

Lichens from St. Matthew and St. Paul Islands, Bering Sea, Alaska

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Abstract. One hundred thirty-nine taxa of lichens including two lichen parasites are reported from St. Matthew and St. Paul Islands in the Bering Sea. *Caloplaca lithophila* is new to Alaska. Wide-ranging arctic-alpine and boreal species dominate the lichens; a coastal element is moderately represented, while amphi-Beringian species form a minor element. In comparison with St. Paul Island, St. Matthew Island is richer in arctic-alpine species.

The most isolated Bering Sea island groups are St. Matthew Island, including Hall and Pinnacle Islands, and the Pribilof Islands, including St. Paul and St. George. The Pribilof Islands are located 400 km north of the Aleutian Chain; St. Matthew lies an additional 400 km north of St. Paul and 330 km south of St. Lawrence Island; St. Matthew and St. Paul are 400 km from the Alaska mainland (Fig. 1). The isolation of St. Matthew and St. Paul Islands makes them of great phytogeographic interest. In spite of this, their lichen diversity has been poorly documented.

All of St. Matthew Island and the western coast of St. Paul Island are part of the Alaska Maritime National Wildlife Refuge managed by the U.S. Fish and Wildlife Service. St. Matthew is a Class I air quality area (Clean Air Act, 42 U.S. Code 7401 et seq.); the western coast of St. Paul Island is a Class II air quality area. In accordance with its responsibility for ensuring high air quality standards, the Service sought to assess the existing condition of wilderness resources of these islands in relation to air quality using the guidelines proposed by Fox et al. (1987). According to these procedures, the first step in characterizing the plant component is to establish a floristic list, which includes for each species distributional information. As the lichens of both islands were poorly known, a major objective of the present study was to list the lichens, including habitat and distribution information.

From a wildlife management perspective, lichens are important in the diet of caribou (Sjenneberg & Slagsvold 1979). A field study of reindeer-range re-

lationships was made on St. Matthew Island in 1953 (Klein 1959). This range study showed serious over-utilization of the lichens in the winter range by the introduced reindeer. A die-off of the herds occurred following over-utilization of the lichens and today the island is devoid of reindeer. Currently on St. Paul Island, a reindeer herd ranges throughout the island and uses lichens particularly in the winter. The herd has increased in numbers to about 600 and appears to be overgrazing lichens. Our list of the lichens provides basic information for an assessment of reindeer range and foraging ecology.

This paper reports lichens collected from the St. Matthew and St. Paul Islands, describes their habitats and phytogeographical distribution, and lists voucher collections. Hitherto the lichens have received moderate attention in these Bering Sea islands with St. Matthew being the least well known. References to the lichen taxa of St. Matthew Island are in Cummings (1910), Degelius (1937), Dibben (1980), Klein (1959), Rausch and Rausch (1968), Rothrock (1884), Thomson (1984, 1997), and Wetmore (1960), and for St. Paul Island in Arup (1994), Degelius (1937), Dibben (1980), Howe (1913), Llano (1950), Macoun (1899), Rothrock (1884), Schindler (1990), Thomson (1984, 1997), and Wetmore (1960), and possibly others that we may have overlooked. The nearest areas of relatively well-known lichen documentation are Adak Island (Talbot et al. 1997; 219 taxa), located in the central Aleutian Islands, and Izembek National Wildlife Refuge, located at the westernmost portion of the Alaska Peninsula (Talbot et al. 2000; 182 taxa), western Kodiak Island (Talbot 1998; 129 taxa), located in the Gulf of Alaska, and Tuxedni Wilderness Area (Talbot et al. 1992; 219 taxa) located in Lower Cook Inlet.

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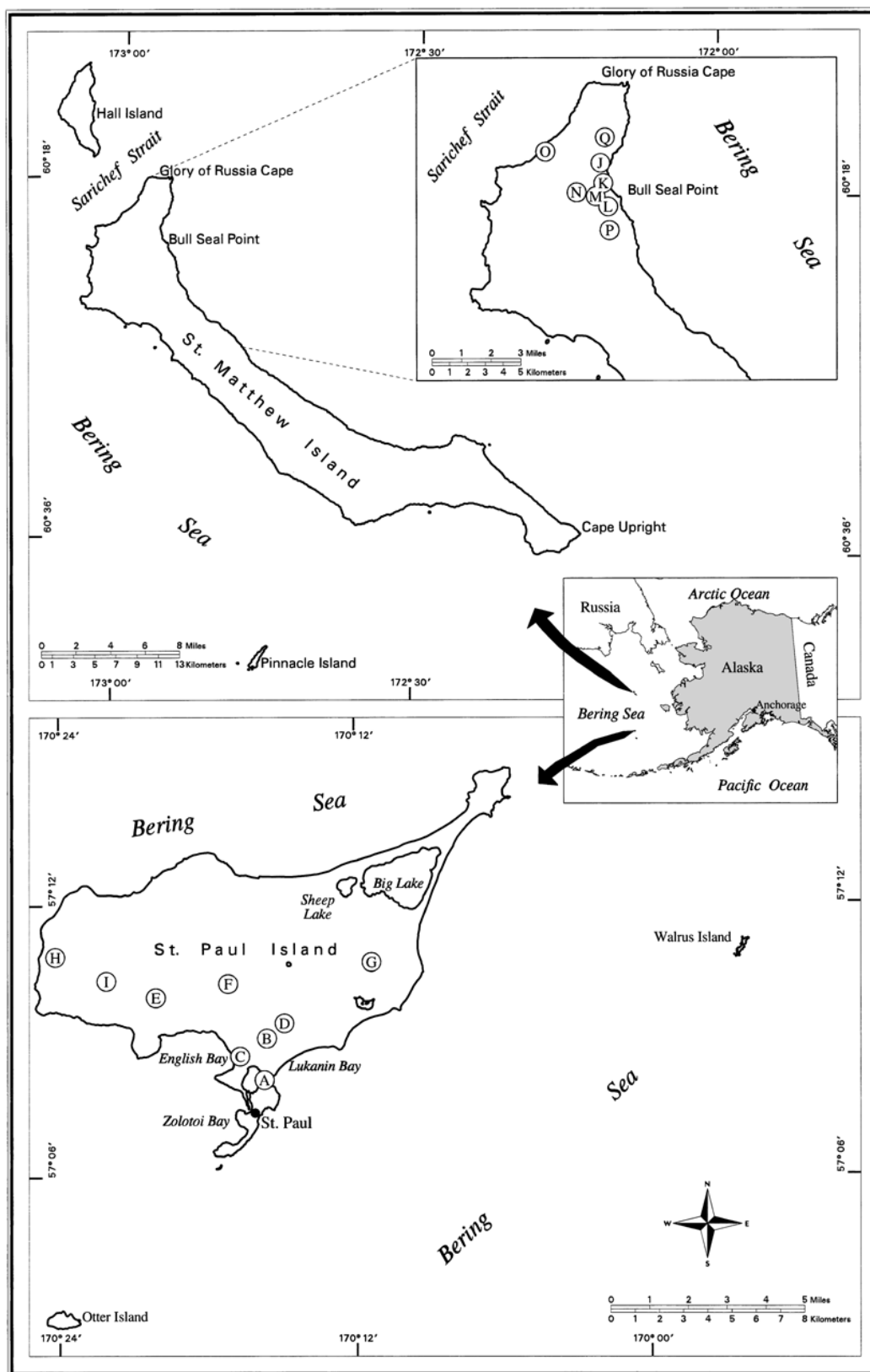


FIGURE 1. Location of St. Paul and St. Matthew Islands, Alaska, and map of the lichen collection sites. Circled letters are collection sites listed in the Methods section.



FIGURE 2. General aspect of the landscape of southwestern St. Paul Island, Alaska, in the Cone Hill area (Site I). Old volcanic cones rise approximately 100 m above the surrounding terrain. The island is mostly low-lying (<180 m) with no streams and nearly no wetlands. Common species collected in this area are *Cetraria ericetorum*, *Cladina mitis*, *Cladonia bellidiflora*, *C. gracilis*, *C. maxima*, *Melanelia hepatizon*, *Parmelia omphaloides*, *Peltigera malacea*, *Stereocaulon arenarium*, *S. intermedium*, and *Tuckermannopsis chlorophylla*.

