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8

# THE LICHENS OF BRITISH COLUMBIA

Illustrated Keys

Part 1 — Foliose and Squamulose Species



Ministry of Forests  
Research Program

1 9 9 4

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# The Lichens of British Columbia

## Illustrated Keys

Part 1 — Foliose and Squamulose Species

by  
Trevor Goward, Bruce McCune, and Del Meidinger  
(Illustrations by Trevor Goward)



Ministry of Forests  
Research Program

1 9 9 4

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## INTRODUCTION

Approximately 1100 species of lichens have been reported to occur in British Columbia (B.C.). Although this figure may appear impressive, lichens are among the most poorly documented elements of the province's macroscopic flora. Judging from the rate at which new species are being added to the lichen flora, it seems likely that hundreds of additional lichens await discovery in this province. Moreover, our understanding of the frequency status of the vast majority of species remains dolefully incomplete.

To date, comprehensive lichen studies have been conducted in only two regions of the province: the Queen Charlotte Islands and southeast Vancouver Island. The macrolichen flora of Wells Gray Park is also reasonably well documented. Most of the remainder of the province has received scant attention. Important collections have been made in the regions indicated in Figure 1, but most of these studies are unpublished and the specimens are now scattered in various herbaria.

A major impediment to the study of lichens in British Columbia is the lack of comprehensive keys to the species. This manual helps to correct this situation by providing illustrated keys to all "leaf" and "scale" (foliose and squamulose) lichens known to occur in the province. In total, 327 species are included, while 19 taxa are excluded from earlier accounts of the flora. Future volumes in this series will provide keys to the fruticose and crustose species.

This manual has two primary objectives. The first is to stimulate lichenological research by making the province's lichens accessible to as broad an audience as possible. To this end, the keys are tailored primarily to the needs and resources of ecologists, biologists, naturalists, teachers and other non-lichenologists wishing to identify lichens. These users can be assumed: (1) to lack access to thin-layer chromatography (TLC) facilities, as well as to various chemical reagents, ultraviolet lamps, light microscopes and/or other apparatus of detailed lichen identification; (2) to be reluctant

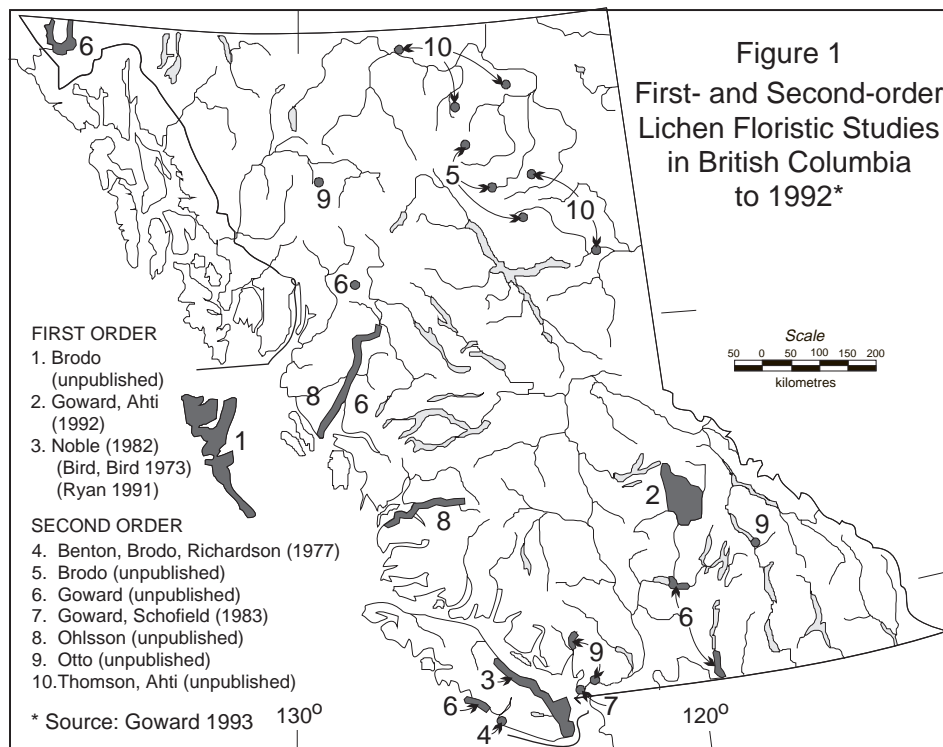


FIGURE 1. First- and second-order lichen floristic studies in British Columbia to 1992.

to handle unnecessary technical jargon; and (3) to be unfamiliar with basic lichen taxonomy. Based on these assumptions, the keys in this manual:

- emphasize morphological characters over chemical and spore characters;
- incorporate technical terms only where necessary<sup>1</sup>; and
- give more or less equal weight to phylogenetic relatedness and morphological similarity.

Accompanying the keys are approximately 350 line drawings. These are intended to convey species concepts based on typical material. In most cases, they illustrate only those portions of a thallus that bear the characters expressed in the adjacent key. Illustrations of whole lichens may be found in Hale (1979), MacKinnon et al. (1992), Pojar and MacKinnon (1994), Thomson (1984) and Vitt et al. (1988).

The manual's second objective is to briefly summarize the ecology, distribution and frequency status of the province's foliose and squamulose lichens. Until the status and ecological requirements of lichens are understood, resource managers will have little hope of intelligently managing for lichen diversity. For this reason, distribution maps are provided for species considered vulnerable to logging, grazing, urban development and other forms of human activity. These maps are based primarily on specimens housed at the University of British Columbia, in Vancouver, and the National Museum of Natural Sciences, in Ottawa, though reliable literature reports are also incorporated in some cases.

It is beyond the scope of this manual to provide a comprehensive summary of the biology of lichens (see instead: Hale 1983; Hawksworth and Hill 1984; Lawrey 1984). Effective identification does, however, require a basic understanding of lichen morphology and chemistry. The reader is therefore urged to consult the remainder of the Introduction before attempting to use the keys.

This manual represents a first attempt to provide comprehensive keys to the province's foliose and squamulose lichens. The keys have been tested by friends, colleagues and students, but numerous errors and oversights doubtless remain. The user is invited to bring these to the authors' attention for the benefit of future users.<sup>2</sup>

### Interpreting the Species Accounts

Lichens may be arranged into as many as seven different lichen growth forms (see "Identifying Lichens," page 10). Because these are units of convenience rather than biological units, it is not surprising that some lichen genera embrace more than one growth form. The following accounts incorporate all genera known to occur in British Columbia in which a majority of the species can be described as foliose or squamulose. In a few instances, foliose and squamulose species from other essentially crustose or fruticose genera are also included in the keys. These appear in parentheses (...) and are not discussed in the species accounts. Species appearing in square brackets [...] have not been reliably recorded in the province, but are expected to occur here. These may or may not be discussed in the text.

The body of the manual consists of genus and species accounts. These accounts are arranged alphabetically first by genus and then by species within each genus. Each genus account provides:

- a common name;
- a short description of the genus, with diagnostic characters placed in ***bold italic*** type;
- pertinent references;
- notes on the derivation of the common name; and
- notes on global status and distribution, taxonomy, chemistry and/or similar genera.

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<sup>1</sup> Technical terms are discussed in "Identifying Lichens" (page 10) and appear in **boldface** at first mention. Additional terms are defined in the keys, as well as in the Glossary (page 165).

<sup>2</sup> Please direct comments to Trevor Goward, Edgewood Blue, Box 131, Clearwater, B.C., V0E 1N0

The species accounts are organized in the following manner:

**Species and Author Citation (Synonym):**

Except in cases of recent taxonomic or nomenclatural revision, species names and author citations follow Egan (1987, 1989, 1990, 1991). Only synonyms in recent and/or widespread use are given.

**Distribution Maps:**

Distribution maps are provided (in Appendix 1) for species judged to be of rare or localized occurrence in the province. Map numbers appear to the right of the species names.

**Common Names:**

Common names are adopted, adapted or introduced for all lichen species included in this manual. Names given in parentheses (...) have been used by previous authors, but are not accepted here. See also "A Note on Common Names," page 14.

**Habitat:**

Habitat descriptions provide information about lichen frequency, common substrates, site characteristics and provincial ranges (see "Lichen Distribution in British Columbia," below). The following terms and schema are adopted: (Rare, infrequent, frequent, or common) *over* (acid, base-rich, mossy, or seasonally inundated) rock, (coniferous or deciduous) trees, (decaying) wood, moss, duff, or soil *in* (exposed, open, sheltered, or shady) (provincial range) (old growth) forests, steppe, depressions, or outcrops, at lower or higher elevations (throughout).

**Lichen Distribution in British Columbia:**

Lichen distribution is expressed according to the terms listed in the first two columns of Table 1 and in part mapped in Figure 2. Distribution is occasionally expressed in biogeoclimatic units, and these are listed in the third column of Table 1 and mapped in Figure 3. For further notes on the Biogeoclimatic System, see "Understanding Biogeoclimatic Zonation," page 5. Species of widespread occurrence in the province are described as occurring "throughout." The corresponding units of continentality in the fourth column are based on Conrad's Index of Continentality (Conrad 1946). These are included to enable ecoclimatic comparisons with other portions of the world (for further details, see Goward and Ahti 1992).

TABLE 1. Distributional units and their definition

General range	Life zone	Biogeoclimatic equivalent <sup>a</sup>	Conrad's Index of Continentality
Coast	Hypermaritime	CWH wh and vh	< 8
	Maritime		9–29
	– dry	CDF	
	– wet	CWH (not wh and vh)	
	– subalpine	MH	
Inland	Intermontane		29–39
	– semi-arid	BG, PP	
	– dry	IDF	
	– moist	SBS, SBPS, MS	
	– wet	ICH	
	– subalpine	ESSF	
	Boreal	BBWS, SWB	> 40
Subalpine	Throughout	MH, ESSF	various
Alpine	Throughout	AT	various
Widespread	Throughout	Throughout	various

<sup>a</sup> See Table 2 or the Glossary for definitions of these biogeoclimatic zone codes.



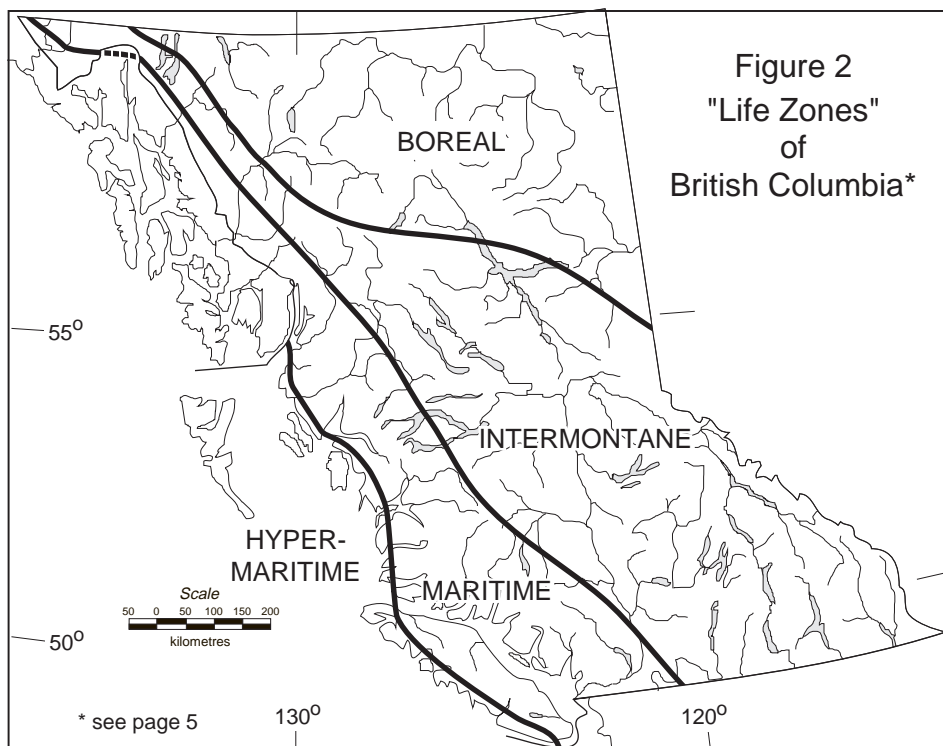


FIGURE 2. "Life zones" of British Columbia.

**Total Range in the Northern Hemisphere:**

Total range in the northern hemisphere is expressed relative to western North America in the following distributional units:

- western N Am
- western N Am – eastern N Am
- western N Am – western Eurasia
- western N Am – eastern Eurasia
- incompletely circumpolar (= any three of the above distributional units)
- circumpolar

North–south ranges in western North America are summarized for each species using the following geographic units: N to AK (Alaska) or YU (Yukon); and S to AZ (Arizona), CA (California), CO (Colorado), ID (Idaho), MT (Montana), MX (Mexico), NM (New Mexico), NV (Nevada), OR (Oregon), UT (Utah), WA (Washington), or WY (Wyoming). Species considered to have the northern or southern limits of their range within the province are denoted as N to BC and S to BC, respectively.

**Reactions:**

Only positive spot test reactions to commonly used chemical reagents are given. For further details see "Making Use of Lichen Chemistry," page 13.

**Contents:**

Here a listing of dominant lichen substances is presented in alphabetical order. Substances given in parentheses (...) do not occur in all specimens.

**Notes:**

This section is reserved for details pertinent to the determination or treatment of the species — taxonomic and nomenclatural problems, notes on similar species, chemistry, and keys to varieties and subspecies.

## Understanding Biogeoclimatic Zonation

British Columbia is a highly diverse province in which hundreds of ecosystems can be recognized. Maintaining these in the face of increasing pressure for resource development represents an enormous challenge — and involves, as a first step, classifying the province's ecosystems in detail.

In recent years, researchers with the B.C. Ministry of Forests have described medium-scale ecosystems according to the principles of biogeoclimatic ecosystem classification (Pojar et al. 1987). They have also arranged these ecosystems into a hierarchical system of biogeoclimatic zones, subzones, and variants.

Collectively, the zones, subzones, and variants of the biogeoclimatic system are referred to as biogeoclimatic units. Each unit is characterized by a unique set of climatic variables, and supports — and is for practical purposes defined by — a unique vegetation. In biogeoclimatic ecosystem classification, the defining vegetation for each unit occurs on moderately well-drained sites. Such sites are said to be “zonal.”

The most encompassing of the biogeoclimatic units is the biogeoclimatic zone. Fourteen biogeoclimatic zones are recognized for British Columbia and many of these are used here to describe lichen distribution. They are briefly characterized in Table 2 and mapped in Figure 3. For a more detailed summary, see *Ecosystems of British Columbia* (Meidinger and Pojar 1991).

Lichen distribution may also be expressed using more generalized classification systems such as the “life zone system” (see Figure 2) and “general range system” adopted here. These systems are compared with their biogeoclimatic counterparts in Table 1. The comparison is made mostly at the zonal level, though two biogeoclimatic subzones have also been used: the Wet Hypermaritime (wh) and Very Wet Hypermaritime (vh) subzones of the Coastal Western Hemlock Zone (CWH). These subzones occur in the hypermaritime or outer coastal areas of British Columbia (see Figure 2). See Table 2 for the full names of other biogeoclimatic zones.

TABLE 2. Summary information on the biogeoclimatic zones of British Columbia (Source: Lavender et al. 1990)

Zone	Code	Zonal vegetation	Zonal soils	Selected climatic characteristics <sup>a</sup>				
				Monthly temp. range	°days > 5°C	°days <0°C	May–Sept. ppt (mm)	Oct.–April ppt (mm)
Alpine Tundra	AT	<i>Cassiope</i> spp., <i>Phyllodoce</i> spp., <i>Luetkea pectinata</i> , <i>Loiseleuria procumbens</i> , <i>Dryas</i> spp., <i>Salix</i> spp., <i>Silene acaulis</i> , <i>Poa</i> spp., <i>Festuca</i> spp., <i>Carex</i> spp., <i>Cetraria</i> spp., <i>Stereocaulon</i> spp., <i>Polytrichum piliferum</i>	Regosols, Humic Regosols, Brunisols, Humo-Ferric Podzols	-11.1–9.5	427	1763	287	469
Boreal White and Black Spruce	BWBS	White spruce, lodgepole pine, black spruce, <i>Rosa acicularis</i> , <i>Viburnum edule</i> , <i>Mertensia paniculata</i> , <i>Pyrola asarifolia</i> , <i>Cornus canadensis</i> , <i>Vaccinium vitis-idaea</i> , <i>Ptilium crista-castrensis</i> , <i>Pleurozium schreberi</i>	Gray Luvisols, Dystric and Eutric Brunisols	-24.5–16.6	709–1268	1692–2742	145–305	182–198
Bunchgrass	BG	<i>Agropyron spicatum</i> , <i>Artemisia tridentata</i> , <i>Artemisia frigida</i> , <i>Poa sandbergii</i> , <i>Koeleria macrantha</i> , <i>Festuca scabrella</i> , <i>Festuca idahoensis</i> , <i>Chrysothamnus nauseosus</i>	Brown and Dark Brown Chernozems	-10.8–22.4	1771–2516	230–878	98–175	108–208

TABLE 2. (Continued)

Zone	Code	Zonal vegetation	Zonal soils	Selected climatic characteristics				
				Monthly temp. range	°days > 5°C	°days <0°C	May–Sept. ppt (mm)	Oct.–April ppt (mm)
Coastal Douglas-fir	CDF	Douglas-fir, grand fir, bigleaf maple, western flowering dogwood, <i>Holodiscus discolor</i> , <i>Gaultheria shallon</i> , <i>Mahonia nervosa</i> , <i>Rosa gymnocarpa</i> , <i>Symphoricarpos albus</i> , <i>Trientalis latifolia</i> , <i>Rubus ursinus</i> , <i>Pteridium aquilinum</i> , <i>Kindbergia oregana</i> , <i>Rhytidiadelphus triquetrus</i>	Dystric Brunisols	1.8–18.0	1794–2121	9–43	107–238	540–1107
Coastal Western Hemlock	CWH	Western hemlock, amabilis fir, Sitka spruce, yellow-cedar, <i>Vaccinium alaskaense</i> , <i>Vaccinium parvifolium</i> , <i>Menziesia ferruginea</i> , <i>Gaultheria shallon</i> , <i>Polystichum munitum</i> , <i>Pteridium aquilinum</i> , <i>Blechnum spicant</i> , <i>Clintonia uniflora</i> , <i>Rhytidiadelphus loreus</i> , <i>Hylocomium splendens</i>	Ferro-Humic and Humo-Ferric Podzols	-6.6–18.7	1059–2205	5–493	159–1162	695–3225
Engelmann Spruce–Subalpine Fir	ESSF	Subalpine fir, Engelmann spruce, <i>Rhododendron albiflorum</i> , <i>Menziesia ferruginea</i> , <i>Vaccinium (membranaceum, ovalifolium, scoparium)</i> , <i>Rubus pedatus</i> , <i>Gymnocarpium dryopteris</i> , <i>Tiarella unifoliata</i> , <i>Valeriana sitchensis</i> , <i>Orthilia secunda</i> , <i>Streptopus roseus</i> , <i>Veratrum viride</i> , <i>Barbilophozia lycopodioides</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiopsis robusta</i>	Humo-Ferric Podzols	-10.9–13.3	629–801	879–1189	205–425	271–1597
Interior Cedar–Hemlock	ICH	Western hemlock, western redcedar, hybrid white spruce, Douglas-fir, subalpine fir, <i>Vaccinium ovalifolium</i> , <i>Oplopanax horridus</i> , <i>Vaccinium membranaceum</i> , <i>Rubus parviflorus</i> , <i>Paxistima myrsinites</i> , <i>Smilacina racemosa</i> , <i>Streptopus (amplexifolius, roseus)</i> , <i>Chimaphila umbellata</i> , <i>Goodyera oblongifolia</i> , <i>Gymnocarpium dryopteris</i> , <i>Ptilium crista-castrensis</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus triquetrus</i>	Humo-Ferric Podzols Gray Luvisols, and Dystric Brunisols	-10.7–20.8	1267–2140	238–820	200–439	294–1098

TABLE 2. (Continued)

Zone	Code	Zonal vegetation	Zonal soils	Selected climatic characteristics				
				Monthly temp. range	°days > 5°C	°days < 0°C	May–Sept. ppt (mm)	Oct.–April ppt (mm)
Interior Douglas-fir	IDF	Douglas-fir, lodgepole pine, ponderosa pine, <i>Spiraea betulifolia</i> , <i>Amelanchier alnifolia</i> , <i>Juniperus communis</i> , <i>Symphoricarpos albus</i> , <i>Mahonia aquifolium</i> , <i>Paxistima myrsinites</i> , <i>Calamagrostis rubescens</i> , <i>Arctostaphylos uva-ursi</i> , <i>Agropyron spicatum</i> , <i>Pleurozium schreberi</i>	Gray Luvisols, Eutric and Dystric Brunisols	-13.1–21.3	903–2366	235–1260	107–291	149–1022
Montane Spruce	MS	Hybrid white spruce, subalpine fir, lodgepole pine, Douglas-fir, <i>Vaccinium scoparium</i> , <i>Lonicera utahensis</i> , <i>Shepherdia canadensis</i> , <i>Paxistima myrsinites</i> , <i>Vaccinium membranaceum</i> , <i>Alnus viridis</i> , <i>Linnaea borealis</i> , <i>Empetrum nigrum</i> , <i>Calamagrostis rubescens</i> , <i>Pleurozium schreberi</i>	Dystric Brunisols and Humo-Ferric Podzols	-12.5–17.4	891–1310	847–890	158–252	223–469
Mountain Hemlock	MH	Mountain hemlock, amabilis fir, yellow-cedar, <i>Vaccinium (ovalifolium, membranaceum, alaskaense)</i> , <i>Menziesia ferruginea</i> , <i>Rhododendron albiflorum</i> , <i>Rubus pedatus</i> , <i>Phyllodoce empetriformis</i> , <i>Rhytidiopsis robusta</i> , <i>Rhytidiadelphus loreus</i> , <i>Hylocomium splendens</i>	Ferro-Humic Podzols and Folisols	-2.3–13.2	919–933	307–352	694–707	1857–2260
Ponderosa Pine	PP	Ponderosa pine, <i>Agropyron spicatum</i> , <i>Balsamorhiza sagittata</i> , <i>Festuca (saximontana, idahoensis)</i> , <i>Koeleria macrantha</i> , <i>Lithospermum ruderale</i> , <i>Achillea millefolium</i>	Eutric and Dystric Brunisols	-8.6–21.6	1505–2442	258–861	86–270	170–334
Spruce – Willow – Birch	SWB	White spruce, subalpine fir, <i>Salix glauca</i> , <i>Betula glandulosa</i> , <i>Potentilla fruticosa</i> , <i>Shepherdia canadensis</i> , <i>Festuca altaica</i> , <i>Lupinus arcticus</i> , <i>Pedicularis labradorica</i> , <i>Epilobium angustifolium</i> , <i>Empetrum nigrum</i> , <i>Vaccinium (vitis-idaea, caespitosum)</i> , <i>Hylocomium splendens</i> , <i>Cladina</i> spp., <i>Nephroma arcticum</i>	Eutric or Dystric Brunisols, Humo-Ferric Podzols	-19.2–14.0	534–933	2036–2298	275–280	179–424

TABLE 2. (Concluded)

Zone	Code	Zonal vegetation	Zonal soils	Selected climatic characteristics				
				Monthly temp. range	°days > 5°C	°days <0°C	May–Sept. ppt (mm)	Oct.–April ppt (mm)
Sub-Boreal Pine – Spruce	SBPS	Lodgepole pine, white spruce, <i>Shepherdia canadensis</i> , <i>Spiraea betulifolia</i> , <i>Rosa acicularis</i> , <i>Calamagrostis rubescens</i> , <i>Arctostaphylos uva-ursi</i> , <i>Vaccinium caespitosum</i> , <i>Linnaea borealis</i> , <i>Pleurozium schreberi</i> , <i>Peltigera</i> spp., <i>Cladina</i> spp.	Gray Luvisols and Dystric Brunisols	-13.8–14.3	697–1044	1140–1405	243–300	218–222
Sub-Boreal Spruce	SBS	Hybrid white spruce, subalpine fir, lodgepole pine, <i>Vaccinium membranaceum</i> , <i>Rubus parviflorus</i> , <i>Viburnum edule</i> , <i>Lonicera involucrata</i> , <i>Spiraea betulifolia</i> , <i>Rosa acicularis</i> , <i>Aralia nudicaulis</i> , <i>Cornus canadensis</i> , <i>Linnaea borealis</i> , <i>Arnica cordifolia</i> , <i>Clintonia uniflora</i> , <i>Aster conspicuus</i> , <i>Osmorhiza chilensis</i> , <i>Oryzopsis asperifolia</i> , <i>Smilacina racemosa</i> , <i>Gymnocarpium dryopteris</i> , <i>Pleurozium schreberi</i> , <i>Ptilium crista-castrensis</i> , <i>Hylocomium splendens</i> , <i>Dicranum polysetum</i> , <i>Rhytidiadelphus triquetrus</i> , <i>Peltigera</i> spp.	Gray Luvisols and Dystric Brunisols Humo-Ferric Podzols	-14.6–16.9	884–1510	792–1369	189–353	250–1383

<sup>a</sup> Selected climatic characteristics summarized from AES Long-term stations. Prepared by D. Meidinger.

