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Lichens of Chowder Ridge, Mt. Baker, Washington

Abstract

A preliminary list of the alpine and subalpine lichens of Chowder Ridge and vicinity, Mt. Baker, Washington is presented, with notes on the habitats, relative cover and frequency of selected taxa. Of the approximately 200 taxa identified to species in this report, 80 are newly recorded for the North Cascade Mountains, and 45 of these are new for the State of Washington. Three are new to North America: *Aspicilia nordlandica* (Magn.) Degel., *Lecanora bicincta* Ram., and *Leciophysma finmarckicum* Th. Fr.

Introduction

Lichens, which contribute to the formation, stabilization and nutrient-enrichment of soil, are often abundant enough in alpine habitats to be major components of the vegetation. Knowledge of the lichens is therefore useful in understanding the ecology of high mountain areas.

The alpine lichens of Washington State are poorly known. Only the macrolichens (foliose and fruticose taxa) were included in the keys of Imshaug (1957) for western North America, and those keys are incomplete and outdated. Ecological notes on the conspicuous lichens on soil were given by Milleren (1983) and Kunze (1980) for an area in the Olympic Mountains, and by Douglas and Bliss (1977) for the North Cascades.

The Chowder Ridge area, located in the North Cascades immediately northwest of Mt. Baker, has been proposed as a Research Natural Area for a number of reasons (Taylor and Douglas 1978). The only previous reports on the lichens of this area (mostly Skyline Divide) were brief mentions by Herre (1943) and Douglas (1974), and some ecological data given by Gilleland (1980) on common species on solifluction lobes. The first extensive collections of lichens from the site were Fred Rhoades' 1978 collections, which formed part of the basis for the present report.

The purpose of the present study was to make a preliminary list of the lichens occurring in the Chowder Ridge area, and to give a rough idea of the distribution, relative frequency, and cover of the common or conspicuous taxa at the site.

Study Site

A map of the Chowder Ridge area is given in Figure 1. The major features of the site were described by Taylor and Douglas (1978). Habitats for lichens varied from protected subalpine forests (below about 1700 m) to areas that were fairly open but often moist or with late snowmelt (on north- or east-facing slopes, 1700-1900 m) to dry, often windy, relatively snow-free areas (on ridgetops and south- or west-facing slopes, 1900-2300 m).