STUDY AREA

St. Matthew and St. Paul Islands that comprise the study area occur in two distinctly different ecoregions of Alaska (Gallant et al. 1995). St. Matthew Island located at 60°30' N, 172°45' W occurs within the "Subarctic Coastal Plains" ecoregion, while St. Paul Island, located at 57°11' N, 170°18' W occurs within the "Aleutian Islands" ecoregion. In a floristic division of the Arctic, Yurtsev (1994) assigned St. Matthew Island to the Southern Hypoarctic tundra subzone, and St. Paul Island to the Oceanic Boreal subzone. St. Paul Island is relatively small (16 km across), mostly low-lying with no streams and a maximum elevation of 180 m (Bogoslof Hill) (Fig. 2). In contrast, St. Matthew Island is larger (56 km long, 6 km wide), more mountainous, rich in streams, and three mountains are in excess of 305 m; mountains at the northern end at the Glory of Russia Cape and the southern end at Cape Upright, rise to elevations of 450 m and 459 m, respectively (Fig. 3).

Vegetation of these Bering Sea islands was mapped as wet, moist, and alpine tundra (Selkregg 1974). Klein (1959) described the vegetation of St. Matthew Island. He classified the plant communities into five major groups based on landform and drainage characteristics: 1) "dry flats," dry tundra vegetation consisting mainly of lichens (*Cladina stellaris*, *Flavocetraria cucullata*, *Sphaerophorus globosus*, *Thamnomia vermicularis*), willows (*Salix*

crassijulis × *ovalifolia*), and sedges (*Carex nesophila*) that occur on well-drained rocky soils; 2) "dry, low ridge tops and benches," the vegetation is similar to the dry flats but lichen, willow, and moss cover is less and the well-drained mineral soils are exposed; 3) "moist, well-drained meadows," the vegetation of this type is closed and the mineral soils are exposed; the type is dominated by sedges (*Carex nesophila*), a diversity of alpine forbs (such as *Aconitum delphinifolium*, *Pedicularis capitata*, and *Valeriana capitata*), willows (*Salix rotundifolia*, *S. reticulata*), and lichens are very scattered; 4) "wet, poorly-drained meadows," the vegetation is dominated by wet sedge meadows (*Carex glareosa*, *C. stans*, *Eriophorum angustifolium*, *E. russeolum*) with *Sphagnum* spp., a few lichens (*Cladina stellaris*, *Thamnomia vermicularis*, and others), and vascular plants as *Petasites frigidus*, *Potentilla palustris*, *Rubus arcticus*, and *Salix fuscescens*; the type is common in some sections of flats, broad valleys, and low mountain passes with poorly drained soils; and 5) "rock rubble fields and high ridge cops," vegetation is mainly restricted to crustose lichens.

Macoun (1899: 560–561) described the vegetation of the Pribilof Islands as "tundra-like and much resembles the barren grounds of arctic America." He mentioned that common vascular plants of wind-exposed and elevated portions of the islands are *Arenaria macrocarpa*, *Artemisia globularia*, *Eritrichium chamissonis*, *Eutrema ed-*



FIGURE 3. General aspect of the fog-laden landscape of northeastern St. Matthew Island, Alaska, in the Bull Seal Point area (Sites L, M, and P); steep rock cliffs rise from the Bering Sea. St. Matthew Island is more mountainous and is richer in streams and wetlands than St. Paul Island. Common lichen species within the photograph area are *Alectoria nigricans*, *A. ochroleuca*, *Cetraria ericetorum*, *Cladonia mitis*, *C. rangiferina*, *C. stellaris*, *Cladonia amaurocrea*, *C. borealis*, *C. fimbriata*, *C. gracilis*, *Flavocetraria cucullata*, *F. nivalis*, *Lobaria linita*, *Parmelia omphalodes*, *Peltigera aphthosa*, *P. britannica*, *P. membranacea*, *P. scabrosa*, *Pertusaria alaskensis*, *Pseudophebe pubescens*, *Stereocaulon intermedium*, *Thamnolia vermicularis*, *Umbilicaria cylindrica*, *U. polyphylla*, and *Xanthoria elegans*.

wardsii, *Geum rossii*, *Papaver radicum*, *Pedicularis langsдорфii*, *P. lanata*, *Potentilla villosa*, and *Silene acaulis*. Grassy banks and upland meadows are frequent, particularly near the sea. Some conspicuous species from these areas are *Pedicularis verticillata*, *Ranunculus eschscholtzii*, *R. sulphureus*, and *Valeriana capitata*. On St. Paul Island, there are few wetland species and only one true bog; *Sphagnum* is rare. Sandy shores and dunes are extensive and are characterized by meadow species such as *Elymus mollis*, *Honckenya peploides*, and *Lathyrus maritimus*.

Frequent cyclonic storms crossing the Bering Sea dominate the weather pattern (National Climatic Data Center 1986). The climate is maritime with considerable wind and cool, humid, and cloudy conditions. Mean annual temperature for St. Paul is 3.7°C and mean annual precipitation, 590 mm (Leslie 1989). A single year's data from St. Matthew Island recorded by the U.S. Army during the period September 1943–August 1944 (Klein 1959) showed a mean annual temperature of 3.2°C and total annual precipitation, 389 mm. Using an ecoclimatic-phyto-geographical system, Tuhkanen (1984) included the study area in the hemiarctic subzone, hyperoceanic (O₂) sector, and humid (h) province. Others place the area in the Low Arctic (Bliss & Matveyana 1991; Knapp 1965).

Volcanic rocks of Quaternary age underlie the study area (Beikman 1980). Major rock constituents are andesite and basalt lava flows, lahar deposits, sills, and plugs. Surficial deposits of both islands contain high percentages of volcanic rock particles, ash, and pumice flanking peaks of Quaternary and Tertiary age (Karlstrom et al. 1964). St. Matthew Island is underlain almost entirely of calc-alkaline volcanic rocks of Late Cretaceous and earliest Tertiary age (Patton et al. 1975).

The dominant soils of St. Matthew Island are Pergelic Cryaquolls and Pergelic Cryoborolls; these Mollisols have a mollic epipedon but no underlying horizon is dominated by ashy material (Rieger et al. 1979). Other soils include Histic Pergelic Cryaquepts, Pergelic Cryofibrists, Pergelic Cryaquepts, and Pergelic Cryorthents. In contrast, the dominant soils of St. Paul Island are Typic Cryandepts, a type of Inceptisol formed in volcanic ash. Lithic Cryandepts are a minor type.

METHODS

Field studies were done during July, 1997 with collections from 25 localities. A total of 528 specimens were collected. All collections were made by the first, second, and fourth authors (SST, SLT, & WBS) and the collection

numbers are theirs. The third author (JWT) made all determinations. Voucher specimens are deposited in the University of Wisconsin Herbarium (wis). Nomenclature follows Esslinger and Egan (1995) with Internet updates, Esslinger (1998).

The primary purpose of our work on St. Matthew Island was to collect lichen and moss samples for elemental analysis in relation to air quality. Additionally, collections of macro- and microlichens were made to develop a baseline list of taxa as we traveled on foot to randomly selected sample sites. An attempt was made to include a representative spectrum of habitat types over complex topographic gradients. Our primary purpose on St. Paul Island differed from St. Matthew Island in that we focussed on the macrolichens because of their value to reindeer.

The major collection sites are shown in Figure 1 and listed below. The island name is followed by general location, latitude and longitude measured with hand-held Global Positioning System (GPS), elevational range, and collection date. For the habitats, we have simplified more explicit data presented on the labels in interests of saving space. Minor variations of location that help to explain differences in habitat are indicated as Arabic numerals.

ST. PAUL ISLAND:

- A.—East of Salt Lagoon, 57°08.0' N, 170°16.0' W, 30–45 m, 11 July 1997.
 B.—1.—Telegraph Hill, 57°08.8' N, 170°16.2' W, 91 m, 11 July 1997; 2.—South of Telegraph Hill at south end of pond, 57°08.4' N, 170°16.2' W, 30 m, 12 July 1997.
 C.—West side of Salt Lagoon, 57°08.2' N, 170°16.9' W, 30 m, 11 July 1997.
 D.—1.—Rock outcrop 0.5 km northeast of Telegraph Hill, 57°09.3' N, 170°15.5' W, 91 m, 12 July 1997; 2.—Talus slope 0.5 km northeast of Telegraph Hill, 57°09.5' N, 170°15.8' W, 91 m, 12 July 1997.
 E.—Tor like outcrop 1 km NW of Zapadni-Tolstoi Rookery, 57°09.5' N, 170°18.8' W, 30 m, 13 July 1997.
 F.—Bogoslof Hill, 57°10.7' N, 170°17.7' W, 152 m, 13 July 1997.
 G.—Polovina Hill, 57°11.0' N, 170°11.2' W, 61–91 m, 13 July 1997.
 H.—1.—Rush Hill, 57°11.1' N, 170°24.2' W, 122 m, 14 July 1997; 2.—0.5 km E of Rush Hill, 57°11.0' N, 170°23.7' W, 46 m, 14 July 1997; 3.—0.5 km SE of Rush Hill, 57°10.5' N, 170°21.8' W, 30 m, 14 July 1997.
 I.—1.—Cone Hill area, cave caldera, 57°10.3' N, 170°22.5' W, 122 m, 15 July 1997; 2.—Cone Hill area, cave caldera, 57°10.2' N, 170°22.7' W, 122 m, 15 July 1997.