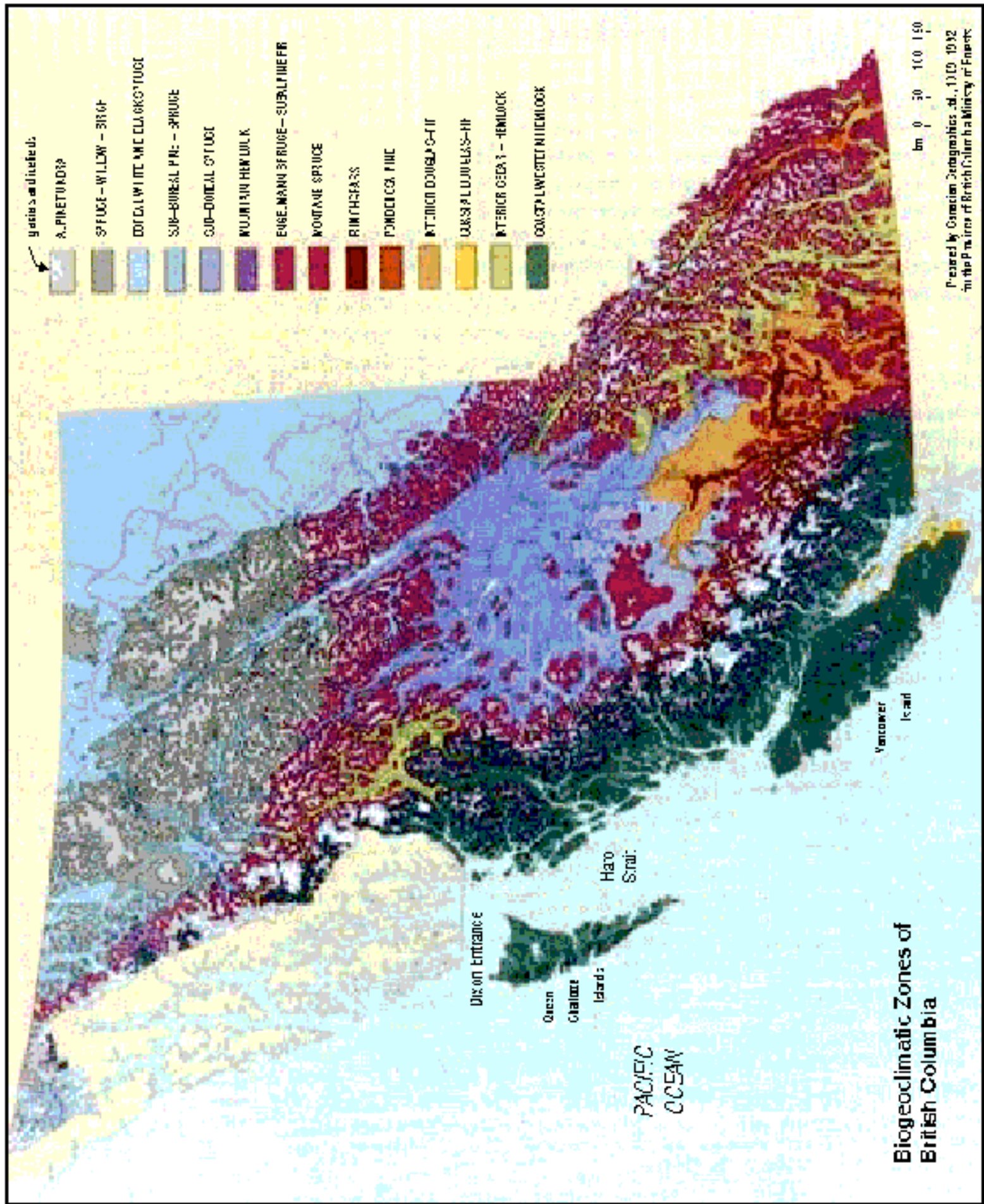


FIGURE 3. Biogeoclimatic zones of British Columbia

## Identifying Lichens

The vast majority of lichens are classified as cup fungi (**Ascomycetes**) — the same group to which morels and elf saddles belong. However, while most cup fungi derive their nourishment from sources external to themselves (e.g., decaying leaves or logs), lichen cup fungi “cultivate” their foodstuff among the fungal threads of which they themselves are composed. This foodstuff consists of tiny, photosynthesizing algal and/or cyanobacterial cells. Lichens can therefore be viewed as living greenhouses supported by carbohydrates derived from the photosynthetic “crops” growing within them. This accounts for the unusually exposed life style adopted by most lichens: whereas a majority of other fungi (except when fruiting) live within the things they feed on, lichens colonize the surfaces of rocks, trees, duff and soil.

The body of a lichen is called a **thallus** (Figures 4–5). A lichen thallus can be thought of as a kind of biological sandwich in which the fungal partner (**mycobiont**) and the “algal” partner (**photobiont**) are usually **stratified** in distinct layers (Figure 4). In many conspicuous lichen species four layers are present: a protective rind or **upper cortex** (Figure 4a); an “algal” or **photobiont layer** (Figure 4b); a pale, usually whitish region of loose fungal threads called the **medulla** (Figure 4c); and another protective covering or **lower cortex** (Figure 4d).

As already mentioned, the photobionts in nearly all lichens are comprised of green algae or **cyanobacteria**, or occasionally both. When exposed by a razor blade and viewed under a hand lens, algae are usually easily recognized by their bright grassy green colour. Cyanobacteria are more variable in colour and range from holly-green to bluish green or a dark steel-blue. In some species dominated by a green algal photobiont, scattered colonies of cyanobacteria may also be present. Such colonies are called **cephalodia** (Figure 4e) and may occur internally or over the upper or lower surface (Figure 8e).

In some lichens in which the photobiont is a cyanobacterium, the photobiont cells are intermingled throughout with fungal threads, and the thallus appears dark from top to bottom. These lichens, which are said to be **nonstratified** (Figure 5), tend to be brownish, blackish or bluish grey. They often assume a gelatinous consistency when wet, and are also popularly called “gel lichens.” Most nonstratified lichens lack a cortex (Figure 5a), though a primitive cellular cortex is present in the genus *Leptogium* (Figure 5b).

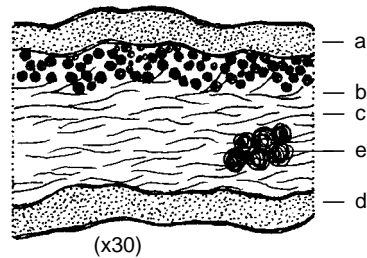


FIGURE 4. Thallus stratified/heteromerous (cross-section): a) upper cortex, b) algal or cyanobacterial layer/ photobiont layer, c) medulla, d) lower cortex, and e) cephalodia.

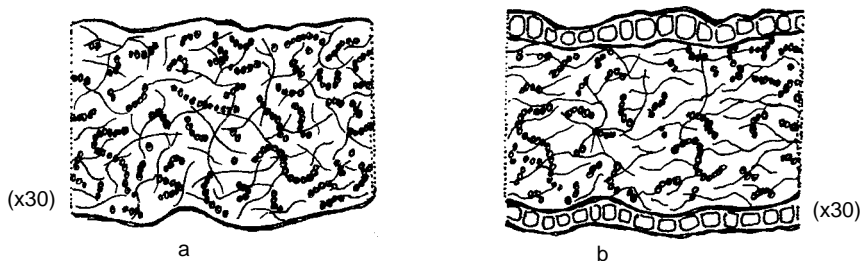


FIGURE 5. Thallus nonstratified/homoiomerous (cross-section): a) noncorticate, and b) corticate.

Distinct hairlike holdfasts or **rhizines** (Figure 6a–e) may occur in many species having a lower cortex. Rhizines anchor the lichen to the colonized surface or **substrate**, and may be **simple** (Figure 6a), **forking** (Figure 6b), **laterally branching** (Figure 6c), **tufted** (Figure 6d) or **flocculent** (Figure 6e). In a few groups of lichens, rhizines are replaced by a single thickened point of attachment, the **umbilicus** (Figure 6f). In others, the rhizines are replaced by a dark, woolly **hypothallus** (Figure 6g) that may sometimes extend beyond the margins of the lichen. Rhizine-like structures that occur along the lobe margins are called **cilia** (See Figure 8g).

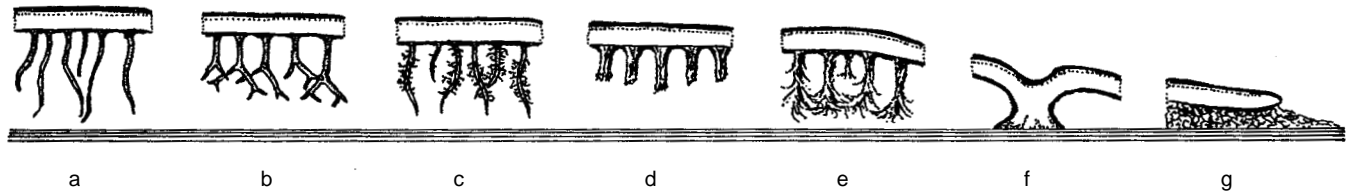


FIGURE 6. Organs of attachment (cross-section): a) simple rhizines, b) forking/dichotomous rhizines, c) laterally branching/squarrose rhizines, d) tufted rhizines, e) flocculent, confluent rhizines, f) umbilicus, and g) hypothallus.

Traditionally, lichens have been divided into three growth forms (crustose, foliose, and fruticose), though other classification systems are possible. The one adopted here recognizes seven growth forms.

1. **Dust lichens/leprose lichens** (Figure 7a) lack both an upper and lower cortex, the medulla being attached directly to the substrate so that the lichen cannot be separated from it intact. The medulla's upper surface disintegrates into a continuous covering of fine powder.
2. **Crust lichens/crustose lichens** (Figure 7b) resemble dust lichens, but have a hard, protective upper cortex, often giving a stain-like appearance. Some crust lichens intergrade with scale and leaf lichens, below.
3. **Scale lichens/squamulose lichens** (Figure 7c) are similar to dust and crust lichens in lacking a lower cortex (and rhizines). The thallus, however, consists of small, often partly raised, and usually overlapping **scales** or **squamules**, the lower surface of which is often white and cottony. Some scale lichens give rise to a fruiting structure called a **podetium** (Figure 7e): an erect, hollow stalk, resembling a golf tee, a toothpick or, less often, a branching shrub (see Club and Shrub Lichens).
4. **Leaf lichens/foliose lichens** (Figure 7d) more or less resemble leaves — their thalli are flattened and typically possess both an upper and lower cortex. The lobes can be narrow or broad, elongate or short. This is the only growth form in which rhizines occur. The degree of attachment varies from closely appressed through loosely attached to semi-erect or even unattached.
5. **Club lichens/fruticose lichens** (Figure 7e), being radially symmetrical, have no lower surface and therefore no lower cortex and rhizines. In most instances, club lichens have thickened, upright, unbranched, or sometimes sparsely branched stems. When hollow, the stems are called podetia and are then usually associated with basal scales.
6. **Shrub lichens/fruticose lichens** (Figure 7f) resemble club lichens in having somewhat thickened stems, and in being more or less radially symmetrical. In these species, however, the stems are also strongly branched. Occasionally the stems may be hollow, in which case they are again called podetia; usually, however, they are solid. Shrub lichens are typically upright and tufted.
7. **Hair lichens/fruticose lichens** (Figure 7g) differ from shrub lichens in having much finer, and proportionately much longer, branches. Hair lichens are frequently pendent.

In most lichens, the upper cortex is smooth and naked, though in some species it may be minutely roughened (i.e., **scabrid**) or else covered in a fine whitish frosting called **pruina**. In others, the cortex may bear a fine nap of tiny, erect or appressed glasslike hairs, which are collectively termed **tomentum** (Figure 8a). These may also be present over the lower surface.



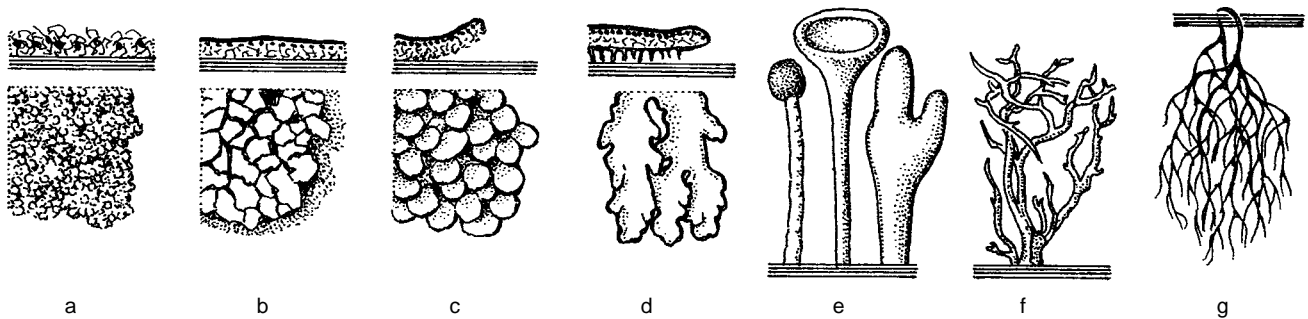


FIGURE 7. Lichen growth forms: a) dust/leprose (cross-section and surface view), b) crust/crustose (cross-section and surface view), c) scale/squamulose (cross-section and surface view), d) leaf/foliose (cross-section and surface view), e) club/fruticose, f) shrub/fruticose, and g) hair/fruticose.

The lower surface of some leaf lichens can also be sparsely speckled with minute pits through which the medulla is exposed. When rimmed and crater-like, these are termed **cyphellae** (Figure 8c); otherwise they are called **pseudocyphellae** (Figure 8d). Pseudocyphellae occur in some lichens over the upper cortex as well, and then must be carefully distinguished from **maculae** (Figure 8b): pale areas of the upper surface in which the cortex is unbroken.

Wart-like outgrowths called **cephalodia** (Figure 8e) are also present in the upper surface of some species. Cephalodia are localized colonies of cyanobacteria that occur (also internally or over the lower surface) in many lichens in which the primary photobiont is a green alga.

The lower surface of most lichens is smooth, though a **veined** (Figure 8f) surface is present in many species of *Peltigera* and, to a lesser extent, *Solorina*.

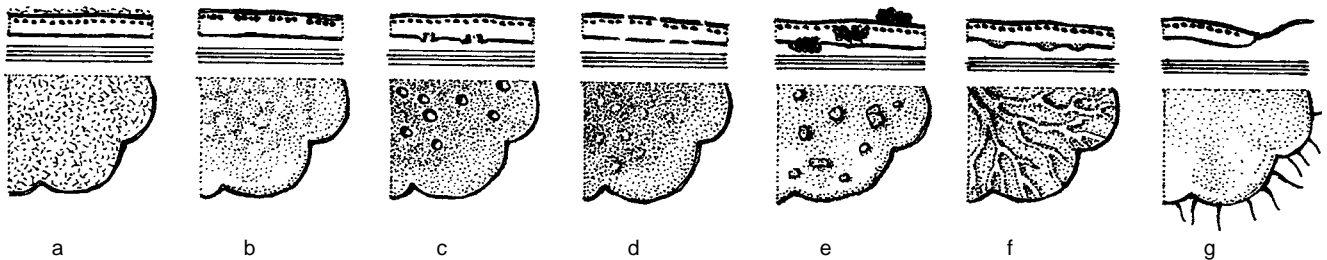


FIGURE 8. Surface details (cross-section and surface view): a) tomentum, b) maculae, c) cyphellae, d) pseudocyphellae, e) cephalodia, f) veins, and g) cilia.

Lichen fungi reproduce both sexually and asexually. For most species covered in this manual, sexual fruiting bodies take the form of tiny button-like, saucer-like or hemispherical structures called **apothecia** (Figure 9a). Fruiting bodies in other groups, however, can take the form of **perithecia** (Figure 9b) ( i.e., sunken, flask-shaped structures that are visible from above as blackish dots). The primary function of both types of fruiting bodies is to produce sexual **spores** (Figure 9d–e).

Within apothecia and perithecia, spores are borne in microscopic, club-shaped sacs called **asci**. A majority of fungal spores are simple, **two-celled** or **multi-celled** (Figure 9d), though in some lichens the spores can be **submuriform** or **muriform** (Figure 9e). The spores can be examined only with a light microscope.

Perithecia must be carefully distinguished from **pycnidia** (Figure 9c) which, though also dot-like, bear asexual reproductive cells called **pycnoconidia**. Pycnoconidia tend to be very small, usually only 4–5 $\mu$  long. By contrast, sexual spores are usually much longer and are produced in asci. In *Umbilicaria*, conidia may be produced (in well-demarcated, black, sooty patches) directly over the lower cortex and are then known as **thalloconidia**.

Asexual (vegetative) reproduction is also achieved by mechanical fragmentation (wear and tear) or by specialized outgrowths called soredia and isidia. **Soredia** (Figure 9f) arise in the medulla, erupting through the thallus surface as a soft, often granular powder. This powder may be diffuse or confined to delimited “wounds” called **soralia** (Figure 9f).

**Isidia** (Figure 9g), by contrast, are tiny fingerlike or coral-like outgrowths of the upper cortex. Their hardened outer surface is usually readily distinguished from the powdery appearance of soredia. Both propagules contain photobiont cells *and* fungal threads.

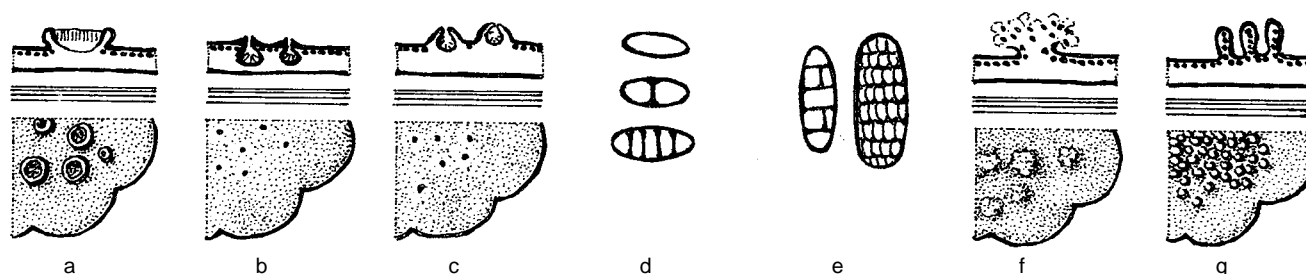


FIGURE 9. Reproductive structures (cross-section and surface view): a) apothecia, b) perithecia, c) pycnidia (protruberant), d) spores (simple, two-celled, multi-celled), e) spores (submuriform, muriform), f) soredia in sorallium, and g) isidia.

### Making Use of Lichen Chemistry

Lichens produce a diverse array of chemicals and for this reason lichen chemistry provides a useful tool in the identification of many species. Chemical substances are commonly identified by use of: (1) spot tests; (2) ultraviolet lamps; and (3) thin-layer chromatography.

#### 1. Spot Tests

Spot tests are performed using small quantities of various liquid reagents applied with a capillary pipette that has been drawn to a point over a flame. Five reagents are mentioned in the identification keys: calcium hypochlorite (C),<sup>3</sup> nitric acid (HNO<sub>3</sub>), potassium iodide (I), potassium hydroxide (K), and paraphenylenediamine (PD). Of these, only C, K and PD are used routinely. All of these substances are toxic and should be stored carefully in small, tightly sealed glass bottles. Spot tests can be performed using a hand lens (10x or stronger), though a dissecting microscope is preferable. When examining the specimen, it is helpful to work the material using a stiff, single-edged razor blade and a pair of fine forceps or tweezers. Never apply a reagent to the specimen itself; instead, apply it to a tiny fragment from which the cortex has been partly scraped away to reveal the medulla. Having tested both the medulla and the cortex, record the colour reactions (e.g., "Cortex K+ yellow"; "Medulla PD+ yellow becoming orange") for future reference. It is helpful to record both positive *and* negative reactions.

**Calcium hypochlorite (C):** This reagent, commercial chlorine bleach (e.g., Javex), can be purchased from most grocery stores. Because the reaction (a reddish or pinkish coloration) is usually fleeting, the lichen must be closely observed when it is wetted. In cases where the reaction is unconvincing, a more vivid reaction can usually be obtained by using K followed by C. Calcium hypochlorite is unstable and should be tested periodically (e.g., once per month, using a species known to give a C+ reaction) to ensure that it is still active.

**Nitric acid (HNO<sub>3</sub>):** This reagent is rarely used but is helpful in distinguishing the genus *Neofuscelia* from *Melanelia*. The expected reaction (in *Neofuscelia*) is a rapid darkening of the upper cortex, with a blue-green tinge.

**Potassium iodide (I):** Iodine solutions react with a variety of starches. When applied to the **hymenium** in, for example, *Pannaria*, the colour change is to blue, violet or even blueish black. The preferred formula is Lugol's iodine solution: 0.5 g iodine, 1.5 g potassium iodide, and 100 ml distilled water.

**Potassium hydroxide (K):** This is a 10–35% solution of potassium hydroxide in water. The reagent can be purchased (in pellet form) from most drugstores. The usual colour reactions are yellow, yellow changing to orange or red, and red.

**Potassium hydroxide/calcium hypochlorite (KC):** In this test, the K is applied first and then the C. The reactions yield vivid pinks or reds, and, though instantaneous, these colours often fade quickly.

<sup>3</sup> The abbreviations of calcium hypochlorite (C), potassium iodide (I), and potassium hydroxide (K) are commonly used by lichenologists and should not be confused with the standard symbols for the chemical elements carbon, iodine, and potassium.

**Paraphenylenediamine (PD):** This reagent is most safely used as Steiner's Stable PD Solution: 1 g PD crystals, 10 g sodium sulphite, 5 ml detergent (e.g., Photo-flo), 100 ml distilled water. An alternative solution can also be prepared by dissolving a few crystals of PD in two or three drops of 70% ethyl alcohol. This solution is highly unstable, however, and deteriorates after only a few minutes. By contrast, Steiner's Solution lasts a month or more, especially if stored in a dark bottle; it should be discarded after it has turned a dark pink. This reagent must be handled carefully, as it is absorbed through the skin, is suspected of being a carcinogen, and stains cloth, books, and specimens. Reactions may require a minute or more to develop properly and result in yellow, orange, or red coloration. The reagent is often available from scientific supply outlets.

## 2. Ultraviolet Lamps

Ultraviolet (UV) fluorescence is an effective means of detecting many lichen substances. The technique involves exposing the medulla of the specimen with a razor blade, and then examining it with a UV lamp in a darkened room. A positive UV reaction is unmistakable, yielding a vivid bluish or whitish colour. Because UV light is damaging to the eye, protective goggles should always be worn when conducting these tests. Avoid using UV lamps for extended periods and never look directly into the lamp. Ultraviolet lamps can be obtained from scientific and geological supply outlets.

## 3. Thin-layer Chromatography

Thin-layer chromatography (TLC) is more expensive and time-consuming than spot tests or UV tests. It is also, however, a more discriminating means of identification. In fact, many chemical substances can be detected in no other way (i.e., without the use of still more sophisticated techniques). The technique is not difficult to learn, but instruction in the method is beyond the scope of this manual. A good introduction can be found in White and James (1985).

## A Note on Common Names

In this manual, common names are proposed for all foliose and squamulose lichens known to occur in British Columbia. Although many lichenologists (including the second author) resist the coining of common names, others (including the first author) feel common names are prerequisite to the popularization of lichenology. To some extent the names adopted here are based on the latest recommendations of the Lichen Names Working Committee, though most are original with this publication. Names in parentheses have been used by earlier authors — for example, Ainsworth (1971), Alvin (1977), Benton and Underhill (1977), Bland (1971), Bolton (1960), Brodo (1988), McGrath (1977), MacKinnon et al. (1992), Nearing (1947), Perez-Llano (1944), Richardson (1975), Smith (1921) and Vitt et al. (1988) — but for various reasons are not accepted here.

Most of the common names are based on readily observable attributes of the species and genera, though some are also intentionally fanciful. Members of a given genus usually bear the same common "family" name, but that name may also apply to similar genera. Likewise, the same names are often applied to similar species within a genus on the assumption that students prepared to distinguish beyond this level of detail already favour the use of Latin binomials over that of common names.

Common names can be most satisfactorily viewed as vehicles of communication for those who are unwilling to use scientific names. Scientific names are intended to be universal and stable; common names are by nature regional and highly plastic. The common names introduced here are intended primarily for use by the naturalist community of British Columbia. While some may gain currency elsewhere in North America, alternative names will probably be coined for many of the species.

## KEYS TO GENERA OF FOLIOSE AND SQUAMULOSE LICHENS

### Making Use of the Keys

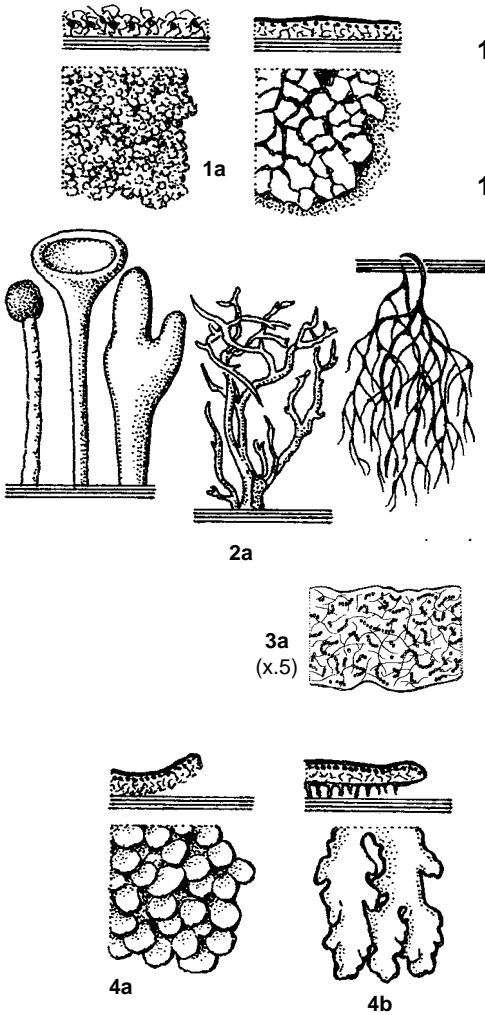
The keys in this manual consist of sequential pairs of parallel, but opposing, statements that can be compared against any foliose or squamulose species known to occur in British Columbia. To identify a lichen, begin with the first statement or “lead” in Key A and select the statement (i.e., 1a or 1b) that most accurately describes the specimen in hand. Proceed next to the lead indicated at the end of the more appropriate statement and repeat this process. The user will eventually be directed to one of the genus keys (i.e., Keys B, C or D), and then, following the same process, to one of the species keys (i.e., the keys appearing within the genus accounts). The end point in the keying process is reached when the selected lead yields a species name. If the illustration accompanying that name matches the specimen, then the identification is probably correct. If it does not, then the process must be repeated to determine where a wrong turn was taken. It may prove helpful to jot down the identification sequence so as to retrace it more quickly.