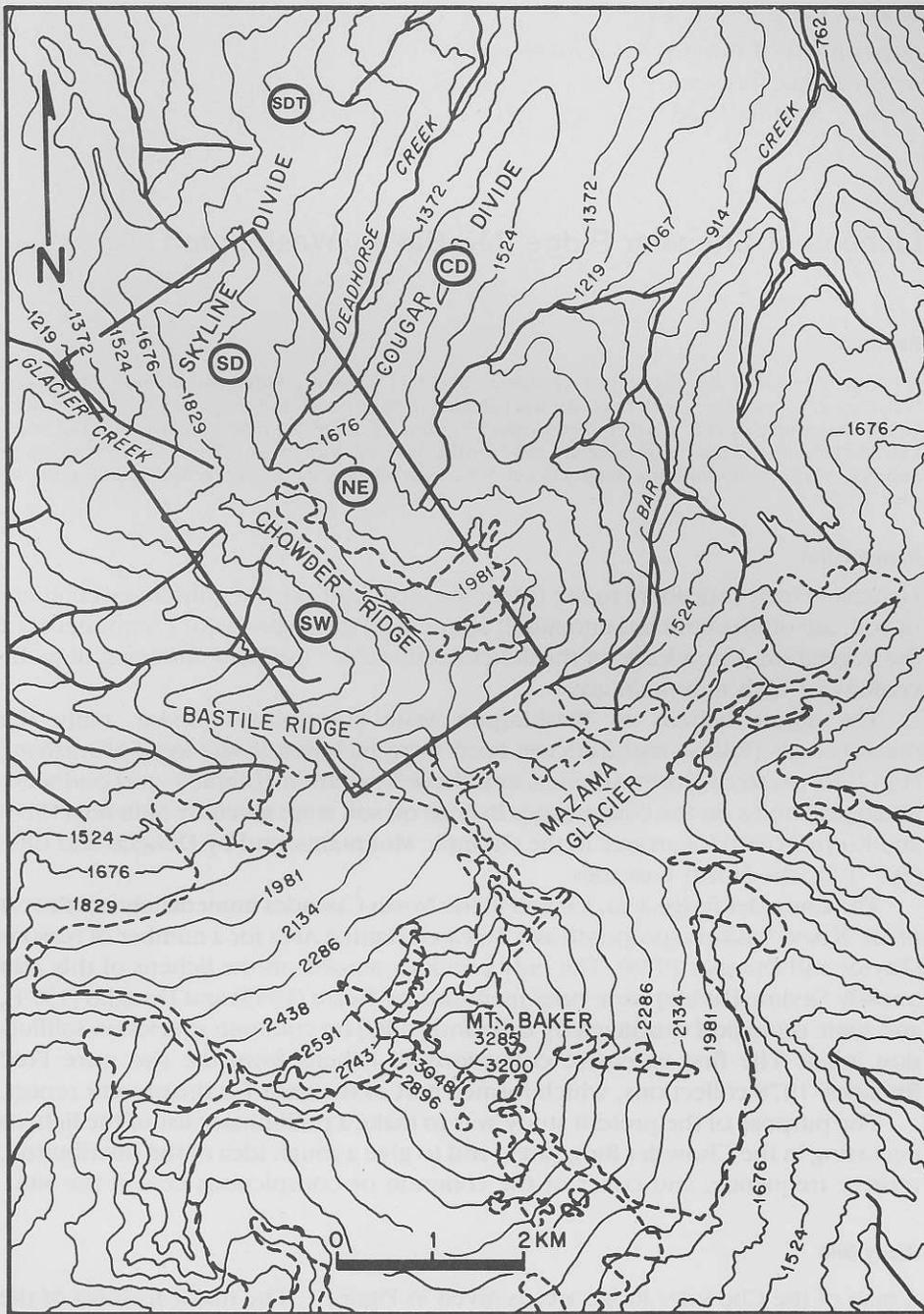


Figure 1. Map of Chowder Ridge and Mt. Baker, Whatcom County, Washington. Elevation is given in meters with topographic lines separated by about 152 m (500 ft). The area enclosed within the rectangle is the research natural area proposed by Taylor and Douglas (1978). The circled letters indicate collecting areas cited in present paper. Modified from Taylor and Douglas (1978).

Various types of bark and wood were substrates for lichens. Firs (*Abies* spp.) and hemlock (*Tsuga mertensiana*) dominated the forests and krumholz clumps. Juniper (*Juniperus occidentalis*), heathers (species of *Cassiope* and *Phyllodoce*), huckleberries (*Vaccinium* spp.), and a cinquefoil (*Potentilla fruticosa*) were also important.

Soil or humus, mosses (especially *Grimmia* spp.), and the spike moss *Selaginella densa* were often covered by lichens. The various vascular plant communities described by Taylor and Douglas (1978) provided different microhabitats for lichens on the ground; the dwarf shrub (*Cassiope/Phyllodoce/Vaccinium*) types were especially rich. Solifluction lobes, clumps of krumholz trees, and rock crevices each offered special habitats.

Rock types varied from smooth and soft, often fossiliferous siltstone (sometimes weakly HCl+), to harder and rougher rocks of volcanic origin. Some outcrops were rich in iron oxides. A natural archway in a large outcrop on NE (1775 m—see Figure 1), talus slopes, and streambeds each provided special conditions.

Methods

Five trips to Chowder Ridge via Cougar Divide and two to Skyline Divide were made by the author in 1982 and 1983. Collections or observations were made in five areas of the site, abbreviated in the text and in Figure 1 as follows: CD = Cougar Divide Ridgetop (1300-1700 m), NE = northeast slope of Chowder Ridge (1700-1900 m), SW = Chowder Ridge summit and southwest of it (1900-2300 m), SD = north/central Skyline Divide (1700-2100 m), and SDT = Skyline Divide Trail (1300-1700 m). Information on subalpine lichens was gathered on CD and SDT.

An attempt was made to examine as many different substrates and microhabitats as possible, but no specific system of sampling was used. For most of the common or conspicuous taxa, subjective notes were made in the field about their relative frequency, cover and ecological distribution, and photographs were taken to help describe habitats or species groupings. For these taxa and the less common or less distinctive ones, the substrate, general area of the site (NE, SW, etc.) and elevation (estimated from map) were recorded on the collecting packet and used in describing distribution patterns.

Voucher specimens have been deposited in the herbarium of Western Washington University (WWB); duplicates of most species have been retained in the author's own collection. Duplicates of many taxa were given to R. Anderson (University of Denver), T. Esslinger (NDA), M. Hale (US), H. Hertel (M), J. Sheard (SASK) and J. Thomson (WIS) for identification, and have been placed in those herbaria.

Results and Discussion—Ecology and Distribution

A list of lichens from the site is given on pp. 285-292. More detailed notes on individual taxa are available from the author on request. The ecology and distribution of common or conspicuous taxa are described below according to major habitat type (alpine or subalpine), substrate type, and microhabitat.

Subalpine Zone

Compared to the alpine, relatively few species of lichens occurred in the subalpine zone at the site; most are widely distributed boreal or temperate species typical of subalpine or montane areas throughout much of western Washington.

Bark and Wood. Approximately 35 species of lichens occurred on bark or wood in the subalpine area on CD and SDT. Most of these occurred on *Abies* spp. in the forests. Two species, *Alectoria sarmentosa* and *Mycoblastus alpinus*, were very frequent with high cover in the forests but rare in the alpine area. At least 12 other, less common taxa also appeared to be restricted to the forests. The remainder of the lichens in the forests were about equally common in the alpine area and are discussed under that heading. One lichen, *Cetraria subalpina*, was very abundant on the twigs of *Phyllodoce* and other shrubs in open subalpine areas. Several taxa were common on fairly rotten wood in a few areas: *Cladonia coniocraea* (strictly subalpine at this site), *C. carneola*, *Trapeliopsis granulosa* and *Xylographa bians*.

Soil, Moss, Vegetable Matter. Approximately 15 taxa of lichens occurred on the ground in the subalpine areas. Several unidentified taxa in the genus *Lepraria* were abundant on soil or moss in the forests but rare in the alpine and the open subalpine areas. Most of the other lichens on the ground occurred in the dwarf shrub (*Phyllodoce*) communities. The most common taxa were also common in the alpine zone: *Cladonia* spp., *Trapeliopsis granulosa*, *Lepraria neglecta*, *Peltigera canina* and *P. rufescens*. A few primarily alpine species such as *Solorina crocea* also occurred occasionally in the subalpine areas.