ST. MATTHEW ISLAND:

- J.—1.—Coastal tundra 1.5 km NNW of Bull Seal Point, 60°33.1' N, 172°55.6' W, 12 m, 18 July 1997; 2.—Coastal logs 1.5 km NNW of Bull Seal Point, 60°33.1' N, 172°55.6' W, 12 m, 19 July 1997; 3.—Bird cliffs 1.5 km NNW of Bull Seal Point, 60°33.1' N, 172°55.6' W, 3 m, 22 July 1997.
 K.—1.5 km NW of Bull Seal Point, 60°33.6' N, 172°56.4' W, 12–30 m, 19 July 1997.
 L.—1.—Talus slope area 1 km W of Bull Seal Point, 60°33.4' N, 172°56.8' W, 91 m, 19 July 1997; 2.—Coastal bluffs and talus slope area, Bull Seal Point, 60°33.0' N, 172°55.0' W, 2–70 m, 24 July 1997.
 M.—Fen area 1 km W of Bull Seal Point, 60°33.6' N, 172°56.9' W, 30 m, 19 July 1997.
 N.—2 km WNW of Bull Seal Point, 60°33.4' N, 172°56.0' W, 30 m, 20 July 1997.

TABLE 1. Geographic distribution patterns of lichens of St. Matthew (SM) and St. Paul (SP) Islands, Alaska. Values indicate the presence of each taxon occurring within each category; many are combinations of these. Percentage values are in parentheses. Key: A = arctic-alpine; B = boreal; C = coastal; M = amphi-Beringian; W = widespread; U = unclear; *n* = total number of lichens. Many lichens fall into more than one distribution pattern.

	A	B	C	M	W	U
SM	125	74	18	9	41	5
(<i>n</i> = 148)	(83.9)	(49.7)	(12.1)	(6.0)	(27.5)	(3.4)
SP	98	66	20	7	36	11
(<i>n</i> = 132)	(74.2)	(50.0)	(15.2)	(5.3)	(27.3)	(8.3)

O.—Sarichef Strait area, 60°34.5' N, 172°59.4' W, 30 m, 21 July 1997.

P.—1.—Hill 600 above Bull Seal Point, 60°32.8' N, 172°55.5' W, 152 m, 22 July 1997; 2.—Coastal cliffs at Bull Seal Point, 60°32.8' N, 172°55.5' W, 152 m, 22 July 1997.

Q.—Mountain 1475, Glory of Russia Cape area, 60°34.9' N, 172°55.8' W, 61–273 m, 23 July 1997.

World distribution patterns are assigned to each taxon using the following geographic categories (many have combinations of these): A, arctic-alpine north of the latitudinal treeline south into the mountains of the east (Adirondak and White Mountains) and west (Rocky Mountain and Cascade Ranges) (Thomson 1984); B, boreal, latitudinal treeline to the southern limit of the closed coniferous forest with some species being common in the temperate regions; C, coastal, present in a strip along the maritime coast and reflecting a maritime climate; M, amphi-Beringian, western American Arctic and also in eastern Asia; W, widespread, present in many or most of the other categories; U, unclear distributions, either under study or too poorly known taxonomically to be confident of published maps. We assigned these phytogeographic categories based on Arup (1994), Dibben (1980), Geiser et al. (1994), Gould (1994), Goward et al. (1994), Jahns (1981), Søchting & Olech (1995), Talbot et al. (1991, 1992, 1997), and Thomson (1984, 1997).

LIST OF LICHENS

One hundred thirty-nine taxa of lichens were found on St. Matthew and St. Paul Islands in the Bering Sea. Of these, 96 are new reports for these Bering Sea islands, 76 are new reports for St. Matthew Island, 36 for St. Paul Island, and 15 are new to both St. Matthew and St. Paul Islands. The present results, together with the existing literature records of species not collected by us, total 207 taxa.

The distribution pattern for lichens of St. Matthew and St. Paul Islands are given in Table 1. The lichen diversity is characterized by wide-ranging arctic-alpine and boreal species with a moderately well-represented coastal element. Amphi-Beringian species form a minor component. On St. Matthew Island, which is more northerly and with greater topographic relief than St. Paul Island, the percentage of arctic-alpine species is about 10% higher.

Taxa are ordered alphabetically; bold font indi-

cates taxa in our collection and normal font indicates taxa collected by previous workers. A single asterisk (*) indicates that the taxon is the first known report from St. Matthew Island, double asterisks (**) indicate the first known report from St. Paul Island, and triple asterisks (***) indicate the first known reports from St. Matthew and St. Paul Islands. Taxa collected by previous workers are followed by symbols for the name of the island, SM = St. Matthew and SP = St. Paul, and the citation. Synonymy is given in cases where the taxon name has changed from the original report. The name of each taxon collected in the present study followed by symbols for island names; these are followed by collection site letter (A-Q) which is in turn succeeded by specimen number. This sequence is followed by substrate, habitat information, phytogeographic distribution class, and when applicable, citation of previously recorded species.

Adelolecia pilati (Hepp) Hertel & Hafellner, SM: Thomson (1997:37). A.

Alectoria nigricans (Ach.) Nyl., SM: J(1) 97-47, L(1) 97-97, L(2) 97-588, P(1) 97-280, 97-304, talus slopes, Klein (1959:42); SP: A 97-11, D(2) 97-64, 97-87, 97-98; Degelius (1937:137), *A. thulensis* Th. Fr., Cummings (1910:138) Macoun (1899:580). A.

***A. ochroleuca* (Hoffm.) A. Massal., SM: L(1) 97-96, talus slopes, Rausch and Rausch (1968:71); SP: D(2) 97-97. A.

***Allantoparmelia alpicola* (Th. Fr.) Essl., SP: B(1) 97-25, outcrop on ridge. A, B.

**Amygdalaria consentiens* (Nyl.) Hertel, Brodo & Mas. Inoue, SM: P(1) 97-300, rocks along talus ridge. A.

**A. panaeola* (Nyl.) Hertel & Brodo, SM: N 97-175, rock cliff in willow-graminoid moss meadow. A.

Arctocetraria andrejevii (Oksner) Kärnefelt & Thell, SM: J(1) 97-82, N 97-161, mosses in crowberry-lichen heath, *Cetraria andrejevii* Oksn., Rausch and Rausch (1968:68). A, M.

***A. nigricascens* (Nyl.) Kärnefelt & Thell, SP: D(2) 97-61, talus slope on boulder. A.

**Aspicilia aquatica* Körber, SM: J(3) 97-241, Q 97-319, 97-321, streamlet boulder in meadow. B.

Biatora turgidula (Fr.) Nyl., SM: *Lecidea turgidula* Fr., Thomson (1997:388). B.

**Brigantiaea fuscolutea* (Dickson) R. Sant., SM: J(1) 97-4, 97-48, humus and mosses in lichen heath. A.

****Brodoa oroarctica* (Krog) Goward, SM: L(1) 97-118, L(2) 97-586, N 97-178, P(1) 97-293, rocks of talus slopes, fellfield ridges, and willow-graminoid moss meadow; SP: G 97-235. A, B.

Bryocaulon divergens (Ach.) Kärnefelt, SM: J(1) 97-68, L(1) 97-98, over dwarf willow in lichen heath, also on rocks, *Alectoria divergens* (Ach.) Nyl., Cummings (1910:139); SP: G 97-238; Cummings (1910:139), Macoun (1899:580). A.

Bryoria chalybeiformis (L.) Brodo & D. Hawksw., SP: Schindler (1990:340), *Alectoria jubata chalybeiformis*, Cummings (1910:139), Macoun (1899:580). A.

**B. nitidula* (Th. Fr.) Brodo & D. Hawksw., SM: J(1) 97-80, L(2) 97-589, mosses in talus slope and talus boulder in crowberry heath. A, B.