Many species are keyed out at more than one location: where a specimen seems well described by both leads of a pair, it can usually be looked for under both leads.

Unless otherwise indicated, the colour values given in the keys are based on dry material; moist specimens may be considerably darker. Measurements are also based on dry material. Spores, however, can only be accurately measured when mounted in water (or other liquid) on a glass slide and covered with a cover slip. Spores are measured in microns ( $\mu$ ) and should be examined under a light microscope, usually at between 100x and 400x. Measurements represent the average of the *larger* spores — an observation that also applies to lobes, isidia, pseudocyphellae, and other structures.

The line drawings accompanying the keys are tied to the keys by lead number (e.g., 23a) and, in many cases, by pointer arrows ( $\leftarrow$ ). The arrows call attention to specific statements in the keys and are intended to identify salient features of the species. Magnification is indicated by the symbol “x” (e.g., “x2” indicates a lichen shown at twice life size). The drawings illustrate the upper surface of the species, unless otherwise noted.

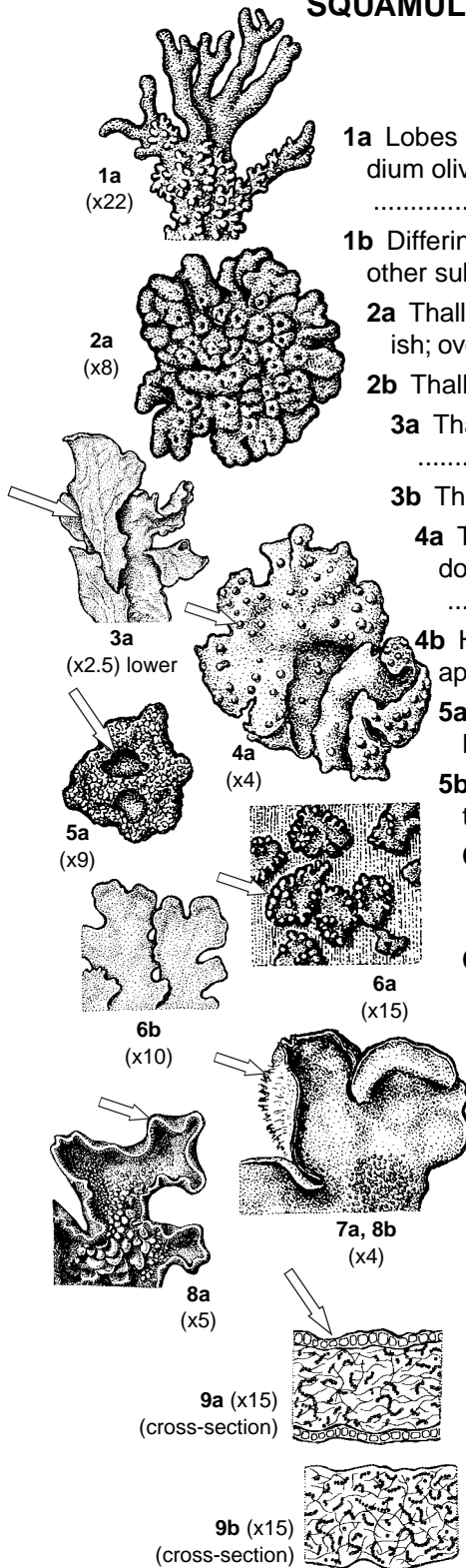
**KEY A: LICHEN GROWTH FORMS**



- 1a Thallus crustose: entirely crust-like, paint-like, granular or powdery, attached to the substrate throughout and inseparable from it .....  
 ..... **Leprose and Crustose Lichens (i.e., Dust and Crust Lichens)**  
 (not treated)
- 1b Thallus otherwise: either flattened and with a distinct upper and lower surface or else club-like, shrub-like or hairlike ..... 2
- 2a Thallus fruticose: consisting of cylindrical branches that are club-like, shrub-like or hairlike; or, if thallus somewhat flattened, then coloured alike on all sides .....  
 ..... **Fruticose Lichens (i.e., Club, Shrub and Hair Lichens)**  
 R(not treated)
- 2b Thallus foliose or squamulose: consisting of more or less flattened, dorsiventral lobes that are usually coloured differently above and below (Note: all orange-coloured lichens key here) ..... 3
- 3a Thallus nonstratified, internal portions of thallus darkened throughout; upper surface dark (blackish, dark brownish, or bluish grey); thallus often swollen and/or semi-translucent when wet .....  
 ..... Key B: **Nonstratified Foliose and Squamulose Lichens (i.e., Gel Lichens)** (page 17)
- 3b Thallus stratified, internal portions of thallus white or pale; upper surface pale or dark; thallus pliant when wet, but never distinctly swollen or semi-translucent ..... 4
- 4a Thallus squamulose: consisting of numerous short, rounded/isodiametric scalelike lobes/squamules, these averaging to at most 8 mm wide, often overlapping .....  
 ..... Key C: **Stratified Squamulose Lichens (i.e., Scale Lichens)**  
 (page 18)
- 4b Thallus foliose: consisting of more or less elongate lobes, or if lobes short/isodiametric, then individual lobes averaging to more than 8 mm wide ..... Key D: **Stratified Foliose Lichens (i.e., Leaf Lichens)**  
 (page 22)

**KEY B: NONSTRATIFIED (OR APPARENTLY NONSTRATIFIED) FOLIOSE AND SQUAMULOSE LICHEN GENERA OF BRITISH COLUMBIA**

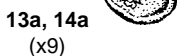
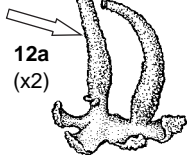
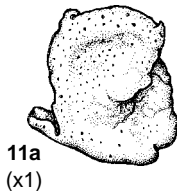
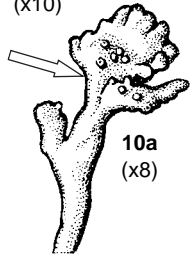
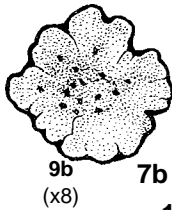
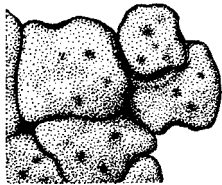
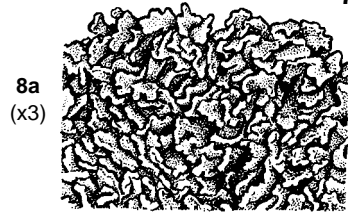
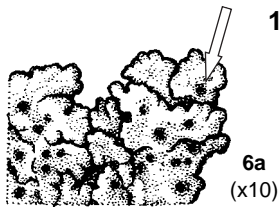
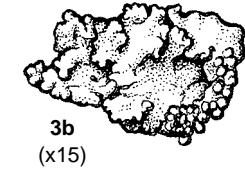
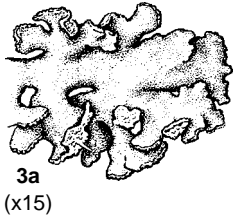
**“GEL LICHENS”**



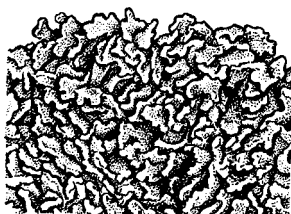
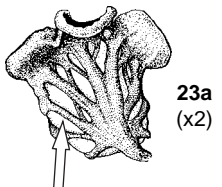
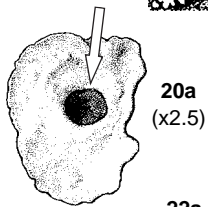
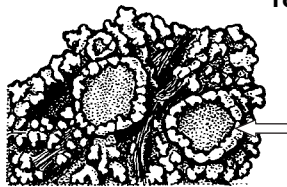
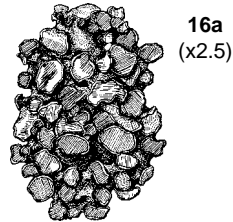
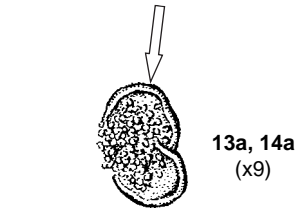
- 1a** Lobes minute, usually elongate, averaging to less than 0.5 mm wide; upper surface medium olive-brown; over rock ..... *Koerberia, Placynthium, Vestergrenopsis* (see key to *Placynthium*)
- 1b** Differing in one or more respects from the above: larger, or coloured differently, or over other substrates ..... 2
- 2a** Thallus distinctly umbilicate: attached by a thickened central holdfast; upper surface blackish; over rock; coastal ..... *Phylliscum demangeonii*
- 2b** Thallus not at all umbilicate; colour, habitat and distribution various ..... 3
- 3a** Thallus permanently submerged in mountain streams; lower surface veined(←) ..... *Hydrothyria venosa*
- 3b** Thallus not permanently submerged; lower surface not at all veined ..... 4
- 4a** Thallus a “seaweed,” occurring over rock below high tide (intertidal zone); numerous dot-like perithecia present(←); apothecia absent ..... (*Kohlmeyera complicatula, Turgidosculum ulvae*)
- 4b** Habit and habitat various, but never occurring below high tide; perithecia absent; apothecia present or absent ..... 5
- 5a** Over soil in arid inland localities; apothecia present(←), sunken below average level of thallus, disc reddish ..... *Heppia lutosa*
- 5b** Habitat and distribution various; apothecia absent or if present, then not sunken, the disc usually brownish (rarely reddish) ..... 6
- 6a** Thallus squamulose: consisting of numerous short, rounded/isodiametric, scalelike lobes(←), these averaging to at most 0.3 mm wide, often overlapping; upper surface never black ..... *Pannaria, Parmeliella* (see key to *Pannaria*)
- 6b** Thallus foliose: consisting of more or less elongate lobes, or if lobes short or rounded/isodiametric, then individual lobes averaging to more than 0.4 mm wide (Note: species having a distinctly black upper surface should key here) ..... 7
- 7a** Lower surface more or less evenly covered in dense, white woolly hairs/tomentum(←) ..... 8
- 8a** Upper surface naked; lobe margins and/or isidia bearing minute, erect white hairs(←) ..... *Leptochidium albociliatum*
- 8b** Upper surface naked or sparsely covered in white hairs (i.e., hairs, if present, not confined to lobe margins and/or isidia) ..... *Leptogium*
- 7b** Lower surface naked or, if in part hairy, then hairs distributed in localized tufts ..... 9
- 9a** Cellular cortex present(←); upper surface often finely wrinkled, usually partly bluish or slate grey, and often somewhat shiny near lobe tips; thallus thin or at least not distinctly thick and swollen ..... *Leptogium*
- 9b** Cellular cortex absent: upper surface smooth to pustulate (rarely finely wrinkled), olive-green to blackish and with dull lobe tips; thallus thin or distinctly swollen, especially at the lobe tips ..... *Collema, Gonohymenia, (Leciophysma), (Lempholemma)* (see key to *Collema*)

**KEY C: STRATIFIED SQUAMULOSE LICHEN GENERA OF BRITISH COLUMBIA**

**“SCALE LICHENS”**



- 1a Upper surface bright orange, bright yellow or bright greenish yellow ..... 2
- 2a Soredia and/or isidia present (check lobe tips); over bark, wood or rock; widespread ..... 3
- 3a Upper surface bright orange, K+ purple ..... ***Xanthoria fallax***
- 3b Upper surface bright yellowish, never distinctly orange, K- ..... ***Candelaria concolor***
- 2b Soredia and isidia absent; over soil usually in semi-arid climates ..... 4
- 4a Thallus K+ purple, resting on a white hypothallus (readily seen by carefully scraping away the lobes); apothecia uncommon, disc orangish or reddish .....  
..... (***Fulgensia bracteata***)
- 4b Thallus K-; hypothallus absent; apothecia usually abundant, the disc medium brown to dark brownish ..... (***Acarospora schleicheri***)
- 1b Upper surface not coloured as above ..... 5
- 5a Photobiont a grass-green alga; upper surface pale or dark ..... 6
- 6a Upper surface bearing scattered immersed perithecia and/or pycnidia(←), these appearing as tiny brownish or blackish dots or slightly raised “nipples”; apothecia absent; over soil or rock ..... 7
- 7a Over soil (including thin soil over rock) or over moss ..... 8
- 8a Lobes raised, attached to substrate at one edge; lower surface pale, often rather exposed, readily seen from above ..... (***Cladonia***)
- 8b Lobes appressed, broadly attached to substrate by wefts of threadlike rhizoids that cover much of the lower surface; lower surface pale or dark, exposed only along margins, if at all ..... 9
- 9a Lobes strong reddish brown (or pale greyish to brownish grey in some alpine species); spores simple, colourless, never intermixed with algal cells .....  
..... ***Catapyrenium***
- 9b Lobes pale or occasionally dark, but never strong reddish brown; lowland intermontane; spores multi-celled/muriform, brownish, intermixed with algal cells .....  
..... ***Endocarpon pusillum***
- 7b Growing directly attached to rock ..... 10
- 10a Lobes upright(←), dark brownish; pruina absent; spores muriform .....  
..... ***Endocarpon pulvinatum***
- 10b Lobes appressed, pale brownish to pale greyish; pruina present or absent; spores simple or few-celled ..... 11
- 11a Upper surface distinctly pruinose or, if otherwise, then lower surface dark .....  
..... ***Dermatocarpon***
- 11b Upper surface not at all pruinose; lower surface pale brownish .....  
..... (***Acarospora***)
- 6b Upper surface usually lacking black dots (i.e., perithecia absent); apothecia present or absent; habitat various (Note: all lichens occurring over bark, wood or moss key here) ..... 12
- 12a Lobes associated with hollow, upright podetia(←) ..... (***Baeomyces, Cladonia***)
- 12b Lobes not associated with podetia ..... 13
- 13a Lobe margins minutely and strongly inrolled, forming a thin, white peripheral rim(←) especially at lobe tips; upper surface greenish or pale greyish; apothecia absent; over moss, lichens or bark in humid climates ..... 14



25b (x3)

- 14a Upper surface sorediate in patches, often bearing faint concentric “growth rings”; infrequent ..... ***Normandina pulchella***
- 14b Soredia absent; upper surface not at all concentrically zoned; rare ..... ***(Omphalina)***
- 13b Lobe margins not minutely and strongly inrolled; upper surface variously coloured; apothecia present or absent; habitat and distribution various (Note: all lichens having soredia over the lower surface key here) ..... 15
- 15a Growing directly over bark or wood ..... 16
  - 16a Upper and lower surface coloured alike, dark brown; apothecia present, abundant ..... ***Cetraria sepincola***
  - 16b Upper and lower surface coloured differently, lower surface pale; apothecia present or absent ..... 17
  - 17a Lobes mostly less than 1 mm long, often wider than long(←); apothecia present or absent; upper surface C+ red or C- ..... ***Hypocenomyce, Waynea*** (see key to ***Hypocenomyce***)
  - 17b Lobes mostly to more than 1.5 mm long, generally longer than wide; apothecia absent; upper surface C- ..... ***(Cladonia)***
- 15b Growing over soil, moss, or rock, never directly over bark or wood ..... 18
  - 18a Upper surface with a distinctly greenish (or pale bluish green) cast; never growing directly over rock (Note: all species having strongly ascending lobes key here) ..... 19
    - 19a Apothecia present, apothecial rim distinctly “warty”(←); over moss or plant debris ..... ***Psoroma hypnorum***
    - 19b Apothecia present or absent, apothecial rim not at all warty; habitat various ..... 20
  - 20a Apothecia present(←), sunken below average surface of thallus ..... ***Solorina***
  - 20b Apothecia absent or, if present, then not at all sunken ..... 21
  - 21a Thallus more or less crustose, attached to substrate almost throughout, only the margins elevated and lobe-like ..... 22
  - 22a Apothecia absent; upper surface often exfoliating in spots; humid localities ..... ***(Baeomyces placophyllus)***
  - 22b Apothecia usually present; upper surface never exfoliating; dry, exposed localities ..... ***(Squamarina cartilaginea)***
  - 21b Thallus not at all crustose; lobes elevated above substrate almost throughout ..... 23
  - 23a Lower surface distinctly veined(←) ..... ***Peltigera venosa***
  - 23b Lower surface not at all veined ..... 24
    - 24a Lobes averaging to less than 0.4 mm wide; apothecia absent or, if present, erect and strawberry-shaped/ampulliform ..... ***Agonimia tristicula***
    - 24b Lobes averaging to at least 0.8 mm wide (often much wider); apothecia absent or if present, hemispherical(←) ..... 25
      - 25a Apothecia present: hemispherical at maturity ..... ***Psora***
      - 25b Apothecia absent ..... ***(Cladonia)***
- 18b Upper surface blackish, whitish, brownish, greyish or pinkish; occasionally growing directly over rock ..... 26





28a  
(x4)



30a  
(x6)



31a  
(x15)



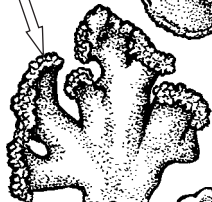
32a  
(x8)



32b, 33a  
(x11)



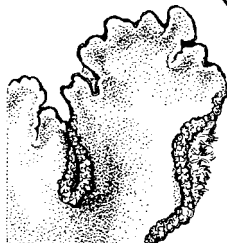
34a  
(x2.5)



35a, 36a  
(x9)

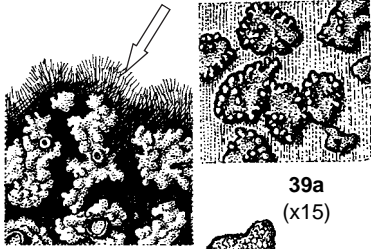


37a  
(x9)

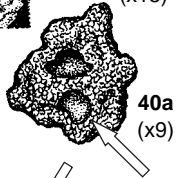


37b  
(x6)

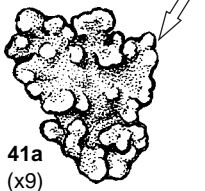
- 26a Lobes strongly convex, largely hemispherical; spores colourless ..... (*Toninia*)
- 26b Lobes concave or partly convex, but never largely hemispherical; spores colourless or dark ..... 27
- 27a Lobes whitish, greyish or blackish ..... 28
- 28a Lobes blackish; alpine ..... *Umbilicaria lambii*
- 28b Lobes whitish or greyish; restricted to lowland sites ..... 29
- 29a Lobes averaging to less than 1.5 mm wide, tending to overlap; medulla C+ red; coastal ..... (*Trapeliopsis wallrothii*)
- 29b Lobes averaging to more than 1.5 mm wide, not overlapping; medulla C-; inland ..... (*Squamarina cartilaginea*)
- 27b Lobes brownish or pinkish ..... 30
- 30a Apothecia present, apothecial rim distinctly "warty" (←); lobes strongly appressed throughout, over moss ..... *Psoroma hypnorum*
- 30b Apothecia present or absent; apothecial rim smooth, not at all warty; lobes usually somewhat elevated toward tips; habitat various ..... 31
- 31a Lobes intermixed with (sparse) external brownish or blackish cephalodia (←), these distinctly convoluted above and measuring to 1 mm across; over acid outcrops in northern alpine localities ..... *Psoroma* sp. 1
- 31b Cephalodia absent; habitat and distribution various ..... 32
- 32a Apothecial disc strongly convex, often hemispherical at maturity (←); spores 1-celled; inland ..... *Psora*
- 32b Apothecial disc plane (←) or weakly convex; spores 2-celled at maturity; distribution various ..... 33
- 33a Apothecial disc black (←); spores brown; inland ..... (*Buellia badia*)
- 33b Apothecial disc brownish; spores colourless; over seaside rocks ..... (*Lecania dudleyi*)
- 5b Photobiont a dark holly-green to greyish blue cyanobacterium; upper surface generally greyish, bluish, brownish or blackish ..... 34
- 34a Lobes attached by thickened central holdfast/umbilicus; growing directly over vertical rock in arid climates ..... *Peltula euploca*
- 34b Lobes variously attached, but umbilicus absent; habitat various ..... 35
- 35a True soredia present, originating on undersides of lobes (←) ..... 36
- 36a Upper surface lacking hairs (Note: a few cobwebby hairs may be present at the lobe tips in *Pannaria ahlneri*) ..... *Pannaria*
- 36b Upper surface partly bearing hairs, these stiffly erect or appressed-woolly/tomentose ..... 37
- 37a Hairs stiffly erect (←) ..... *Erioderma solediatum*
- 37b Hairs appressed and woolly/tomentose ..... *Leioderma solediatum*
- 35b True soredia absent (Note: species having soredia-like isidia or lobules that do not originate on the undersides of the lobes should key here) ..... 38



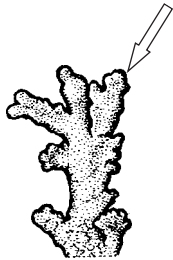
38a, 39b  
(x11)



40a  
(x9)



41a  
(x9)



41b  
(x8)

- 38a Thallus resting on conspicuous black hypothallus(←); lobes scalelike; over bark or rock in humid climates ..... 39
- 39a Over bark or wood (also rarely among moss over rock) ..... *Parmeliella triptophylla*
- 39b Growing directly over rock ..... *Placynthium nigrum*
- 38b Hypothallus absent or inconspicuous; lobes scalelike or elongate; habitat and distribution various ..... 40
- 40a Apothecia present(←), strong reddish, sunken below the average surface of the thallus; over soil in arid climates ..... *Heppia lutosa*
- 40b Apothecia present or absent, never strong reddish or sunken; habitat and distribution various ..... 41
- 41a Exposed areas of upper surface grey, greyish brown or almost black; lobe tips and/or "isidia" often soft-corticate and pale-felted(←); over wood or bark or, if over moss, then thallus forming a dense mat that completely obscures the substrate; spores 1-celled (but often containing one or more oil bodies) ..... *Pannaria*
- 41b Exposed areas of upper surface more or less medium brown; lobe tips and "isidia" hard-corticate(←), never pale-felted; over soil, rock or, if over moss, then usually forming loose mats that do not usually completely obscure the substrate; spores 2–multi-celled ..... *Massalongia*

KEY D: STRATIFIED FOLIOSE LICHEN GENERA OF BRITISH COLUMBIA

“LEAF LICHENS”

1a Thallus umbilicate: attached to the substrate by a single, thickened, more or less central holdfast; over rock ..... 2  
 2a Photobiont a dark greyish blue cyanobacterium; restricted to arid inland climates; rare ..... ***Peltula euploca***

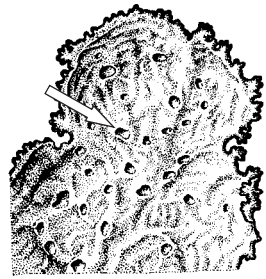
2b Photobiont a grass-green alga; distribution various (Note: specimens in which the photobiont is difficult to assess with a hand lens should key here) ..... 3  
 3a Upper surface distinctly pale greenish; apothecia also pale(←); restricted to arid or dry inland climates ..... ***Rhizoplaca***  
 3b Upper surface pale or dark, but never pale greenish; apothecia black or absent; distribution various ..... 4

4a Upper surface bearing scattered immersed perithecia and pycnidia, these appearing from above as tiny brownish or blackish dots(←); apothecia and rhizines absent; medulla C- ..... ***Dermatocarpon***  
 4b Upper surface usually lacking black dots (i.e., perithecia absent); apothecia and rhizines present or absent; medulla C+ red or C- ..... 5

5a Upper surface bearing scattered blisters/pustules(←), these never united and ridge-like; spores 1 or 2 per ascus ..... ***Lasallia pensylvanica***  
 5b Upper surface plane or variously wrinkled or ridged(←), but never bearing scattered pustules; spores 8 per ascus ..... ***Umbilicaria***