Rock. Because the most common saxicolous species occurred in the alpine areas, a comprehensive description of lichens on subalpine rocks is not given. Except for *Huillia crustulata*, few lichens were present on rock in the forests. In open areas with early snowmelt, a number of crustose lichens were abundant on the larger rocks. These included *Aspicilia* spp. (*A. gibbosa* group and *A. alpina* group), *Lecanora polytropa*, *Lecidea* spp. (especially the *L. atrobrunnea* group and various grey or cryptothalline taxa) and *Rhizocarpon* spp. (mostly the *R. geographicum* complex). One macrolichen, *Parmelia saxatilis*, was also common in some areas. The subalpine talus slopes were mostly barren except for occasional *Lecanora polytropa* or *Staurothele fuscocuprea*. Small rocks among *Phyllodoce* in flat, late snowmelt areas in the high subalpine/low alpine zone were often completely dominated by *Bacidia nivalis*, which seemed to be restricted to such habitats.

Alpine Area

Approximately half of the nearly 200 lichen species identified from the alpine area of the site are typical of arctic/alpine areas in the northern hemisphere. The rest are mostly boreal or temperate species with wide ecological and geographical distributions. The lichen floras on the three substrate types partially overlapped.

Bark and Wood. Over 35 species of lichens occurred on bark or wood in the alpine area. About a third of these are primarily saxicolous or terricolous taxa. Most of the corticolous and lignicolous lichens occurred on krumholz *Abies lasiocarpa* and were also common in the subalpine area. The most common taxa on

krumholz were *Bryoria* spp., *Hypogymnia* spp. (especially *H. imsbaugii*), *Lecanora coilocarpa* auct., *Lecidea nylanderii* and *Parmeliopsis hyperopta*. Several of the rarer lichens on krumholz appeared to be restricted to the alpine area at this site: *Candelariella lutella*, *Cetraria sepincola*, *C. platyphylla*, *Ocbrolechia androgyna*, and the primarily saxicolous or terricolous taxa.

The lichen flora on *Juniperus* was similar to that on *Abies* but not as species rich. Most of the species on *Phyllodoce*, *Potentilla* and *Vaccinium* were primarily terricolous, strictly alpine taxa, except for *Cetraria subalpina* which extended up only into the lower part of the alpine zone. A few lichens, namely *Cladonia carneola*, *C. sulphurina* and *Xylographa hians*, occurred mainly on rotten wood on the ground.

Soil, Moss Vegetable Matter. At least 80 species of lichens occurred on the ground in the alpine zone. The distributions of these species are described below according to the habitats or vascular plant communities the lichens inhabited, arranged roughly along a gradient from those in moist areas with late snowmelt and high humus content to those in dry, rocky areas with early snowmelt.

On the moist end of the gradient, relatively few lichens occurred. Only a few lichens, such as *Cetraria islandica*, *Cladonia* spp. and *Lepraria neglecta* auct. occurred in moist meadows, and these taxa were much more abundant in somewhat drier areas. However, a few taxa, especially *Cladonia rangiferina* and *Lepraria* spp. other than *L. neglecta*, were essentially restricted to areas sheltered by trees.

The greatest species richness and highest cover of lichens on the ground was in the dwarf shrub communities (*Cassiope/Phyllodoce/Vaccinium*). In general the dominant macrolichens in these communities were *Cetraria islandica*, *Cladonia mitis*, *Cladonia* spp. (especially *C. ecmocyna*), *Peltigera* spp. (especially *P. malacea*) and *Stereocaulon* spp. At the edges of heather hummocks *Solorina crocea* was often abundant. *Cetraria nivalis* occurred only occasionally but was conspicuous. *Thamnolia vermicularis* was frequent but low in cover. Among the crustose lichens, *Lepraria neglecta* auct. was the most abundant and conspicuous, but *Lecidella wulfenii*, *Parmeliella praetermissa*, *Psoroma hypnorum* and species of *Buellia*, *Caloplaca*, *Lecanora*, *Lecidea* and *Rinodina* were very frequent, especially on moss. Some lichens, such as *Lecidoma demissum*, occurred mainly on patches of fairly barren soil between the shrubs. The lichen flora in the dwarf shrub communities on the ridgetops appeared to be fairly similar to that in the moist, late snowmelt areas.

Most of the lichens that were common on soil or moss among dwarf shrubs were also frequent on those substrates in the dry graminoid communities (*Carex spectabilis*) on SW, but they often had lower cover in the latter.

The macrolichen flora on solifluction lobes on SW and SD was described in some detail by Gilleland (1980), whose data showed that most of the lichens occurred mainly on the flatter, relatively snow-free parts ("treads"). Some of the dominant lichens, e.g. *Cladonia mitis* and the *Cladonia gracilis* complex (mostly *C. ecmocyna*) had higher prominence values on the solifluction lobes than those given for *Phyllodoce* communities in the North Cascades by Douglas and Bliss (1977), while others such as *Cetraria islandica*, *Cladonia bellidiflora*, and *Thamnolia vermicularis* had lower values. To Gilleland's observations it may be added that

two lichen taxa appeared to be much more common on solifluction lobes than elsewhere at the site: *Peltigera spuria* (in dry graminoid meadows) and *Lobaria linita* (in dwarf shrub areas).

Several lichens occurred on soil in areas that were moist but rocky: *Collema* sp. (in crevices of rock outcrops on SW) and *Solorina crocea* (sometimes among moist rocks on SD).

Patches of soil, moss, or vegetable matter in dry rocky areas (e.g. vegetation stripes, fellfields, and rock outcrops, especially on the ridgetops) were often partly covered by *Cladonia* spp. (mostly basal squamules), *Melanelia elegantula*, *Ochrolechia upsaliensis*, *Parmelia* spp., *Peltigera rufescens*, *Stereocaulon* spp., *Thamnolia vermicularis*, and many less conspicuous lichens.

