Psora nipponica* (Zahlbr.) Gotth. Schneider – Harding Icefield Trail, ridge above Exit Glacier, in crack of vertical cliff face, *Walton 19384*.
- Psoroma hypnorum* (Vahl) Gray – Common on moss over bark, rock, or soil.
- Psoroma tenue* Henssen – Exit Glacier Campground, near Exit Glacier Creek, on moss on rocks marking path between campsites, *Tønsberg 45621* (TLC: porphyritic acid).
- Pyrenopsis furfurea* (Nyl.) Th. Fr. – Near Harding Icefield Trail, ridge above Exit Glacier, alpine tundra, on soil among moss, *Schultz 16925*, also on metasedimentary rock, *Schultz 16934*, *Schultz 16935b*. Several specimens from low altitude moist rock sites are morphologically transitional to the closely related *P. haematina*, requiring further studies: *Schultz 16890b*; *Schultz 16876c*.
- Pyrenopsis haemalella* (Nyl.) Blomb. & Forss. – Occasional on wet rock at low altitudes: *Schultz 16779*; *Schultz 16885a*; *Schultz 16886a*; *Schultz 16891*; *Schultz 16899*; *Schultz 16917a*.
- Pyrenopsis haematina* P. M. Jørg. & Henssen – Occasional on wet rock from lower to higher altitudes, *Schultz 16878*, *16894b*, *16904b*, *16916c*, *16927a*, *16940*.
- Pyrenopsis reducta* Th. Fr. – North of Pilot Harbor on North Arm of Nuka Bay, on noncalcareous metasedimentary shoreline rock, *Schultz 16780* p.p.; Harding Icefield Trail, *Schultz*

16950. The material fits well with Scandinavian material matching the holotype of *P. reducta* (UPS), a still poorly understood species with small-sized, irregularly shaped areoles and one to several minute apothecia with open discs surrounded by thin, slightly elevated thalline margin. *Pyrenopsis reducta* was previously reported from North America (California) by Hutten et al. (2013).

***Pyrenopsis sanguinea*** Anzi – Occasional on rock from low to higher elevations, apparently at slightly drier sites than *P. haematina*. Harding Icefield Trail, lower slope, on metasedimentary rock, *Schultz 16951, 16952a, 16954a*; near Harding Icefield Trail, ridge above Exit Glacier, on exposed metasedimentary boulders at base, *Schultz 16932a*. Superficially very similar to closely related *Pyrenopsis phaeococca* and *P. reducta* as well as *P. haematina*. *Pyrenopsis phaeococca* is not confirmed from Kenai NP, but fertile material from Glacier Bay NP collected by A. Fryday matches very well syntypes preserved in FH and BM.

***Pyrenopsis* sp.** – East side of Harris Bay, steep chasm, granitic cliffs and boulders at base of rocky chute, *Schultz 16886b*; peninsula into Three Hole Bay off Aialik Bay, on steep granitic boulders, *Schultz 16916c*. This material matches sequenced samples from Katmai and Lake Clark National Parks (see below) that represent an undescribed species in the *P. sanguinea* aggregate.

***Racodium rupestre*** Pers. – Northwest Lagoon Beach, on rock, beneath overhang of boulder, *Walton 18104*; peninsula into Three Hole Bay off Aialik Bay, on twigs of dwarf *Tsuga mertensiana*, *Tønberg 45507b*. First reported for Alaska from Kenai Fjords by Walton et al. (2014).

***Ramalina farinacea*** (L.) Ach. – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Picea* bark, *Rosentreter 19018*; north arm of spit across James Lagoon, on *Picea* twigs, *Rosentreter 19130*; Verdant Cove, north side at shoreline, on *Picea* bark, *Rosentreter 19178*; Seward (Krog 1968).

***Ramalina roesleri*** (Hochst. ex Schaerer) Hue – FIA plot at Verdant Cove, on *Picea sitchensis* twig, *Walton 18203*; Verdant Cove, north side at shoreline, on *Picea* bark, *Rosentreter 19179*; Exit Glacier Campground, on *Populus* bark, *Rosentreter 19260*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on thin twigs of *Picea × lutzii*, *Schultz 16717*.

***Ramboldia cinnabarina*** (Sommerf.) Kalb, Lumbsch & Elix – West of Resurrection River and north of Exit Glacier Road, on trunk of *Alnus incana*, *Tønberg 45641, 45662*.

***Ramboldia gowardiana*** (T. Sprib. & Hauck) Kalb, Lumbsch & Elix – North arm of spit across James Lagoon, on *Picea* twig, *McCune 36163*.

***Ramboldia subcinnabarina*** (Tønberg) Kalb, Lumbsch & Elix – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on trunks of *Alnus incana*, *Tønberg 44924, 44952, 44979*; north of Exit Glacier Visitor Center, on trunk of *Alnus*, *Tønberg 45050, 45051*.

***Rhizocarpon alpicola*** (Anzi) Rabenh. – Bear Glacier nunatak, on rock, *McCune 36927* (sterile); NPS weather station, McArthur Ridge, on rock, *McCune 36968*.

***Rhizocarpon bolanderi*** (Tuck.) Herre – Harding Icefield Trail, lower slope, on rock, *McCune 36468*; near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36377*. TLC of both specimens: stictic acid.

***Rhizocarpon cinereonigrum*** Vainio – Harding Icefield Trail, lower slope, on rock, *McCune 36483* (TLC: stictic acid).

***Rhizocarpon copelandii*** (Körber) Th. Fr. – Skilak nunatak within Harding Icefield, on dry talus, *McCune 36828, 36875*.

***Rhizocarpon eupetraeoides*** (Nyl.) Blomb. & Forss. – Skilak nunatak within Harding Icefield, on dry talus, *McCune 36813, 36921*. The latter specimen fits the species in all respects but has K– apothecial section.

***Rhizocarpon ferax*** H. Magn. – Northeast end of Harris Bay, edge of estuary, on rock, *McCune 36239*; Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36402b*.

***Rhizocarpon geminatum*** Körber – North of Exit Glacier Visitor Center, on semi-shaded boulder, *McCune 36016*.

***Rhizocarpon geographicum*** (L.) DC. – Occasional on rock, near sea level to alpine.

***Rhizocarpon grande*** (Flörke ex Flotow) Arnold – Verdant Cove, north side at shoreline, on shoreline granite, *McCune 36271*.

***Rhizocarpon hessseniae*** Brodo – Occasional on rock, near sea level to alpine.

***Rhizocarpon hochstetteri*** (Körber) Vainio – Bay on east side and south end of McCarty Fjord, on creekside rock, *McCune 36118*; Exit Glacier Campground, near Exit Glacier Creek, on river cobbles, *McCune 36418*; northeast end of Harris Bay, edge of estuary, on rock, *McCune 36236*.

***Rhizocarpon intersitum*** Arnold – Coleman Bay, northeast end, off Aialik Bay, on rock, *McCune 36302* (stictic acid chemotype, treated as *R. diversisporum* by some authors).

***Rhizocarpon jemtlandicum*** (Malme) Malme – Occasional on rock, near sea level to alpine.

***Rhizocarpon lavatum*** (Fr.) Hazsl. – Crater Bay off of Harris Bay, on streamside granite, *McCune 36263*.

***Rhizocarpon* aff. *lavatum*** – East side of Harris Bay, steep chasm, on sheltered granite, *McCune 36246*. The same species is also present in Lake Clark N.P.: Shoulder of mountain overlooking Tuxedni Bay, alpine tundra with noncalcareous outcrops and shrub thickets; on pebbles, *Tønberg 44252b* (GenBank MN906298). ITS sequences for the two cited specimens are nearly identical but do not fit *R. lavatum* (E. Tindal pers. comm., 2019).

***Rhizocarpon lecanorinum*** Anders – Coleman Bay, northeast end, off Aialik Bay, on rock, *McCune 36309*.

***Rhizocarpon polycarpum*** (Hepp) Th. Fr. – Bear Glacier nunatak, on rock, *McCune 36936*; spit across James Lagoon, on beach cobbles, *McCune 36183*.

***Rhizocarpon postumum*** (Nyl.) Arnold – Headland between two arms of Coleman Bay, on rock, damp metasedimentary cliffs, *McCune 36320b*.

***Rhizocarpon quinonum*** McCune, Tindal & Bendiksbj – Bear Glacier nunatak, on rock, *McCune 36918, 36919*. As in the original collections (McCune et al. 2016), no mature apothecia were found.

***Rhizocarpon riparium*** Räsänen – Exit Glacier Campground, near Exit Glacier Creek, on river cobbles, *McCune 36416, 36417*; near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36402a*.

***Rhizocarpon riparium* subsp. *lindsayanum*** (Räsänen) J. W. Thomson – National Park Service weather station, McArthur Ridge, on rock, *McCune 36952*.

***Rhizocarpon saanaense*** Räsänen – Verdant Cove, north side at shoreline, on shoreline granite, *McCune 36272*.

***Rhizocarpon subpostumum*** (Nyl.) Arnold – National Park Service weather station, McArthur Ridge, on rock, *McCune 36979*.

***Rhizocarpon* sp. 1** – Coleman Bay, above northeast end, off Aialik Bay, on rock in creek bed, *McCune 36314*. The specimen belongs to the *Rhizocarpon badioatrum* group but has umbonate apothecia; thallus brown, areolate; apothecial section POL–, K–, streaming droplets in K; exciple edge

bluegreen black, grading to nearly hyaline within; hypothecium very pale brown; paraphyses  $\pm$  even, not capitate, about 2  $\mu\text{m}$  diam; ascospores dark, 1-septate, 30–40  $\times$  12–17  $\mu\text{m}$ , 8 in ascus. The surficial cells of the umbo are blackish green, contrasting with the orange brown epihymenium. Very similar material has been seen in the subalpine of Siskiyou Mountains of northern California (McCune 2017, as *Rhizocarpon* sp.).