***B. tenuis* (E. Dahl) Brodo & D. Hawksw., SP: D(2) 97-96, volcanic talus boulders in crowberry heath. B, C.

**Buellia stigmatea* Körber, SM: J(3) 97-244A, O 97-225, epilithic on coastal cliffs. A.

Caloplaca coralloides (Tuck.) Hulting, SP: Cummings (1910:113). This report is probably erroneous as Wetmore and Kärnefelt (1998) report the species occurs only north to Oregon. C.

C. jungermanniae (Vahl.) Th. Fr., SM: *Placodium jungermanniae* (Vahl.) Tuck., Cummings (1910:112). A.

**C. lithophila* H. Magn., SM: J(2) 97-143, 97-152, epilithic on beach log in coastal meadow. NEW TO ALASKA. A.

C. tornioensis H. Magn., SP: Schindler (1990:340). A.

C. verruculifera (Vainio) Zahlbr., SM: L(2) 97-377; epilithic on coastal rocks, Thomson (1997:177); SP: Arup (1994:391), Cummings (1910:114) sub *C. granulosa* (Müll. Arg.) Jatta. A, B, W.

Candelariella arctica (Körber) R. Sant., SM: Thomson (1997:180). A.

C. xanthostigma (Ach.) Lettau, SP: Thomson (1997:190). A, B.

Catapyrenium cinereum (Pers.) Körber, SP: *Endocarpon cinereum* Pers., Rothrock (1884:9). U.

Cetraria aculeata (Schreber) Fr., SP: A 97-9, sand in fescue-yarrow coastal dune, Cummings (1910:146), Macoun (1899:580), Thomson (1984:198). A.

**C. ericetorum* Opiz, SM: J(1) 97-16, 97-20, L(2) 97-568, O 97-194, 97-203, P(1) 97-273, 97-301, 97-303, Q 97-364, among mosses and rocks in crowberry-willow heath; SP: B(1) 97-15, D(2) 97-76, 97-86, 97-87A, 97-95, 97-120A, E 97-187, 97-193, 97-212, 97-213, G 97-247, 97-255A, H(1) 97-275, 97-277, H(3) 97-297, I(1) 97-311A, 97-314, 97-315A, I(2) 97-322A, *C. crispa* (Ach.) Nyl., Degelius (1937:136). A, B.

C. islandica (L.) Ach., SM: K 97-84, Q 97-317, peat mound in sedge-willow peatland as well as on mosses and gravel, Cummings (1910:144), Klein (1959:42); SP: Cummings (1910:144), Macoun (1899:580). A, B.

**C. laevigata* Rass., SM: L(1) 97-108, M 97-137, N 97-158, 97-159, mosses in talus slope sedge-lichen peatland. A, B, M.

Cetrariella delisei (Bory) Kärnefelt & Thell, SM: J(1) 97-1, 97-10, 97-13, 97-41, N 97-162, O 97-202, humus, also on mosses in lichen heath; *Cetraria delisei* (Bory) Th. Fr., Rausch and Rausch (1968:68), Cummings (1910:145); SP: H(3) 97-305; Cummings (1910:145), *Cetraria islandica* var. *delisei* Bor., Macoun (1899:581), Thomson (1984:77). A.

**C. fastigiata* (Delise) Kärnefelt & Thell, SM: K 97-95, peat mound in sedge-willow peatland. A.

***Cetrelia alaskana* (C. Culb. & Culb.) Culb. & C. Culb., SP: J(1) 97-82, talus boulder in crowberry heath. M.

Cladidium bolanderi (Tuck.) B. D. Ryan, SM: *Lecanora thamnitis* Tuck., Cummings (1910:110), Macoun (1899:582). U.

Cladina arbuscula (Wallr.) Hale & Culb., SM: N 97-157, O 97-228, 97-232, L(2) 97-572, sedge-lichen peatland, Thomson (1984:110). A, B.

****C. mitis* (Sandst.) Hustich, SM: J(1) 97-32, 97-35, 97-75, mosses in crowberry-willow heath and peatland; SP: D(2) 97-58, 97-67, 97-105, 97-110, 97-121, E 97-299, I(1) 97-313, I(2) 97-324. A, B, W.

C. rangiferina (L.) Nyl., SM: J(1) 97-29, 97-76, N 97-165, mosses in crowberry-willow heath, also in sedge-willow peatland, Thomson (1984:159); SP: D(2) 97-56, 97-56A, 97-103, 97-109, 97-127, mosses over talus, Cummings (1910:92), Macoun (1899:582, 583). A, B, W.