Rock. Over 100 species of lichens occurred on alpine rocks. The highest species richness and cover, especially for macrolichens, was on siltstone. However, many taxa appeared to be equally common on all rock types. No definite indicators of calcareous rock were apparent. The lichens can be arranged roughly along a gradient from those in moist, shaded or late snowmelt areas to those on dry, exposed ridgetops.

The aquatic lichens were the most distinct grouping. In one stream (1700-1850 m on NE), *Verrucaria elaeomelaena* and *V. margacea* co-dominated. In two streams on SD (about 1850 m), *Dermatocarpon rivulorum* and *Staurothele* spp. dominated.

Very shaded areas usually had few lichens, with low cover. *Acarospora oxytona* was very abundant on the shaded west face of the natural arch (NE) but rare elsewhere at the site. Some taxa, e.g. *Huillia crustulata*, occurred sometimes on stones under shrubs.

In areas that were less shaded but had late snowmelt, the larger rocks were sometimes dominated by *Umbilicaria cylindrica*, but more often by various crustose taxa. *Tremolechia atrata* was common on iron-rich outcrops. Species of *Aspicilia* (mainly the *A. alpina* group and *A. subsorediza*), *Lecidea* (mainly the *L. atrobrunnea* group and *L. leucothallina*), and *Rhizocarpon* (the *R. geographicum* group, *R. obscuratum*, and *R. polycarpum*) covered large areas on outcrops and were also frequent on small stones, along with *Lecanora polytropha*, which was low in cover.

Talus slopes in late snowmelt areas were often bare except for *Staurothele fuscocuprea*, which was frequent but low in cover. Volcanic rocks (mostly small stones) amidst heather in flat areas of the low alpine were often covered by *Bacidia nivalis*.

The larger, more stable rocks on the relatively snow-free ridgetops (SW and parts of NE and SD) usually had a rich flora. The dominant macrolichens were most often *Cetraria hepatizon*, *Pseudephebe* spp., and *Umbilicaria* spp. (mainly *U. proboscidea* and *U. hyperborea*). In some areas (more nutrient-rich?) species of *Parmelia sensu lato* and *Physcia sensu lato* were also abundant. On steep slopes *Xanthoria elegans* was sometimes the only abundant macrolichen. On more-or-less horizontal surfaces, *Alectoria* spp. and *Bryoria cf. subdivergens* were often important. *Cornicularia normoerica* was restricted to the most exposed, windy areas on the crest of SW. *Hypogymnia oroarctica* occurred mainly on the ridgetops. The placodioid taxa *Aspicilia alphoplaca*, *Lecanora cf. muralis*, and

Rhizoplaca melanoptalma were also conspicuous in some areas. The crustose taxa that were most characteristic of the ridgetops and often had the highest cover were *Aspicilia* cf. *mastrucata*, the *Lecanora rupicola* group, and *Sporostatia testudinea*. These species were usually mixed with others such as *Lecanora polytropa* and *Rhizocarpon geographicum*, which were also common in the late snowmelt areas. Several other crustose lichens, e.g. *Haematomma lapponicum* and *Lecidea armeniaca*, were conspicuous and restricted to the ridgetops, but they were rare. A number of others occurred mainly on the ridgetops and were high in frequency but low in cover: *Acarospora fuscata*, *Candelariella* cf. *vitellina*, *Lecanora* cf. *hageni*, *L. melaena*, the *Lecidea lapicida* group, and *Rhizocarpon disporum*. Most taxa that were common on the large rocks also occurred, with low cover, on small loose rocks in fellfields and vegetation stripes (SW).

Results and Discussion—Floristics

A preliminary list of lichens from the Chowder Ridge area is given below. Comments on variability or taxonomic problems are restricted to common or conspicuous taxa. About 200 taxa, in 75 genera, are listed. This is probably about two-thirds of the total number of species at the site. A number of taxa, including some that were common, have not yet been identified to species. This is especially true of sterile crustose lichens and members of large and poorly understood genera such as *Acarospora*, *Aspicilia*, *Lecanora*, and *Lecidea*. Many taxa were very inconspicuous or difficult to distinguish in the field, and were represented by fragmentary collections. Larger areas of the site (especially the lower elevations on SW) remain to be explored.

Of the identified species, 80 are newly recorded for the North Cascades; of these, 45 are new for Washington State, and 3 are new for North America. New records are indicated by asterisks in front of the name: * = North Cascades, ** = Washington State, and *** = North America. In the absence of monographic treatments, many lichens cannot be determined with complete certainty. Therefore in this paper *cf.* is used to indicate a degree of uncertainty.

Most newly recorded taxa were very common at the site (and often at other alpine sites in the North Cascades). Several of them have been previously collected by other workers in the same geographical areas but were not reported (or were reported as other species). There have been too few detailed reports on alpine lichens in the Pacific Northwest to draw definite conclusions about biogeographical patterns. The apparent richness of the lichen flora at the present site may be due partly to the lack of comparable studies and partly to the unusual rock type at the site.

Acarospora Mass.

A. fuscata (Schrad.) Arn.—On rock, SW.

**A. oxytona* (Ach.) Mass.—On rock, NE.

A. cf. smaragdula—On rock, NE, SW, SD; several varieties, all with thallus K-

Alectoria Ach.