***Rhizocarpon* sp. 2** – Exit Glacier Campground, near Exit Glacier Creek, on river cobble, *McCune 36429*. This yellow, sterile, specimen appears to have schizidia.

***Rimularia limborina*** Nyl. – Skilak nunatak within Harding Icefield, on rock, dry talus, *McCune 36814*.

***Rinodina disjuncta*** Sheard & Tønsberg – Occasional on bark and mossy bark.

***Rinodina efflorescens*** Malme – North of Exit Glacier Visitor Center, on trunk of *Alnus* in stand of *Populus*, *Tønsberg 45048, 45060*; west of Resurrection River and north of Exit Glacier Road, on *Parmelia sulcata* on trunk of dead *Alnus*, *Tønsberg 45659*.

***Rinodina laevigata*** (Ach.) Malme – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus viridis*, *Tønsberg 45616*.

***Rinodina mniaraea*** (Ach.) Körber – Skilak nunatak within Harding Icefield, on alpine sod in damp depression, *McCune 36864*.

***Rinodina oregana*** H. Magn. – North of Exit Glacier Visitor Center, on *Populus*, *McCune 36024a*; on *Salix*, *Tønsberg 45030*. See Sheard et al. (2014) for notes on the disjunct status of Alaskan populations.

***Rinodina pallidescens*** Sheard & Tønsberg – Common at low elevations, mostly on *Alnus*, also on *Salix* and *Picea*.

***Rinodina septentrionalis*** Malme – Exit Glacier Campground, near Exit Glacier Creek, on *Populus balsamifera*, *McCune 36452b, 36452c*.

***Rinodina sheardii*** Tønsberg – North of Exit Glacier Visitor Center, on *Populus balsamifera*, *Tønsberg 45028* (fertile); west of Resurrection River and north of Exit Glacier Road, on dead moss on *Populus* bark, *McCune 36492*; on *Alnus incana*, *Tønsberg 45670*; west shore of Beauty Bay, on trunk of *Picea sitchensis*, *Tønsberg 45125*.

***Rinodina subpariata*** (Nyl.) Zahlbr. – Occasional on *Alnus* and *Picea* at low elevations.

***Rinodina trevisanii*** (Hepp) Körber – North arm of spit across James Lagoon, on moss at base of *Picea sitchensis*, *Tønsberg 45368*.

***Ropalospora hibernica*** (P. James & Poelt) Tønsberg – East side of Harris Bay, steep chasm, on slightly overhanging rock wall in chasm, *Tønsberg 45431* (TLC: gyrophoric acid, two fatty acids).

***Ropalospora viridis*** (Tønsberg) Tønsberg – Near pond at north end of Three Hole Bay off Aialik Bay, on trunk of *Picea sitchensis*, *Tønsberg 45523, 45524*; on *Alnus*, *Tønsberg 45518*. TLC (all tested): perlatolic acid with satellite.

***Ropalospora* sp.** – National Park Service weather station, McArthur Ridge, on rock, *McCune 36946*. Thallus pale greenish gray, distinct, rimose-areolate to thinly areolate where thallus is sparse; prothallus dark brown, visible on the thallus margin and among the areoles where they are sparse; soredia and isidia lacking; apothecia to about 1 mm diam, black, flat to slightly convex, margin distinct, rather persistent, blackish or somewhat grayer than disk; hypothecium hyaline to pale brown, K–; exciple edge dark brown, brown within, POL+, with no algae, K–; paraphyses simple,

tips small, < 2.5  $\mu\text{m}$ ; hymenial gelatin K/I+B; ascus wall K/I+B, tholus K/I+B; ascospores narrowly fusiform, *Bacidia*-like, 3–7 septate, about 37  $\times$  4  $\mu\text{m}$ , 8 in ascus; thallus UV+ weakly whitish, P–; TLC: nil. ITS sequence GenBank: MN906286: NCBI blast is closest to the morphologically different *Ropalospora lugubris* (GenBank KY266893), but differing in 33 positions.

***Rostania occultata*** (Bagl.) Otálora, P. M. Jørg. & Wedin – Exit Glacier Campground, near Exit Glacier Creek, on *Alnus*, *Schultz 16943*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana*, *Schultz 16696, 16697b*; west of Resurrection River and north of Exit Glacier Road, on *Alnus* in swamp, *Tønsberg 45685*.

***Rostania occultata* var. *populinum*** (Th. Fr.) Perlmutter & Rivas Plata – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus* bark, *Rosentreter 19023*.

***Rusavskia sorediata*** (Vainio) S. Y. Kondr. & Kärnefelt – South of Exit Glacier Visitor Center, on moss over rock, *Rosentreter 19288*.

***Schaereria corticola*** Muhr & Tønsberg – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus incana*, *Tønsberg 44935, 44936, 44940, 44984*.

***Schaereria endocyanea*** (Stirton) Hertel & Gotth. Schneider – Alpine lake system on Harris Peninsula, on boulder, *McCune 37002*.

***Schaereria fuscocinerea*** (Nyl.) Clauzade & Cl. Roux – Bear Glacier nunatak, on rock, *McCune 36920*.

†† ***Sclerococcum attendendum*** (Nyl.) Ertz & Diederich (= *Dactylospora attendenda* (Nyl.) Arnold) – National Park Service weather station, McArthur Ridge, on rock, *McCune 36993b*.

† ***Sclerococcum parasiticum*** (Flörke) Ertz & Diederich (= *Dactylospora parasitica* (Flörke ex Sprengel) Zopf) – Verdant Cove, north side at shoreline, on *Pilophorus acicularis*, *Tønsberg 45450*. The apothecia have a violet pigment that is K+ brown; spores 11–13  $\times$  4–5  $\mu\text{m}$ . According to Triebel (1989), *S. attendendum*, which has been reported from *Pilophorus*, has a brown (not violet) pigment.

***Scoliciosporum umbrinum*** (Ach.) Arnold – Near North Arm Nuka Bay Public Use Cabin, on twigs on *Picea sitchensis*, *Tønsberg 45186*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *Tønsberg 44915, 45003*; on *Picea* twigs, *Schultz 16716*; west shore of Beauty Bay, on *Sambucus* in beach meadow, *Tønsberg 45100*.

***Scytinium aquale*** (Arnold) Otálora, P. M. Jørg. & Wedin – North of Exit Glacier Visitor Center, on rock, shaded boulder in woods, *McCune 36002b* (many minute apothecia but ascospores not found).

***Scytinium cellulsum*** (P. M. Jørg.) Otálora, P. M. Jørg. & Wedin – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus balsamifera*, *Schultz 16711*; on *Alnus incana*, *Schultz 16700*; north of Exit Glacier Visitor Center, on *Populus balsamifera*, *Schultz 16740*.

***Scytinium imbricatum*** (P. M. Jørg.) Otálora, P. M. Jørg. & Wedin – West shore of Beauty Bay, on moss, *Rosentreter 19030* (det. Schultz 2016).

***Scytinium intermedium*** (Arn.) Otálora, P. M. Jørg. & Wedin – N end of Harris Bay, near opening to Northwestern Lagoon, on soil, sandy depression, *McCune 36220*.

***Scytinium lichenoides*** (L.) Otálora, P. M. Jørg. & Wedin s.l. – Harding Icefield Trail, lower slope, on moss over rock, *McCune 36474*; northwest Lagoon Beach FIA plot, on moist bedrock, *Hutten 16158*; Verdant Cove, north side at shoreline, on moss on seashore rock above high tide