1b Thallus not umbilicate, central holdfast absent; ecology various ..... 6  
 6a Primary photobiont a dark greenish blue to dark greyish blue cyanobacterium; upper surface generally dark greyish, bluish or brownish ..... 7  
 7a Lobes narrow or if proportionately broad, then minute, averaging to less than 2 mm wide, often elongate; lower surface never bearing veins or pale spots ..... 8  
 8a Lower surface and rhizines blue-green (Note: this character is best demonstrated under a light microscope, but can sometimes be checked by scraping away portions of thallus, and examining the [discoloured] substrate below) ..... ***Placynthium***  
 8b Lower surface pale, or at least never blue-green ..... 9  
 9a Lobes averaging to more than 0.5 mm wide; thallus growing over moss, soil, bark or wood, almost never directly over rock ..... ***Massalongia, Pannaria, Parmeliella*** (see key to ***Pannaria***)  
 9b Lobes averaging to less than 0.2 (–0.3) mm wide; thallus growing directly over rock ..... ***Koerberia, Placynthium, Vestergrenopsis*** (see key to ***Placynthium***)  
 7b Lobes proportionately broad, often rather large, averaging to more than 3 mm wide, usually short and rounded; lower surface often veined or sparsely covered in pale spots ..... 10  
 10a Apothecia located on lower surface(←) ..... ***Nephroma***  
 10b Apothecia located on upper surface, or apothecia absent ..... 11  
 11a Lower surface veined or sparsely covered in pale spots ..... 12  
 12a Lower surface at least in part distinctly veined(←), bearing copious rhizines; usually ground-dwelling ..... ***Peltigera***  
 12b Lower surface more or less sparsely covered in pale spots(←), not veined; rhizines absent or sparse; habitat various ..... 13

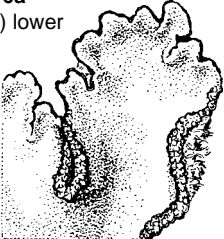
2a (x2.5)  
 3a (x2.5)  
 4a (x2.5)  
 5a (x1.5)  
 5b (x2.5)  
 8a (x22)  
 9a (x8) *Massalongia*  
 9b (x22) *Placynthium*  
 10a (x3)  
 12a (x2) lower  
 14a (x1) lower



15a (x4) lower



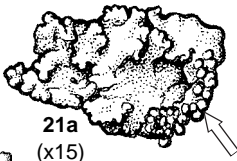
16a (x1.5) lower



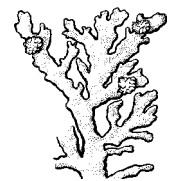
17b (x6)



20a (x20)



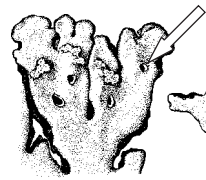
21a (x15)



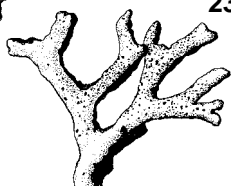
22a (x5)



22b (x5)



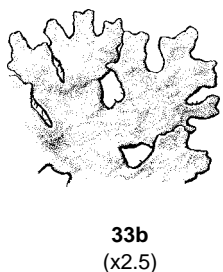
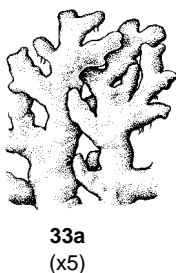
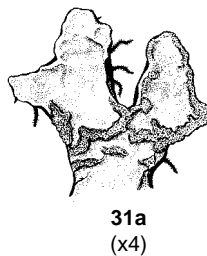
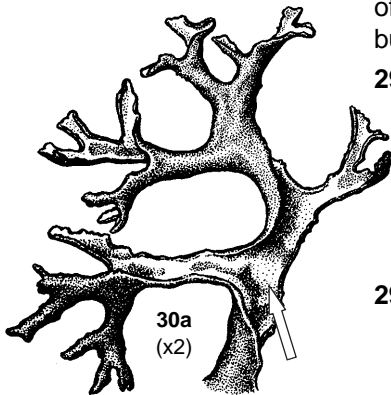
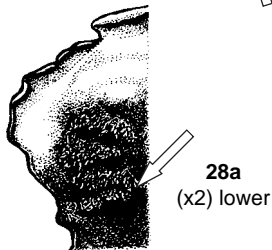
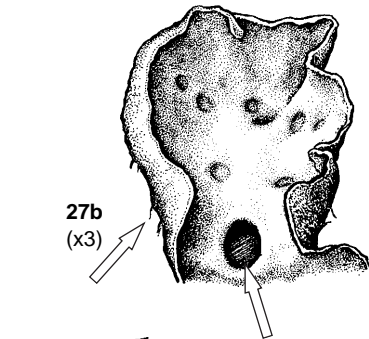
24a (x2.5)

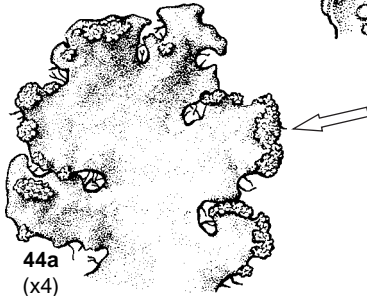
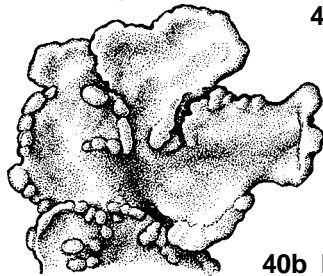
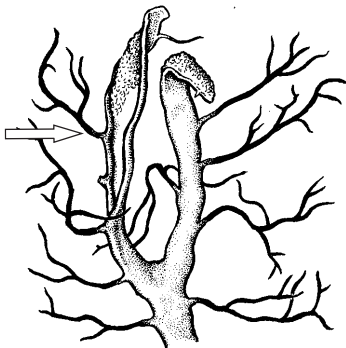
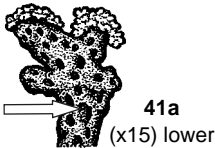
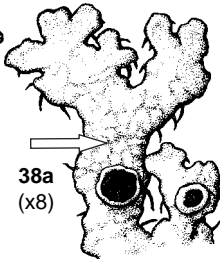
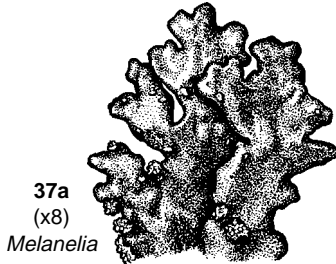
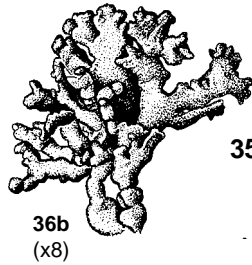
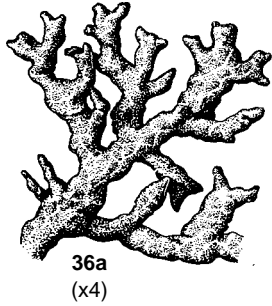


24b (x2.5)

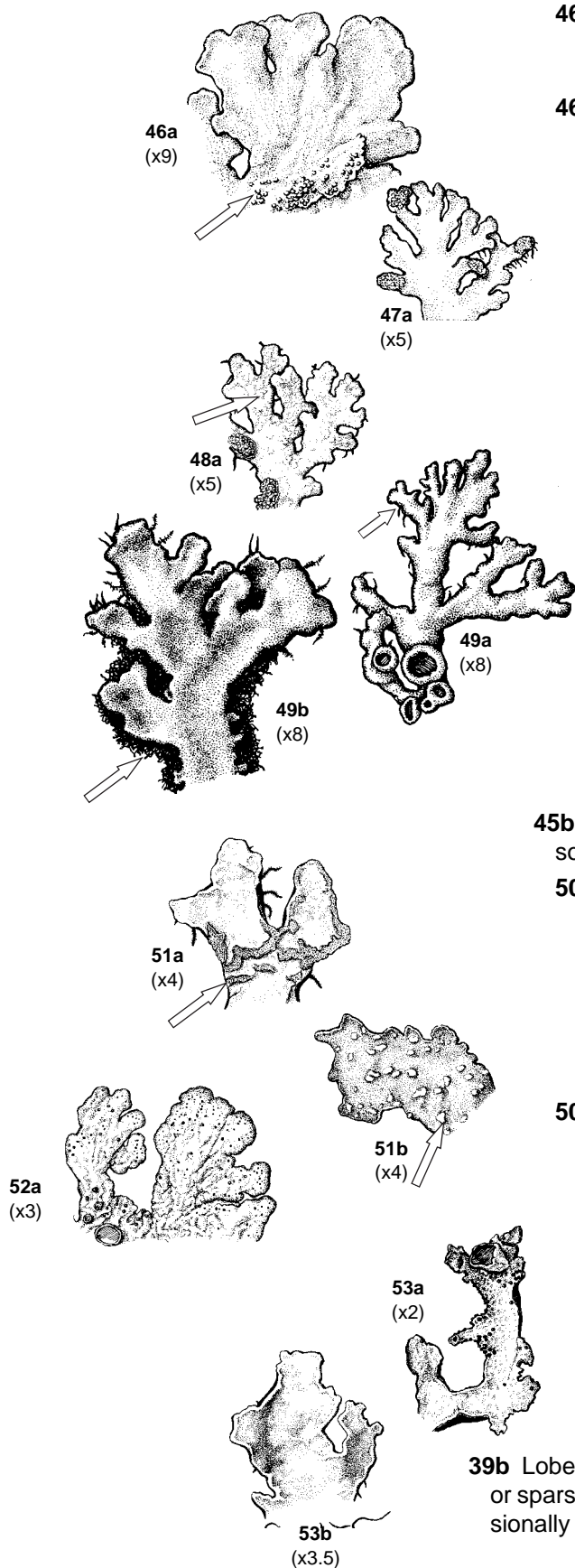
- 13a Spots averaging to more than 1.5 mm wide ..... 14
- 14a Lower surface (except spots) densely covered in minute erect hairs(←); spots hard-corticate, often somewhat shiny; apothecia located primarily over central portions of upper surface ..... **Lobaria**
- 14b Lower surface cottony, but not at all covered in minute erect hairs; spots also cottony, dull; apothecia located at thallus periphery(←) ..... **Peltigera**
- 13b Spots minute, averaging to less than 1 mm wide ..... 15
- 15a Lower surface cyphellate: spots distinctly sunken(←) and rimmed ..... **Sticta**
- 15b Lower surface pseudocyphellate: spots plane or raised(←), not rimmed ..... **Pseudocyphellaria**
- 11b Lower surface more or less uniform, not at all veined or pale-spotted ..... 16
- 16a Lower surface either hard-corticate and naked, or densely covered in minute erect hairs; widespread ..... **Nephroma**
- 16b Lower surface appressed-cottony, not hard-corticate or densely covered in minute erect hairs; hypermaritime ..... 17
- 17a Upper surface bearing minute erect hairs(←), medulla PD+ orange ..... **Erioderma solediatum**
- 17b Upper surface hairless or bearing minute appressed hairs; medulla PD- ..... **Leioderma solediatum**
- 6b Primary photobiont a grass-green alga; upper surface pale or dark (Note: all brightly coloured species key here) ..... 18
- 18a Upper surface orange or, if yellow-green or grey-green, then lobes tiny, less than 0.5 mm wide ..... 19
- 19a Upper surface orange (sometimes yellowish green in shady sites), K+ purplish .... **Xanthoria**
- 19b Upper surface yellowish green or grey-green, K- ..... 20
- 20a Thallus minute; lobes averaging to 0.1–0.3 mm wide; isidia and soredia absent; over moss ..... **Agonimia tristicula**
- 20b Thallus minute or small; lobe sometimes averaging to more than 0.3 mm wide; isidia and/or soredia present; growing directly over bark or rock ..... 21
- 21a Isidia and/or soredia present(←), located mostly along lobe margins and/or lobe tips; lobes averaging to less than 0.2 mm wide ..... **Candelaria concolor**
- 21b Isidia absent; soredia present, located over upper surface (including upper surface of lobe tips); lobes averaging to more than 0.4 mm wide ..... 22
- 22a Over rock; upper surface generally somewhat shiny throughout; coastal; medulla K+ yellow, PD+ orange ..... **Xanthoparmelia mougeotii**
- 22b Over bark (very rare over rock); upper surface generally dull toward thallus centre; widespread; medulla K-, PD- ..... **Parmeliopsis ambigua**
- 18b Upper surface variously coloured, but never orange; if yellow-green or grey-green, then lobes larger, averaging to more than 1 mm wide ..... 23
- 23a Lobes distinctly hollow in cross-section (readily observed through hand lens) ..... 24
- 24a Upper surface sparsely perforate(←), perforations to 2 mm across; soredia sometimes present around openings; coastal ..... **Menegazzia**
- 24b Upper surface not perforate, but lobe tips occasionally perforate; soredia variously located or soredia absent; distribution various ..... **Hypogymnia**
- 23b Lobes leaflike or partly cylindrical, but never hollow ..... 25

- 25a** Lobes proportionately broad; lower surface with an appressed-cottony appearance (check near lobe tips), often bearing darkened veins; wart-like cephalodia sometimes scattered over upper surface (Note: species with distinctly sunken apothecia key here) ..... 26
- 26a** Lower surface more or less distinctly veined or pale-spotted; and/or upper surface bearing wart-like cephalodia; apothecia located near lobe margins ..... 12
- 26b** Lower surface uniform or weakly veined, not at all pale-spotted; cephalodia absent over upper surface; apothecia located over central portions of upper surface, more or less sunken (Note: species with an orange lower surface key here) ..... 27
- 27a** Lobes numerous and conspicuously overlapping; rhizines and apothecia absent ..... (*Cladonia*)
- 27b** Lobes sparse to numerous, but never conspicuously overlapping; rhizines and apothecia usually present(←) ..... *Solorina*
- 25b** Lobes broad or narrow; lower surface hard-corticate to rarely appressed-cottony; veins absent; wart-like cephalodia also absent over upper surface ..... 28
- 28a** Apothecia (if present) located on lower surface; lobes averaging to more than 15 mm wide; lower surface strongly woolly-tomentose toward thallus centre(←); rhizines absent; usually ground-dwelling ..... *Nephroma*
- 28b** Apothecia (if present) located over upper surface or along lobe margins; lobes often averaging to less than 15 mm wide; lower surface bare or bearing rhizines, but never strongly woolly-tomentose; ecology various ..... 29
- 29a** Thallus unattached to substrate, and upper surface dark brown; exposed localities ..... 30
- 30a** Lower surface partly white-pruinose(←); northern B.C.; alpine .....  
..... *Masonhalea richardsonii*
- 30b** Lower surface not white-pruinose; southern B.C.; restricted to arid inland sites at lower elevations ..... *Dermatocarpon*
- 29b** Thallus attached or if unattached (as very rarely), then upper surface not dark brown; distribution various ..... 31
- 31a** Thallus "parmeliod," (i.e., combining at least two of the following characters: upper and lower surfaces obviously unlike in colour; rhizines abundant over lower surface; lobes more or less closely appressed) (Note: all species having a white-pruinose upper surface key here) ..... 32
- 32a** Upper surface distinctly yellowish (including yellowish green), and thallus growing over rock or soil ..... 33
- 33a** Upper surface dull throughout; lower surface also dull, usually weakly white-pruinose; boreal and alpine localities; medulla KC+ reddish, UV+ .....  
..... *Arctoparmelia*
- 33b** Upper surface more or less distinctly shiny (check lobe tips); lower surface also shiny, never white-pruinose; widespread, but most common in southern regions of B.C. at lower elevations; medulla KC-, UV- .....  
..... *Xanthoparmelia*
- 32b** Upper surface coloured otherwise or, if yellowish, then growing over bark or wood ..... 34
- 34a** Upper surface essentially dark: brownish, olivaceous or blackish ..... 35
- 35a** Rhizines absent over lower surface (sparse peg-like outgrowths may, however, be present); lobes strongly convex throughout; over acid rock in exposed alpine localities ..... 36

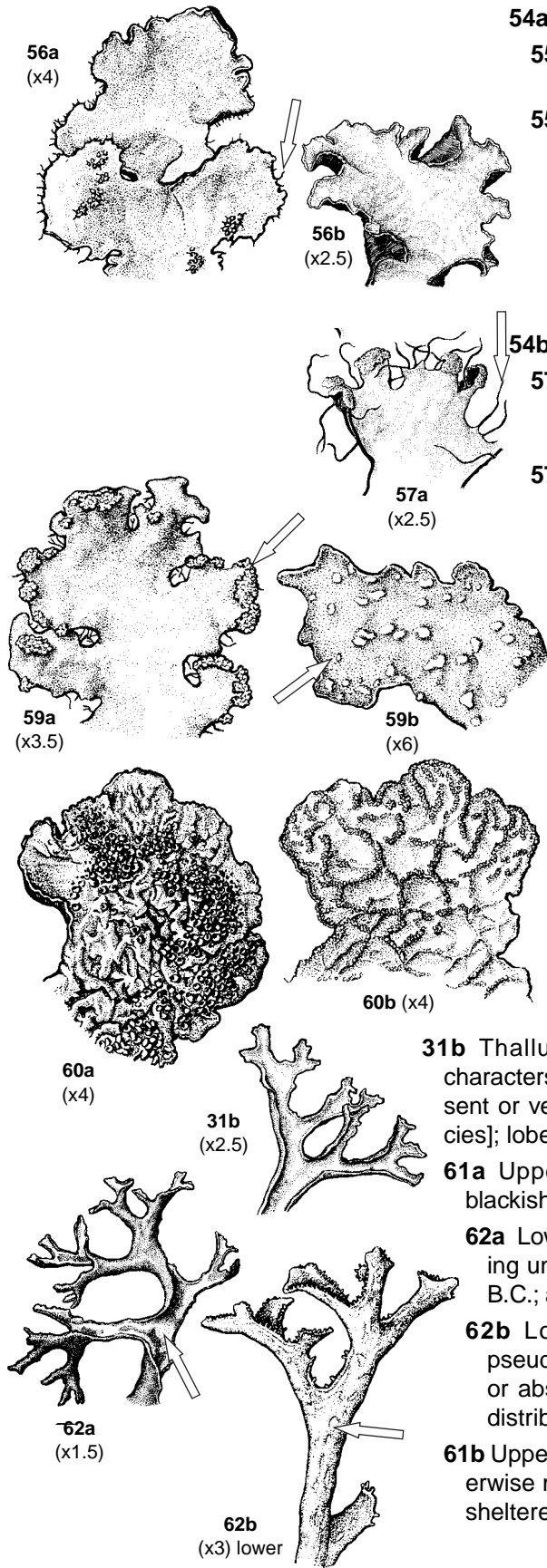




- 36a** Lobes partly semi-erect, sparsely branched, seldom completely obscuring substrate; cortex K+ yellow (check lobe tips or other pale areas); medulla PD+ orangish or PD- ..... ***Brodoa oroarctica***
- 36b** Lobes mostly appressed throughout, densely branched, generally completely obscuring substrate; cortex K- throughout; medulla PD+ strong yellow or PD- ..... ***Allantoparmelia***
- 35b** Rhizines present below; lobes generally weakly convex (rarely strongly convex) throughout; ecology and distribution various ..... 37
- 37a** Upper surface medium brown, partly shiny (check lobe tips); apothecial discs distinctly brown; lobes generally averaging to more than 2 mm wide; spores 1-celled/simple, colourless ..... ***Melanelia, Neofuscelia*** (see key to ***Melanelia***)
- 37b** Upper surface medium brown to nearly black, dull throughout; apothecial discs black or (when pruinose) pale greyish; lobes generally averaging to less than 2 mm wide; spores 2-celled, brown .... 38
- 38a** Upper surface dark greyish (never distinctly brownish), pale-spotted/maculate(←), K+ yellow (check sheltered lobes); lower surface pale; rhizines unbranched ..... ***Physcia***
- 38b** Upper surface brownish or blackish brown, not at all pale-spotted/maculate, K-; lower surface pale or more often dark; rhizines branched or unbranched ..... 49
- 34b** Upper surface occasionally brown where exposed, but otherwise pale: whitish, greyish, bluish, greenish or yellow (check sheltered lobes) ..... 39
- 39a** Lobes generally averaging to less than 4 mm wide; rhizines abundant or occasionally absent; lobe margins ciliate or not ..... 40
- 40a** Rhizines absent over lower surface (cilia, however, present along lobe margins in *Heterodermia*); lower cortex hard-corticate or not ... ..... 41
- 41a** Lower surface black, regularly pitted with minute black craters(←) (hand lens); essentially coastal ..... ***Cavernularia***
- 41b** Lower surface pale and smooth or at most wrinkled, never pitted; distribution various ..... 42
- 42a** Over bark; lobe margins strongly ciliate (←) ..... ***Heterodermia***
- 42b** Over rock or soil; lobe margins lacking cilia ..... 43
- 43a** Lobes distinctly elongate; upper surface strongly white-pruinose; restricted to exposed soil in semi-arid intermontane localities ..... ***Buellia elegans***
- 43b** Lobes short, more or less squamulose; upper surface at most weakly white-pruinose; over rock or soil in cool, boreal localities ..... ***Baeomyces placophyllus***
- 40b** Rhizines present and usually conspicuous over lower surface; lower cortex hard-corticate ..... 44
- 44a** Lobes semi-erect at maturity, soresiate, soresidia borne partly on downturned lobe tips(←); coastal ..... ***Hypotrachyna***
- 44b** Lobes appressed or semi-erect at maturity; lobe tips never both soresiate and downturned; distribution various ..... 45
- 45a** Lobes averaging to less than 2.5 mm wide; pseudocyphellae absent ..... 46

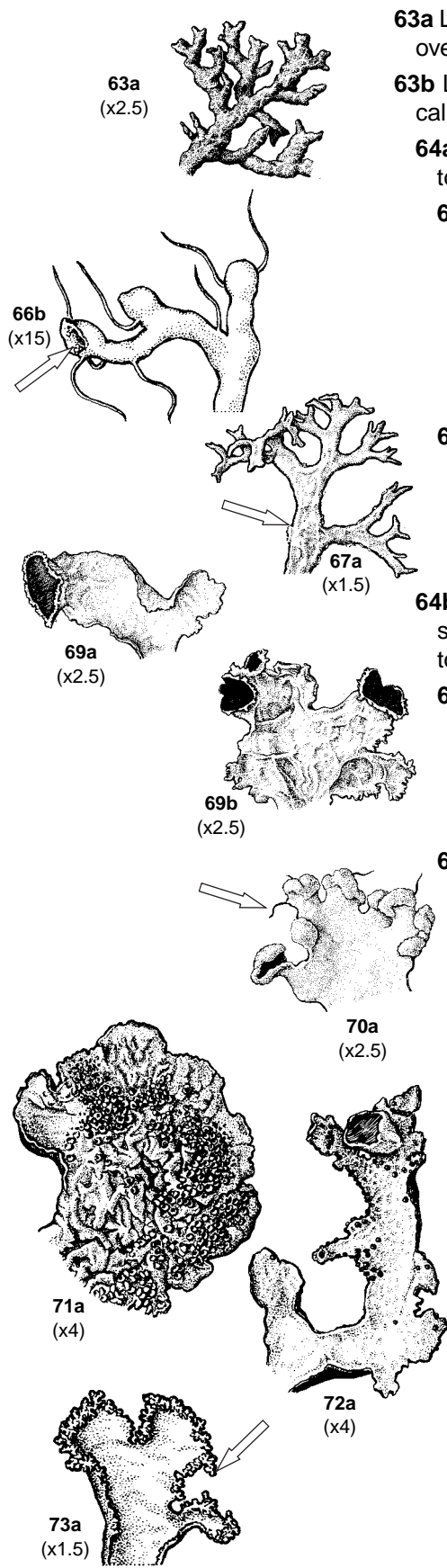


- 46a** Upper surface isidiate(←), isidia pale; soredia absent; lower surface pale throughout; upper cortex K+ gold ..... *Imshaugia aleurites*
- 46b** Upper surface isidiate or not; isidia (if present) dark brown or black; soredia present or absent; upper cortex K- or K+ yellow ..... 47
- 47a** Upper surface shiny, especially near lobe tips; soredia present over upper surface; often over conifers; medulla KC+ rose (fading), UV+ ..... *Parmeliopsis*
- 47b** Upper surface dull near lobe tips; thallus sorediate or not; rarely over conifers (except in localities rich in calcium); medulla KC-, UV- ..... 48
- 48a** Upper surface pale greyish or rarely dark greyish (never distinctly brownish), often pale-spotted/maculate(←); rhizines unbranched; lower cortex pale; upper cortex K+ yellow ..... *Physcia*
- 48b** Upper surface partly distinctly brownish at maturity, lacking pale-spotting/maculae; rhizines unbranched or woolly-branched; lower cortex dark or occasionally pale; upper cortex K- ..... 49
- 49a** Rhizines unbranched(←) or only sparsely branched at maturity; upper surface generally lacking white pruina ..... *Phaeophyscia*
- 49b** Rhizines densely woolly-branched(←) at maturity; upper surface generally distinctly white-pruinose (check lobe tips) ..... *Physconia*
- 45b** Lobes averaging to more than 3 mm wide; pseudocyphellae sometimes present over upper surface ..... 50
- 50a** Soredia and/or isidia present, conspicuous ..... 51
- 51a** Upper surface isidiate or sorediate, soredia confined to somewhat elongate soralia(←); lower surface rhizinate almost to lobe tips; widespread ..... *Parmelia*
- 51b** Upper surface sorediate, soredia confined to somewhat circular soralia(←); isidia absent; lower surface rhizinate mostly toward the thallus centre; coastal ..... *Punctelia*
- 50b** Soredia and isidia absent ..... 52
- 52a** Upper surface strong yellow, thallus closely appressed throughout; mostly over whitebark pine ..... *Ahtiana sphaerosporella*
- 52b** Upper surface greyish or only weakly yellowish; thallus loosely appressed to occasionally semi-erect; never over whitebark pine ..... 53
- 53a** Over bark or wood; lower surface distinctly wrinkled; rhizines sparse ..... *Esslingeriana idahoensis*
- 53b** Over rock; lower surface more or less smooth; rhizines rather abundant ..... *Parmelia omphalodes*
- 39b** Lobes generally averaging to more than 5 mm wide; rhizines absent or sparse and restricted to thallus centre (lobe margins, however, occasionally ciliate) ..... 54