**A. lata* (Tayl.) Linds.—On bark or wood (*Abies*, *Phyllodoce*, *Potentilla*), NE, SW, SD; on rock, SW.

- A. nigricans* (Ach.) Nyl.—On rock, SW; rarely on bark, NE.
A. sarmentosa (Ach.) Ach. ssp. *sarmentosa*—On bark (*Abies*, *Tsuga*), CD, NE, SDT, and rarely SD.
- Allantoparmelia* (Vain.) Essl.
A. alpicola (Th. Fr.) Essl.—On rock, SW.
- Arthonia* Ach. *nom. cons.*
 **A. sp.*—On rock, SW.
- Aspicilia* Mass.
 **A. alphoplaca* (Wahlenb. ex Ach.) Poelt & Leuck.—On rock, SW.
A. alpina (Somm.) Arn.—On rock, NE, SW, SD; rather variable.
 ***A. cf. americana*—On rock, NE.
A. cinereorufescens sensu lato—On rock, CD, NE, SW, SD; including one form with brown, shiny thallus.
 **A. cf. contorta*—On rock, SW.
 ***A. cf. mastrucata*—On rock, SW; rather variable; often sterile.
 ****A. nordlandica* (Magn.) Degel.—On rock, SW.
 ***A. subsorediza* (Lynge) R. Sant. *in Vezda*—On rock, NE, SW, SD.
- Bacidia* De Not.
B. nivalis Follm.—On rock, CD, NE.
- Baeomyces* Pers.
B. rufus (Huds.) Rebent.—On soil, NE, SD; poorly formed.
- Bryonora* Poelt.
 ***B. cf. castanea*—On soil or moss, NE, SW; spores rather large.
- Bryoria* Brodo & Hawksw.
B. cf. abbreviata—On wood (*Abies*, *Potentilla*), NE, SW; sterile, with long slender branches and few spinules.
B. capillaris (Ach.) Brodo & Hawksw.—On bark (*Abies*), CD.
B. cf. chalybeiformis—On bark (*Abies*, *Tsuga*), NE; on rock, SW; non-sorediate.
B. fremontii (Tuck.) Brodo & Hawksw.—On bark (*Abies*, *Tsuga*), CD, NE, SD, SDT; one form brittle, with fairly dull surface, thick cortex, and numerous pycnidia.
B. fuscescens (Gyeln.) Brodo & Hawksw.—On bark (*Abies*), CD, NE; including v. *positiva* (Gyeln.) Hawksw.
B. glabra (Mot.) Brodo & Hawksw.—On bark (*Abies*, *Tsuga*), CD, NE, SD, SDT.
 ***B. cf. subdivergens*—On rock, SW.
- Buellia* De Not.
 ***B. cf. aethalea*—On rock, NE, SW; thallus K-.
 **B. geophila* (Flörke ex Somm.) Lynge—On moss and vegetable matter (*Cassiope*, *Selaginella*), NE, SW.
B. papillata (Somm.) Tuck.—On moss, NE, SW.
 **B. verruculosa* (Sm.) Mudd—On rock, SW.
- Calicium* Pers.
 **C. glaucellum* Ach.—On wood, SDT.
- Caloplaca* Th. Fr. *nom. cons.*
 ***C. cf. exsecuta*—On soil, NE, SW; disks red-black.
 ***C. festiva* (Ach.) Zw.—On rock, NE, SD.

- C. jungermanniae* (Vahl) Th. Fr.—On moss, rarely on wood, NE, SW; apothecia varying from yellow-olive to red-orange.
- ***C. leucoraea* (Ach.) Branth.—On soil, NE, SD.
- C. stillicidiorum* (Vahl) Lynge—On moss, rarely on wood, SW.
- Candelariella* Müll. Arg.
- ***C. lutella* (Vain.) Räs.—On wood (*Abies*), NE.
- C. terrigena* Räs.—On soil or moss, NE, SW.
- **C. cf. vitellina*—On rock, SD, SW; spores unusually small.
- Cetraria* Ach. *nom. cons.*
- C. hepatizon* (Ach.) Vain.—On rock, NE, SW, SD; rarely on wood, NE; lobes quite variable in width.
- C. islandica sensu lato*—On soil or moss, NE, SW, SD; quite variable in form and color; both P + red and P – strains (including report of *C. ericetorum* by Douglas, 1974).
- C. nivalis* (L.) Ach.—On soil, NE, SW.
- C. platyphylla* Tuck.—On wood (*Abies*), NE.
- C. sepincola* (Ehrh.) Ach.—On wood (*Abies*, *Juniperus*), NE.
- C. subalpina* Imsh.—On bark or wood (*Abies*, *Phyllodoce*), CD, NE, SD, SDT.
- Cladina* (Nyl.) Harm.
- C. mitis* (Sandst.) Hale & Culb.—On soil, NE, SW, SD.
- C. rangiferina* (L.) Harm.—On soil, SD.
- Cladonia* Hill ex Wigg.
- C. bellidiflora* (Ach.) Schaer.—On soil, CD, NE, SD.
- C. carneola* (Fr.) Fr.—On soil or rotten wood, NE, SD, SDT; reported by Gilleland (1980) as *C. pleurota*.
- C. coccifera* (L.) Willd.—On soil, NE, SD, SW.
- C. coniocraea* (Flörke) Spreng.—On rotten wood, CD, SDT.
- C. ecmocyna* (Ach.) Nyl.—On soil or moss, NE, SD; several varieties; reported by Gilleland (1980) as *C. gracilis*.
- C. fimbriata* (L.) Fr.—On soil, CD, NE, SD, SDT.
- C. gracilis* (L.) Willd.—On soil, NE, SW, SD; several varieties.
- **C. macrophyllodes* Nyl.—On soil or moss, CD, NE, SW.
- C. pyxidata* (L.) Harm.—On soil or moss, CD, NE, SW, SD.
- C. squamosa* (Scop.) Harm.
- ssp. *squamosa*—On soil, SD (Douglas, 1974).
- ssp. *subsquamosa* (Nyl.) Vain.—On soil, CD, NE, SD; reported by Gilleland (1980) as *C. furcata*.
- C. sulphurina* (Michx.) Fr.—On soil or rotten wood, NE, SD.
- Coelocaulon* Link
- C. cf. aculeatum*—On soil or rock, NE, SW, SD; rarely on wood (*Abies*, *Juniperus*), NE; some forms close to *C. muricatum*.
- Collema* Wigg. *nom. cons.*
- C. sp.*—On soil or rock, SW; isidiate; poorly formed, sterile.
- Coniocybe* Ach.
- C. furfuracea* (L.) Ach.—On soil under *Abies* stump, SDT.
- Cornicularia* (Schreb.) Hoffm.
- C. normoerica* (Gunn.) Du Rietz—On rock, SW.