- line, *Tønsberg 45449*; west shore of Beauty Bay, on moss, *Rosentreter 19035*.
- Scytinium subtile*** (Schrad.) Otálora, P. M. Jørg. & Wedin – Exit Glacier Campground, near Exit Glacier Creek, on bark, *Populus*, *Rosentreter 19263b* (det. Schultz 2016; mixed collection); near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on moss and soil, on mossy ground among *Peltigera*, *Schultz 16728* (fertile).
- Scytinium teretiussculum*** (Wallr.) Otálora, P. M. Jørg. & Wedin – Exit Glacier Campground, near Exit Glacier Creek, on *Populus balsamifera*, *McCune 36452a*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Populus balsamifera*, *Schultz 16710*; north of Exit Glacier Visitor Center, on *Populus balsamifera*, *Schultz 16731a*.
- Siphula ceratites*** (Wahlenb.) Fr. – Occasional on moist soil or alpine sod, low elevations to alpine.
- Solorina crocea*** (L.) Ach. – Occasional on soil and alpine sod.
- Sphaerophorus fragilis*** (L.) Pers. – National Park Service weather station, McArthur Ridge, rock crevice, *McCune 36950*. Some specimens have an I+ violet medulla but with morphology similar to *S. fragilis*. We obtained an ITS sequence for one of these (Skilak Nunatak, *McCune 36815*, GenBank: MN906281) and it fell in a weakly supported clade with *S. fragilis* (AY256766, AY256767) suggesting that the morphology is more reliable than the iodine reaction in this case.
- Sphaerophorus globosus*** (Hudson) Vainio – Occasional on moss or soil over rock and alpine sod.
- Sphaerophorus tuckermanii*** Räsänen – Common at low elevations on conifer bark, less often on wood or hardwoods.
- Sphaerophorus venerabilis*** Wedin, Högnabba & Goward – Occasional on bark of conifers and hardwoods at low elevations.
- Spilonema revertens*** Nyl. – Peninsula into Three Hole Bay off Aialik Bay, on rock, *McCune 36340*. Verdant Cove, north side at shoreline, on granite, *Schultz 16898*; *Rosentreter 19174*.
- Sporastatia polyspora*** (Nyl.) Grumann – Near Harding Icefield Trail, ridge above Exit Glacier, on rock, *McCune 36372*; Skilak nunatak within Harding Icefield, on dry talus, *McCune 36826*.
- Sporodictyon cruentum*** (Körber) Körber – North of Pilot Harbor on North Arm of Nuka Bay, on creekside rock, *McCune 36088*.
- Staurothele clopima*** (Wahlenb.) Th. Fr. – Harding Icefield Trail, ridge above Exit Glacier, on rock in stream, *McCune 36385*, *36386* (det. Breuss 2016), *Schultz 16928d*.
- Staurothele* sp.** – Exit Glacier Campground, near Exit Glacier Creek, floodplain forest with cobble openings, quartz vein in metasedimentary rock, *Schultz 16942a*. Thallus dark brown, very thin, indistinctly areolate, with fringed dark prothallus when young; perithecia sessile in small areoles, hemispherical, c. 300 µm; involucrellum blackening, exciple otherwise pale; ascospores hyaline to pale brownish, eumuriform, ellipsoid, ~23–25.5 × 10–13 µm, 1–2 per ascus; hymenial algae ellipsoid, 5.5–7.5 × 3–3.5 µm. In Morse and Ladd (2019) it keys to *S. arctica* though the ascospores are too small, perhaps not fully developed.
- Steineropsis alaskana*** T. Spribille & Muggia – Headland between two arms of Coleman Bay, on steep face of seashore rock, *Tønsberg 45486*.
- †† ***Stenocybe clavata*** Tibell – Peninsula into Three Hole Bay off Aialik Bay, on *Tsuga*, *McCune 36350*.
- †† ***Stenocybe flexuosa*** Selva & Tibell – West shore of Beauty Bay, on *Picea* bark, *McCune 36063*.
- †† ***Stenocybe pullatula*** (Ach.) Stein – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus* twigs, *McCune 35995*, *35977b*; on *Alnus incana*, *Schultz 16698b*.
- Stereocaulon alpinum*** Laurer ex Funck – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36411*; Harding Icefield Trail, lower slope, on moss over rock, *McCune 36476*; north of Exit Glacier Visitor Center, on mossy rock, *McCune 36014*, *36015*; Skilak nunatak within Harding Icefield, on alpine sod, *McCune 36900*.
- Stereocaulon arenarium*** (Savicz) Lamb – Harding Icefield Trail, ridge above Exit Glacier, on moss and soil over rock, *McCune 36398*; Skilak nunatak within Harding Icefield, on gravelly soil, *McCune 36852*; Double Glacier nunatak, *Walton 19573*; TLC of all specimens: porphyritic acid and atranorin.
- Stereocaulon areolatum*** McCune, E. Di Meglio & Tønsberg – Harding Icefield Trail, ridge above Exit Glacier, on rock, stones in flat area with late snow, *McCune 36370*. See McCune et al. (2019) for more information.
- Stereocaulon botryosum*** Ach. – Skilak nunatak within Harding Icefield, on alpine sod, northwest slope, *McCune 36899* (TLC: porphyritic acid and atranorin).
- Stereocaulon cephalocrustatum*** McCune, E. Di Meglio & Tønsberg – East side of Harris Bay, steep chasm, on granite, *McCune 36244*; northeast end of Coleman Bay, on granite, *McCune 36298*. See McCune et al. (2019) for more information.
- Stereocaulon fecundum*** McCune, E. Di Meglio & Tønsberg – Verdant Cove, north side at shoreline, on rock, *McCune 36276*; bay on east side and south end of McCarty Fjord, on creekside rock, *McCune 36117*. See McCune et al. (2019) for more information.
- Stereocaulon groenlandicum*** (E. Dahl) Lamb – Northeast end of Harris Bay, edge of estuary, on rock, tightly attached, *McCune 36238*; Harding Icefield Trail, ridge above Exit Glacier, on tundra sod, *McCune 36365* (thallus S+ red indicating miriquidic acid; Alphandary & McCune 2013). To perform the S test, an acetone extract on a glass slide is painted with 0.5% sulfuric acid, let dry for 10 minutes, then gently heated over a flame for a few seconds or in an oven (100°C for 15 minutes). Hold against a white background. Miriquidic acid gives a violet or purple reaction. Negative reactions are usually just slightly charred blackish.
- Stereocaulon intermedium*** (Savicz) H. Magn. – Bay on east side and south end of McCarty Fjord, on shoreline granite boulder, *McCune 36126*; northeast end of Harris Bay, edge of estuary, on rock, tightly attached, *McCune 36222*.
- Stereocaulon leucophaeopsis*** (Nyl.) P. James & Purvis s.str. – East side of Harris Bay, steep chasm, on boulder, *McCune 36249*. See phylogenetic tree in McCune et al. (2019).
- Stereocaulon nivale*** (Follmann) Fryday – Alpine lake system on Harris Peninsula, on rock, N-facing rocky tundra with seasonal seepage, *McCune 37008* (McCune et al. 2019).
- Stereocaulon paschale*** (L.) Hoffm. – Harding Icefield Trail, lower slope, on moss over rock, *McCune 36471*; northwest Lagoon Beach, on organic soil, *Walton 18133*; Skilak nunatak within Harding Icefield, on alpine sod, *McCune 36888*.
- Stereocaulon plicatile*** (Leighton) Fryday & Coppins – National Park Service weather station, McArthur Ridge, on talus in small ravine, *McCune 36987*. Also known from Katmai National Park (McCune et al. 2018, 2019).

***Stereocaulon rivulorum*** H. Magn. – Bear Glacier nunatak, on moss over rock in snowmelt stream, *McCune 36932*; Wosnesenski Glacier nunatak, on soil, *Walton 19576*; Petrof Glacier nunatak, on rock, *Walton 19568*. TLC of all specimens: perlatolic and anziaic acids. The population at Bear Glacier nunatak was unusual in being almost completely submerged in what appeared to be a perennial snowmelt stream. One specimen, *Walton 19568*, has the morphology of *S. subcoralloides* but chemistry of *S. rivulorum* and thus needs verification.

***Stereocaulon saviczii*** Du Rietz – Bay on east side and south end of McCarty Fjord, on granitic boulder, *McCune 36120*, *Walton 19401*; N end of Harris Bay, near opening to Northwestern Lagoon, on rock, *Rosentreter 19143*, *Walton 19389*; northeast end of Harris Bay, edge of estuary, on vertical, ± mossy wall of huge boulder, *Tønsberg 45413*; on boulder, *Tønsberg 45421*, *45424*; Petrof Glacier nunatak, on boulder, *Walton 19569*. All collections were near sea level, except *Walton 19569*, a small, poorly developed colony but with typical elongate phyllocladia.

***Stereocaulon spathuliferum*** Vainio – Occasional on rock, near sea level to alpine. TLC: stictic acid and atranorin, ± trace norstictic acid. Previously reported from KEFJ by Walton et al. (2014). Although normally this species grows on rock, one specimen was found on soil (Skilak nunatak within Harding Icefield, on alpine sod, *McCune 36840*). Molecular data for twelve specimens from SE and SW Alaska showed two weakly defined clades: clade A typically with more strongly spherical terminal clusters of phyllocladia and soredia, and with either *Nostoc* or *Stigonema*, and the more common clade B with irregular to subspherical clusters of phyllocladia and always with *Stigonema*. One specimen initially identified as *S. dactylophyllum* was determined with ITS and nuLSU sequences to be an esorediate morph of *S. spathuliferum* in clade B: Verdant Cove, north side at shoreline, on rock, *McCune 36280*. A similar esorediate specimen, genetically nearly identical, has also been found in the alpine on Baranof Island, Alaska (*McCune 34323*). Molecular and morphological studies of this group are expanding to include a broader geographic range (B. McCune, unpubl. data).

***Stereocaulon sterile*** (Savicz) Lamb ex Krog – National Park Service weather station, McArthur Ridge, on thin soil in rock crevice, *McCune 36947*; north of Pilot Harbor on North Arm of Nuka Bay, on rock, *McCune 36077* (TLC: atranorin, lobaric acid). Assignment of collections to *S. sterile* vs. *S. subcoralloides* and *S. intermedium* is tentative. The three are very similar in chemistry and cyanobiont and intergrade in appearance. Molecular studies of samples from the circumboreal belt, south-central Alaska, and the Pacific Northwest are needed.

***Stereocaulon subcoralloides*** (Nyl.) Nyl. – Bear Glacier nunatak, on dry talus, *McCune 36933* (TLC: atranorin only); Skilak nunatak within Harding Icefield, on dry talus, *McCune 36822*, *36885* (TLC: atranorin only), *36887*, *36894*; Wosnesenski Glacier nunatak, *Walton 19615*. Several anomalous specimens are similar in morphology to *S. subcoralloides* but differ in containing only atranorin and having *Nostoc* as the cyanobiont (*McCune 36510*, *36822*, *36885*, *36887*, *36894*). See additional comments under *S. sterile*.