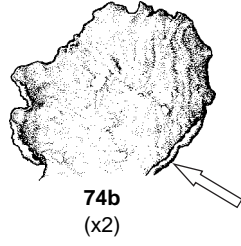
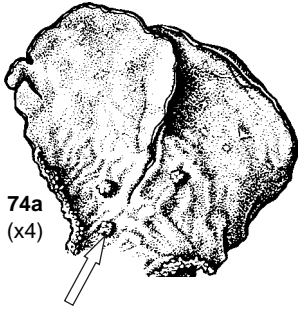


- 54a Soredia and isidia absent ..... 55
- 55a Lobes mostly elongate, averaging to 1.5–4 (–6) mm wide; inland ..... *Esslingeriana idahoensis* (see lead 53a)
- 55b Lobes mostly short, averaging to 5–20 mm wide; distribution various, but most common in humid localities ..... 56
- 56a Lobe margins bearing flexuous black cilia(←); upper surface more or less smooth; coastal; medulla K- or K+ yellow ..... *Parmotrema*
- 56b Lobe margins lacking cilia; upper surface smooth to strongly ridged; distribution various; medulla K- ..... *Platismatia*
- 54b Soredia and/or isidia present ..... 57
- 57a Lobe margins bearing long black cilia(←); lower surface lacking rhizines near lobe margins; upper surface whitish grey, lacking pseudocyphellae; coastal ..... *Parmotrema*
- 57b Lobe margins naked; lower surface rhizinate almost to lobe margins or rhizines sparse or absent; upper surface whitish grey or yellowish green; pseudocyphellae present or absent; distribution various ..... 58
- 58a Thallus sorediate ..... 59
- 59a Upper surface lacking pseudocyphellae; soredia borne at least partly on distinctly downturned lobe tips(←) ..... *Hypotrachyna*
- 59b Upper surface pseudocyphellate(←); soredia variously positioned but never associated with distinctly downturned lobe tips ..... *Punctelia*
- 58b Thallus strictly isidiate or bearing both isidia and soredia .... 60
- 60a Upper surface often blackening when growing in exposed conditions; over rock; alpine; northern; medulla KC+ reddish, PD+ slowly strong yellow ..... *Asahinea scholanderi*
- 60b Upper surface brownish when exposed, never blackening; over bark (rare over rock); temperate to boreal; medulla KC-, PD- ..... *Platismatia*
- 31b Thallus “cetrarioid,” (i.e., combining at least two of the following characters: upper and lower surface coloured more or less alike; rhizines absent or very sparse [marginal cilia, however, may be present in some species]; lobes loosely attached or semi-erect) ..... 61
- 61a Upper surface essentially dark throughout: olive-green, brown or blackish ..... 62
- 62a Lower surface broadly white-pruinose(←); rhizines absent; thallus growing unattached to substrate, often ball-like in the dry condition; northern B.C.; alpine ..... *Masonhalea richardsonii*
- 62b Lower surface occasionally bearing small, white, localized pseudocyphellae(←), but never broadly white-pruinose; rhizines present or absent; thallus attached to substrate; individual thalli never ball-like; distribution various ..... *Cetraria*
- 61b Upper surface occasionally brownish or blackish where exposed, but otherwise mostly pale: yellowish, greyish, pale greenish or pale bluish (check sheltered lobes) ..... 63





- 63a Lobes narrow, elongate *and* distinctly swollen (i.e., convex above and below); over rock in exposed alpine localities ..... ***Brodoa oroarctica***
- 63b Lobes various but never distinctly swollen; restricted primarily to lowland localities (Exception: *Asahinea scholanderi*) ..... 64
- 64a Lower surface more or less white, hard-corticate or partly appressed-cottony (i.e., lower cortex lacking); lobes narrow, elongate ..... 65
- 65a Lobe margins distinctly ciliate ..... 66
- 66a Lower surface appressed-cottony (i.e., lower cortex absent); rhizines, if present, restricted to area of lobe margins; soredia present or absent ..... ***Heterodermia*** (see lead 42a)
- 66b Lower surface distinctly hard-corticate (rarely in part appressed-cottony), bearing scattered rhizines throughout; soredia present(←) (check lobe tips) ..... ***Physcia***
- 65b Lobe margins lacking cilia ..... 67
- 67a Soredia present(←); upper surface dull, pale yellowish green; widespread ..... (***Evernia prunastri***)
- 67b Soredia absent; upper surface generally shiny, pale bluish grey to greenish grey; coastal ..... ***Platismatia*** (see lead 31b)
- 64b Lower surface dark or at least not white (Exception: some ***Platismatia*** species may occasionally have a white lower surface), never appressed-cottony; lobes various ..... 68
- 68a Upper surface yellowish or yellowish green, never bearing pseudocyphellae; lower surface more or less coloured alike with upper surface; medulla white or pale yellow ..... 69
- 69a Medulla white ..... ***Cetraria***
- 69b Medulla pale yellow ..... ***Vulpicida***
- 68b Upper surface coloured differently or, if yellowish, then lower surface partly distinctly blackish; upper surface pseudocyphellate or not; medulla white ..... 70
- 70a Lobe margins ciliate(←); lower surface mostly black ..... ***Parmotrema***
- 70b Lobe margins lacking cilia; lower surface pale or blackening ..... 71
- 71a Lobes short and broad, averaging to more than 12 mm wide; rhizines absent; over rock and soil; alpine; northern ..... ***Asahinea scholanderi***
- 71b Lobes of various proportions, but averaging to less than 10 mm wide; lower surface rhizinate or not; over bark (rare over rock); temperate and boreal ..... 72
- 72a Soredia absent; thallus isidiate or not ..... ***Esslingeriana, Platismatia*** (see key to ***Platismatia***)
- 72b Soredia present; thallus isidiate or not ..... 73
- 73a Lobe margins lacerate(←); isidia often intermixed with soredia ..... ***Platismatia glauca***
- 73b Lobe margins even; isidia absent ..... 74
- 74a Upper surface yellowish green; soralia located both over



upper surface(←) and along lobe margins; pseudocyphellae absent over lower surface; medulla C+ reddish; widespread ..... **Flavopunctelia flaventior**

**74b** Upper surface pale bluish grey or greenish grey; soralia more or less strictly marginal(←); pseudocyphellae present over lower surface; medulla C-; essentially coastal ..... **Cetrelia cetrarioides**

## KEYS TO SPECIES OF FOLIOSE AND SQUAMULOSE LICHENS, BY GENUS

### AGONIMIA

#### *Agonimia* Zahlbr.

#### The Trifle Lichens

**Minute stratified scale** (or crust) lichens, corticate above, ecorticate below, neither sorediate nor isidiate, lobes closely to loosely appressed, **mostly elongate**, averaging to 0.1–0.3 mm wide, delicate. Upper surface pale whitish or bluish, dull, strongly convex, **cortical cells obviously papillate at 400 magnification**. Lower surface pale, lacking rhizines. Medulla white. Photobiont green.

Ascocarp a **perithecium**, located over upper surface, **protruberant, strawberry-shaped/ampulliform**, black; spores muriform, ellipsoid, brown, 1 or 2 per ascus (ours).<sup>4</sup>

References: Coppins and James (1978); Coppins and Bennell (1979).

Common Name: Reflects the minute size of the species.

Notes: *Agonimia* is a widespread genus of north temperate latitudes. It contains two species worldwide, only one of which occurs in B.C. The papillate cortical cells provide a useful diagnostic character for this genus. Chemistry, however, is of no taxonomic value.

#### *Agonimia tristicula* (Nyl.) Zahlbr.

Map 2

(Syn. *Polyblastia tristicula* (Nyl.) Arnold)



(x20)

Moss trifle

Habitat/Range: Rare (overlooked?) over moss in sheltered base-rich intermontane outcrops at lower elevations; western N Am – western Eurasia, N to BC, S to CO.

Notes: Mature ascocarps have not yet been found in B.C. Material resembling *A. tristicula* has been detected over Garry oak on southeast Vancouver Island and can probably be referred to *Bacidia rubella* (Hoffm.) Massal.

### AHTIANA

#### *Ahtiana* Goward

#### The Candlewax Lichen

A small to medium **stratified foliose lichen**, corticate above and below, neither sorediate nor isidiate, lobes **closely appressed, short to subrotund**, averaging to 2–3 (–4) mm wide, thin. Upper surface **pale yellowish green** (except blackish in exposed sites), shiny. **Lower surface whitish to pale tan**, bearing sparse to abundant short, simple rhizines. Medulla white. Photobiont green.

**Apothecia located over upper surface**, disc brown; spores simple, spherical, colourless, 8 per ascus.

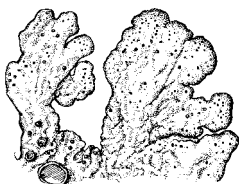
Reference: Goward (1985).

Common Name: Stresses the fluid, waxlike configuration of the lobes.

Notes: *Ahtiana* is a monotypic genus. It was formerly included within *Parmelia*, but is more closely related to *Cetraria* (in the broad sense).

#### *Ahtiana sphaerosporella* (Müll. Arg.) Goward

(Syn. *Parmelia sphaerosporella* Müll. Arg.)



(x3)

Whitebark candlewax

Habitat/Range: Frequent over whitebark pine, rare over other conifers, in open intermontane subalpine forests; western N Am, N to BC (rarely to NWT), S to CA.

Reactions: Cortex KC+ yellow.

Contents: Caperatic and usnic acids.

<sup>4</sup> "Ours" refers to British Columbia material, but does not necessarily apply to the genus as a whole.

**ALLANTOPARMELIA**

**Allantoparmelia (Vainio) Essl.**

**The Rockgrub Lichens**

Small to occasionally medium **stratified foliose lichens**, corticate above and below, neither sorediate nor isidiate, lobes closely appressed, elongate, **thick**, averaging to **0.15–1.5 mm** wide. Upper surface olive-brown to more often blackening, dull. Lower surface pale tan to black, dull, **lacking rhizines**, attached by thickened cortical outgrowths. Medulla white. Photobiont green.

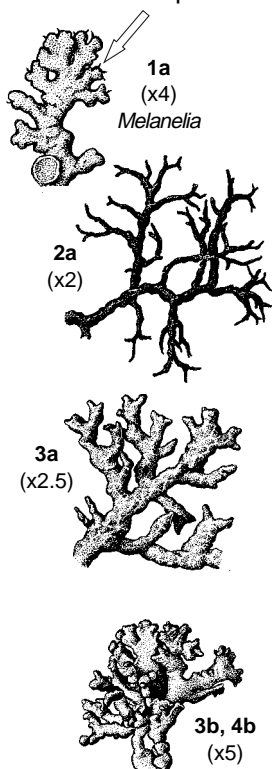
Apothecia located over upper surface, disc black; spores simple, ellipsoid, colourless, 8 per ascus.

Over acid rock in exposed **alpine** localities.

Common Name: Describes the habitat and the thick, annulate, grub-like lobes.

Reference: Esslinger (1977a).

Notes: *Allantoparmelia*, which was recently segregated from *Parmelia*, is an arctic-alpine genus consisting of three species worldwide. Two of these occur in B.C.



**Key to Allantoparmelia and Similar Lichens**

- 1a Rhizines present below(←); lobes usually (but not always) thin and leaflike; upper surface often convex or plane; over trees or rock; widespread ..... **Melanelia/Neofuscelia**
- 1b Rhizines absent (sparse peg-like cortical outgrowths, however, sometimes present); lobes oval or circular in cross-section; upper surface distinctly convex; over rock; alpine ..... 2
- 2a Thallus shrub-like/fruticose; lobes more or less circular/terete in cross-section; medulla KC- ..... **Pseudephebe**
- 2b Thallus not shrub-like; lobes more flattened and with distinct upper and lower surface; medulla KC+ reddish ..... 3
- 3a Lower surface apparently white-pruinose; at least some lobes in part semi-erect when mature, sparsely branched, seldom completely obscuring substrate; cortex K+ yellow (check lobe tips or other pale areas); medulla PD+ orangish or PD- ..... **Brodoa oroarctica**
- 3b Lower surface not at all white-pruinose; lobes mostly appressed throughout, densely branched, generally obscuring substrate; cortex K- throughout; medulla PD+ strong yellow or PD- ..... 4
- 4a Lobes generally averaging to less than 0.5 mm wide; lower surface usually pale brownish throughout; medulla C+ orangish to reddish, PD-, K-; rare ..... **Allantoparmelia almquistii**
- 4b Lobes generally averaging to more than 0.5 mm wide; lower surface blackening; medulla C- or C+ reddish, PD+ yellow, K+ pale yellow; common ..... **Allantoparmelia alpicola**

**Allantoparmelia almquistii (Vainio) Essl.**

Map 3

(Syn. *Parmelia almquistii* Vainio)

Rockgrub

Habitat/Range: Rare over acid rock in exposed maritime alpine and subalpine localities; western N Am – eastern N Am – eastern Eurasia, S to BC.

Reactions: Medulla C+ reddish to orangish, KC+ reddish.

Contents: Olivetoric acid.

**Allantoparmelia alpicola (Th. Fr.) Essl.**

(Syn. *Parmelia alpicola* Th. Fr.)

Rockgrub

Habitat/Range: Infrequent over acid rock in exposed inland alpine localities; possibly incompletely circumpolar, S to CO.

Reactions: Medulla K+ pale to dingy yellow, C- or C+ reddish, KC+ reddish, PD+ strong yellow.

Contents: Alectorialic acid, barbatolic acid, one unknown substance (and a fatty acid).

Notes: Spot tests are required to reliably distinguish *A. alpicola* from *A. almquistii*.

**ANAPTYCHIA**

**Anaptychia Körber**

**The Centipede Lichens**

Small to medium **stratified foliose lichens**, corticate above, corticate or **ecorticate below** (ours), lacking soredia and isidia (ours), lobes **loosely attached or semi-erect**, elongate-linear to **elongate**, averaging to 0.2–0.5 mm wide (ours), thin. Upper surface **pale whitish green to pale brownish grey, often weakly longitudinally striate (check also below), lobe margins ciliate or not**. Medulla white. Photobiont green.

Apothecia located over upper surface, often near lobe tips, disc brown; spores 2-celled, ellipsoid, brown, 8 per ascus.

References: Kurokawa (1962, 1973); Morberg (1980).

Common Name: Descriptive of the often elongate lobes and leg-like cilia that line the lobe margins in most species.

Notes: *Anaptychia* is a primarily temperate genus of approximately 40 species worldwide. Four of these occur in North America and one in B.C. For points of distinction with similar species, see the key under *Heterodermia*.

**Anaptychia setifera Räsänen**

Map 4

(Syn. *Anaptychia kaspica* Gyelnik)

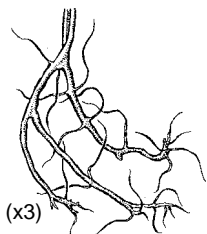
Eyed centipede

Habitat/Range: Rare (but locally common: Goward et al. 1994a) over base-enriched conifers in intermontane forests at lower elevations; incompletely circumpolar, N to AK, S to BC.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: The B.C. material is abundantly fertile.



**ARCTOPARMELIA**

**Arctoparmelia Hale**

**The Rockfrog Lichens**

Medium to large **stratified foliose lichens**, corticate above and below, sorediate or not, lobes **closely appressed**, elongate, averaging to 0.3–0.5 mm wide, thin. Upper surface **pale yellowish green, dull. Lower surface** pale to black, **apparently white-pruinose**, bearing scattered, short, simple rhizines. Medulla white. Photobiont green.

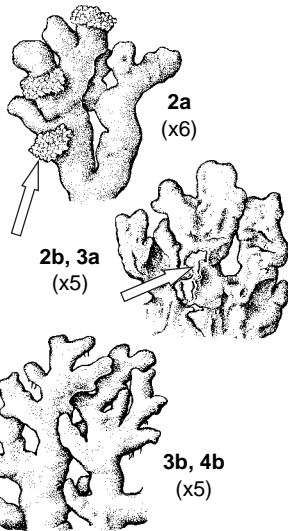
Apothecia located over upper surface, disc brown; spores simple, ellipsoid, colourless, 8 per ascus.

**Over acid rock in arctic-alpine to boreal localities.**

References: Thomson (1984); Hale (1986); Clayden (1992).

Common Name: Suggested by the greenish colour of the upper surface, as well as by the strict association with rock surfaces.

Notes: *Arctoparmelia* consists of four species worldwide, all of which occur in B.C. For points of distinction with similar species in other genera, see the key under *Xanthoparmelia*.



- 1a Thallus sorediate or apparently sorediate ..... 2
  - 2a Upper cortex firm; soredia confined to large, discrete, orbicular soralia(←) ..... **Arctoparmelia incurva**
  - 2b Upper cortex soft and eroding(←); soredia more or less diffuse ..... **Arctoparmelia subcentrifuga**
- 1b Thallus lacking soredia ..... 3
  - 3a Upper cortex soft and eroding(←); lobe tips generally downturned ..... **Arctoparmelia subcentrifuga**
  - 3b Upper cortex firm, never eroding; lobe tips only rarely downturned ..... 4
    - 4a Lower surface grey or black toward thallus centre; northern B.C. .... **Arctoparmelia separata**
    - 4b Lower surface whitish or tan throughout; widespread ..... **Arctoparmelia centrifuga**

**Arctoparmelia centrifuga (L.) Hale**(Syn. *Parmelia centrifuga* (L.) Ach.; *Xanthoparmelia centrifuga* (L.) Hale)

Rippled rockfrog (ring lichen, sunburst lichen)

Habitat/Range: Frequent over acid or somewhat base-rich rock in open inland sites, especially in boulderbeds; circumpolar, S to OR.

Reactions: Cortex K+ pale yellow, KC+ yellow; medulla C+ slowly yellow, KC+ reddish.

Contents: Alectoronic acid, atranorin and usnic acid.

**Arctoparmelia incurva (Pers.) Hale**(Syn. *Parmelia incurva* (Pers.) Fr.; *Xanthoparmelia incurva* (Pers.) Hale)

Powdered rockfrog (fist lichen)

Habitat/Range: Infrequent over acid rock in open inland sites, reported only in ICH zone; circumpolar, S to BC.

Reactions: Cortex K+ pale yellow, KC+ yellow; medulla C+ slowly yellow, KC+ reddish.

Contents: Alectoronic acid, atranorin and usnic acid.

**Arctoparmelia separata (Th. Fr.) Hale**

Map 5

(Syn. *Parmelia separata* Th. Fr.; *Xanthoparmelia separata* (Th. Fr.) Hale)

Rippled rockfrog

Habitat/Range: Infrequent over acid rock in open boreal localities; probably circumpolar, S to northern BC.

Reactions: Cortex K+ yellow; medulla KC+ reddish, I+ blue.

Contents: Alectoronic acid, atranorin and usnic acid.

**Arctoparmelia subcentrifuga (Oxner) Hale**

Map 6

(Syn. *Parmelia subcentrifuga* Oxner; *Xanthoparmelia subcentrifuga* (Oxner) Hale)

Dissolving rockfrog

Habitat/Range: Rare over acid and somewhat base-rich rock in rather sheltered intermontane sites; apparently western N Am – eastern N Am – eastern Eurasia, N to AK, S to southern BC.

Reactions: Cortex K+ pale yellow, KC+ yellow; medulla C+ slowly yellow, KC+ reddish.

Contents: Alectoronic acid, atranorin and usnic acid.

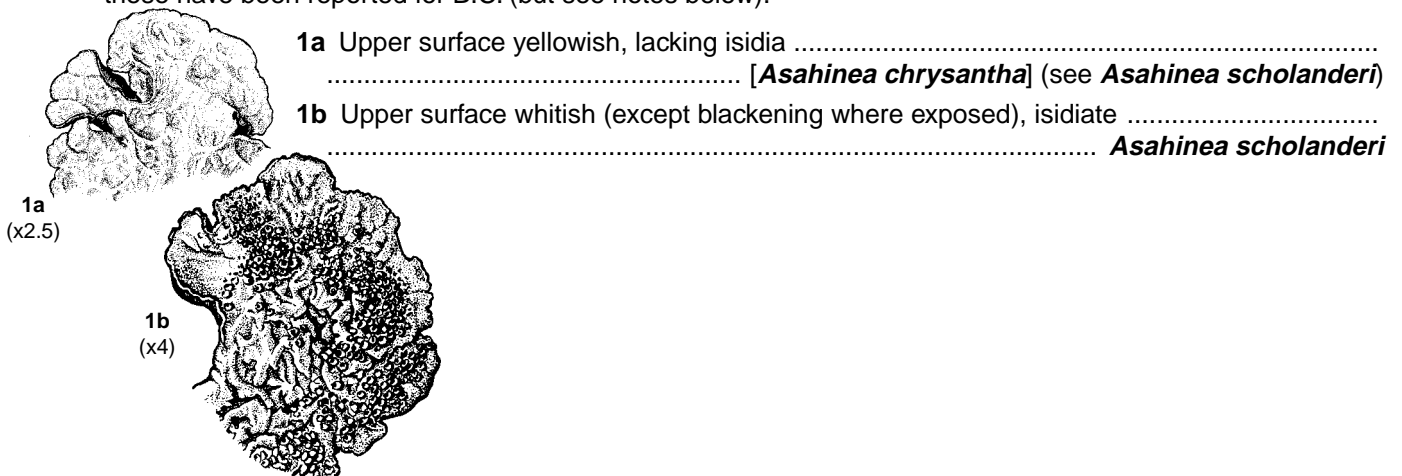
**ASAHINEA****Asahinea Culb. & C. Culb.****The Rag Lichens**

Medium to **large stratified foliose lichens**, corticate above and below, isidiate or not, lobes loosely attached, **rotund, 1–3 mm wide**, thin. Upper surface whitish to yellowish, pseudocyphellate or not, shiny. **Lower surface black**, shiny, **lacking rhizines**. Medulla white. Photobiont green.

Apothecia unknown in B.C. material, located on lobe margins.

References: Culberson and Culberson (1965); Randlane and Saag (1989); Gao (1991).

Common Name: Describes the broad, pale, often wrinkled lobes of the species.

Notes: *Asahinea*, a recent arctic-alpine segregate of *Cetraria*, is comprised of three species worldwide. Two of these have been reported for B.C. (but see notes below).

**Asahinea scholanderi (Llano) Culb. & C. Culb.**

Map 7

(Syn. *Cetraria scholanderi* Llano)

Arctic rag

Habitat/Range: Rare over acid rock and humus in open alpine localities in northern regions; western N Am – eastern Eurasia, S to BC.

Reactions: Medulla KC+ pinkish.

Contents: Alectoronic acid, alpha-collatolic acid, atranorin, (and unidentified purple pigment).

Notes: *Asahinea chrysantha* (Tuck.) Culb. & C. Culb. has also been reported for B.C., but the record is doubtful. See comments under “Excluded Species.”

**BRODOA**

**Brodoa Goward**

**The Rockgrub Lichens**

Small to occasionally medium **stratified foliose lichens**, corticate above and below, lacking soredia and isidia, lobes closely appressed to in part **semi-erect**, elongate-linear to elongate, averaging to 0.5–1.5 mm wide, **thick**. Upper surface **pale grey to nearly black, bearing white angular markings/maculae**. Lower surface tan or black, dull, apparently white-pruinose, **lacking rhizines**. Medulla white. Photobiont green.

Apothecia located over upper surface; spores simple, ellipsoid, colourless, 8 per ascus.

References: Krog (1974); Goward (1986).

Common Name: Descriptive of the habitat and the cylindrical lobes of the species.

Notes: *Brodoa* is an arctic-alpine genus containing three species worldwide, though only one of these occurs in B.C. *Brodoa* was formerly treated within *Hypogymnia*. For points of distinction with similar species in other genera, see the keys under *Allantoparmelia* and *Melanelia*.

**Brodoa oroarctica (Krog) Goward**

(Syn. *Hypogymnia oroarctica* Krog)



(x2.5)

Rockgrub

Habitat/Range: Frequent over acid rock in exposed inland alpine sites; circumpolar, N to AK, S to NM.

Reactions: Cortex K+ yellow; medulla KC+ reddish, PD- or PD+ orange in upper portions.

Contents: Atranorin, physodic acid (and protocetraric acid).

**CANDELARIA**

**Candelaria Massal.**

**The Candleflame Lichens**

**Minute stratified foliose or fruticose lichens**, corticate above and below, sorediate or not, lobes loosely appressed to semi-erect, elongate, finely divided, averaging to **0.2 mm wide**. Upper surface **greenish yellow, K-**. Lower surface pale, bearing scattered, short, simple rhizines. Medulla white. Photobiont green.

Apothecia unknown in B.C. material.

Reference: Poelt (1974).

Common Name: Reflects the yellowish orange colour and typically narrow, erect lobes.

Notes: *Candelaria* is a cosmopolitan genus consisting of seven species worldwide. Of these, two species occur in North America and only one in B.C. For points of distinction with similar species, see the key under *Xanthoria*.

**Candelaria concolor (Dickson) B. Stein**

Candleflame



(x15)

Habitat/Range: Infrequent over base-rich bark, rare over rock, in open to sheltered sites at lower elevations throughout, except probably absent from boreal regions; circumpolar, N to BC, S to NM.

Reactions: All spot tests negative.

Contents: Calycin and pulvinic dilactone.

CATAPYRENIUM

**Catapyrenium Flotow**

**The Stipplescale Lichens**

**Minute** to occasionally small **stratified squamulose lichens**, corticate above, corticate or not below, lacking isidia and soredia, squamules attached to substrate by entire lower surface, or by central portions only, closely appressed to loosely appressed, subrotund to rotund, thin to thick, averaging to 0.4–3 mm wide. Upper surface **greyish to reddish brown**. Lower surface becoming blackish, **lacking rhizines**, though usually bearing hairlike rhizohyphae. Medulla white. Photobiont green.