Dermatocarpon Eschw. (including *Catapyrenium* Flot.)

**D. cf. lachneum*—On soil, NE.

D. cf. reticulatum—On soil or rock, NE, SW.

D. rivulorum (Arn.) DT. & Sarnth.—On rock, SD and rarely NE.

Diplotomma Flot.

D. alboatrum Hoffm.) Flot.—On rock, NE.

Haematomma Mass.

H. lapponicum Räs.—On rock, SW.

Huillia Zahlbr.

H. cf. albocaerulescens—On rock, NE, SD.

H. crustulata (Ach.) Hertel—On rock, CD, NE, SD, SDT.

Hypogymnia (Nyl.) W. Wats.

***H. bitteri* (Lynge) Ahti—On bark or wood (*Abies*, *Potentilla*), NE, SW; often poorly developed.

**H. imshaugii* Krog—On bark or wood (*Abies*, *Juniperus*, *Tsuga*), CD, NE, SD, SDT.

***H. oroarctica* Krog—On rock, SW and rarely NE.

***H. cf. rugosa*—On bark (*Abies*), SD.

Ionaspis Th. Fr.

***I. epulotica* (Ach.) Th. Fr.—On rock, NE, SW, SD; one form with dark bluish apothecia.

Lecanora Ach.

****L. bicincta* Ram.—On rock, NE, SW.

L. cenisia Ach.—On rock, NE.

L. coilocarpa auct.—On bark (*Abies*, *Juniperus*, *Tsuga*), CD, NE, SD, SDT; epithecium not granular.

L. hageni sensu lato

form #1—On rock, SW; apothecia red-brown, bare.

form #2—On soil, moss, vegetable matter (*Selaginella*) or wood (*Potentilla*); apothecia mostly tan and pruinose.

***L. intricata* (Ach.) Ach.—On rock, SW.

**L. melaena* (Hedl.) Fink—On rock, SW.

L. cf. muralis—On rock, CD, SD; thallus greenish to brown.

**L. novomexicana* Magn.—On rock, NE; "*L. thomsonii*" form.

L. polytropa (Ehrh.) Rabenh.—On rock, CD, NE, SW, SD; rarely on moss, NE; several varieties.

L. rupicola (L.) Zahlbr.—On rock, NE, SW.

Lecidea Ach.

**L. armeniaca* (DC.) Fr.—On rock, SW; one form with whitish thallus and weak K reaction, on NE.

***L. atromarginata* Magn.—On rock, NE, SW; hypothallus poorly developed; rather variable; report of "*L. elata*" from SD by Herre (1943) may have been based on this species.

L. cf. atrobrunnea—On rock, CD, NE, SD, SW; extremely variable; often with brownish hypothecium, small pale areoles and weak reaction with I; one form with norstictic acid in exciple but not thallus.

L. fusca (Schaer.) Th. Fr.—On soil, NE.

- ***L. helvola* (Körb.) Oliv.—On bark (*Abies*), CD.
 ***L. impavida* Th. Fr.—On rock, SW.
 ***L. instrata* Nyl.—On rock, NE, SW.
L. lactea Flörke ex Schaer.—On rock, NE, SW, SD; not listed for North Cascades by Douglas (1974) but reported from SD (as *L. pantherina*) by Herre (1943).
 ***L. leucothallina* Arn.—On rock, NE, SD; thallus K-, P-.
 ***L. mannii* Tuck.—On rock, NE.
 ***L. nylanderii* (Anzi) Th. Fr.—On bark (*Abies*, *Tsuga*), CD, NE, SD, SDT.
L. tornoensis Nyl.—On bark (*Abies*, *Juniperus*), NE.
 ***L. cf. truckeei*—on rock, NE; thallus not pulvinate.
L. uliginosa (Schrad.) Arn.—On soil, NE, SD.
- Lecidella* Körb.
L. cf. stigmatea—On rock, SW.
 **L. wulfenii* (Hepp) Körb.—On moss, vegetable matter, or wood (*Juniperus*, *Potentilla*), NE, SW; thallus C-, KC-.
- Lecidoma* G. Schneid. & Hertel
L. demissum (Rutstr.) G. Schneid. & Hertel—On soil, NE, SD, SW.
- Leciophysma* Th. Fr.
 ****L. finmarckicum* Th. Fr.—On soil, NE.
- Lepraria* Ach. nom. cons.
L. neglecta auct.—On soil or moss, rarely rock or wood, CD, NE, SW, SD, SDT; granular thalli, matching *L. arctica sensu* Anderson (exsiccat no. 23).
L. cf. incana—On soil, moss, bark, wood or rock, CD, SD, SDT, NE, SW; farinose thalli, probably several taxa.
- Leprocaulon* Nyl. ex Lamy
 **L. subalbicans* (Lamb) Lamb & Ward—On soil or moss, NE, SW.
- Leptogium* (Ach.) S. Gray
L. lichenoides (L.) Dicks.—On moss, NE, SW.
L. tenuissimum (Dicks.) Fr.—On moss, NE.
- Lobaria* (Schreb.) Hoffm.
L. linita (Ach.) Rabenh.—On soil or moss, NE, SW, SD.
- Lopadium* Korb. nom. cons.
L. pezizoideum (Ach.) Korb.—On bark (*Abies*) on CD and SDT; on vegetable matter, NE.
- Massalongia* Körb.
M. carnosa (Dicks.) Körb.—On moss, SD.
- Melanelia* Essl.
 **M. elegantula* (Zahlbr.) Essl.—On soil, moss, or rock, NE, SD, SW; rather variable, often poorly developed.
- Microglaena* Korb.
 ***M. cf. muscorum*—On moss, NE.
- Mycoblastus* Norm.
 **M. alpinus* (Fr.) Kernst.—On bark or wood (*Abies*, *Tsuga*), CD, SDT and rarely SD.
M. sanguinarius (L.) Norm.—On bark (*Abies*), SDT.
- Nephroma* Ach.
N. parile (Ach.) Ach.—On soil or moss, NE, SD.