***Stereocaulon tomentosum*** Fr. – Exit Glacier Campground, near Exit Glacier Creek, on soil, *McCune 36434* (with stictic acid); *Schultz 16946*; Double Glacier nunatak, on soil, *Walton 19575* (P+ chemotype); northwest Lagoon Beach, on sand, *Walton 18134* (medulla P– chemotype). The P– chemotype of the *S. tomentosum* group has an oceanic to

suboceanic distribution and has been known as *S. sasakii* var. *tomentosoides* Lamb, but treated as a chemotype of *S. tomentosum* by McCune and Geiser (2009). In contrast the P+ orange (stictic acid) chemotype is typical *S. tomentosum*. Ongoing molecular studies have revealed a more complex structure in the *S. tomentosum* group than acknowledged by the current taxonomy (B. McCune, unpubl. data).

***Stereocaulon vesuvianum*** Pers. – Fairly frequent on rock, sea level to subalpine. TLC: atranorin, stictic acid ± trace norstictic acid, rarely with atranorin only; always with *Stigonema* as cyanobiont; extremely variable in thallus morphology, ranging from very dense, hard cushions with no stalks visible to quite open branching with exposed stalks, but with very little variation in ITS and nuLSU regions.

***Sticta fuliginosa*** (Hoffm.) Ach. s.l. – Near mouth of creek at north end of James Lagoon, on *Salix alaxensis*, *Rosentreter 19118*, *Schultz 16825*; west shore of Beauty Bay, on *Picea*, *Schultz 16766*.

***Sticta* sp.** – Near mouth of creek at north end of James Lagoon, on *Alnus* in *Salix alaskana* – *Alnus* thicket, *Tønsberg 45304*; north arm of spit across James Lagoon, on shaded soil bank, *Tønsberg 45349*. This *Sticta* is a segregate of *S. fuliginosa* that is previously known from outside of North America. It is distinguishable by DNA sequences and morphology (J. Di Meglio et al., unpubl. manuscript). It is easily mistaken for *S. sylvatica*. The species was also found in material from Lake Clark National Park previously identified as *S. fuliginosa* (Near Chinitna Ranger Station on north side of Chinitna Bay, on trunk of *Populus* inland from beach meadow, *Tønsberg 44235*).

† ***Stigmidium* sp.** – North of Exit Glacier Visitor Center, on *Aspicilia* on rock, *McCune 36006c* (spores 1-septate, elongate, hyaline 8/ascus).

***Szczawinskia tsugae*** A. Funk – Bay on east side and south end of McCarty Fjord, on *Alnus* just above rocky beach, *Tønsberg 45273*; near North Arm Nuka Bay Public Use Cabin, on twigs and trunk of, *Picea*, *McCune 36108*; *Schultz 16787*, *16796b*; *Tønsberg 45194*; near pond at north end of Three Hole Bay off Aialik Bay, on *Picea* twigs, *Schultz 16919b* (with *Lichinodium ahlneri*).

***Tetramelas chloroleucus*** (Körber) A. Nordin – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35990*.

***Tetramelas insignis*** (Nägeli) Kalb – Near Harding Icefield Trail, ridge above Exit Glacier, on alpine sod, *McCune 36392*.

***Tetramelas triphragmioides*** (Anzi) A. Nordin & Tibell – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus*, *McCune 35976*.

***Thamnomia subuliformis*** (Ehrh.) Culb. – Occasional on soil, rock crevices, and alpine sod.

***Thamnomia vermicularis*** (Sw.) Ach. ex Schaerer – Skilak nunatak within Harding Icefield, on alpine sod, *McCune 36839b* (growing mixed with *T. subuliformis*). The traditional distinction between *T. subuliformis* and *T. vermicularis* was not supported by a global analysis by Onut-Brännström et al. (2017, 2018), but three clades do exist; see also Leavitt et al. (2016).

***Thelignya lignyota*** (Wahlenb.) P. M. Jørg. & Henssen – Occasional on rock by freshwater and seashores.

***Thelotrema petraetoides*** P. M. Jørg. & Brodo – West shore of Beauty Bay, on *Alnus* bark, *McCune 36046*; near outlet of pond at north end of Three Hole Bay off Aialik Bay, on *Alnus* in *Alnus* thicket, *Schultz 16921b*.

- Thelotrema suecicum*** (H. Magn.) P. James – Bay on east side and south end of McCarty Fjord, on *Alnus* just above rocky beach, *Tønsberg 45268a*; near North Arm Nuka Bay Public Use Cabin, on *Alnus*, *Tønsberg 45236* (ascospores 7-septate, 30–40 × 8–15 µm); near pond at north end of Three Hole Bay off Aialik Bay, *Tønsberg 45536, 45541*; north of Pilot Harbor on North Arm of Nuka Bay, on *Alnus viridis*, *Tønsberg 45142*; west shore of Beauty Bay, on *Alnus viridis*, *Tønsberg 45078*.
- Aff. ***Tholurna* sp.** – West shore of Beauty Bay, on tiny twigs of *Picea sitchensis*, *Tønsberg 45108* (with *Biatora rufidula* and *Gyalideopsis piceicola*). This specimen differs markedly from *Tholurna dissimilis* in having a strongly coralloid growth form with pale greenish to pale tan, anastomosing branches. More study is needed.
- Tingiopsidium elaeinum*** (Wahlenb. ex Ach.) Hafellner & T. Strib. – Occasional on rock, low elevations to alpine.
- Tingiopsidium isidiatum*** (Degel.) Hafellner & T. Strib. – Occasional on rock, dry talus to damp streamside rock.
- Toensbergia leucococca*** (R. Sant.) Bendiksby & Timdal – Occasional on *Alnus* at low elevations.
- Toninia squalida*** (Ach.) A. Massal. – Harding Icefield Trail, ridge above Exit Glacier, on moss and detritus over rock, *McCune 36367a* (with black pycnidia and orange medulla); *36367c* (fertile, typical).
- Trapelia coarctata*** (Turner ex Sm. & Sow.) M. Choisy – Crater Bay off of Harris Bay, on streamside granite, *McCune 36260*; headland between two arms of Coleman Bay, on rock near creek, *McCune 36325*; on damp metasedimentary cliffs, *McCune 36319*.
- Trapelia corticola*** Coppins & P. James – Headland between two arms of Coleman Bay, on moss on seashore rocks, *Tønsberg 45487, 45488, 45491*. The soralia are the typical pale brownish yellow. In two of these the species co-occurs with a trapelioid, green species with a distinct, continuous thallus and much larger soralia, perhaps *Trapeliopsis pseudogranulosa* (anthraquinone deficient form). Also in *Tønsberg 45488* are hyphophores of *Gyalideopsis piceicola* on the moss.
- Trapeliopsis granulosa*** (Hoffm.) Lumbsch – Occasional on soil, moss, and plant detritus, low elevations to alpine.
- Trapeliopsis pseudogranulosa*** Coppins & P. James – Near North Arm Nuka Bay Public Use Cabin, on huge trunk of *Picea sitchensis*, *Tønsberg 45237* (TLC: gyrophoric acid (major), lecanoric acid; fertile); north of Pilot Harbor on North Arm of Nuka Bay, on bark, base of *Picea*, *McCune 36093*.
- Tremolecia atrata*** (Ach.) Hertel – Occasional on granite and metal-rich rock, near sea level to alpine.
- Umbilicaria angulata*** Tuck. – Occasional on rock, near sea level to subalpine; previously reported from KEFJ by Walton et al. (2014).
- Umbilicaria arctica*** (Ach.) Nyl. – National Park Service weather station, McArthur Ridge, on rock, *McCune 36973*; Skilak nunatak within Harding Icefield, on rock, *McCune 36886*.
- Umbilicaria cylindrica*** (L.) Delise ex Duby – Occasional on rock, near sea level to alpine.
- Umbilicaria deusta*** (L.) Baumg. – Occasional on rock, near sea level to alpine.
- Umbilicaria herrei*** Frey – Spit across James Lagoon, on beach cobbles, *McCune 36180*.
- Umbilicaria hyperborea*** (Ach.) Hoffm. – Common on rock, near sea level to alpine. The typical morph is common, with brown lower surface and rugose upper surface, but mixed in these populations are forms with a black lower surface (but lacking thalloconidia and not sooty) and a form with upper surface nearly smooth.
- Umbilicaria multistrata*** McCune – Harding Icefield Trail, lower slope, on rock, *McCune 36465*; Skilak nunatak within Harding Icefield, on rock, outcrop knob, *McCune 36873* (see McCune 2018).
- Umbilicaria polyphylla*** (L.) Baumg. – Skilak nunatak within Harding Icefield, on rock, *McCune 36842*.
- Umbilicaria polyrhiza*** (L.) Fr. – Spit across James Lagoon, on metasedimentary rock, *Schultz 16857*.
- Umbilicaria proboscidea*** (L.) Schrader – Bay on east side and south end of McCarty Fjord, on granite boulder, *McCune 36121*; NPS weather station, McArthur Ridge, on rock, *McCune 36972*; spit across James Lagoon, on beach cobbles, *McCune 36176*.
- Umbilicaria torrefacta*** (Lightf.) Schrader – Common on rock from near sea level to alpine.
- Umbilicaria vellea*** (L.) Hoffm. s.l. – Seward (Krog 1968).
- Umbilicaria virginis*** Schaerer – Spit across James Lagoon, on metasedimentary rock, *Schultz 16856*.
- Usnea diplotypus*** Vainio – Exit Glacier Campground, near creek, on *Picea* twigs, *Rosentreter 19257*.
- Usnea lapponica*** Vainio – Exit Glacier Campground, near creek, on *Populus* bark, *Walton 19571*; near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on *Alnus* bark, *Rosentreter 19004*.
- Usnea longissima*** Ach. – Crater Bay South, on conifer branch, *Walton 19078*. TLC: barbatic acid with trace of norbarbatic acid.
- Usnea pacificana*** P. Halonen – West shore of Beauty Bay, on bark, *Rosentreter 19053* (det. McCune 2016).
- Usnea scabrata*** Nyl. – FIA plot at Verdant Cove, on *Picea sitchensis* twig, *Walton 18201, 18202*; reported as *U. filipendula* by Walton et al. (2014).
- Verrucaria ditmarsica*** Erichsen – North of Pilot Harbor on North Arm of Nuka Bay, on noncalcareous metasedimentary rock, upper intertidal, *Schultz 16775* (det. Schultz 2016). This taxon belongs to the *V. erichsenii* group, and has the following characteristics: exciple pale at the base; thallus partly black dotted, film-like, and thin; ascospores < 12 µm long. Previously reported from Adak Island (Talbot et al. 1997).
- Verrucaria dolosa*** Hepp – Near Park entrance on Exit Glacier Road, floodplain of Resurrection River, on cobble, *McCune 36000a*.
- Verrucaria epimaura*** Brodo – North arm of spit across James Lagoon, on *Hydropunctaria* on boulder on beach, *McCune 36166b, Schultz 16843c*; Verdant Cove, north side at shoreline, on *Hydropunctaria* on shoreline granite, *McCune 36275*.
- ? ***Verrucaria erichsenii*** Zschacke – North arm of spit across James Lagoon, on granite, flushed by sea water, *Schultz 16845b* (det. Schultz 2016).
- Verrucaria floerkeana*** Dalla Torre & Sarnth – North of Exit Glacier Visitor Center, on semi-shaded boulder, *McCune 36006a*.
- Verrucaria fusca*** auct. – Headland between two arms of Coleman Bay, on damp metasedimentary cliffs, *McCune 36321*.
- Verrucaria halophila*** (Nyl.) Nyl. in Branth & Rostr. (= *V. halizoa* auct.) – North of Pilot Harbor on North Arm of Nuka Bay, on noncalcareous metasedimentary rock, upper intertidal, *Schultz 16774* (det. Schultz 2016); thallus olive brown, smooth, not dotted, algae in vertical rows, perithecia prominent, exciple base pale, ascospores 6.5–8.5 × 4.5–5 µm. This