C. stellaris (Opiz) Brodo, SM: L(1) 97-109, L(2) 97-

- 574, N 97-187, O 97-234, mosses in rocky talus slope, *C. alpestris* (L.) Rabenh., Rausch and Rausch (1968: 68), Klein (1959:42), *Cladonia alpestris* (L.) Rabenh., Cummings (1910:91); SP: D(2) 97-102, 97-120, *Cladonia rangiferina* Hoffm. var. *alpestris* L., Macoun (1899:582), Thomson (1984:163). A, B.
- C. stellaris* (Opiz) Brodo var. *aberrans* (Abbeyes) Ahti, SM: Thomson (1984:103). A, B.
- **C. stygia* (Fr.) Ahti, SM: J(1) 97-56B, 97-76A, mosses in sedge-willow peatland and mosses over talus. A, B, C.
- ****Cladonia amaurocraea* (Flörke) Schaerer, SM: J(1) 97-71A, M 97-139, mosses in peatland; SP: B(1) 97-27, C 97-41, 97-43, D(2) 97-83, 97-91, 97-108, 97-111, 97-125, E 97-213B. A, B.
- C. bellidiflora* (Ach.) Schaerer, SM: J(2) 97-149, K 97-91, M 97-140, peat mound in sedge-willow peatland, and also epixylic on beach log in coastal meadow and on rocks, Rausch and Rausch (1968:68), Cummings (1910:89), Thomson (1984:114); SP: D(2) 97-85, E 97-205, I(2) 97-319, 97-327, Cummings (1910:89), Macoun (1899:582). A, B, C.
- **C. borealis* S. Stenroos, SM: O 97-239, L(2) 97-582, mosses, boulders, and gravel; SP: B(1) 97-18, D(1) 97-48, D(2) 97-89, E 97-188, 97-190, 97-194A, 97-196, 97-202, 97-205A, 97-211, G 97-236A, 97-239, 97-245, H(3) 97-294, 97-303, 97-306, 97-308, *C. cornucopioides* (L.) Fr., Macoun (1899:582). B.
- C. carneola* (Fr.) Fr., SM: J(1) 97-78, mosses at margin of sedge-willow peatland, Rausch and Rausch (1968: 68), Thomson (1984:117). A, B, W.
- C. cladinoidea* (Nyl.) Zahlbr., SP: *Pycnothelia cladinoidea* Nyl., Cummings (1910:147). Possibly this is *Cladonia amaurocraea*, but it is not traceable. Cummings indicated "no specimens in Harriman collection." The specimen was collected by William Palmer and determined by Calkins (Macoun 1899:583), but there appears to be no information as to where the specimen went and even if it is extant. U.
- ****C. coniocraea* (Flörke) Sprengel, SP: D(1) 97-49, 97-50A, D(2) 97-73, 97-84, E 97-203, mosses and humus over rock and crowberry heath. A, B, W.
- C. coccifera* (L.) Willd., SM: Rausch and Rausch (1968: 68), Cummings (1910:90); SP: Cummings (1910:90), Thomson (1984:121). A, B, W.
- C. cornuta* (L.) Hoffm., SM: O 97-193, mosses over peat mound in cloudberry meadow, Thomson (1984:124). A, B, W.
- **C. cyanipes* (Sommerf.) Nyl., SM: K 97-83, sedge-willow peatland. A, B.
- **C. decorticata* (Flörke) Sprengel, SM: J(1) 97-74, O 97-190A, 97-191, mosses in lichen heath; SP: Cummings (1910:96), Macoun (1899:582). B.
- Cladonia ecmocyna* Leighton, SM: Thomson (1984:132). A.
- **C. fimbriata* (L.) Fr., SM: J(1) 97-80, mosses, dead shoots of cottongrass in sedge-willow peatland, as well as humus is crowberry heath; SP: D(2) 97-74, 97-99, 97-113, 97-197, F 97-232, Cummings (1910:96), Macoun (1899:583). A, B, W.
- C. furcata* (Hudson) Schrader, SM: *C. furcata palamaea* (Ach.) Nyl., Cummings (1910); SP: *C. furcata racemosa* (Hoffm.) Floerk., Cummings (1910:92), Macoun (1899:582), *C. furcata palamaea* (Ach.) Nyl., Cummings (1910:92), Macoun (1899:583), *C. furcata* (Hudson) Schrader var. *subulata* Fl., Macoun (1899:582). B, W.
- **C. graciliformis* Zahlbr., SM: N 97-166, talus in willow-graminoid moss meadow. U.
- ****C. gracilis* (L.) Willd., SP: D(2) 97-93, E 97-192, F 97-217, 97-224, H(1) 97-278, H(3) 97-289, 97-290, 97-298, I(1) 97-311, 97-312, I(2) 97-328, 97-329, 97-330, mosses over and between volcanic talus boulders, rock shelf, over and under boulder. A, B, W.
- ****C. gracilis* (L.) Willd. subsp. *gracilis*, SM: J(1) 97-1A, 97-2, 97-22, 97-24, 97-33, 97-51, 97-56, O 97-205, humus as well as boulders and mosses in crowberry-willow heath and lichen heath; SP: D(2) 97-90. A, B, W.
- C. gracilis* (L.) Willd. subsp. *elongata* (Jacq.) Vainio, SM: J(1) 97-30, 97-31, 97-36, L(2) 97-576, O 97-209, mosses in crowberry-willow heath, raised peat mound, talus slope, *C. gracilis elongata* (Jacq.) Floerk., Cummings (1910); SP: D(2) 97-57, 97-72, E 97-207, 97-208, F 97-228, 97-230, G 97-255, Cummings (1910:93), Macoun (1899:582). U.
- **C. gracilis* (L.) Willd. subsp. *vulnerata* Ahti, SM: J(1) 97-90, K 97-93B, humus in lichen heath. A, B.
- **C. macrophylla* (Schaerer) Stehn., SM: J(2) 97-148, epixylic on beach log in coastal meadow. A.
- ***C. maxima* (Asah.) Ahti, SP: I(2) 97-325, mosses over boulder at cave. A, B, C.
- **C. phyllophora* Hoffm., SM: N 97-181, mosses over rock along streamside in willow-graminoid moss meadow; SP: *C. degenerans* (Flörk.) Spreng., Cummings (1910:94), Macoun (1899:582). A.
- C. pleurota* (Flörke) Schaerer, SM: J(1) 97-6, humus of eroding streamlet, *Cladonia coccifera* var. *pleurota*, Klein (1959:42). A, B, W.
- **C. pyxidata* (L.) Hoffm., SM: K 97-85, peat mound in sedge-willow peatland; SP: Cummings (1910:95), Macoun (1899:582). A, B, W.
- C. scabriuscula* (Delise) Nyl., SP: Degelius (1937:120). C.
- ****C. squamosa* Hoffm., SM: M 97-138, stones surrounded by willow-lichen heath; SP: D(2) 97-104, E 97-210. A, B, W.
- C. stricta* (Nyl.) Nyl., SP: Thomson (1984:164). A, B.
- C. subfurcata* (Nyl.) Arnold, SM: K 97-089, O 97-226, peat mound in sedge-willow peatland, Thomson (1984: 166); SP: *C. delessertii* (Nyl.) Vain., Degelius (1937: 118). A, B, C.
- C. uncialis* (L.) F. H. Wigg., SM: K 97-93, M 97-141, peat mound in sedge-willow peatland, Thomson (1984: 173); SP: H(3) 97-296A, 97-300, *C. uncialis* Fr. var. *turgescens* Fr., Macoun (1899:582). A, B, W.
- Dactylina arctica* (Richardson) Nyl., SM: J(1) 97-15, 97-77, K 97-94, L(2) 97-600, mosses in crowberry-willow heath, over rock, and peat mound in sedge-willow peatland, Klein (1959:42), *Cetraria arctica* (Hook.) Tuck., Cummings (1910:145); SP: C 97-33, *Cetraria arctica* (Hook.) Tuck., Cummings (1910:145), Macoun (1899:580). A.
- **D. beringica* C. D. Bird & J. W. Thomson, SM: O 97-238, mosses in peat mound. M.
- **Dermatocarpon arnoldianum* Degel., SM: J(3) 97-250, Q 97-318, epilithic on coastal cliffs, mosses and gravel in streamside meadow. This is the second known record for the American Arctic, also known from the Ukinyik Creek drainage, Alaska (Thomson 1984:209). A.
- Diplotomma alboatrum* (Hoffm.) Flotow, SP: *Buellia atro-alba* Fr., Cummings (1910:78), Rothrock (1884:7). A, B, W.
- Diplotomma* sp., SP: *Buellia nivalis* (Bagl. & Car.) Hertel, Schindler (1990:340). U.
- **Farnoldia jurana* (Schaerer) Hertel, SM: Q 97-341, rock tor. A.
- Flavocetraria cucullata* (Bellardi) Kärnefelt & Thell, SM: J(1) 97-18, 97-025, L(2) 97-570, mosses in crowberry-willow heath, talus slope, as well as stabilized coastal dune, Klein (1959:42); SP: A 97-1, C 97-42,