Ochrolechia Mass.

- ***O. androgyna* (Hoffm.) Arn.—On bark or wood (*Abies*), NE.
- ***O. frigida* (Sw.) Lynge—On moss, vegetable matter, or wood (*Juniperus*), NE, SD.
- O. oregonensis* Magn.—On bark (*Abies*), CD, SDT.
- O. cf. pallescens*—On bark (*Abies*), CD, SDT.
- O. upsaliensis* (L.) Mass.—On soil, moss, or vegetable matter (*Selaginella*, *Potentilla*), NE, SW, SD.

Pannaria Del.

- **P. leucophaea* (Vahl) P. Jorg.—On moss, SW, SD.
- **P. pezizoides* (Web.) Trev.—On moss, NE, SD.

Pachyospora Mass.

- **P. verrucosa* (Ach.) Mass.—On soil, moss or vegetable matter (*Potentilla*), SW.

Parmelia Ach.

- P. omphalodes* (L.) Ach.—On moss or rock, NE, SW, SD; poorly developed.
- P. saxatilis* (L.) Ach.—On rock, soil, or moss, CD, NE, SW, SD, and SDT.
- P. sulcata* Tayl.—On bark (*Abies*) SDT.

Parmeliella Müll. Arg.

- P. praetermissa* (Nyl.) P. James—On soil or moss, NE, SW.

Parmeliopsis sensu lato

- P. ambigua* (Wulf.) Nyl.—On bark (*Abies*), CD, NE.
- P. hyperopta* (Ach.) Arn.—On bark or wood (*Abies*, *Juniperus*, *Tsuga*), CD, NE, SD, SDT.

Peltigera Willd. *nom. cons.*

- P. canina* (L.) Willd.—On soil, SW, SD.
- P. lepidophora* (Nyl.) Vain.—On moss over rock, NE.
- P. leucophebia* (Nyl.) Gyeln.—On soil, moss, or rock, NE, SW.
- P. malacea* (Ach.) Funck.—On soil or moss, NE, SW, SD.
- P. cf. polydactyla*—On soil or moss, NE, SD; sterile.
- P. rufescens* (Weis.) Mudd—On soil or rock, CD, NE, SW, SD, SDT.
- **P. scabrosa* Th. Fr.—On soil or moss, SD.
- P. spuria* (Ach.) DC.—On soil, SW and rarely NE.

Pertusaria DC. *nom. cons.*

- **P. ophthalmiza* (Nyl.) Nyl.—On bark (*Abies*), SDT.

Phaeophyscia Moberg

- ***P. constipata* (Norrl. & Nyl.) Moberg—On moss, NE.
- **P. sciastra* (Ach.) Moberg—On rock, rarely on moss, SW.

Phaeorrhiza Mayrh. & Poelt

- ***P. nimbosa* (Fr.) Mayrh. & Poelt—On moss, SW.

Physcia (Schreb.) DC.

- P. cf. aipolia*—On rock, NE, SW; lobes very broad.
- P. caesia* (Hoffm.) Hampe—On rock, SW; rarely on moss, NE, SD; often poorly formed.
- P. dubia* (Hoffm.) Lett.—On rock, NE, SW, SD; variable, often poorly formed.
- **P. cf. phaea*—On moss, NE; lobes pruinose above.

Physconia Poelt

- P. muscigena* (Ach.) Poelt—On moss, NE, SW.