Ascocarp a **perithecium**, immersed in upper surface, appearing blackish from above; spores simple (but occasionally appearing 2-celled, owing to oil droplets), ellipsoid, colourless, 8 per ascus.

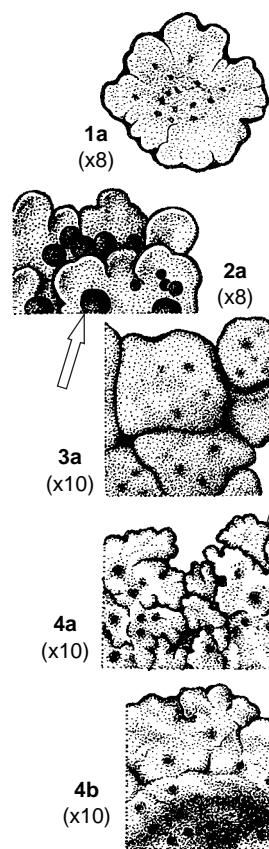
**Over moss and soil.**

References: Thomson (1987, 1989); Goward and Thor (1992); Breuss (1993); Goward et al. (1994a).

Common Name: Suggested by the general scale-like appearance and by the presence of dot-like perithecia over the upper surface.

Notes: Of the 16 species of *Catapyrenium* reported for North America, only three are known to occur in B.C. The species listed here have until recently been included in *Dermatocarpon*. Chemistry is of no diagnostic value in this genus and has been omitted in the following species accounts.

**Key to *Catapyrenium* and Similar Lichens**



- 1a Lobes pale or occasionally dark, but never reddish brown; restricted to lowland intermontane localities; spores multi-celled/muriform, brownish, intermixed with algal cells ..... ***Endocarpon pusillum***
- 1b Lobes pale or reddish brown; widespread; spores 1-celled/simple, colourless, never intermixed with algal cells ..... 2
- 2a Fruiting bodies (apothecia) more or less hemispherical(←), located on upper surface; lobes attached mostly along one edge, opposite margin often somewhat raised; tending to form overlapping/imbricate colonies ..... ***Psora globifera*** (and others)
- 2b Fruiting bodies (perithecia) appearing dot-like from above, immersed in upper surface; lobes attached over central portion of lower surface, appressed throughout or margins somewhat raised all around; thalli rarely overlapping ..... 3
- 3a Lobes strong reddish brown (rarely pale), attached to substrate by predominantly pale woolly hairs/rhizohyphae; spores 11–18 μ long, aligned in the ascus in single row (i.e., uniseriate); over soil in inland localities at all elevations ..... ***Catapyrenium squamulosum***
- 3b Lobes pale greyish brown, attached by uniformly dark woolly hairs/rhizohyphae; spores 16–23 μ long, aligned in the ascus in two rows (i.e., biseriate); restricted to subalpine and alpine localities ..... 4
- 4a Lobe margins finely lobulate(←); lower surface dark, corticate, rhizohyphae growing out of distinct lower cortex ..... ***Catapyrenium cinereum***
- 4b Lobe margins at most coarsely lobulate; lower surface lacking a lower cortex, medullary hyphae grading downward into minute, rhizine-like hairs/rhizohyphae ..... ***Catapyrenium daedaleum***

***Catapyrenium cinereum* (Pers.) Körber**

Map 8

Ashen stipplescale

Habitat/Range: Rare over moss and humus in open inland subalpine and alpine sites; circumpolar, N to YU, S to CA.

***Catapyrenium daedaleum* (Krempelh.) B. Stein**

Map 9

Ashen stipplescale

Habitat/Range: Rare over moss and humus in open inland subalpine and alpine sites; circumpolar, N to BC, S to CO.



**Catapyrenium squamulosum (Ach.) O. Breuss**

Brown stipple-scale

Habitat/Range: Common over base-rich soil in open inland sites, especially in BG zone, but also occasionally in exposed alpine sites; circumpolar, N to AK, S to MX.

Notes: The B.C. material was previously identified as *C. lachneum* (Ach.) R. Sant. That species, however, is characterized by conspicuous black pycnidia that appear as knoblike projections along the margins of the lobes and contain cylindrical pycnospores 5–7 μ long. In *C. squamulosum*, by contrast, the pycnidia are dot-like and immersed in the upper surface (thus resembling the perithecia) and the pycnospores are oblong and 2.5–4.5 μ long. *Catapyrenium lachneum* is not yet reliably documented in B.C., but is expected to occur in alpine localities (O. Breuss, Wien, pers. comm., 1993).

**CAVERNULARIA**

**Cavernularia Degel.**

**The Saguaro Lichens**

**Small stratified foliose lichens**, corticate above and below, sorediate or not, lobes closely appressed, elongate, averaging to 1 mm wide, thin. Upper surface **whitish**. Lower surface black, shiny, **lacking rhizines**, **dimpled with numerous minute pits**. Medulla white. Photobiont green.

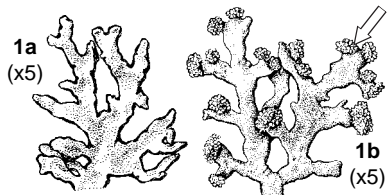
Apothecia located over upper surface, disc brownish; spores simple, globose, colourless, 8 per ascus.

Over conifer branches and lignum.

References: Degelius (1937); Ahti and Henssen (1965).

Common Name: Emphasizes the numerous tiny pits/cavernulae present over the lower surface (i.e., resembling a dead saguaro).

Notes: The genus *Cavernularia* contains only two species, both of which occur in B.C.



- 1a Thallus without soredia; apothecia generally present ..... ***Cavernularia lophyrea***
- 1b Thallus sorediate(←); apothecia rare ..... ***Cavernularia hultenii***

**Cavernularia hultenii Degel.**

Powdered saguaro

Habitat/Range: Frequent over conifers at lower elevations in open coast forests, also rare in ICH zone; western N Am–eastern N Am–western Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ reddish.

Contents: Atranorin and physodic acid.

**Cavernularia lophyrea (Ach.) Degel.**

Eyed saguaro

Habitat/Range: Infrequent over conifers at lower elevations in open coast forests, especially in hypermaritime localities; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ reddish.

Contents: Atranorin and physodic acid.

**CETRARIA**

**Cetraria Ach.**

**The Icelandmoss Lichens (and others)**

Small to large **stratified foliose lichens**, corticate above and below, sorediate or not, lobes rather closely appressed to **semi-erect or erect**, short to more often **elongate**, averaging to 0.5–10 (–12) mm wide, thin to somewhat thick, occasionally bearing **protruberant marginal pycnidia or cilia**. Upper surface **brownish, blackish, or brightly coloured**; **lower surface coloured alike with upper surface**, often lacking rhizines. Medulla white (rarely yellow). Photobiont green.

**Apothecia located along lobe margins**, disc brown or black; spores simple, spherical or ellipsoid, colourless, 8 per ascus.

References: Esslinger (1971, 1973); Kärnefelt (1979); Mattsson (1993); Mattsson and Lai (1993).

Common Names: Several are assigned to this genus, reflecting its very heterogeneous circumscription:

“Brown” is applied to two species (*C. commixta* and *C. hepatizon*), stressing their surface colour and, more importantly, their generic similarity with other lichens of that name (i.e., members of *Melanelia* and *Neofuscellia*).

“Icelandmoss” is the traditional name given to *Cetraria islandica* and its allies.

“Paperdoll” is a fanciful name applied to two species (*C. cucullata* and *C. nivalis*), referring to their pale, upright, “cut-out” lobes.

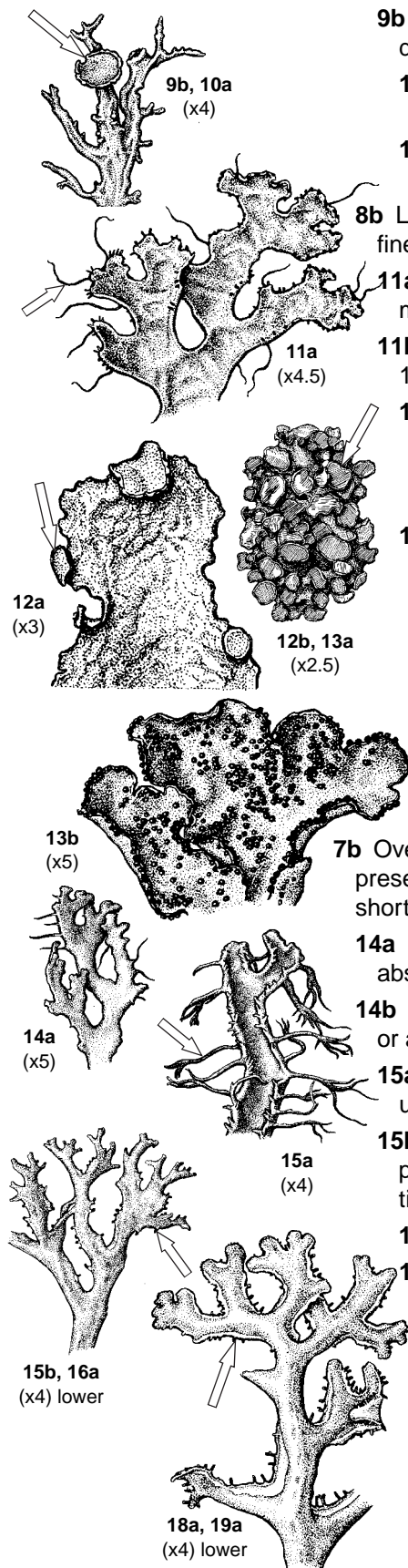
“Ruffle” is applied to several species, describing their typically wrinkled upper surface.

“Thornbush” is applied to two species (*C. californica* and *C. merrillii*), conveying their spiny, shrub-like habit.

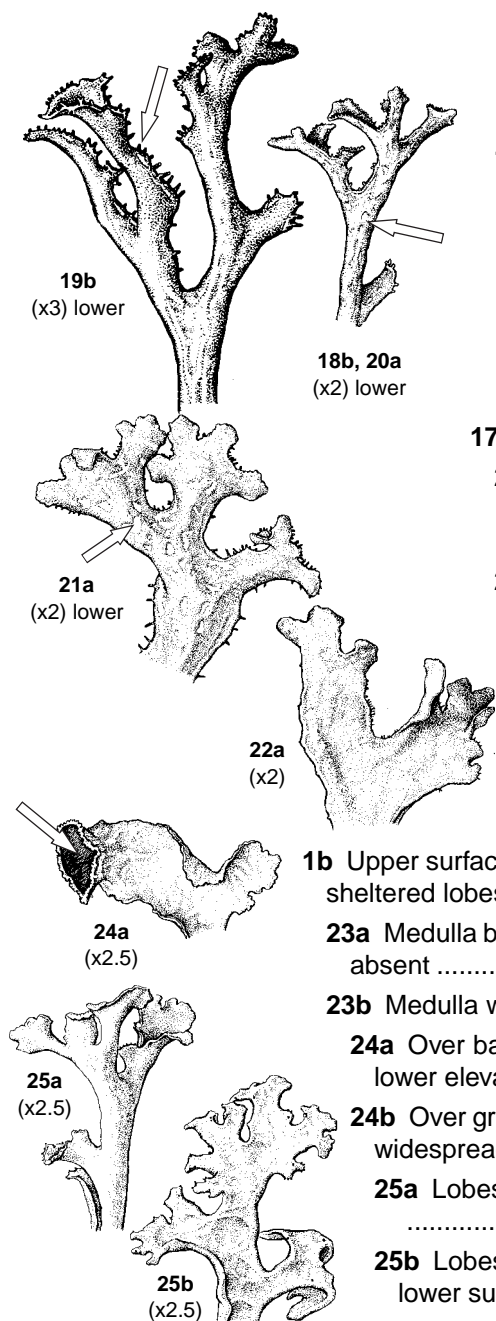
Notes: Thirty-eight species of *Cetraria* are reported for North America. Nineteen of these occur in B.C. As presently delimited, *Cetraria* is a heterogeneous genus. Although several species groups are segregated from it as distinct genera (e.g., *Asahinea*, *Cetrelia*, *Esslingeriana*, *Masonhalea*, *Platismatia* and *Vulpicida*), a number of other species and species groups also deserve generic rank. Recently Hale (1987) transferred some of these to *Tuckermannopsis*. This disposition, however, seems more nomenclatural than taxonomic and is not followed here. Also not accepted here (pending further study) is the separate genus *Allocetraria* (Randlane and Saag 1992).

**Key to *Cetraria* and Similar Lichens**

2a Upper surface essentially dark: olive-green, brown or blackish ..... 2  
 2a Soredia present(←), located along margins of lobes, occasionally intermixed with isidia ..... ***Cetraria chlorophylla***  
 2b Soredia absent; true isidia also absent ..... 3  
 3a Growing directly over rock ..... 4  
 4a Thallus tough, wiry, difficult to cut; lobes raised to semi-erect, attached to substrate only at base; rhizines absent; alpine ..... (***Cornicularia normoerica***)  
 4b Thallus more delicate, usually readily cut; lobes more broadly attached to substrate; rhizines present; distribution various ..... 5  
 5a Pseudocyphellae scattered over upper surface(←) (check lobe tips); pycnidia absent or, if present, then immersed, never erect-cylindrical; medulla thickish; rhizines marginal or scattered over lower surface ..... "***Cetraria***" ***agnata*** (and others) (see key to ***Melanelia***)  
 5b Pseudocyphellae and pycnidia usually restricted to lobe margins(←), pycnidia erect and cylindrical; medulla thin; rhizines located only along lobe margins ..... 6  
 6a Lobes usually elongate-linear; lobe margins somewhat rimmed; lower surface blackening; pseudocyphellae located strictly along lobe margins or submarginal over upper surface; medulla KC- ..... ***Cetraria hepatizon***  
 6b Lobes usually rather short; lobe margins not distinctly rimmed; lower surface pale; pseudocyphellae strictly marginal (i.e., positioned at right angles to upper surface); medulla KC+ reddish or KC- ..... ***Cetraria commixta***  
 3b Growing over bark, wood, earth or humus ..... 7  
 7a Over trees and shrubs; pseudocyphellae absent over lower surface; lobes short to occasionally elongate, margins usually even (i.e., lacking short projections, though marginal cilia may be present) ..... 8  
 8a Lobes dark olive-green to blackish or, if distinctly greyish or brownish, then finely dissected and shrub-like at maturity ..... 9  
 9a Lobes dark olive-green to blackish, usually averaging to more than 1 mm wide; apothecial disc blackish(←); primarily intermontane (but rare also in CDF zone) ..... ***Cetraria merrillii***



- 9b** Lobes greyish or reddish brown, averaging to less than 1 mm wide; apothecial disc blackish or brownish(←); distribution various ..... 10
- 10a** Lobes grey or greyish brown, averaging to 1.5 cm long; apothecial disc blackish; hypermaritime; rare ..... *Cetraria californica*
- 10b** Lobes brown or reddish brown, averaging to more than 2 cm long; apothecial disc reddish brown; intermontane; common ..... (*Bryoria abbreviata*)
- 8b** Lobes pale olive-green to dark brown, sparsely to moderately branched, but never finely dissected or shrub-like ..... 11
- 11a** Lobe margins bearing long, slender cilia(←), these averaging to 3–6 mm long; medulla KC+ reddish ..... *Cetraria ciliaris* var. *halei*
- 11b** Lobe margins naked or at most bearing very short cilia, these averaging to 1 mm long; medulla KC- ..... 12
- 12a** Lobes averaging to 4–12 mm wide at maturity; lower surface generally same colour as upper surface; apothecia often present(←), but rarely dominating lobes; medulla often pale yellow (and then K+ yellowish) near apothecia ..... *Cetraria platyphylla*
- 12b** Lobes generally averaging to 1–5 mm wide at maturity; lower surface generally distinctly paler than upper surface; apothecia frequently dominating lobes(←); medulla white (and K-) throughout ..... 13
- 13a** Thallus distinctly cushion-forming, generally less than 1 cm across when mature; upper surface usually smooth; pycnidia sparse; over deciduous trees and shrubs, especially birch and soopalallie ..... *Cetraria sepincola*
- 13b** Thallus mat-forming to rarely cushion-forming, averaging to 3–7 cm across at maturity (Note: some forms can be smaller); upper surface wrinkled at maturity; pycnidia generally numerous; over deciduous and coniferous trees ..... *Cetraria orbata*
- 7b** Over earth, humus or occasionally on branches at bases of shrubs; pseudocyphellae present or absent over lower surface; lobes generally elongate, margins often bearing short projections and/or cilia ..... 14
- 14a** Lobes averaging to less than 1 mm wide, more or less flat; pseudocyphellae absent ..... *Phaeophyscia constipata*
- 14b** Lobes averaging to more than 2 mm wide, often concave; pseudocyphellae present or absent ..... 15
- 15a** Lobe margins ciliate(←), cilia averaging to 0.5–2 mm long; lobes blackening; usually alpine; northernmost regions ..... *Cetraria nigricans*
- 15b** Lobe margins lacking cilia (Note: marginal projections(←) may, however, be present, these averaging to 0.1–1 mm long); lobes at most dark brown; distribution various ..... 16
- 16a** Medulla KC+ reddish; alpine; northernmost regions ..... *Cetraria delisei*
- 16b** Medulla KC-; ecology and distribution various ..... 17
- 17a** Lobes strongly concave to conspicuously inrolled along margins, with or without distinct central axis that runs length of lobes ..... 18
- 18a** Pseudocyphellae more or less submarginal over lower surface (i.e., restricted to near lobe margins)(←) ..... 19
- 19a** Thallus lobes with a distinct central axis running length of lobes; pseudocyphellae frequently forming almost continuous line averaging 0.3–1 mm wide(←); alpine; northernmost regions; medulla PD+ orange ..... *Cetraria laevigata*



- 19b Thallus lobes usually dichotomously branched, central axis usually not running length of lobes; pseudocyphellae distributed in discontinuous patches or forming a narrow line averaging 0.1–0.2 mm wide(←); widespread; medulla PD- ..... ***Cetraria ericetorum* ssp. *reticulata***
- 18b Pseudocyphellae scattered over entire lower surface(←) (check broader lobes), usually including near the lobe margins ..... 20
- 20a Submarginal pseudocyphellae generally poorly developed, inconspicuous; widespread in subalpine and alpine habitats; medulla PD+ orange or rarely PD- ..... ***Cetraria islandica* ssp. *crispiformis***
- 20b Submarginal pseudocyphellae generally well developed and distinct, often forming an almost continuous line; hypermaritime; medulla PD- ..... [ ***Cetraria islandica* ssp. *orientalis*** ]
- 17b Lobes flat or weakly concave, without distinct central axis ..... 21
- 21a Pseudocyphellae scattered over entire lower surface(←) (check broader lobes); medulla PD+ orange or rarely PD- ..... ***Cetraria islandica* ssp. *islandica***
- 21b Pseudocyphellae mostly located along margins of lower surface (i.e., restricted to near lobe margins); medulla PD- ..... 22
- 22a Upper surface smooth; lobe margins bearing projections to 0.1–0.5 mm long; apothecia, if present, located along lobe margins; alpine and subalpine ..... ***Cetraria subalpina***
- 22b Upper surface generally wrinkled at maturity; lobe margins bearing projections to 0.3–1.0 mm long; apothecia, if present, restricted to lobe tips; widespread .... ***Cetraria ericetorum* ssp. *reticulata*** (see lead 19b)
- 1b Upper surface sometimes partly brownish in exposed localities, but otherwise pale (check sheltered lobes) yellowish or pale greenish ..... 23
- 23a Medulla bright yellow; upper surface yellow to occasionally greenish; soredia present or absent ..... ***Vulpicida***
- 23b Medulla white; upper surface yellowish green; soredia absent ..... 24
- 24a Over bark; lobes proportionately short and broad; apothecia generally present (←); lower elevations; intermontane ..... ***Cetraria pallidula***
- 24b Over ground; lobes more or less elongate; apothecia rare; mainly subalpine to alpine; widespread ..... 25
- 25a Lobes more or less curling inward along margins; upper and lower surface smooth ..... ***Cetraria cucullata***
- 25b Lobes flat to weakly concave (i.e., lobe margins never strongly infolded); upper and lower surfaces wrinkled when mature. .... ***Cetraria nivalis***

***Cetraria californica* Tuck.**

Map 10

(Syn. *Cornicularia californica* (Tuck.) Du Rietz)

Seaside thornbush

Habitat/Range: Rare over shore pine, in open coast forests at lower elevations, especially hypermaritime localities; western N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Cetraria chlorophylla* (Willd. in Humb.) Vainio**(Syn. *Tuckermannopsis chlorophylla* (Willd. in Humb.) Hale)

Shadow ruffle

Habitat/Range: Common over coniferous and deciduous trees and shrubs in open to shaded forests throughout, except probably absent from boreal regions; incompletely circumpolar, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: Protocetraric and rangiformic acids.

***Cetraria ciliaris* Ach. var. *halei* (Culb. & C. Culb.) Ahti**(Syn. *Tuckermannopsis americana* (Sprengel) Hale)

Fringed ruffle

Habitat/Range: Frequent over trees, especially conifers, in open lowland forests throughout; N Am, N to AK and YU, S to OR.

Reactions: Medulla KC+ reddish, UV+ white.

Contents: Alectoronic and alpha-collatolic acids.

Notes: Only var. *halei* has been reported for B.C.***Cetraria commixta* (Nyl.) Th. Fr.**

Map 11

(Syn. *Cetraria fahlunensis* (L.) Schreber)

Rock brown

Habitat/Range: Infrequent over acid rock in open inland localities, also rare in coast localities; circumpolar, S to CO.

Reactions: Medulla KC+ reddish.

Contents: Alectoronic acid or alpha-collatolic acid and one unknown (or occasionally no substances present).

Notes: For points of distinction with similar species, see the key under *Melanelia*. *Cetraria commixta* is said to have a pale lower surface, whereas in the related *C. hepatizon* the lower surface is black. In the B.C. material, however, these characters are variable.***Cetraria cucullata* (Bellardi) Ach.**(Syn. *Allocetraria cucullata* (Bellardi) Randl. & Saag)

Curled snow (Furled paperdoll, Curled Cetraria)

Habitat/Range: Common over ground in open inland alpine and subalpine sites, also rare at lower elevations in dry localities on leeward side of ridges; circumpolar, S to NM.

Reactions: Cortex KC+ yellowish.

Contents: Protolichesterinic and usnic acids.

***Cetraria delisei* (Bory ex Schaerer) Nyl.**

Map 12

(Syn. *Cetraria hiascens* (Fr.) Th. Fr.)

Icelandmoss

Habitat/Range: Infrequent over sheltered ground in open northern alpine localities; circumpolar, S to northern BC.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Gyrophoric and hiassic acids.

***Cetraria ericetorum* Opiz ssp. *reticulata* (Räsänen) Kärnef.**

Icelandmoss

Habitat/Range: Frequent over ground in open inland forests and alpine sites; N Am, N to AK, S to OR.

Reactions: All spot tests negative.

Contents: Lichesterinic acid and two unidentified substances.

Notes: The type locality of ssp. *reticulata* is given as "Kamloops."***Cetraria hepatizon* (Ach.) Vainio**

Rock brown

Habitat/Range: Frequent over acid rock in open sites throughout; circumpolar, S to AZ.

Reactions: Medulla K+ yellowish or becoming orangish, PD+ orangish.

Contents: Norstictic and stictic acids (occasionally in trace amounts, rarely absent).

Notes: For points of distinction with similar species, see the key under *Melanelia*. Also see notes under *C. commixta*.

***Cetraria islandica* (L.) Ach.**

Icelandmoss

Notes: Two subspecies of *C. islandica* occur in B.C., distinguished by the characters outlined in the above keys. A third subspecies, ssp. *orientalis* (Asah.) Kärnef., has also been reported, but no specimens have been examined by us.

**- ssp. *crispiformis* (Räsänen) Kärnef.**

Habitat/Range: Infrequent over ground in open subalpine and alpine sites throughout, except probably rare in boreal regions; incompletely circumpolar, S to WA.

Reactions: Medulla K- or K+ yellowish, PD+ yellowish or reddish or PD-.

Contents: Lichesterinic and protolichesterinic acids (and fumarprotocetraric acid).

**- ssp. *islandica***

Habitat/Range: Frequent over ground in open inland forests and alpine localities; circumpolar, S to MX.

Reactions: Medulla K- or K+ yellowish, PD+ yellowish or reddish or PD-.

Contents: (Fumarprotocetraric, lichesterinic and protolichesterinic acids, and rarely two unknown substances.)

***Cetraria laevigata* Rass.**

Map 13

Icelandmoss

Habitat/Range: Infrequent over ground in open inland alpine and subalpine localities in northern regions; incompletely circumpolar, S to northern BC.

Reactions: Medulla K+ yellowish or rarely K-, PD+ reddish or rarely PD-.

Contents: Fumarprotocetraric, lichesterinic and protolichesterinic acids.

***Cetraria merrillii* Du Rietz**(Syn. *Tuckermannopsis merrillii* (Du Rietz) Hale)

Blackened thornbush

Habitat/Range: Common over conifers, especially lodgepole pine, in open intermontane and maritime forests; western N Am, N to YU, S to CA, though also known from one locality in Spain.

Reactions: All spot tests negative.

Contents: Two unknown fatty acids.