species has previously been reported from North America as *V. halizoa* Leighton or 'auct.' (see synonymy in Santesson et al. 2004), e.g., Brodo & Santesson (1997), Brodo (2016), McCune (2017).

*Verrucaria* cf. *invenusta* H. Magn. – West shore of Beauty Bay, on shaded rock, *McCune 36064* (with poor thallus).

*Verrucaria margacea* (Wahlenb.) Wahlenb. – Crater Bay off of Harris Bay, on streamside granite, *McCune 36266*.

*Verrucaria memnonia* (Flotow in Körber) Arnold – Headland between two arms of Coleman Bay, on damp metasedimentary rock, *McCune 36315*.

*Violella fucata* (Stirt.) T. Sprib. – West of Resurrection River and north of Exit Glacier Road, on trunk of dead *Alnus incana*, *Tønsberg 45672* (TLC: atranorin, fumarprotocetraric acid).

*Wahlenbergiella mucosa* (Wahlenb.) Gueidan & Thüs – North arm of spit across James Lagoon, on metasedimentary rock, flushed by sea water, *Schultz 16843a, 16844*.

*Wahlenbergiella striatula* (Wahlenb.) Gueidan & Thüs – North of Pilot Harbor on North Arm of Nuka Bay, on shoreline rock, just above *Fucus*, *McCune 36070*.

*Xylographa bjoerkii* T. Sprib. – West shore of Beauty Bay, on wood, beach log, *McCune 36032b*.

*Xylographa hians* Tuck. – Occasional on wood at low elevations.

*Xylographa opegraphella* Nyl. ex Rothr. – Near mouth of creek at north end of James Lagoon, on wood, conifer snag, *McCune 36132*.

*Xylographa parallela* (Ach.: Fr.) Behlen & Desberger – West shore of Beauty Bay, on beach log, *McCune 36030*.

*Xylographa soralifera* Holien & Tønsberg – Near mouth of creek at north end of James Lagoon, on driftwood, *Tønsberg 45282*.

*Xylographa trunciseda* (Th. Fr.) Minks – Occasional on wood at low elevations.

*Xylographa vitiligo* (Ach.) J. R. Laundon – Near pond at north end of Three Hole Bay off Aialik Bay, on wood, hard snag, *McCune 36359*. The specimen has dark brown to black, elongate or, more rarely, punctiform soralia. TLC: stictic acid and two fatty acids.

*Xylographa* sp. – Near mouth of creek at north end of James Lagoon, on driftwood, *Tønsberg 45278*. TLC: stictic acid and two fatty acids. The material differs from *X. vitiligo* because of the fatty acids, which are not previously reported for the species. This sterile sorediate specimen was confirmed for *Xylographa* by the ITS sequence, but sequence quality was low. Both the chemistry and the colour and shape of the soralia indicate that it does not belong to *X. vitiligo*.

## Addendum to previous reports from Katmai and Lake Clark National Parks

The following records supplement previous reports from nearby national parks (McCune et al. 2018).

*Aspicilia cinerea* (L.) Körber s.l. – Katmai National Park: shore of Naknek Lake on peninsula northeast of Brooks Camp, *Tønsberg 42720* (TLC: norstictic acid; ascospores: 14–19 × 8–11 µm; pycnidia abundant, spermatia 12–22 µm). ITS sequence (PCR by Louise Lindblom, GenBank MN906290) in the maximum likelihood tree by McCune (unpubl.) placed this specimen with *A. cinerea*, including a sequence from Sweden (GenBank EU057910). Lake Clark National Park: shore of Lake Clark, stop 2, W of Hatchet Point, *McCune 35353* (dark thallus). ITS sequence (GenBank MN906262)

in maximum likelihood tree places the specimen with *A. cinerea*, including specimens cited above. They may belong to undescribed species according to T. Wheeler (pers. comm. 2018);

*Bellemerea cinereorufescens* (Ach.) Clauzade & Cl. Roux – Lake Clark National Park: shoulder of mountain overlooking Tuxedni Bay, on metal-rich rock, *Tønsberg 44274* (orange-brown iron-stained thallus; TLC: unidentified substance in Rf classes A4, B'5, C5 and fatty acids). ITS sequence (GenBank MN906299) differs by two base pairs from KY800500 (*McCune 35490*) from the same site.

*Buellia alboatra* (Hoffm.) Th. Fr. – Katmai National Park: shoreline of Naknek Lake, peninsula northeast of Brooks Camp, *Tønsberg 42704b* (TLC: no substances). ITS sequence (GenBank MN906288) closely matches several *B. alboatra* from GenBank, but *B. alboatra* is polyphyletic (McCune, maximum likelihood analysis).

*Lecidella stigmatea* (Ach.) Hertel & Leuckert – Lake Clark National Park, near campsite at northwest end of Turquoise Lake, on caribou antler, *Tønsberg 43804*. Maximum likelihood tree with ITS sequence (GenBank MN906294) places this specimen in a poorly resolved group with *L. stigmatea* and *L. carpathica*. The specimen contains atranorin and zeorin, which supports *L. stigmatea*, rather than *L. carpathica*, according to current concepts. Both of those taxa are, however, polyphyletic in the tree, so it is impossible to be definitive (McCune, maximum likelihood analysis).

*Lecidella* cf. *wulfenii* (Hepp) Körber – Lake Clark National Park, near campsite at northwest end of Turquoise Lake, on *Salix* bark at upper edge of gravelly beach, *Tønsberg 43815*. ITS sequence (GenBank MN906295) closest match differs from a sequence of *Lecidella wulfenii* from Austria (GenBank JN873903) in seven positions along with a 10-base indel, but the substrate of *Tønsberg 43815* is not typical for that species.

*Lecidella* sp. – Katmai National Park: shoreline of Naknek Lake on peninsula northeast of Brooks Camp, on rock, *Tønsberg 42709* (sorediate, fertile; containing atranorin and three xanthenes). The ITS sequence (GenBank MN906289) places it in a group with *L. elaeochroma* and *L. scabra*, but with no close matches to any available sequences. Reidar Haugan (pers. comm. 2019) regarded this as a probable new species.

*Lepraria* sp. – Katmai National Park: low rocky ridge northeast of Mirror Lake, coarse talus, boulders, and bedrock, saxicolous on sheltered and shaded floor in deep gap between boulders, *Tønsberg 42828*. The specimen is distinctly sorediate. TLC: atranorin and stictic acid. The ITS region (GenBank MN906291) fell in no supported species group, despite about 260 *Lepraria* sequences available. The closest matches were *Lepraria* sp. EF619557, Czech Republic, *Bayerova 3893B* (PRA), and as part of NORBOL, the Norwegian barcode of life network: *OLICH 3739 BG\_L\_99189, OLICH3770 BG\_L\_98944*.

*Porpidia* sp. 1 – Lake Clark National Park: summit of Slope Mountain, overlooking Tuxedni Channel, on loose rocks on bare soil, *Tønsberg 44162a*. Similar to *Porpidia contraponenda* but containing porphyritic and stictic acids. We are not aware of previous reports of porphyritic acid from North American species of *Porpidia*, but this substance is easily overlooked on TLC plates. The ITS sequence (GenBank MN954401) is very close to three specimens in GenBank from Tierra del Fuego, Chile: KX12029, KX12030, KX12031, all identified as '*Porpidia* sp.'