- Placopsis* (Nyl.) Linds.
P. gelida (L.) Linds.—On rock, NE, SW; poorly developed.
- Placynthium* S. Gray
 ***P. asperellum* (Ach.) Trev.—On rock, SW.
- Platismatia* W. Culb. & C. Culb.
P. glauca (L.) W. Culb. & Culb.—On bark or wood (*Abies*), CD, NE, SDT.
P. norvegica (Lynge) W. Culb. & C. Culb.—On bark (*Abies*), SDT.
- Polychidium* (Ach.) S. Gray
 **P. muscicola* (Sw.) S. Gray—On moss, SW.
- Protoblastenia* (Zahlbr.) Steiner
 **P. cinnabarina* (Sommerf.) Räs.—On bark (*Abies*), CD, NE.
- Protoparmelia* Choisy
P. badia (Hoffm.) Haffelner—On rock, NE, SW.
- Pseudephebe* Choisy
P. minuscula (Nyl. ex Arn.) Brodo & Hawksw.—On rock, NE, SW.
P. pubescens (L.) Choisy—On rock, NE, SW, SD; rarely on wood (*Abies*), NE.
- Psora* Zahlbr. emend. G. Schneid.
 ***P. nipponica* (Zahlbr.) G. Schneid.—On soil or moss, SD, SW.
P. rubiformis (Wahlenb. ex Ach.) Hook.—On soil, NE, SW.
- Psoroma* (Ach.) Ach. ex Michx.
P. hypnorum (Vahl) S. Gray—On moss or vegetable matter (*Cassiope*), NE, SW, SD.
- Rhizocarpon* Ram. ex DC.
 ***R. copelandii* (Körb.) Th. Fr.—On rock, SW.
R. disporum (Naeg. ex Hepp) Müll. Arg.—On rock, SW.
R. geographicum sensu lato—On rock, CD, NE, SW, SD, SDT; quite variable.
 ***R. inarense* (Vain.) Vain.—On rock, CD, SW; form on SW with white (but UV + yellow) thallus.
R. obscuratum (Ach.) Mass.—On rock, NE, SW.
 ***R. polycarpum* (Hepp) Th. Fr.—On rock, NE, SW, SD.
R. riparium sensu lato—On rock, NE, SD, SW; quite variable, often approaching the *R. lecanorinum* group in external form, but spores few-celled.
 ***R. simillium* (Anzi) Lett.—On rock, SW.
- Rhizoplaca* Zopf.
R. chrysoleuca (Sm.) Zopf.—On rock, NE.
R. melanoptalma (Ram.) Leuck.—On rock, NE, SW; sometimes poorly developed and non-umbilicate.
- Rinodina* (Ach.) S. Gray
 ***R. archaea* (Arn.) Arn. (Including *R. archaeoides* Magn.)—On wood (*Abies*, *Juniperus*), NE; on soil or moss, SW, rarely NE.
 ***R. roscida* (Somm.) Arn.—On moss or vegetable matter (*Potentilla*), SW.
 ***R. septentrionalis* Malme—On wood (*Juniperus*, *Potentilla*), NE, SW.
- Schaereria* Körb.
 ***S. tenebrosa* (Flot.) Hertel & Poelt—On rock, NE, SW.
- Solorina* Ach.
S. crocea (L.) Ach.—On soil or moss, NE, SW, SD, and rarely CD.

Sphaerophorus Pers. *nom. cons.*

S. tuckermanii Räs.—On bark (*Abies*), SDT.

Sporostatia Mass.

***S. polyspora* (Nyl.) Grumm.—On rock, NE.

S. testudinea (Ach.) Mass.—On rock, NE, SW; several varieties.

Staurothele Norm. *nom. cons.*

S. cf. fissa—On rock, SD; hymenial algae often elongated.

***S. fuscocuprea* (Nyl.) Zsch.—On rock, CD, NE, SD, SW, SDT; rather variable, often with poorly developed thallus.

Stenocybe Nyl. *ex* Körb.

**S. euspora* (Nyl.) Arn.—On wood, CD.

Stereocaulon Hoffm. *nom. cons.*

S. alpinum Laur.—On soil or moss, NE, SD, SW; quite variable, often poorly developed.

S. cf. condensatum—On soil, NE, SW, SD; probably a mixture of several taxa; often poorly developed.

S. cf. glareosum—On soil, NE, SD; distinguished mainly by large reddish cephalodia; phyllocladia not very elongated.

***S. grande* (Magn.) Magn.—On soil, SW.

S. cf. rivulorum—On soil and rock, NE; probably a mixture of several taxa.

Thamnotia Ach. *ex* Schaer. *nom. cons.*

T. vermicularis (Sw.) Ach. *ex* Schaer.—On soil, moss, or rock, NE, SW, SD; both *v. vermicularis* and *v. subuliformis* (Ehrh.) Schaer, usually mixed together.

Trapeliopsis Hertel & Schneider

T. granulosa (Ehrh.) H. T. Lumbisch in Hertel—On soil, moss, or rotten wood, CD, NE, SD, SDT; often sterile.

Tremolechia Choisy

**T. atrata* (Ach.) Hertel—On rock, NE, SW, SD.

Umbilicaria Hoffm.

U. cylindrica (L.) Del.—On rock, NE, SW; several varieties.

U. deusta (L.) Baumg.—On rock, NE, SD.

U. hyperborea (Ach.) Hoffm.—On rock, NE, SW, SD; several varieties; apothecia often with few gyri.

**U. kraschenikovii* (Sav.) Schol.—On rock, SW.

U. proboscidea (L.) Schrad.—On rock, NE, SW; two varieties.

U. torrefacta (Lightf.) Schrad.—On rock, NE, SW.

**U. virginis* Schaer.—On rock, SW.

Verrucaria Schrad. *nom. cons.*

***V. elaeomelaena* (Mass.) Arn.—On rock, NE.

**V. margacea* (Wahlenb.) Wahlenb.—On rock, NE.

Vestergrenopsis Gyeln.

***V. isidiata* (Degel.) Dahl—On rock, NE, SD.

Xanthoria (Fr.) Th. Fr. *nom. cons.*

X. candelaria (L.) Fr.—On rock, SW; poorly developed.

X. elegans (Link) Th. Fr.—On rock, NE, SW; several varieties.

***X. soreliata* (Vain.) Poelt—On rock or moss, NE, SW.

Xylographa (Fr.) Fr.

X. abietina (Pers.) Zahlbr.—On wood, SDT.

X. bians Tuck.—On wood, SD, SDT.

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