- D(2) 97-58B, *Cetraria cucullata* (Bell.) Ach., Cummings (1910:143), Macoun (1899:580). A, B.
- F. nivalis (L.) Kärnefelt & Thell**, SM: L(1) 97-101, L(2) 97-581, on talus slope, *Cetraria nivalis* (L.) Ach., Cummings (1910:143), Macoun (1899:580); SP: B(1) 97-26, D(2) 97-106, Cummings (1910:143), Macoun (1899:580). A, B, W.
- **Hypogymnia austerodes (Nyl.) Räsänen**, SP: I(1) 97-309, on boulder. A.
- H. physodes* (L.) Nyl., SM: *Parmelia physodes obscurata* Ach., Cummings (1910:132). A, B, W.
- ***H. subobscura (Vainio) Poelt**, SM: P(1) 97-281, on mineral soil and boulders in crowberry-willow heath; SP: D(2) 97-075, 97-078. A.
- *H. vittata (Ach.) Parrique**, SM: Q 97-333, on boulder and outcrops; SP: B(1) 97-22, D(2) 97-65, E 97-181, *Parmelia physodes vittata* Ach., Cummings (1910:133), Macoun (1899:581). A.
- *Lecanora aleutica H. Magn.**, SM: J(2) 97-142, O 97-212, epixylic on beach log in coastal meadow and whalebone in Yupik midden; SP: Schindler: (1990:344), Thomson (1997:265). M.
- L. atrosulphurea* (Wahlenb.) Ach., SM: Thomson (1997:267). A.
- *L. beringii Nyl.** ("behringii"), SM: J(1) 97-79, dead shoots of cottongrass in sedge-willow peatland. A.
- *L. crenulata Hook.**, SM: J(3) 97-248, epilithic on coastal cliffs. A.
- *L. dispersa (Pers.) Sommerf.**, SM: P(1) 97-310, reindeer antler in crowberry-lichen heath. A, B, W.
- *L. epibryon (Ach.) Ach.**, SM: O 97-221, coastal driftwood log in dunegrass beach. A, B, W.
- L. intricata* (Ach.) Ach., SP: Schindler (1990:344). A.
- L. marginata* (Schaerer) Hertel & Rambold, SM: Thomson (1997:291). A.
- L. muralis* (Schreber) Rabenh., SM: Cummings (1910:109), Rothrock (1884:4); SP: Schindler (1990:344), Cummings (1910:109), Howe (1913:497), Rothrock (1884:4), Thomson (1997:295). A, B, W.
- **L. orae-frigidae R. Sant.**, SP: B(1) 97-013, D(2) 97-151, wood in Nootka lupine-seacoast angelica meadow. A, C.
- *L. polytropa (Hoffm.) Rabenh.**, SM: L(1) 97-116, pebbles in fellfield ridge. A, B, W.
- L. straminea* Ach., SM: Cummings (1910:109), Thomson (1997:306); SP: Schindler (1990:344), Cummings (1910:109), Thomson (1997:306). A, B, C.
- L. symnicta* (Ach.) Ach., SP: Thomson (1997:309). B.
- L. xylophila* Hue, SP: *L. grantii* Magnusson, Thomson (1997:284). A, B, C.
- *Lecidea lapicida (Ach.) Ach. fo. ochracea (Nyl.) Vainio**, SM: L(1) 97-106A, P(1) 97-288, stones in crowberry-lichen heath. A, B, C.
- Lecidella carpathica* Körber, SM: Thomson (1997:395). A, B, W.
- L. euphorea* (Flörke) Hertel, SM: Thomson (1997:398). A, B, W.
- L. stigmatea* (Ach.) Hertel & Leuckert, SP: Schindler (1990:344). A.
- Lobaria linita (Ach.) Rabenh.**, SM: J(1) 97-8, 97-071, J(3) 97-255, L(2) 97-571, humus and rock in mesic and peatland sites, Rausch and Rausch (1968:71), Klein (1959:42), *Sticta pulmonaria linita* (Ach.) Nyl., Cummings (1910:125); SP: C 97-045, D(1) 97-050, D(2) 97-058A, 97-062, 97-088, 97-123, E 97-213A, Cummings (1910:125), *Sticta linita* Ach., Macoun (1899:581). A, C.
- Lobothallia melanaspis* (Ach.) Hafellner, SP: *Lecanora melanaspis* Ach., Degelius (1937:125). A, B, W.
- Melanelia commixta (Nyl.) Thell**, SM: E 97-172, rock cliff, *Cetraria fahlunensis* (L.) Schaer., Cummings (1910:143); SP: Cummings (1910:143), Macoun (1899:580). A.
- M. hepatizon (Ach.) Thell**, SM: L(1) 97-119, tors, volcanic scoria gravel in fellfield and on mosses; SP: D(2) 97-069, G 97-237, H(2) 97-284, I(2) 97-322, *Cetraria hepatizon* (Ach.) Vain., Degelius (1937:136). A, B, W.
- Mycobilimbia berengeriana* (Massal.) Hafellner & W. Wirth, SM: Thomson (1997:331). A, B, W.
- *Mycoblastus alpinus (Fr.) Kernst.**, SM: O 97-218, 97-229, coastal driftwood log, mineral soil in crowberry-willow heath. A, B.
- M. sanguinarius* (L.) Norman, SP: Thomson (1997:425), *Heterothecium sanguinarium* (L.) Flot., Macoun (1899:583). A, B.
- Nephroma arcticum (L.) Torrs.**, SM: L(2) 97-569, talus slope and among heaths, Rausch and Rausch (1968:68, 71), Cummings (1910:122), Thomson (1984:277), Wetmore (1960:403); SP: D(2) 97-115, E 97-200, Wetmore (1960:403). A, B.
- N. expallidum* (Nyl.) Nyl., SM: Klein (1959:42). A.
- Ochrolechia frigida (Sw.) Lyng**, SM: J(2) 97-147, L(1) 97-112, 97-126, N 97-174A, Q 97-354, diverse substrata: willow in talus slopes, epixylic on beach log, and fellfield ridge, *Lecanora tartarea pterulina* Nyl., Cummings (1910:106) Thomson (1997:431); SP: H(1) 97-262, *L. oculata gonatodes* Ach., Cummings (1910:111), Macoun (1899:581), *L. tartarea* Ach. *frigida* Sw., Macoun (1899:581), Degelius (1937:126), Schindler (1990:346). A.
- ***O. frigida (Sw.) Lyng fo. theleporoides (Th. Fr.) Lyng**, SM: J(1) 97-66, O 97-201, P(1) 97-311, humus in crowberry-lichen heath, peat mound in cloudberry meadow, and rock; SP: G 97-252. A.
- *O. subplicans (Nyl.) Brodo**, SM: L(1) 97-128, rocks in fellfield ridge; SP: *P. subplicans* Nyl., Dibben (1980:113), Thomson (1997:435). A.
- O. tartarea (L.) A. Massal.**, SP: D(2) 97-100, F 97-222, talus boulders and rock outcrops, *L. tartarea* (L.) Ach., Cummings (1910:105), Macoun (1899:581). A, B, C.
- *Ophioparma lapponica (Räsänen) Hafellner & R. W. Rogers**, SM: N 97-172A, rock cliff in willow-graminoid moss meadow. A.
- Pannaria pezizoides* (Weber) Trevisan, SP: Schindler (1990:346). A, B, C.
- Parmelia omphalodes (L.) Ach.**, SM: J(1) 97-69, L(1) 97-100A1, 97-102, 97-113, P(1) 97-287, Q 97-344, humus, rock, and mosses, Rausch and Rausch (1968:71), *Parmelia saxatilis omphalodes* (L.) Fr., Cummings (1910:135); SP: B(1) 97-31, D(1) 97-53, D(2) 97-77, 97-92, 97-112, E 97-185, H(2) 97-285, H(3) 97-301, I(1) 97-316, *Parmelia saxatilis omphalodes* (L.) Fr., Howe (1913:497), Schindler (1990:346). A, B.
- P. saxatilis (L.) Ach.**, SM: L(1) 97-125, N 97-174, tors and rock outcrops in willow-graminoid moss meadow; SP: C 97-35, D(1) 97-51, 97-52, E 97-182, G 97-249, Cummings (1910:133), SP: Howe (1913:497), Macoun (1899:581), *P. saxatilis* Ach. *furfuracea* Schaer., Howe (1913:497). A, B, W.
- ***P. sulcata Taylor**, SM: O 97-222, wood, mosses, and tors; SP: B(1) 97-14, 97-23, E 97-180, 97-186. A, B, W.
- *Peltigera aphthosa (L.) Willd.**, SM: J(3) 97-259, N 97-183, O 97-208, Q 97-327, mosses and plant litter; SP: D(2) 97-106A, 97-119, E 97-201, F 97-225A, G 97-242, H(1) 97-276, 97-279, H(3) 97-307, Cummings (1910:121), Macoun (1899:581). A, B, W.
- **P. britannica (Gyelnik) Holt-Hartw. & Tønsberg**, SP:

- D(2) 97-55, 97-63, 97-81, 97-126, talus slope on mosses over volcanic boulder. C, M.
- P. canina* (L.) Willd.**, SP: A 97-5, B(1) 97-32, B(2) 97-47, C 97-37, D(1) 97-54, mosses, *P. canina spongiosa* Tuck., Cummings (1910:118), Macoun (1899:581). A, B, W.
- P. didactyla* (With.) J. R. Laundon, SP: *P. spuria* (Ach.) DC., Degelius (1937:111), *P. canina spuria* (Ach.) Nyl., Cummings (1910:119), Macoun (1899:581), *P. erumpens* (Tayl.) Vain., Degelius (1937:110). A, B, W.
- ***P. leucophlebia* (Nyl.) Gyelnik**, SP: E 97-204, mosses on moist rock. A, B, W.
- ***P. malacea* (Ach.) Funck**, SP: D(2) 97-129, I(2) 97-320, 97-323, mineral soil over boulders. A, B, W.
- P. membranacea* (Ach.) Nyl.**, SM: J(1) 97-28, 97-81, N 97-177, O 97-210, mosses in heath and in peatland, Thomson (1984:341); SP: A 97-004, B(1) 97-012, C 97-044, D(2) 97-071, 97-124, E 97-191, F 97-226, G 97-233, 97-234, H(1) 97-274, 97-280, *P. canina membranacea* (Ach.) Nyl., Cummings (1910:119). B, C, W.
- **P. polydactylon* (Necker) Hoffm.**, SM: L(1) 97-104, M 97-133, N 97-163, O 97-188, mosses in talus slope interspersed with heath. C, W.
- **P. rufescens* (Weiss) Humb.**, SM: J(1) 97-27, K 97-87, mosses in heath and peatland. A, B.
- ****P. scabrosa* Th. Fr.**, SM: K 97-88, N 97-167, 97-182, Q 97-316, mosses in peatland and meadows; SP: D(2) 97-122, E 97-206, F 97-216, G 97-240. A, B, C, W.
- **P. venosa* (L.) Hoffm.**, SM: J(1) 97-59, mosses in crowberry-lichen heath. A, B.
- **Pertusaria alaskensis* Erichsen**, SM: J(3) 97-253, L(2) 97-595, P(1) 97-283, 97-295, 97-296, Q 97-353, epilithic on coastal cliffs, mosses and stones in heath; SP: C 97-39, G 97-254, Dibben (1980:82), Thomson (1997:446). M.
- **P. bryontha* (Ach.) Nyl.**, SM: O 97-204, peat mound in coudberry meadow. A.
- **P. coriacea* (Th. Fr.) Th. Fr.**, SM: O 97-197, J(3) 97-267, humus peat mound meadow and on mosses over upper coastal cliff rocks; SP: Schindler (1990:347), Thomson (1997:452). A.
- **P. dactylina* (Ach.) Nyl.**, SM: Q 97-330, heath; SP: Dibben (1980:53), Schindler (1990:347), Thomson (1997:453). A.
- **P. glomerata* (Ach.) Schaerer**, SM: J(1) 97-37, 97-64, mosses and humus in crowberry heath. A.
- P. oculata* (Dickson) Th. Fr., SM: Dibben (1980:62); SP: Degelius (1937:124), *Lecanora oculata* (Diks.) Ach., Cummings (1910:105), Macoun (1899:581), Thomson (1997:458). A.
- P. panyrgra* (Ach.) A. Massal., SP: Cummings (1910:101), Dibben (1980:65), Macoun (1899:582), and Thomson (1997:459). A.
- P. subobducens* Nyl., SM: Thomson (1997:462). A.
- **Physcia caesia* (Hoffm) Fűrnr.**, SM: L(2) 97-596, O 97-218A, P(1) 97-313, whalebone in Yupik midden and on boulders; SP: Cummings (1910:101), Thomson (1997:459). A, B, W.
- P. dubia* (Hoffm.) Lettau, SP: Schindler (1990:348). A, B, W.
- Physconia deterosa* (Nyl.) Poelt, SP: Schindler (1990:348). A, B, W.
- P. distorta* (With.) Laundon, SP: *P. pulverulenta* (Schreb.) Nyl., Cummings (1910:129). Misidentifications for North America according to Esslinger and Egan (1995), but no correct name given. B.
- **P. muscigena* (Ach.) Poelt**, SM: O 97-215, whalebone in Yupik midden and rock outcrop on ridge; SP: B(1) 97-17, 97-21, Schindler (1990:348). A, B, W.
- ***Pilophorus acicularis* (Ach.) Th. Fr.**, SP: D(2) 97-60, 97-198, E 97-199, I(2) 97-329, boulders in talus in crowberry heath and meadows. A, C.
- **P. robustus* Th. Fr.**, SM: P(1) 97-268, pebbles in *Anthelia* moss meadow within heath; SP: *P. cereolous robustus* Tuck., Cummings (1910:97), Macoun (1899:582). A, B.
- **Placopsis gelida* (L.) Lindsay**, SM: Q 97-347, stones in frost boil in crowberry-lichen tundra; SP: Schindler (1990:348). A, B, C, W.
- **Platismatia lacunosa* (Ach.) Culb. & C. Culb.**, SM: Q 97-332, boulder in meadow and in talus; SP: D(2) 97-070, *Cetraria lacunosa* Ach., Cummings (1910:142), Macoun (1899:580). C.
- **Porpidia flavocaerulescens* (Hornem.) Hertel & A. J. Schwab**, SM: L(1) 97-106, N 97-173A, rock in talus slope interspersed with crowberry-willow heath. A.
- P. macrocarpa* (DC.) Herel & A. J. Schwab, SM: *Lecidea platycarpa* Ach., Cummings (1910:79). A, B, W.
- **P. thomsonii* Gowan**, SM: J(1) 97-7, 97-60, J(3) 97-262, L(2) 97-593, Q 97-324, 97-331, stones and upper coastal cliff rocks. A.
- **Pseudephebe minuscula* (Nyl.) Brodo & D. Hawksw.**, SM: L(2) 97-578, talus slope. A.
- ****P. pubescens* (L.) M. Choisy**, SM: L(1) 97-100, 97-122, P(1) 97-297, rock in rocky talus slope and in fellfield; SP: B(1) 97-24, F 97-219, G 97-236. A, B.
- **Psoroma hypnorum* (Vahl.) Gray**, SM: O 97-207, sedge culms on peat mound in cloudberry meadow. A, B, C.
- Pycnothelia papillaria* Dufour, SP: *Cladonia papillaria* (Ehrh.) Hoffm., Cummings (1910:95), Macoun (1899:583). A dubious report as is only known from eastern North America and Europe (Thomson 1984). U.
- **Ramalina almqvistii* Vainio**, SM: N 97-173, rock cliff in willow-graminoid moss meadow; SP: *R. cuspidata* (Ach.) Nyl., Cummings (1910:147), Schindler (1990:343). M.
- R. geniculata* Hook. f. & Tayl., SM: *R. pusilla geniculata* (Hook. & Taylor) Tuck., Cummings (1910:147); SP: Macoun (1899:580). U.
- R. polymorpha* (Lilj.) Ach., SP: Cummings (1910:146), Macoun (1899:580), Rothrock (1884:1). U.
- R. scoparia* Vainio**, SM: J(2) 97-153, L(1) 97-120, Q 97-335-X-3, rock in exposed sites, epixylic on beach log, Rausch and Rausch (1968:71); SP: A 97-7, 97-10, B(1) 97-19, C 97-34, 97-46, D(2) 97-114, G 97-251, Schindler (1990:343). M.
- R. subfarinacea* Nyl., SP: Howe (1913:500). Identity uncertain, specimens not available. U.
- Rhizocarpon copelandii* (Körber) Th. Fr., SM: Thomson (1997:531). A, B.
- **R. eupetraeoides* (Nyl.) Blomb. & Forss.**, SM: L(1) 97-121, 97-124, 97-131, P(1) 97-298, rock in fellfield ridge; SP: Schindler (1990:349). A.
- R. geminatum* Körber, SM: Thomson (1997:537); SP: *Buellia petraea montagnaei* (Flot.) Tuck., Cummings (1910:77). A.
- R. geographicum* (L.) DC.**, SM: L(1) 97-108A, talus slope interspersed with crowberry-willow heath, *Buellia geographica* (L.) Tuck., Cummings (1910:75). A, B, C.
- R. grande* (Flörke) Arnold**, SM: J(1) 97-32, rock in streamside meadow, Thomson (1997:539); SP: Schindler (1990:349). A, B, W.
- **R. hochstetteri* (Körber) Vainio**, SM: O 97-235, P(1) 97-279, pebbles in crowberry-dominated heath. A.