*Porpidia* sp. 2 – Katmai National Park: north end of ridge west of Contact Creek, *Tønsberg 42889*. The ITS sequence

(GenBank MN906292) is not close to anything else in GenBank but definitely within *Porpidia*. The thallus colour is similar to *P. melinodes* and the chemistry as in *P. ochrolemma* (stictic acid).

***Porpidia* sp. 3** – Lake Clark National Park, northwest side of Turquoise Lake, small drainage, on loose rock on the ground, *Tønberg 43791*. With the general appearance of *P. melinodes* but not grouping with the numerous sequences of that species in GenBank (GenBank MN906293).

***Pyrenopsis phaeococca* (Tuck.) Tuck.** – Among several specimens collectively reported as *Pyrenopsis sanguinea* (s.l.) by McCune et al. (2018), more detailed studies revealed that *McCune 32769* from Naknek Lake northeast of Brooks Camp is morphologically indistinguishable from syntypes of *P. phaeococca* in BM and FH. DNA work on this and other material has not yet been finished. Confirmation of the remaining material of *Pyrenopsis sanguinea* requires further studies (see below).

***Pyrenopsis sanguinea* Anzi** – McCune et al. (2018) adopted a broad concept for this central European taxon for an aggregate comprising *P. sanguinea* s.str. and the very similar *P. phaeococca* earlier reported from NE North America and the Scandinavian *P. reducta*, *P. impolita*, and conspecific *P. subfuliginea*. However, molecular data suggest that there are several lineages assignable to distinct species in this complex. While part of the Katmai/Lake Clark material seems to represent a yet undescribed taxon (see below), *P. sanguinea* s.str. cannot be confirmed, but does occur in Kenai NP (see main list). *McCune 35357* from shore of Lake Clark, west of Hatchet Point differs in thallus and hymenial features and therefore is kept here as s.l., and the final placement remaining to be solved.

***Pyrenopsis* sp. 1** – Among the material listed by McCune et al. (2018) as *Pyrenopsis sanguinea* Anzi the following specimens turned out to belong to an undescribed species: *McCune 34101*, ridge west of Contact Creek, *McCune 34017*, north side of Mirror Lake, *Rosentreter 18855*, *18856*, *18869* and *Tønberg 44252a* all from Tuxedni Bay. The thallus is small squamulose with somewhat tessellate surface and numerous semi-immersed apothecia. A specimen from Glacier Bay NP (*Fryday 10346*) possibly belongs here as well. The species also occurs in Kenai NP (see main list).

***Sticta* sp. 1, Clade C** (J. Di Meglio pers. comm. 2020) – Lake Clark National Park, Near Chinitna Ranger Station on north side of Chinitna Bay, *Tønberg 44228*, *44294* (unpubl. ITS sequence and det. by J. Di Meglio 2019).

***Xylographa vermicularis* T. Sprib.** – Lake Clark National Park: bay on SW side of Portage Lake, on ± hard wood of *Picea glauca* on slope facing lake, *Tønberg 43918* (TLC: stictic and confriesiiic acids, the latter missing or in low concentrations in one split of this specimen). Two ITS sequences (GenBank MN906296, MN906297) from different part of the same specimens, but similar morphologies – both sequences essentially identical.

## Acknowledgements

We contribute this paper in honor of our friend and colleague, the illustrious Philippe Clerc, whose critical work on *Usnea* has enlightened us all and established an excellent basis for future studies of one of the most difficult genera of all. We thank the National Park Service in Anchorage and Chris Lauver in the Cooperative Ecosystem Studies Unit in Seattle for sponsoring this project under Cooperative Agreement H8W07110001 with Oregon State University. We thank Heidi Lie Andersen, Elve

Arvebakk, Astri Botnen, Irwin Brodo, Karen Dillman, Alan Fryday, Per Magnus Jørgensen, Martin Kukwa, Helmut Mayrhofer, Leena Myllys, Raquel Pino-Bodas, Christian Printzen, Toby Spribille, Daphne Stone, Einar Timdal, and Tim Wheeler for providing identifications, advice, and specimens for comparison; and Irwin Brodo and James Lendemer for constructive criticism of the manuscript. Leon Rogers and Dongling Niu assisted with thin-layer chromatography and DNA extraction, PCR, and sequencing. Additional and substantial molecular work was performed by Michelle Wiseman at the Plant Clinic at Oregon State University and Louise Lindblom of the University of Bergen. Einar Timdal provided information on Krog's specimens and data from Alaska. Tim Wheeler helped to place *Aspicilia* ITS sequences using his unpublished data. We thank Capt. Melissa Knight and first mate J.P. for facilitating the field work from the research vessel M/V Serac.

## Supplementary electronic material

**Table S1.** Collecting sites in Kenai Fjords National Park visited in summer 2015 (McCune, Rosentreter, Schultz, Tønberg & Walton) and 2016 (McCune & Walton). [Download file](#)

**Table S2.** FIA-style plot characteristics at Kenai Fjords National Park (data by Walton and Hutten) sampled in 2012 and 2013. [Download file](#)

**Table S3.** New GenBank accession numbers. Park codes: KATM = Katmai, KEFJ = Kenai Fjords, LACL = Lake Clark. [Download file](#)

## References

- Alaska National Interest Lands Conservation Act (ANILCA). 1980. Public Law 96–487. 94 Statute 2371. <https://www.nps.gov/locations/alaska/anilca.htm>
- Alaska Natural Heritage Program (AKNHP). 2015. Rare lichen list. Alaska Natural Heritage Program. <http://accs.uaa.alaska.edu/botany/rare-lichen-list> [accessed 12 May 2016]
- Allen, J. L., McMullin, R. T., Tripp, E. A. & Lendemer, J. C. 2019. Lichen conservation in North America: a review of current practices and research in Canada and the United States. *Biodiversity and Conservation* 28: 3103–3138.
- Alphandary, E. & McCune, B. 2013. A new chemical spot test for miriquidic acid. *The Lichenologist* 45: 697–699.
- Arup, U., Vondrák, J. & Halici, M. G. 2015. *Parvoplaca nigroblastidiata*, a new corticolous lichen (*Teloschistaceae*) in Europe, Turkey and Alaska. *The Lichenologist* 47: 379–385.
- Bendiksby, M., Haugan, R., Spribille, T. & Timdal, E. 2015. Molecular phylogenetics and taxonomy of the *Calvitimela aglaea* complex (*Tephromelataceae*, *Lecanorales*). *Mycologia* 107: 1175–1183.
- Bennett, J. & Wetmore, C. 2005. Lichens of the U. S. National Parks. *The Bryologist* 108: 544–553.
- Bergamini, A., Scheidegger, C., Stofer, S., Carvalho, P., Davey, et al. 2005. Performance of macrolichens and lichen genera as indicators of lichen species richness and composition. *Conservation Biology* 19: 1051–1062.
- Boggs, K., Klein, S. C., Flagstad, L., Boucher, T., Grunblatt, J. & Koltun, B. 2008. Landcover classes, ecosystems and plant associations of Kenai Fjords National Park. Natural Resource Technical Report NPS/KEFJ/NRTR–2008/136. National Park Service, Fort Collins, Colorado.
- Brodo, I. M. 1988. Studies of the lichen genus *Ochrolechia*. 1. A new classification for *Pertusaria subplicans* and *P. rhodoleuca*. *Canadian Journal of Botany* 66: 1264–1269.
- Brodo, I. M. 1995. The lichens and lichenicolous fungi of Haida Gwaii (Queen Charlotte Islands), British Columbia, Canada. 1 Introduction and new records for B.C., Canada and North America. *Mycotaxon* 56: 135–173.