***Cetraria nigricans* Nyl.**

Map 14

Blackened icelandmoss

Habitat/Range: Rare over ground in open dry alpine localities in northern regions; circumpolar, S to northern BC.

Reactions: All spot tests negative.

Contents: Lichesterinic and protolichesterinic acids.

***Cetraria nivalis* (L.) Ach.**(Syn. *Allocetraria nivalis* (L.) Randl. & Saag)

Ragged snow (Ragged paperdoll)

Habitat/Range: Common over ground in open inland alpine and subalpine localities, also infrequent on leeward sides of ridges at lower elevations in dry regions; circumpolar, S to NM.

Reactions: Cortex KC+ yellow.

Contents: Protolichesterinic and usnic acids.

***Cetraria orbata* (Nyl.) Fink**(Syn. *Tuckermannopsis orbata* (Nyl.) Lai)

Variable ruffle

Habitat/Range: Common over conifers and deciduous trees and shrubs, especially Douglas-fir, in open intermontane and maritime forests; western N Am – eastern N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: Protolichesterinic acid.

**Cetraria pallidula Tuck. ex Riddle**

(Syn. *Tuckermannopsis pallidula* (Tuck. ex Riddle) Hale)

Pallid ruffle

Habitat/Range: Infrequent over conifers, especially Douglas-fir, in open, but somewhat humid, intermontane forests at lower elevations, also rare in maritime forests; western N Am, N to BC, S to CA.

Reactions: Cortex KC+ yellow or apparently KC-.

Contents: Caperatic and usnic acids and an unknown fatty acid.

Notes: Abnormally pale specimens of *C. platyphylla* and especially *C. orbata* might be mistaken for *C. pallidula*. Neither of the former species, however, are distinctly yellowish green.

**Cetraria platyphylla Tuck.**

(Syn. *Tuckermannopsis platyphylla* (Tuck.) Hale)

Weathered ruffle

Habitat/Range: Frequent over conifers in open inland forests, usually at lower elevations, also rare in dry maritime localities; western N Am, N to YU, S to CA.

Reactions: Medulla K- or in part K+ yellow and KC+ yellowish or orangish.

Contents: (Atranorin and an unidentified fatty acid.)

**Cetraria sepincola (Ehrh.) Ach.**

(Syn. *Tuckermannopsis sepincola* (Ehrh.) Hale)

Eyed ruffle (chocolate shield)

Habitat/Range: Frequent over deciduous shrubs, especially scrub birch, in open inland thickets and open forests, essentially boreal; circumpolar, S to WA.

Reactions: All spot tests negative.

Contents: Protolichesterinic acid.

**Cetraria subalpina Imsh.**

Icelandmoss

Habitat/Range: Frequent over lower branches of shrubs, also infrequent over ground, in snowy subalpine forests throughout, rare in alpine; western N Am, N to AK, S to OR.

Reactions: All spot tests negative.

Contents: Lichesterinic acid and two unknown substances.

**CETRELIA**

**Cetrelia Culb. & C. Culb.**

**The Rag Lichens**

**Medium to large stratified foliose lichens**, corticate above and below, **sorediate**, lobes loosely appressed to loosely attached, short, thin, averaging to 1–1.5 cm wide. Upper surface whitish or pale tan, **pseudocyphellate**. Lower surface mostly black, shiny, bearing sparse, short simple rhizines. Medulla white. Photobiont green.

Apothecia unknown in B.C. material.

Reference: Culberson and Culberson (1968).

Common Name: Describes the broad, pale, somewhat uneven lobes of the species.

Notes: *Cetrelia* is essentially a temperate genus consisting of about 14 species worldwide. Five of these are reported for North America, though only one is known to occur in B.C. For points of distinction with similar species in other genera, see the key under *Platismatia*.

**Cetrelia cetrarioides (Delise ex Duby) Culb. & C. Culb.**

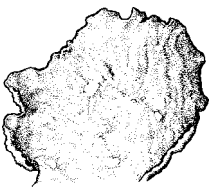
Speckled rag

Habitat/Range: Infrequent over deciduous trees and shrubs, also rare over mossy rock, in open coastal forests at lower elevations, also rare in old-growth intermontane forests; incompletely circumpolar, N to AK, S to OR.

Reactions: Cortex K+ yellow; medulla KC- or KC+ reddish.

Contents: Atranorin and (perlatolic and imbricatic acids).

Notes: *Cetrelia cetrarioides* is very similar to *C. olivetorum* (Nyl.) Culb. & C. Culb. and is often treated as a chemotype of that species.



(x2)

COLLEMA

**Collema Wigg.**

**The Tarpaper Lichens**

Minute to occasionally large **nonstratified foliose lichens (gelatinous when wet), lacking true cortex**, (except cortex present on apothecial margin: see below) isidiate or not, lobes closely appressed to semi-erect, 0.5–10 (–15) mm wide, **thin to thick**. Upper surface **dark olive brownish or blackish** (ours), **dull**. Lower surface dark, rhizines absent or rarely present. Medulla absent. **Photobiont blue-green**.

Apothecia located over upper surface or marginal, with thalline margin, disc reddish brown; spores 2- to multi-celled, ellipsoid to needle-shaped/acicular, (4–) 8 per ascus.

Over bark, earth and rock, usually base-rich.

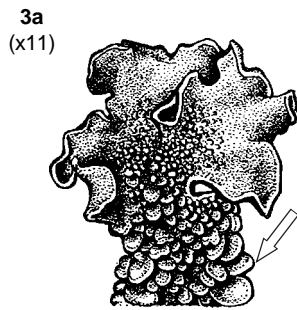
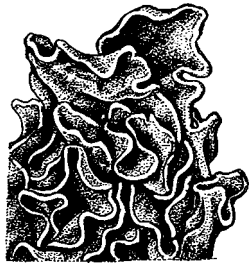
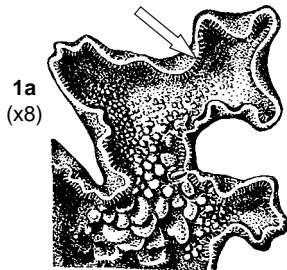
References: Degelius (1954, 1974, 1979).

Common Name: Stresses the blackish nonstratified medulla that becomes somewhat swollen, translucent and jellylike when moistened.

Notes: *Collema* is a taxonomically difficult genus comprising about 80 species, of which 35 are known to occur in North America and 20 in B.C. Chemistry is of no diagnostic value in this genus.

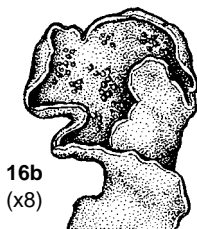
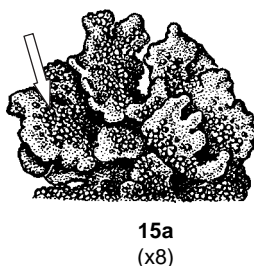
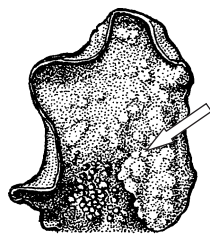
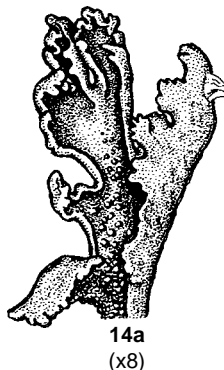
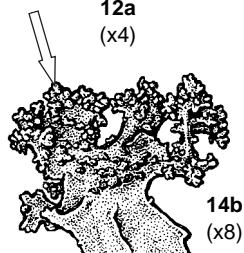
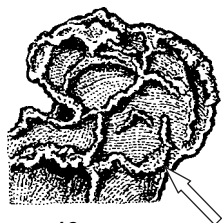
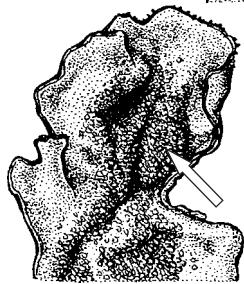
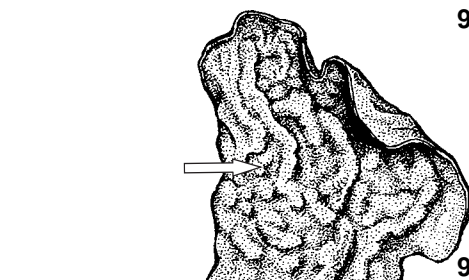
Two keys are provided. The first key emphasizes macroscopic vegetative characters, though spore characters have been incorporated in some places. The second key, to nonisidiate species, stresses spore characters and is more technical.

**Key to *Collema* and Similar Lichens Emphasizing Vegetative Characters**

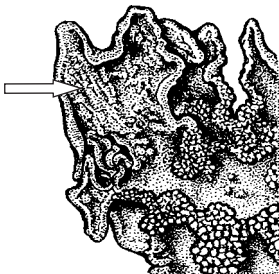
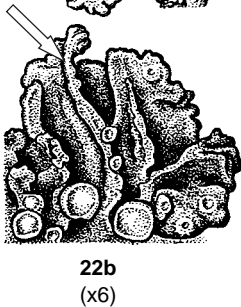
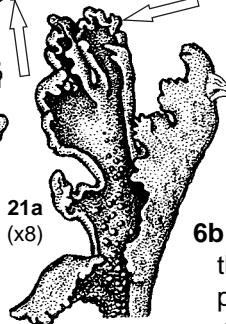
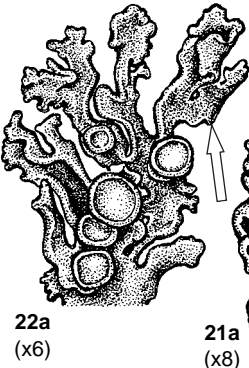
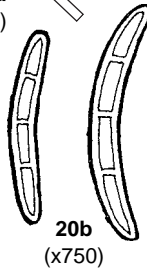
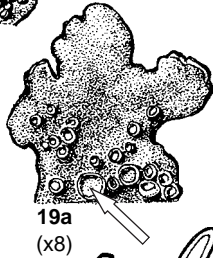
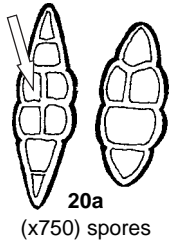
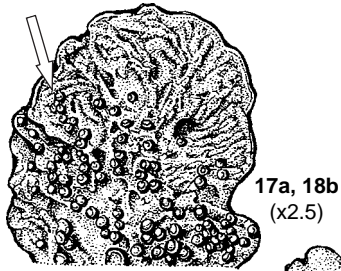


- 1a Lobe margins and/or isidia bearing minute, erect white hairs(←) ..... ***Leptochidium albociliatum***
- 1b Lobe margins hairless; isidia, if present, also lacking hairs ..... 2
- 2a Thallus somewhat appressed to more often erect and essentially fruticose; lobes averaging to 3–5 (–10) mm long x 0.5 (–0.8) mm wide; over soil or rock in humid coastal localities; rare ..... (***Lempholemma radiatum***)
- 2b Thallus foliose or, if somewhat fruticose, then lobes proportionally much shorter and broader; habitat and distribution various ..... 3
- 3a Lobes jet black above and below, except sometimes covered in whitish pruina; thallus cushion-forming, central lobes more or less erect; over rock; inland, restricted to arid climates ..... ***Gonohymenia nigritella***
- 3b Lobes brownish to olive-brownish or blackish, but never jet black above and below; rarely pruinose; habit, substrate and distribution various ..... 4
- 4a Isidia present, these mostly flattened and scalelike(←) at maturity; scalelike lobules therefore rather common over upper surface ..... 5
- 5a Lobes averaging to more than 6 mm wide; lobe margins plane ..... ***Collema flaccidum***
- 5b Lobes averaging to less than 4 (–5) mm wide; lobe margins often undulate ..... ***Collema crispum***
- 4b Isidia absent or, if present, then either essentially globular throughout or becoming cylindrical or branched/coralloid at maturity; scalelike lobules absent (or sparse in some specimens of *C. furfuraceum*) over upper surface ..... 6
- 6a Lobe thickness uniform throughout, lobe tips scarcely (if at all) more swollen than central portions of thallus; upper surface sharply and finely wrinkled or not; central portions of thallus dull (except occasionally shiny in *C. nigrescens*) ..... 7
- 7a Upper surface distinctly isidiate, isidia globular or cylindrical, usually basally constricted ..... 8
- 8a Lower surface more or less evenly covered in dense, white woolly hairs ..... ***Leptogium saturninum***
- 8b Lower surface naked or, if partly hairy, then hairs/hapters occurring in scattered tufts ..... 9



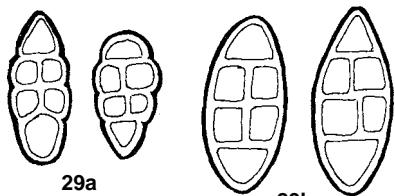


- 9a Lobes averaging to more than 5 mm wide; isidia less than 0.15 mm wide; upper surface often more or less blistered/pustulate ..... 10
- 10a Upper surface strongly pustulate/ridged(←), pustules extending more or less throughout; isidia confined mostly to pustules, usually cylindrical ..... *Collema furfuraceum*
- 10b Upper surface weakly pustulate or lacking pustules; isidia more or less uniformly distributed(←), globular ..... *Collema subflaccidum*
- 9b Lobes averaging to less than 5 mm wide; isidia often (but not always) more than 0.2 mm wide; upper surface not pustulate (except usually weakly pustulate in *C. fuscovirens*) ..... 11
- 11a Upper surface bearing distinctly elongate and/or branched isidia(←); over acid or base-rich rock (occasionally also among mosses over rock) along seasonally submerged shores of lakes and streams ..... *Collema glebulentum*
- 11b Upper surface bearing only more or less globular isidia (Note: elongate isidia-like lobules may be present along lobe margins); habitat various ..... 12
- 12a Central portions of thallus strongly swollen, averaging to 0.2–0.5 mm thick when moist; isidia often arranged in irregular lines(←) over wrinkled upper surface; coastal ..... *Leptogium brebissonii*
- 12b Central portions of thallus not strongly swollen, averaging to less than 0.2 mm thick when moist; isidia more randomly scattered, not in lines; distribution various ..... 13
- 13a Lobe margins and lobe tips more or less densely crowned with isidia or isidia-like lobules; lobes occasionally distinctly erect ..... 14
- 14a Main lobes usually somewhat thickened, concave; marginal and apical lobules unbranched or weakly branching ..... *Collema cristatum* var. *marginale*
- 14b Main lobes thin, often translucent, plane; marginal and apical lobules strongly branched and coralloid in mature specimens(←) ..... *Collema* sp. 1
- 13b Lobe margins and lobe tips weakly or not isidiate or lobulate; lobes appressed to weakly ascending, but never distinctly erect ..... 15
- 15a Lobes averaging to less than 1 mm wide; upper surface never pustulate; isidia usually dense, often partly obscuring lobes(←) ..... *Collema subparvum*
- 15b Lobes averaging to more than 1.5 mm wide; upper surface pustulate or not; isidia usually rather sparse or at least not obscuring lobes ..... 16
- 16a Upper surface usually weakly blistered/ pustulate(←); isidia often averaging to more than 0.2 mm wide; over (mossy) rock; spores submuriform (i.e., with both transverse and longitudinal septa) ..... *Collema fuscovirens*
- 16b Upper surface never pustulate; isidia usually averaging to less than 0.2 mm wide; over (mossy) rock or soil; spores 4-celled, septa transverse ..... *Collema undulatum* var. *granulosum*
- 7b Upper surface lacking isidia (Note: nonconstricted, isidia-like lobules may occur along margins in some species) ..... 17



24a (x8)

- 17a Over trees; upper surface usually somewhat blistered/pustulate(←) ..... 18
- 18a Spores normally 4-celled; less than 40 μ long .....  
..... [*Collema curtisporum*] (see *Collema nigrescens*)
- 18b Spores more than 4-celled, usually more than 40 μ long .....  
..... *Collema nigrescens*
- 17b Over rock; upper surface not blistered/pustulate ..... 19
- 19a Over maritime rocks above intertidal zone; apothecia usually numerous(←)  
..... *Collema fecundum*
- 19b Not associated with intertidal zone; apothecia present or absent ..... 20
- 20a Thallus crust-like, minute, usually less than 0.5 cm across; lobes averaging  
to less than 0.3 mm; spores submuriform(←) (i.e., with both transverse and  
longitudinal septa), (20-) 26-38 (-45) x (9-) 12-15 μ; rare .....  
..... *Collema callopismum*
- 20b Thallus distinctly foliose, larger, more than 1.5 cm across; lobes more than  
0.8 mm wide; spores 4-celled, (i.e., septa strictly transverse) except  
submuriform in *C. cristatum* ..... 21
- 21a Lobe margins bearing irregular, isidia-like lobules; main lobes usually  
concave; spores 8-13 μ wide, submuriform .....  
..... *Collema cristatum* var. *marginale*
- 21b Lobe margins even or at least not bearing isidia-like lobules; main lobes  
usually plane to convex; spores less than 8.5 μ, 4-celled ..... 22
- 22a Well-developed lobes distinctly elongate(←), averaging to less than  
1.5 mm wide, not at all swollen at tips; spores (20-) 26-43 (-60) x 4.5-6.5  
(8) μ ..... *Collema multipartitum*
- 22b Well-developed lobes usually rather broad and platelike(←), more than  
1.5 mm wide, more or less swollen at tips; spores (13-) 18-28 (-30) x  
(5-) 6.5-8.5 μ ..... *Collema polycarpon*
- 6b Lobe thickness uneven: lobe tips either distinctly thicker than central portions of  
thallus or (rarely) vice versa; upper surface never sharply and finely wrinkled; central  
portions sometimes shiny (Note: all specimens growing directly over soil key here)  
23
- 23a Over (mossy) trees in humid sites ..... 24
- 24a Upper surface in part weakly ridged/pustulate(←) ..... *Collema auriforme*
- 24b Upper surface not at all pustulate .....  
..... *Collema undulatum* var. *granulosum* (see lead 16b)
- 23b Over rock or soil or among mosses over rock or soil ..... 25
- 25a Over rock or among mosses over rock ..... 26
- 26a Isidia present; apothecia usually absent ..... 27
- 26b Isidia absent; apothecia usually numerous ..... (see lead 22)
- 27a Lobe margins bearing numerous erect isidia-like lobules .....  
..... *Collema cristatum* var. *marginale* (see lead 21a)
- 27b Lobe margins even or at least not bearing isidia-like lobules .....  
..... *Collema undulatum* var. *granulosum* (see lead 16b)
- 25b Over soil or among mosses over soil (Note: The remaining species, with the  
exception of *Collema ceraniscum* and *Leciophysma finmarkicum*, belong to the  
*Collema tenax* group, and represent some of the most variable and taxonomically  
perplexing of lichens. Specimens lacking mature apothecia are usually best  
referred to the "*Collema tenax* aggregate.") ..... 28



**28a** Lobes averaging to more than 1.5 mm wide; lobe tips appressed or at least not distinctly erect..... 29

**29a** Reddish dot-like pycnidia often present (check lobe margins); apothecial disc plane; apothecial rim smooth; spores colourless (15–) 17–26 (–30) x (5–) 6.5–10.5 (–13) μ ..... **Collema tenax** var. **tenax**

**29b** Pycnidia absent; apothecial disc concave; apothecial rim usually warty at maturity(←); spores pale yellowish brown at maturity, (20–) 26–32 (–36) x (8.5) 13 (–15) μ ..... **Collema bachmanianum**

**28b** Lobes averaging to less than 1.5 mm wide or, if wider, then lobe tips in part distinctly erect..... 30

**30a** Uprturned lobe tips mostly platelike, (somewhat resembling mushroom gills), or lobes appressed ..... 31

**31a** Thallus less than 1 cm across, apparently attached by more or less (broad) central holdfast, rather closely appressed; apothecia, if present, restricted to the upper surface(←) ..... **Collema tenax** var. **crustaceum**

**31b** Thallus more than 1 cm across, lobes attached at one margin, erect; apothecia situated on ends or margins of short, broad, vertical lobes(←) ..... **Collema polycarpon** (rare over soil)

**30b** Uprturned lobe tips mostly cylindrical..... 32

**32a** Spores 1-celled; restricted to northern localities ..... (**Leciophysma finmarkicum**)

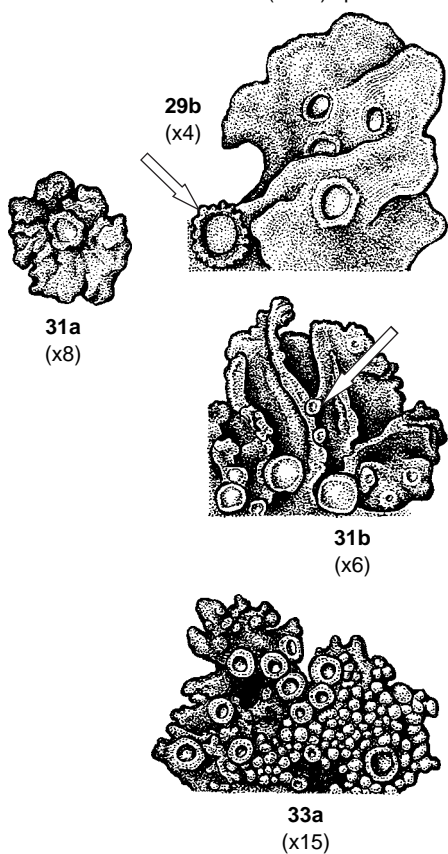
**32b** Spores 2-celled, 4-celled or muriform (i.e., with longitudinal and transverse septa); widespread ..... 33

**33a** Alpine; thallus distinctly and tightly cushion-forming; apothecia usually averaging to less than 1 mm wide; spores broad, 13–22 μ wide, muriform (i.e., with longitudinal and transverse septa), 4 per ascus ..... **Collema ceranicum**

**33b** Distribution various; thallus at most weakly and loosely cushion-forming; apothecia usually averaging to more than 1 mm wide; spores narrower, 6.5–8.5 (–13) μ wide, 2-celled to submuriform (see below), 8 per ascus ..... 34

**34a** Lobe tips both cylindrical and platelike; spores mostly 2-celled (i.e., with single transverse septum) ..... **Collema coccophorum**

**34b** Lobe tips more or less cylindrical; spores mostly 4-celled to submuriform (i.e., with transverse septa or with transverse septa and single longitudinal septum) ..... **Collema tenax** var. **corallinum**



**Key to Nonisidiate Species of Collema Emphasizing Apothecial Characters**

(Key adapted from Degelius 1974; drawings of spores adapted from Degelius 1954)

**1a** Lobes averaging to more than 5 mm across ..... 2

**2a** Spores normally 4-celled(←), less than 40 μ long ..... [**Collema curtisporum**] (see **C. nigrescens**)

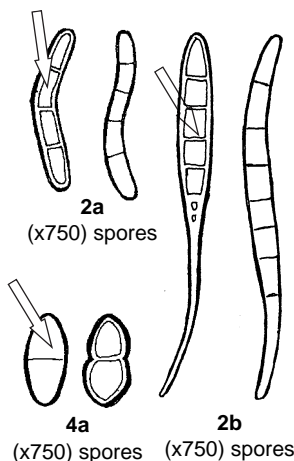
**2b** Spores more than 4-celled(←), usually more than 40 μ long..... **Collema nigrescens**

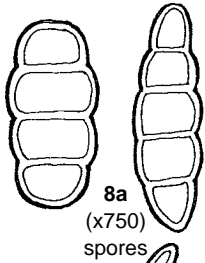
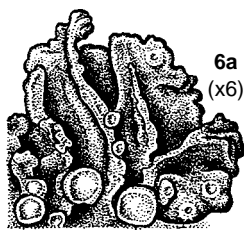
**1b** Lobes averaging to less than 5 mm across ..... 3

**3a** Spores not muriform (i.e., lacking longitudinal septa) ..... 4

**4a** Spores normally 2-celled(←); over soil ..... **Collema coccophorum**

**4b** Spores 4-celled (or more) ..... 5

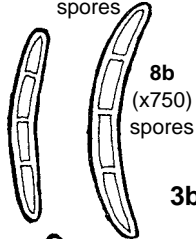
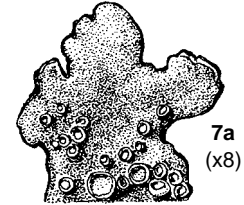




**5a** Lobe tips distinctly swollen and sometimes longitudinally wrinkled/plicate (resembling gills of mushrooms) ..... 6

**6a** Lobes more or less erect; over rock ..... *Collema polycarpon*

**6b** Lobes appressed; usually over (mossy) soil ..... *Collema tenax* var. *tenax*



**5b** Lobe tips not at all distinctly swollen, never wrinkled/plicate ..... 7

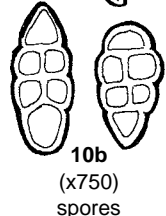
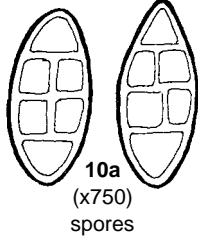
**7a** Growing over maritime rocks above intertidal zone ..... *Collema fecundum*

**7b** Restricted to inland localities east of coast ranges ..... 8

**8a** Spores usually 13–15  $\mu$  wide ..... *Collema crispum*

**8b** Spores usually less than 9  $\mu$  wide ..... *Collema multipartitum*

**3b** Spores muriform or submuriform (i.e., with transverse and longitudinal septa) ..... 9



**9a** Lobe tips distinctly swollen and sometimes longitudinally wrinkled/plicate ..... 10

**10a** Margin of apothecium warty; spores approximately 13  $\mu$  wide, usually pale yellowish brown ..... *Collema bachmanianum* (see lead **29b** of previous key)

**10b** Margin of apothecium more or less smooth; spores 8.5–10.5  $\mu$  wide, colourless ..... *Collema tenax* var. *tenax*

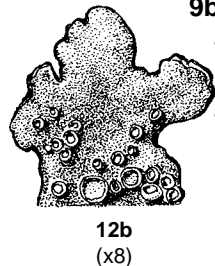
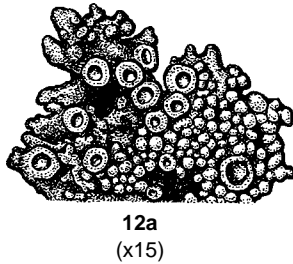
**9b** Lobe tips not at all distinctly swollen, never wrinkled ..... 11

**11a** Thallus crustose to weakly foliose; over rock ..... *Collema callopismum*

**11b** Thallus foliose to almost fruticose ..... 12

**12a** Thallus more or less fruticose; over soil or among moss over soil in alpine localities ..... *Collema ceraniscum*

**12b** Thallus distinctly foliose; over maritime rocks above intertidal zone ..... *Collema fecundum*



***Collema auriforme* (With.) Coppins & Laundon**  
(Syn. *Collema auriculatum* Hoffm.)

Map 15

Jelly tarpaper

Habitat/Range: Rare over deciduous trees in humid forests at lower elevations; western N Am–western Eurasia–eastern Eurasia, N to AK.