- R. inarense (Vainio) Vainio**, SM: P(1) 97–289, rocks in talus slope, Thomson (1997:541). A.
- R. petraeum (Wulfen) A. Massal.**, SP: *Buellia petraea* Tuck., Cummings (1910:76), Rothrock (1884:8). U.
- Rhizoplaca chrysoleuca (Sm.) Zopf**, SM: *Lecanora rubina opaca* (Ach.) Tuck., Cummings (1910:109); SP: *Lecanora rubina* (Vill.) Ach., Cummings (1910:109). A, B, W.
- Rinodina turfacea (Wahlenb.) Körber**, SM: Cummings (1910:102); SP: Schindler (1990:349). A, B.
- Siphula dactyliza Nyl.**, SP: Degelius (1937:140). A, C.
- Solorina crocea (L.) Ach.**, SM: J(1) 97–57, Q 97–345, mosses crowberry-lichen heath, Cummings (1910:117), Thomson (1984:387); SP: D(2) 97–68, 97–116, 97–117, Macoun (1899:581). A, C.
- Sphaerophorus fragilis (L.) Pers.**, SM: *Sphaerophoron fragile* (Crantz) Pers., Cummings (1910:73); SP: B(1) 97–29, 97–30, D(2) 97–80A, E 97–183, H(3) 97–291, 97–296, rock outcrop on ridge, talus boulders, *Sphaerophorum fragile* Pers., Macoun (1899:582). A.
- S. globosus (Hudson) Vainio**, SM: J(1) 97–034, J(2) 97–155, mosses in crowberry-willow heath, epixylic on beach log, *Sphaerophoron coralloides* Pers., Cummings (1910:73), Rausch and Rausch (1968:68), Klein (1959:42); SP: B(1) 97–020, F 97–225, Degelius (1937:107), *S. coralloides* Fr., Macoun (1899:582), *Sphaerophorum globiferum* DC., Macoun (1899:582). A.
- Squamarina cartilaginea (With.) P. James**, SP: *Lecanora cartilaginea* Ach., Howe (1913:497). U.
- Stereocaulon alpinum Laurer**, SM: J(1) 97–39, 97–55, 97–72, 97–73, L(1) 97–127, P(1) 97–271, mosses in crowberry-lichen heath, *Stereocaulon tomentosum alpinum* (Laur.) Th. Fr., Cummings (1910); SP: Degelius (1937:121). A.
- **S. arcticum Lynge**, SP: F 97–221, rock outcrop at peak. A.
- **S. arenarium (Savicz) Lamb**, SP: F 97–231, G 97–244, 97–253, H(3) 97–295, I(1) 97–318, rock inside caldera. A.
- ***S. botryosum Ach.**, SM: Q 97–328, rock in talus slope; SP: D(2) 97–101, F 97–215. A.
- S. dactylophyllum Flörke**, SP: *S. coralloides* Fr., Cummings (1910:99), Macoun (1899:582). B (amphi-Atlantic).
- ***Stereocaulon grande (H. Magn.) H. Magn.**, SM: J(1) 97–3, J(3) 97–256, N 97–185, humus of eroding bank, mosses in fen, and mineral soil. A, B.
- *S. incrustatum Flörke**, SM: J(1) 97–19, N 97–179, mosses crowberry-willow heath and in meadow. A.
- ***S. intermedium (Savicz) H. Magn.**, SM: J(3) 97–254, 97–266, N 97–176, 97–184, O 97–236, P(1) 97–308, Q 97–315, 97–351, frost boil in moss meadow, mosses over rock in heath, and base of coastal cliffs on rock rubble; SP: D(2) 97–59, 97–94, 97–107, 97–118, E 97–195, 97–209, F 97–227, 97–229, G 97–241, 97–243, 97–246, H(3) 97–292, 97–293, 97–302, 97–304, I(1) 97–317, I(2) 97–321. C, M.
- **S. paschale (L.) Hoffm.**, SP: A 97–8, sand in fescue-yarrow coastal dune. A, B, W.
- S. rivulorum H. Magn.**, SP: Schindler (1990:349). A.
- **S. saxatile H. Magn.**, SP: E 97–189, G 97–256, volcanic rocks in crowberry heath. A, B.
- ***S. subcoralloides (Nyl.) Nyl.**, SM: P(1) 97–302, rocks along talus ridge; SP: F 97–218. B.
- **S. tomentosum Fr.**, SM: Cummings (1910:98); SP: A 97–6, mosses in coastal dune meadow. A, B.
- S. vesuvianum Pers.**, SM: Rausch and Rausch (1968:71); SP: *S. denudatum* Flk., Degelius (1937:121). A, B, W.
- Tephromela aglaea (Sommerf.) Hertel & Rambold**, SP: Schindler (1990:350). A.
- T. atra (Huds.) Hafellner**, SM: Thomson (1997:603). A, B, C.
- Thamnomia subuliformis (Ehrh.) Culb.**, SP: Schindler (1990:350). A.
- T. vermicularis (Sw.) Ach.**, SM: J(1) 97–14, K 97–90, Q 97–356, mosses in crowberry-willow heath as well as wind-exposed sites, Rausch and Rausch (1968:68), Klein (1959), *Thamnomia vermicularis taurica* Schaer., Cummings (1910:86); SP: A 97–002, 97–3, F 97–223, G 97–248, H(1) 97–261, Degelius (1937:140), Macoun (1899:582), Schindler (1990:350). A.
- Trapeliopsis granulosa (Hoffm.) Lumbsch**, SM: *Biatora granulosa* (Ehrh.) Mass., Cummings (1910:85). A, B, W.
- **Tuckermannopsis chlorophylla (Willd.) Hale**, SP: I(1) 97–310, boulder at cave. A. *Umbilicaria arctica* (Ach.) Nyl., SM: Llano (1950:117), Thomson (1984:444). A.
- U. cylindrica (L.) Delise**, SP: B(1) 97–16, 97–28, D(2) 97–66, 97–79A, rock outcrop on ridge, Degelius (1937:122), Cummings (1910:128), Llano (1950:120), *U. cylindrica* (L.) Delise var *delisei* Despa., Macoun (1899:581). A.
- *U. havaasii Llano**, SM: Q 97–334, stones in willow-lichen stonefield. A.
- *U. hyperborea (Ach.) Hoffm.**, SM: L(1) 97–111, N 97–171, P(1) 97–305, Q 97–343, rocks in talus slope interspersed with crowberry-willow heath; SP: Macoun (1899:583), Schindler (1990:350). A, B, W.
- **U. phaea Tuck.**, SP: F 97–220, H(1) 97–267, rock outcrop at peak. Western North America.
- ***U. polyphylla (L.) Baumg.**, SM: L(1) 97–99, N 97–168, P(1) 97–291A, 97–306, rock in talus slope interspersed with heath; SP: D(2) 97–79. A.
- U. proboscidea (L.) Schrader**, SM: L(1) 97–117, stones in fellfield ridge, Cummings (1910:127), Rothrock (1884:3), Thomson (1984:458); SP: F 97–214, Schindler (1990:350), Cummings (1910:127), Llano (1950:201), Macoun (1899:581). U.
- U. torrefacta (Lightf.) Schrader**, SP: *U. erosa* (Web.) Hoffm., Cummings (1910:127), Macoun (1899:581). A.
- U. virginis Schaerer**, SP: *U. rugifera* Nyl., Macoun (1899:581). A.
- Verrucaria aethiobola Wahlenb.**, SM: Thomson (1997:632). C, W.
- *V. ceuthocarpa Wahlenb.**, SM: L(2) 97–376, epilithic on coastal rocks. A, C.
- *V. maura Wahlenb.**, SM: L(2) 97–368, 97–369, 97–370, epilithic on coastal rocks. C, M.
- Xanthoria candelaria (L.) Th. Fr.**, SM: *Theloschistes lychnus pygmaeus* (Fr.) Tuck., Cummings (1910:136); SP: *T. lychnus* (Nyl.) Tuck., Cummings (1910:136), *Xanthoria (Theloschistes) lychna* (Ach.) Fries., Howe (1913:498), Macoun (1899:582), *T. lychnus pygmaeus* (Fr.) Tuck., Cummings (1910:136), Macoun (1899:580), *X. candelaria* (L.) Th. Fr. var. *finmarkica* (Ach.) Hillmann, Schindler (1990:351), synonym of *X. candelaria* (Lindblom 1997). A, B, W.
- X. elegans (Link) Th. Fr.**, SM: J(3) 97–251, L(1) 97–123, rocks, Thomson (1984:484); SP: *Placodium elegans* (Link) DC., Cummings (1910:113), Macoun (1899:581), Schindler (1990:351). A, B, W.
- X. polycarpa (Hoffm.) Rieber**, SP: *Theloschistes polycarpus* (Ehrh.) Tuck., Cummings (1910:136), Thomson (1984:487). B, W.
- *X. sorediata (Vainio) Poelt**, SM: L(2) 97–373, epilithic on coastal rocks. A, B.

DISTRIBUTION PATTERNS

A low proportion of the species on the two islands show a strictly amphi-Beringian distribution

(6% and 5.3%). Although both islands have undergone severe overgrazing, the species of this distribution pattern should not have undergone greater selection for elimination than species of other distribution patterns. Amphi-Beringian distribution for other coastal areas within western Alaska are similarly low, Adak Island (7.8%, Talbot et al. 1997), Attu Island (5.2%, Talbot et al. 1991), Izembek National Wildlife Refuge (6.0%, Talbot et al. 2000), and Tuxedni Wilderness Area (4.1%, Talbot et al. 1992).

Our collection efforts were confined, on St. Matthew Island, to a limited portion of the island. Based on our overview of the island, however, it appears probable that our sample included most of the habitats available. The lichens of this island have attained great luxuriance since the disappearance of the reindeer, but there is no adequate baseline list available to indicate the lichen species that were present preceding the introduction of the herds. It is, therefore, impossible to assess the detailed influence of overgrazing on lichen diversity.

The situation is slightly improved for St. Paul Island, but the baseline is the one provided here, and the biodiversity undoubtedly has been affected by the current herds and their ancestors, particularly to their overgrazing during the winter season. We made a concentrated effort to sample sites where the animals could not graze (i.e., high on rock surfaces or deep among boulders), and obtained, in consequence, vouchers to document species otherwise in fragmentary condition in tundra, presumably through trampling and overgrazing.

It is of considerable interest that the proportionate representation of the various distribution patterns is extremely similar between the two islands. The richer representation of arctic-alpine species on St. Matthew Island (nearly 84%) can be attributed, in large part, to its more northern position as well as to its greater habitat diversity than that on St. Paul Island.

We must emphasize, however, that our time available for exploratory sampling on these islands was extremely limited, and that further taxa can be expected to be present. On St. Paul Island, we were unable to sample maritime sites through the presence there of fur seal colonies. On St. Matthew Island we were able to sample maritime sites.

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