- Brodo, I. M. 2010. The lichens and lichenicolous fungi of Haida Gwaii (Queen Charlotte Islands), British Columbia, Canada. 5. A new species of *Lecanora* from shoreline rocks. *Botany* 88: 352–358.
- Brodo, I. M. 2016. *Keys to Lichens of North America: Revised and Expanded*. Yale University Press, New Haven and London.
- Brodo, I. M. & Ahti, T. 1996. Lichens and lichenicolous fungi of the Queen Charlotte Islands, British Columbia, Canada. 2. The *Cladoniaceae*. *Canadian Journal of Botany* 74: 1147–1180.
- Brodo, I. M. & Hawksworth, D. L. 1977. *Alectoria* and allied genera in North America. *Opera Botanica* 42: 1–164.
- Brodo, I. M. & Santesson, R. 1997. Lichens of the Queen Charlotte Islands, British Columbia, Canada. 3. Marine species of *Verrucaria* (*Verrucariaceae*, *Ascomycotina*). *Journal of the Hattori Botanical Laboratory* 82: 27–37.
- Brodo, I. M., Haldeman, M. & Malíček, J. 2019. Notes on species of the *Lecanora albella* group (*Lecanoraceae*) from North America and Europe. *The Bryologist* 122: 430–450.
- Calkin, P. E., Wiles, G. C. & Barclay, D. J. 2001. Holocene coastal glaciation of Alaska. *Quaternary Science Reviews* 20: 449–461.
- Culberson, C. F. 1972. Improved conditions and new data for the identification of lichen products by a standardized thin-layer chromatographic method. *Journal of Chromatography* 72: 113–125.
- Culberson, C. F. & Johnson, A. 1982. Substitution of methyl tert-butyl ether for diethyl ether in standardized thin-layer chromatographic method for lichen products. *Journal of Chromatography* 238: 483–487.
- Culberson, C. F. & Kristinsson, H. 1970. A standardized method for the identification of lichen products. *Journal of Chromatography* 46: 85–93.
- Dibben, M. J. 1980. The chemosystematics of the lichen genus *Pertusaria* in North America north of Mexico. *Milwaukee Public Museum, Publications in Biology and Geology* 5: 1–162.
- Diederich, P. 1996. The lichenicolous *Heterobasidiomycetes*. *Bibliotheca Lichenologica* 61: 1–198.
- Divakar, P. K., Crespo, A., Kraichak, E., Leavitt, S. D., Singh, G., Schmitt, I. & Lumbsch, H. T. 2017. Using a temporal phylogenetic method to harmonize family and genus-level classification in the largest clade of lichen-forming fungi. *Fungal Diversity* 84: 101–117.
- Esslinger, T. L. 2019. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada, version 23. *Opuscula Philolichenum* 18: 102–378.
- Esslinger, T. L., McCune, B. & Haughland, D. L. 2017. *Physconia labrata*, a new species from western North America and Asia. *The Bryologist* 120: 427–434.
- Fontaine, K. M., Beck, A., Stocker-Wörgötter, E. & Piercey-Normore, M. D. 2012. Photobiont relationships and phylogenetic history of *Dermatocarpon luridum* var. *luridum* and related *Dermatocarpon* species. *Plants* 1: 39–60.
- Foucard, T. 2001. *Svenska skorplavlar och svampar som växer på dem*. Interpublishing, Stockholm.
- Fryday, A. M. & Tønsberg, T. 2015. *Ameliella*, a bryicolous lichen genus rediscovered in North America after 50 years. *Evansia* 32: 171–175.
- Geiser, L. H. & Neitlich, P. N. 2007. Air pollution and climate gradients in western Oregon and Washington indicated by epiphytic macrolichens. *Environmental Pollution* 145: 203–218.
- Geiser, L. H., Jovan, S. E., Glavich, D. A. & Porter, M. K. 2010. Lichen-based critical loads for atmospheric nitrogen deposition in western Oregon and Washington forests, USA. *Environmental Pollution* 158: 2412–2421.
- Goward, T. 1999. *The Lichens of British Columbia. Illustrated Keys. Part 2, Fruticose Species*. Crown Publications, Victoria, British Columbia.
- Guindon S., Dufayard, J. F., Lefort, V., Anisimova, M., Hordijk, W. & Gascuel, O. 2010. New algorithms and methods to estimate maximum-likelihood phylogenies: Assessing the performance of PhyML 3.0. *Systematic Biology* 59: 307–321.
- Guzow-Krzemińska, B., Lubek, A., Malíček, J., Tønsberg, T., Oset, M. & Kukwa, M. 2017. *Lecanora stanislai*, a new, sterile, usnic acid containing lichen species from Eurasia and North America. *Phytotaxa* 329: 201–211.
- Henssen, A. 1969. Eine Studie über die Gattung *Arctomia*. *Svensk Botanisk Tidskrift* 63: 126–138.
- Hertel, H. 2006. World distribution of species of *Lecidea* (*Lecanorales*) occurring in Central Europe. In: Lackovičová, A., Guttová, A., Lisická, E., Lizoň, P.: *Central European Lichens – Diversity and Threat*, pp. 19–74. Mycotaxon Ltd., Ithaca, and Institute of Botany, Slovak Academy of Sciences, Bratislava.
- Hite, D. M. & Stone, D. M. 2013. Chapter 1: A history of oil and gas exploration, discovery and future potential: Cook Inlet Basin, south-central Alaska. *AAPG Memoir 104: Oil and Gas Fields of the Cook Inlet Basin, Alaska*, pp. 1–35.
- Hutten, M., Arup, U., Breuss, O., Esslinger, T. L., Fryday, A. M., et al. 2013. Lichens and lichenicolous fungi of Yosemite National Park, California. *North American Fungi* 8(11): 1–47.
- IRMA. 2017. *NPSpecies*. Integrated Resource Management Application, National Park Service <https://irma.nps.gov/NPSpecies/Search/SpeciesList/KEFJ> [accessed 26 July 2017]
- Joly, K., Dale, B. W., Collins, W. B. & Adams, L. G. 2003. Winter habitat use by female caribou in relation to wildland fires in interior Alaska. *Canadian Journal of Zoology* 81: 1192–1201.
- Kearse, M., Moir, R., Wilson, A., Stones-Havas, S., Cheung, M., Sturrock, S., Buxton, S., Cooper, A., Markowitz, S., Duran, C., Thierer, T., Ashton, B., Mentjies, P. & Drummond, A. 2012. Geneious Basic: an integrated and extendable desktop software platform for the organization and analysis of sequence data. *Bioinformatics* 28: 1647–1649.
- Knudsen, K. & Kocourková, J. 2017. *Acarospora toensbergii* sp. nov. (*Acarosporaceae*), a saxicolous lichen from Alaska. *Opuscula Philolichenum* 16: 317–321.
- Krog, H. 1968. *The Macrolichens of Alaska*. Norsk Polarinstitut. Skrifter Nr. 144. Oslo, Norway.
- Lanik, A., Hulst, C. P. & Kurtz, D. 2018. Kenai Fjords National Park: Geologic resources inventory report. Natural Resource Report NPS/NRSS/GRD/NRR–2018/1851. National Park Service, Fort Collins, Colorado.
- Leavitt, S. D., Divakar, P. K., Crespo, A. & Lumbsch, H. T. 2016. A matter of time – understanding the limits of the power of molecular data for delimiting species boundaries. *Herzogia*. 29: 479–492.
- Lendemer, J. C. 2013a. A monograph of the crustose members of the genus *Lepraria* Ach. s.str. (*Stereocaulaceae*, lichenized *Ascomycetes*) in North America north of Mexico. *Opuscula Philolichenum* 11: 27–141.
- Lendemer, J. C. 2013b. Molecular phylogenetic evidence corroborates morphology but not chemistry in the *Lepraria neglecta* group (*Stereocaulaceae*). *Memoirs of the New York Botanical Garden: Harmony and Grit: Papers Celebrating the Holmgrens' Completion of Intermountain Flora* 108: 127–153.
- Lohtander, K. 1994. The genus *Lepraria* in Finland. *Annales Botanici Fennici* 31: 223–231.
- Loso, M., Arendt, A., Larsen, C. F., Rich, J. & Murphy, N. 2014. Alaskan national park glaciers – Status and Trends. National Park Service, Fort Collins, Colorado. <https://irma.nps.gov/App/Reference/Profile/2217472>.
- Lücking, R., Moncada, B., McCune, B., Farkas, E., Goffinet, B., et al. 2017. *Pseudocyphellaria crocata* (*Ascomycota: Lobariaceae*) in the Americas is revealed to be thirteen species, and none of them is *P. crocata*. *The Bryologist* 120: 441–500.
- McCune, B. 2008. Three new species of *Hypogymnia* (*Ascomycota: Parmeliaceae*) from the Bering Sea region, Alaska and Russia. *North American Fungi* 3(6): 1–10.

- McCune, B. 2017. *Microlichens of the Pacific Northwest*. 2 vols. Wild Blueberry Media, Corvallis, Oregon, USA.
- McCune, B. 2018. Two new species in the *Umbilicaria torrefacta* group from Alaska and the Pacific Northwest of North America. *Graphis Scripta* 30: 65–77.
- McCune, B. & Geiser, L. 2009. *Macrolichens of the Pacific Northwest*. 2nd Edition. Oregon State University Press.
- McCune, B. & Grace, J. B. 2002. *Analysis of Ecological Communities*. MjM Software Design, Glenden Beach, Oregon.
- McCune, B., Timdal, E. & Bendiksby, M. 2016. *Rhizocarpon quinonum*, a new anthraquinone-containing species from the Alaska Peninsula. *The Lichenologist* 48: 367–375.
- McCune, B., Arup, U., Breuss, O., Di Meglio, E., Di Meglio, J., Esslinger, T. L., Magain, N., Miadlikowska, J., Miller, A. E., Muglia, L., Nelson, P. R., Rosentreter, R., Schultz, M., Sheard, J. W., Tønsberg, T. & Walton, J. 2018. Biodiversity and ecology of lichens of Katmai and Lake Clark National Parks and Preserves, Alaska. *Mycosphere* 9: 859–930.
- McCune, B., Di Meglio, E., Tønsberg, T. & Yahr, R. 2019. Five new crustose *Stereocaulon* species in western North America. *The Bryologist* 122: 197–218.
- McMullin, R. T. & Lendemer, J. C. 2013. Lichen biodiversity and conservation status in the Copeland Forest Resources Management Area: a lichen-rich second-growth forest in southern Ontario. *Canadian Field-Naturalist* 127: 240–254.
- Miadlikowska, J., Magain, N., Pardo-De la Hoz, C. J., Niu, D., Goward, T., Sérusiaux, E. & Lutzoni, F. 2018. Species in section *Peltidea* (*aphthosa* group) of the genus *Peltigera* remain cryptic after molecular phylogenetic revision. *Plant and Fungal Systematics* 63: 45–64.
- Miller, A. E., Carlson, M., Lipkin, R. & Spencer, P. 2006. *Vascular plant inventory and baseline monitoring of nunatak communities* (2005). Lake Clark National Park and Preserve and Kenai Fjords National Park. Southwest Alaska Network, National Park Service. Anchorage, Alaska.
- Montgomery, S. L., Barker, C. E., Seamount, D., Dallegge, T. A. & Swenson, R. F. 2003. Coalbed methane, Cook Inlet, south-central Alaska: A potential giant gas resource. *AAPG Bulletin* 87: 1–13.
- Morse, C. A. & Ladd, D. 2019. *Staurothele nemorum* sp. nov. (*Ascomycota: Verrucariaceae*), with a revised key to North American *Staurothele* s.lat. *The Lichenologist* 51: 495–506.
- Myllys, L., Velmala, S., Holien, H., Halonen, P., Wang, L. S., Goward, T. 2011. Phylogeny of the genus *Bryoria*. *The Lichenologist* 43: 617–638.
- Myllys, L., Velmala, S., Pino Bodas, R. & Goward, T. 2016. New species in *Bryoria* (*Parmeliaceae, Lecanoromycetes*) from north-west North America. *The Lichenologist* 48: 355–365.
- Nelson, P. R., Roland, C., Macander, M. J. & McCune, B. 2013. Detecting continuous lichen abundance for mapping winter caribou forage at landscape spatial scales. *Remote Sensing of Environment* 137: 43–254.
- Nelson, P. R., McCune, B. & Swanson, D. K. 2015. Lichen traits and species as indicators of vegetation and environment. *The Bryologist* 118: 252–263.
- Onut-Brännström, I., Tibell, L. & Johannesson, H. 2017. A worldwide phylogeography of the whiteworm lichens *Thamnolia* reveals three lineages with distinct habitats and evolutionary histories. *Ecology and Evolution* 7: 3602–3615.
- Onut-Brännström, I., Johannesson, H. & Tibell, L. 2018. *Thamnolia tundrae* sp. nov., a cryptic species and putative glacial relict. *The Lichenologist* 50: 59–76.
- Orange, A. 2012. Semi-cryptic marine species of *Hydropunctaria* (*Verrucariaceae*, lichenised *Ascomycota*) from North-west Europe. *The Lichenologist* 44: 299–320.
- Peel, M. C., Finlayson, B. L. & McMahon, T. A. 2007. Updated world map of the Köppen–Geiger climate classification. *Hydrology and Earth System Sciences* 11: 1633–1644.
- Piercey-Normore, M. D., Ahti, T. & Goward, T. 2010. Phylogenetic and haplotype analyses of four segregates within *Cladonia arbuscula* s.l. *Botany* 88: 397–408.
- Purvis, O., Fernández-Brime, S., Westberg, M. & Wedin, M. 2018. *Myriospora*, a genus newly reported for Antarctica with a worldwide key to the species. *The Lichenologist* 50: 101–112.
- Richter, D. H. 1970. *Geology and lode-gold deposits of the Nuka Bay area, Kenai Peninsula, Alaska*. Professional Paper 625-B. US Geological Survey, Washington, DC. <https://pubs.er.usgs.gov/publication/pp625B>.
- Ruess R. W., McFarland, J. M., Trummer, L. M. & Rohrs-Richey, J. K. 2009. Disease-mediated declines in N-fixation inputs by *Alnus tenuifolia* to early-successional floodplains in interior and south-central Alaska. *Ecosystems* 12: 489–502.
- Root, H. T., McCune, B. & Jovan, S. 2014. Lichen communities and species indicate climate thresholds in southeast and south-central Alaska, USA. *The Bryologist* 117: 241–252.
- Santesson, R., Moberg, R., Nordin, A., Tønsberg, T. & Vitikainen, O. 2004. *Lichen-forming and lichenicolous fungi of Fennoscandia*. Museum of Evolutions, Uppsala.
- Sheard, J. W., McCune, B. & Tønsberg, T. 2014. A new corticolous species of *Rinodina* (*Physciaceae*) and two interesting range extensions for species collected from Katmai National Park, Alaska. *The Bryologist* 117: 253–258.
- Sherriff R. L., Berg, E. E. & Miller, A. E. 2011. Climate variability and spruce beetle (*Dendroctonus rufipennis*) outbreaks in south-central and southwest Alaska. *Ecology* 92: 1459–1470.
- Smith, R. J., Jovan, S. & McCune, B. 2017. *Lichen Communities as Climate Indicators in the U.S. Pacific States*. GTR-PNW-952. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.
- Smith, R. J., Jovan, S. & McCune, B. 2020. Climatic niche limits and community-level vulnerability of obligate symbioses. *Journal of Biogeography* 47: 382–395.
- Spribile, T., Pérez-Ortega, S., Tønsberg, T. & Schirokauer, D. 2010. Lichens and lichenicolous fungi of the Klondike Gold Rush National Historic Park, Alaska, in a global biodiversity context. *The Bryologist* 113: 439–515.
- Spribile, T., Fryday, A. M., Pérez-Ortega, S., Svensson, M., Tønsberg, T., Ekman, S., Elix, J. A., Holien, H., Stabentheiner, E., Thüs, H. & Sharman, L. 2020. Lichens and associated fungi from Glacier Bay, Alaska. *The Lichenologist* (in press).
- Stehn, S. E., Walton, J. K., Nelson, P. R., Hampton-Miller, C. J. & Roland, C. A. 2015. A lichen species list for Denali National Park and Preserve, Alaska, with comments on several new and noteworthy records. *Evansia* 32: 195–215.
- Stenroos, S., Velmala, S., Pykälä, J. & Ahti, T. 2016. Lichens of Finland. *Norrinia* 30: 1–896.
- Stone, D. F., Hinds, J. W., Anderson, F. L. & Lendemer, J. C. 2016. A revision of the *Leptogium saturninum* group in North America. *The Lichenologist* 48: 387–422.
- Szumigala, D. J., Harbo, L. A. & Adleman, J. N. 2010. *Alaska's Mineral Industry 2010: Special Report 65*. Alaska Division of Geological and Geophysical Surveys, Fairbanks, Alaska.
- Talbot, S. S., Talbot, S. L., Thomson, J. W. & Schofield, W. B. 1997. Lichens of Adak Island, Central Aleutian Islands, Alaska. *The Bryologist* 100: 241–250.
- Thomson, J. W. 1984. *American Arctic Lichens, Vol. I: The Macrolichens*. Columbia University Press, New York.
- Thomson, J. W. 1997. *American Arctic Lichens, Vol. II. Crustose Lichens*. University of Wisconsin Press, Madison.
- Thomson, J. W. & Ahti, T. 1994. Lichens collected on an Alaska Highway expedition in Alaska and Canada. *The Bryologist* 97: 138–157.
- Tønsberg, T. 1992. The sorediate and isidiate, corticolous, crustose lichens in Norway. *Sommerfeltia* 14: 1–331.

- Tønsberg, T. 2016. *Jamesiella scotica* new to North America from USA, Alaska. *Folia Cryptogamica Estonica* 53: 23–24.
- Tønsberg, T. & Printzen, C. 2018. *Biatora troendelagica* new to North America from Alaska, USA. *Graphis Scripta* 30: 161–165.
- Triebel, D. 1989. Lecideicole Ascomyceten. Eine Revision der obligat lichenicolen Ascomyceten auf lecideoiden Flechten. *Bibliotheca Lichenologica* 35: 1–278.
- USDA 2010. *Forest inventory and analysis national core field guide. FIA field methods for phase 3 measurements. Version 3.0.* U. S. Department of Agriculture, Forest Service. <https://www.fia.fs.fed.us/library/field-guides-methods-proc/>
- Velmala, S., Myllys, L., Goward, T., Holien, H. & Halonen, P. 2014. Taxonomy of *Bryoria* section *Implexae* (*Parmeliaceae*, *Lecanoromycetes*) in North America and Europe, based on chemical, morphological and molecular data. *Annales Botanici Fennici* 51: 345–371.
- Walton, J. K., Hutten, M. & Torigoe, S. K. 2014. *Inventory of the Mosses, Liverworts, and Lichens of Kenai Fjords National Park, Alaska. 2013 Progress Report.* Natural Resource Data Series Report NPS/SWAN/NRDS–2014/635. National Park Service, Anchorage. Web site [accessed July 2017]: [https://science.nature.nps.gov/im/units/swan/assets/docs/reports/inventories/WaltonJ\\_KEFJ\\_FINAL\\_Bryo-LichenInvStatus\\_20140331.pdf](https://science.nature.nps.gov/im/units/swan/assets/docs/reports/inventories/WaltonJ_KEFJ_FINAL_Bryo-LichenInvStatus_20140331.pdf)
- Wang, L. S., Wang, X. Y., Liu, D., Myllys, L., Shi, H. X., Zhang, Y. Y., Yang, M. X. & Li, L. J. 2017. Four new species of *Bryoria* (lichenized *Ascomycota*: *Parmeliaceae*) from the Hengduan Mountains, China. *Phytotaxa* 297: 29–41.
- Werner R. A., Holsten, E. H., Matsuoka, S. M. & Burnside, R. E. 2006. Spruce beetles and forest ecosystems in south-central Alaska: a review of 30 years of research. *Forest Ecology & Management* 227: 195–206.
- Westberg, M., Crewe, A. T., Purvis, O. W. & Wedin, M. 2011. *Silobia*, a new genus for the *Acarospora smaragdula* complex (*Ascomycota*, *Acarosporales*) and a revision of the group in Sweden. *The Lichenologist* 43: 7–25.
- Zahradníková, M. 2017. Taxonomy and phylogeny of the family *Fuscideaceae* (*Umbilicariales*, *Ascomycota*) with special emphasis on *Fuscidea*. University of Bergen, PhD Thesis.