Notes: The report is tentative (Goward et al. 1994a). If correct, this species can be expected to occur also over base-rich soil and rock.

***Collema bachmanianum* (Fink) Degel.**

Map 16

Tar tarpaper

Habitat/Range: Rare over mossy base-rich soil in open, but humid, inland localities; circumpolar, S to CO and WY.

Notes: Only var. *bachmanianum* is reported from B.C.

***Collema callopismum* Massal.**

Tripe tarpaper

Habitat/Range: Rare over base-rich rock (limestone) in open intermontane sites; incompletely circumpolar.

Notes: Only var. *rhyarodes* (Nyl.) Degel. is reported from B.C. The record comes from Yoho National Park and represents the only report of this variety for North America.

***Collema ceraniscum* Nyl.**

Map 17

Cushion tarpaper

Habitat/Range: Rare over mossy base-rich soil in open alpine localities, probably northern; circumpolar, S to BC.

***Collema coccophorum* Tuck.**

Map 18

Tar tarpaper

Habitat/Range: Rare over bare base-rich soil in open, arid intermontane localities (BG zone); circumpolar, S to MX.

Notes: Some (reduced) forms of *Heppia lutosa* are superficially similar, but in that species the spores are non-septate, versus once-septate in *C. coccophorum*.***Collema crispum* (Hudson) Weber ex Wigg.**

Papoose tarpaper (crinkled pulp)

Habitat/Range: Frequent over base-rich rock and soil in open intermontane localities, especially in dry climates; probably circumpolar, S to CA, NM.

Notes: Only var. *crispum* is reported from B.C. The material seems to be heterogeneous and includes a soil-dwelling taxon in which the lobe tips are distinctly swollen and the "isidia" soon become erect. This material should perhaps be referred to the *C. tenax* group.***Collema cristatum* (L.) Weber ex Wigg.**

Map 19

Fingered tarpaper

Habitat/Range: Infrequent over (mossy) base-rich rock (rarely also over soil) in open intermontane localities; circumpolar, S to CO.

Notes: Only var. *marginale* (Hudson) Degel. is reported from B.C. Together with *Collema* sp. 1, *C. cristatum* could be confused with *Leciophysma finmarkicum*, a much smaller species (lobes less than 1 mm long) with single-celled spores and a strictly northern distribution.***Collema fecundum* Degel.**

Map 20

Seaside tarpaper

Habitat/Range: Frequent in coast localities over acid rock in somewhat sheltered sites near intertidal zone; western N Am, S to WA.

Notes: The type locality of this species is Narvaez Bay on Saturna Island, B.C.

***Collema flaccidum* (Ach.) Ach.**

Map 21

Butterfly tarpaper

Habitat/Range: Rare over (mossy) rocks and trees in open coastal localities; circumpolar, S to CA.

Note: Tentatively included on the basis of a single collection from the Agassiz area by Macoun in 1889.

***Collema furfuraceum* (Arnold) Du Rietz**

Blister tarpaper

Habitat/Range: Frequent over trees and (mossy) rock in somewhat sheltered sites at lower elevations throughout; circumpolar, S to MX.

Notes: Two varieties occur in B.C.; sterile material, however, cannot be distinguished with certainty at the varietal level. Specimens in which the ridges and pustules are rather indistinct may also be difficult to separate from *Collema subflaccidum*.

**1a** Apothecial disc usually white-pruinose, inner apothecial rim composed of inflated isodiametric cells (excipulum proprium paraplectenchymatous); coastal localities ..... var. ***luzonense* (Räsänen) Degel.**

**1b** Apothecial disc usually lacking pruina, inner apothecial rim composed of elongate, rectilinear cells (excipulum proprium euthyplectenchymatous); widespread ..... var. ***furfuraceum***

***Collema fuscovirens* (With.) Laundon**(Syn. *Collema furvum* (Ach.) Ach.; *Collema tuniforme* (Ach.) Ach.)

Bleb tarpaper

Habitat/Range: Frequent over base-rich rock at lower elevations throughout; circumpolar, S to CO.

***Collema glebulentum* (Nyl. ex Crombie) Degel.**

Map 22

Amphibious tarpaper

Habitat/Range: Rare in intermontane localities over seasonally inundated acid and base-rich rock at edges of lakes and streams; circumpolar, S to CO.

Notes: Included on the basis of collections from the wet intermontane (ICH zone), but expected to be more widespread.

**Collema multipartitum Sm.** Map 23

Protracted tarpaper

Habitat/Range: Infrequent over base-rich rock in open boreal and intermontane regions, especially in subalpine and alpine; western N Am–western Eurasia.

**Collema nigrescens (Hudson) DC.** Map 24

Broadleaf tarpaper

Habitat/Range: Infrequent over trees, especially deciduous, in sheltered coast forests, also rare in boreal localities; circumpolar, S to CA.

Notes: The B.C. material may not be taxonomically homogeneous; the inland specimen is characterized by rather small spores and may represent a separate species. *Collema curtisporum* Degel. has been reported for Washington (Degelius 1974) and may be found in British Columbia. It has short, 4-celled spores (averaging to less than 40  $\mu$  long), differing from the spores of *C. nigrescens*, which are 6- to 13-celled and more than 40  $\mu$  long.**Collema polycarpon Hoffm.**

Shaly tarpaper

Habitat/Range: Infrequent over base-rich rock in open inland sites; probably circumpolar, S to MX.

Notes: Only var. *polycarpon* is reported from B.C.**Collema subflaccidum Degel.** Map 25(Syn *Collema subfurvum* sensu Degel.)

Moth tarpaper

Habitat/Range: Infrequent over trees, especially deciduous, in sheltered, humid coastal and intermontane forests, also rare over rock; circumpolar, S to WY.

**Collema subparvum Degel.** Map 26

Western tarpaper

Habitat/Range: Rare over base-rich rock (limestone) in open intermontane localities; western N Am, N to AK.

Notes: *Collema subparvum* is reported from only three localities worldwide (Degelius 1974); the type locality is at Marble Canyon, northwest of Cache Creek, B.C.**Collema tenax (Swartz) Ach.**

Tar tarpaper (sticky lichen)

Habitat/Range: Frequent over (recently disturbed) base-rich soil in open inland localities, especially in arid climates; circumpolar, S to CA, NM.

Notes: Some (reduced) forms of *Heppia lutosa* are superficially similar, but have single-celled spores, differing from the usually 4-celled spores in *C. tenax*. Three varieties of *C. tenax* are reported to occur in B.C.

**1a** Thallus often more than 2 cm across; broadest lobes averaging to more than 2 mm wide; lobes mostly appressed ..... ***C. tenax* var. *tenax***

**1b** Thallus usually less than 1.5 cm across (never more than 2 cm across); broadest lobes averaging to less than 2 mm wide; lobes appressed or erect ..... **2**

**2a** Thallus dark olive-green or brownish; lobe margins more or less even, lobes smooth or at least not forming erect clusters ..... ***C. tenax* var. *crustaceum* (Krempelh.) Degel.**

**2b** Thallus usually blackish; lobes more or less incised and bumpy, forming erect clusters at maturity ..... ***C. tenax* var. *corallinum* (Massal.) Degel.**

**Collema undulatum Laurer ex Flotow**

Protean tarpaper

Habitat/Range: Infrequent over base-rich rock or soil at lower elevations throughout; circumpolar.

Notes: Only var. *granulosum* Degel. is reported from B.C. A few unusually swollen specimens collected from trees are tentatively included here, but are possibly better referred to the *C. tenax* group.**Collema sp. 1** Map 27

Crown-of-thorns tarpaper

Habitat/Range: Rare among moss over base-rich rock in open, semi-arid intermontane outcrops; distribution unknown.

Notes: The material appears to be similar to *Collema thamnodes* Riddle, though G. Degelius (Göteborg, pers. comm., 1992) suggests that it is not conspecific with that species. See notes under *C. cristatum*.

DERMATOCARPON

**Dermatocarpion** Eschw.

**The Stippleback Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, lacking isidia and soredia, lobes **attached to substrate by more or less central holdfast** (except occasionally unattached in some species), loosely attached, subrotund to rotund, entire thallus averaging to 1–3 (–6) cm across, usually somewhat thick. Upper surface **greyish to dark olive brownish**. Lower surface pale brown or blackening, rhizinate or more often **lacking rhizines**. Medulla white. Photobiont green.

Ascocarp a **perithecium** immersed in upper surface, appearing as blackish dot from above; spores simple, ellipsoid, colourless, 8 per ascus.

**Over rock**, rarely over exposed soil.

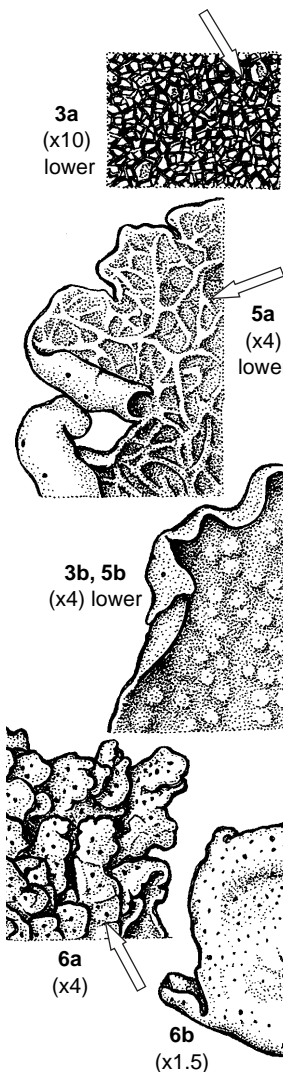
As adopted here, *Dermatocarpion* includes all foliose or squamulose peritheciate lichens having simple spores and attached to substrate by one or more thickened holdfasts, whether central or marginal. Squamulose specimens attached by rhizoidal threads are treated under *Catapyrenium*.

References: Imshaug (1957); Rosentreter and McCune (1992).

Common Name: Emphasizes the presence of numerous dot-like perithecia over the upper surface.

Notes: *Dermatocarpion* is a cosmopolitan genus of approximately 60 species. Only seven species are reported for North America and five occur in B.C. This is a taxonomically difficult group in which many species appear to intergrade. The keys should be considered preliminary, pending a thorough taxonomic revision of the genus. Chemistry is of no diagnostic value in *Dermatocarpion* and has therefore been omitted in the following species accounts.

**Key to *Dermatocarpion* and Similar Lichens**



- 1a Thallus small and scalelike (scales averaging to less than 5 mm across), upper surface pale tan to medium brown, at most only weakly white-pruinose; upper surface KC+ pink or apparently KC-; spores more than 100 per ascus ..... (***Acarospora thamnina***)
- 1b Thallus lobes averaging to more than 6 mm across, or if smaller, then upper surface greyish and strongly white-pruinose; upper surface KC-; spores at most 8 per ascus ..... 2
  - 2a Rhizines present over lower surface ..... [***Dermatocarpion moulinii***]
  - 2b Rhizines absent ..... 3
    - 3a Upper surface white-pruinose; lower surface minutely textured/papillose, individual papillae cylindrical to more often pyramid-shaped, less than 0.1 mm across(←) ..... ***Dermatocarpion reticulatum***
    - 3b Upper surface white-pruinose or not; lower surface varying from smooth to wrinkled or irregularly granular; granules, if present, roughly spheroidal and averaging to more than 0.2 mm across(←) ..... 4
      - 4a Upper surface at most only weakly white-pruinose, in part turning bright green when wetted; confined to sites subject to at least periodic flooding ..... 5
        - 5a Lower surface more or less wrinkled throughout(←); confined to sites subject to periodic flooding ..... ***Dermatocarpion rivulorum***
        - 5b Lower surface smooth, pimpled/papillate(←) or, if wrinkled, then wrinkles weak and seldom covering entire surface; confined to more or less continuously inundated sites ..... ***Dermatocarpion luridum***
      - 4b Upper surface in part heavily white-pruinose; never turning bright green when wetted; confined to dry/xeric sites ..... 6
        - 6a Thallus many-lobed/polyphyllous; central lobes crowded, convex, often appearing chinky-cracked/areolate from above(←), margins usually strongly downturned ..... ***Dermatocarpion intestiniforme***
        - 6b Thallus single-lobed/monophyllous to rarely many-lobed/polyphyllous; central lobes absent or, if present and dense, then concave to more often plane, never appearing chinky-cracked/areolate from above, margins usually upturned or at least not strongly downturned ..... ***Dermatocarpion minutum***

***Dermatocarpon intestiniforme* (Körber) Hasse**

Fissured stippleback

Habitat/Range: Infrequent over base-rich rock in open, usually rather exposed sites throughout; circumpolar.

Notes: An unusually variable species.

***Dermatocarpon luridum* (With.) Laundon**(Syn. *Dermatocarpon aquaticum* (Weis) Zahlbr.; *Dermatocarpon fluviatile* (Weber) Th. Fr.; *Dermatocarpon weberi* (Ach.) Mann)

Streamside stippleback (brook lichen)

Habitat/Range: Frequent over seasonally inundated rock in open waterways throughout, except absent in alpine localities; circumpolar.

***Dermatocarpon miniatum* (L.) Mann**

Limy stippleback (cliff wafer)

Habitat/Range: Frequent over base-rich rock in open sites throughout; circumpolar.

Notes: Like *D. reticulatum*, with which it appears to intergrade, *D. miniatum* may adopt an unattached/vagant habit in highly exposed inland sites. The material is apparently heterogeneous and may include two species:

**1a** Over base-rich rock; lower surface tan, brown or orangish brown, more or less smooth  
 ..... ***Dermatocarpon miniatum***

**1b** Over base-poor rock (e.g., basalt); lower surface dark brown to black, strongly and broadly wrinkled  
 ..... ***Dermatocarpon* sp. 1**

**[*Dermatocarpon moulinsii* (Mont.) Zahlbr.]**

Shag stippleback

Habitat/Range: Not yet confirmed for B.C., but expected to occur in southern inland regions, especially over dry, base-rich rock; incompletely circumpolar.

Notes: *Dermatocarpon moulinsii* may be mistaken for *Umbilicaria vellea* which, however, has a black lower surface and ball-tipped rhizines.***Dermatocarpon reticulatum* Magnusson**

Northwest stippleback

Habitat/Range: Frequent over rock in open or somewhat sheltered maritime and intermontane sites; western N Am, N to AK, S to NM.

Notes: In exposed inland sites, this species may adopt an unattached/vagant habit and is then sometimes treated as a separate species, *D. vagans* Imsh. See the note under "Excluded Species."***Dermatocarpon rivulorum* (Arnold) Dalla Torre & Sarnth.**

Map 28

Streamside stippleback

Habitat/Range: Rare over periodically inundated rock in open inland sites; probably circumpolar.



**ENDOCARPON**

**Endocarpon Hedwig**

**The Stipplescale Lichens**

**Minute** to small **stratified squamulose or occasionally fruticose lichens**, corticate above, corticate or not below, lacking soredia and isidia, squamules/lobes tightly appressed to erect, brownish, rotund to elongate, averaging to 0.5–7 mm wide. Lower surface (when visible) brown or black, lacking rhizines, attached to substrate by non-corticate rhizoids. Medulla white. Photobiont green.

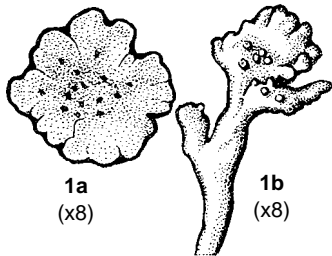
Ascocarp a **perithecium** immersed in upper surface, appearing blackish or brownish from above; spores multicelled (muriform), ellipsoid, brown, 2 per ascus. **Algal cells included with spores in perithecium.**

**Over base-rich soil or rock.**

Reference: Thomson (1984).

Common Name: Suggested by the typical scalelike appearance and by the presence of dot-like perithecia over upper surface.

Notes: *Endocarpon* is mainly a temperate genus of approximately 30 species. Eight of these are reported for North America, though only two are known to occur in B.C. Chemistry is of no diagnostic value in this genus and is omitted in the following species accounts. For points of distinction with similar species in other genera, see the key under *Catapyrenium*.



- 1a Over soil; thallus almost crustose, consisting of appressed squamules ..... **Endocarpon pusillum**
- 1b Over rock; thallus squamulose or fruticose, consisting of upright squamules or cylindrical lobes ..... **Endocarpon pulvinatum**

**Endocarpon pulvinatum Th. Fr.**

Map 29

Rock stippleback

Habitat/Range: Infrequent over (seasonally inundated) outcrops in open inland sites; probably incompletely circumpolar, S to NV.

Notes: Western North America material of *E. pulvinatum* is sometimes referred to the taxonomically rather dubious *E. tortuosum* Herre.

**Endocarpon pusillum Hedwig**

Soil stippleback

Habitat/Range: Frequent over base-rich soil (rarely moss) in open intermontane sites, especially BG zone; probably circumpolar, S to CA, NM.

Notes: Much of the B.C. material has a dark lower surface and therefore belongs in var. *pusillum*, though var. *pallidum* (Ach.) Körber, with a pale lower surface, is also reported to occur (Henssen 1963d). The latter taxon is also sometimes treated as a distinct species, *E. pallidum* Ach.

**ERIODERMA**

**Erioderma Fee**

**The Treepelt Lichens**

Small **stratified foliose lichens**, corticate above, **noncorticate below**, **sorediate**, lobes loosely attached, rotund (ours), averaging to 5 mm wide, somewhat thick. Upper surface greyish brown, **bearing short erect hairs**. Lower surface whitish, **lacking veins**, bearing short to long rhizines, restricted to vicinity of margins. Medulla white.

**Photobiont blue-green.**

Apothecia unknown in B.C. material.

**Over branches of acid-barked trees and shrubs.**

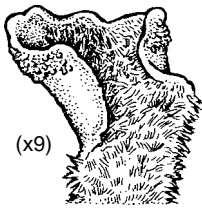
References: Galloway and Jørgensen (1975); Galloway (1985).

Common Name: Reflects strict occurrence of species over bark and superficial resemblance to certain pelt lichens (*Peltigera*).

Notes: *Erioderma* is an essentially tropical genus of approximately 22 species. Of these, only three are known to occur in North America and one in B.C. For points of distinction with similar species, see the keys under *Pannaria* and *Peltigera*.

***Erioderma solediatum* D. Galloway & P.M. Jørg.**

Map 30



Treepelt

Habitat/Range: Rare over trees and shrubs in somewhat sheltered open hypermaritime forests; western N Am, N to BC, S to OR.

Reactions: Medulla PD+ orange.

Contents: Eriodermin.

**ESSLINGERIANA*****Esslingeriana* Hale & Lai****The Rag Lichen**

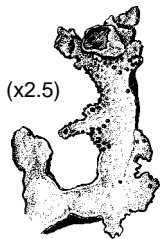
Small to medium **stratified foliose lichen**, corticate above and below, lacking soredia and isidia, lobes **loosely attached, elongate**, averaging to 1.5–5 (–7) mm wide, thin. Upper surface **pale yellowish grey**, usually wrinkled. **Lower surface mostly black**, bearing sparse, short, simple rhizines. Medulla white. Photobiont green.

Apothecia usually located along margins, especially near lobe tips, disc brown; spores simple, ovoid to subspherical, colourless, 8 per ascus. Pycnidia black, conspicuous.

**Over conifers.**

Reference: Esslinger (1971).

Common Name: Descriptive of the pale, often somewhat tattered lobes of the species.

Notes: *Esslingeriana* is a monotypic genus restricted to western North America at temperate latitudes. For points of distinction with similar species in other genera, see the key under *Platismatia*.***Esslingeriana idahoensis* (Essl.) Hale & Lai**(Syn. *Cetraria idahoensis* Essl.)

Yellow rag

Habitat/Range: Infrequent over conifers in open intermontane forests, mostly at lower elevations, also rare in dry maritime forests; western N Am, N to BC, S to CA.

Reactions: Cortex K+ yellow, PD+ pale yellow; medulla K- or K+ pale violet.

Contents: Atranorin, endocrocin, and two unknown substances.

**FLAVOPUNCTELIA*****Flavopunctelia* Hale****The Speckleback Lichens**

Medium to large **stratified foliose lichens**, corticate above and below, sorediate, lobes loosely appressed, short, averaging to 3–7 mm wide, thin. Upper surface **greenish yellow, pseudocyphellate. Lower surface blackening toward thallus centre**, shiny, bearing short, simple rhizines. Medulla white. Photobiont green.

Apothecia unknown in B.C. material.

Over trees, shrubs and rock.

References: Hale (1984); Goward (1985).

Common Name: Suggested by the presence of pale, speckle-like pseudocyphellae over the upper surface.

Notes: *Flavopunctelia* is essentially a temperate genus consisting of four species, all of which occur in North America, though only one is reported for B.C. *Flavopunctelia* was formerly treated within *Parmelia*. For points of distinction with similar species in other genera, see the key under *Platismatia*.***Flavopunctelia flaventior* (Stirton) Hale**

Map 31

(Syn. *Parmelia flaventior* Stirton; *Punctelia flaventior* (Stirton) Krog)

Green speckleback

Habitat/Range: Infrequent over trees and mossy rock in open coastal forests (CDF zone), also rare over shrubs in semi-arid intermontane (BG zone); incompletely circumpolar, N to southern BC, S to CA.

Reactions: Cortex K+ yellow; medulla C+ reddish, KC+ reddish.

Contents: Atranorin, lecanoric acid and usnic acid.

## GONOHYMENIA

**Gonohymenia Steiner**

Small **nonstratified squamulose, foliose or subfruticose lichens**, (**gelatinous when wet**), corticate above and below, lacking isidia, lobes loosely appressed to **semi-erect**, averaging to 0.5–0.8 (–1) mm wide. Upper and lower surfaces **black**, except often **strongly pruinose**, lacking rhizines. Medulla absent. **Photobiont blue-green**.

Apothecia unknown in B.C. material.

**Over base-rich rock.**

Common Name: Stresses the nonstratified medulla, which becomes somewhat swollen, translucent and jellylike when moistened.

Notes: *Gonohymenia* is a genus primarily of arid temperate regions. Approximately a dozen species are described; at least three of these occur in North America, with one species reported for B.C. For points of distinction with similar genera, see the key under *Collema*.

**The Tarpaper Lichens****Gonohymenia nigritella (Lettau) Henssen**

Map 32

(Syn. *Thyrea nigritella* Lettau)



(x11)

Coal tarpaper

Habitat/Range: Infrequent over base-rich rock in exposed semi-arid to dry intermontane localities; probably incompletely circumpolar, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

## HEPPIA

**Heppia Naeg. in Massal.****The Ruby Lichens**

**Minute stratified squamulose lichens**, corticate above and below, lacking soredia and isidia, scales **attached to substrate by wefts of hyphae**, rather loosely appressed, rotund, entire thallus averaging to 1–5 mm wide, somewhat thick. Upper surface dark olive-brown, rough. Lower surface lacking rhizines. Medulla white, uneven, cellular. **Photobiont blue-green**, arranged in vertical columns.

**Apothecia somewhat immersed in upper surface**, disc reddish brown; spores simple, spindle-shaped, colourless, 8 per ascus.

**Over base-rich soil.**

Reference: Wetmore (1971).

Common Name: Reflects the colour of the apothecia.

Notes: *Heppia* is primarily a genus of dry, desert regions. Only one species is reported for North America.

**Heppia lutosa (Ach.) Nyl.**

Map 33



(x9)

Soil ruby

Habitat/Range: Rare over base-rich soil in open semi-arid intermontane localities (BG zone); probably circumpolar, S to MX.

Reactions: All spot tests negative, except hymenium I+ wine-red.

Contents: No lichen substances reported.

Notes: Some (reduced) forms of *H. lutosa* are superficially similar to members of the *Collema tenax* group (e.g., *C. coccophorum*, *C. tenax* var. *corallinum*), but in those species the spores are septate, not nonseptate as in *H. lutosa*.

**HETERODERMIA**

**Heterodermia Trevisan**

**The Centipede Lichens**

Small to medium **stratified foliose lichens**, corticate above, **corticate or not below**, sorediate or not, lobes **loosely attached or semi-erect**, elongate-linear to **elongate**, averaging to 0.5–2 mm wide, thin. Upper surface **whitish**, sometimes maculate, **weakly longitudinally striate**, **lobe margins ciliate**. Lower surface white, partly noncorticate (and then **appressed-cottony**), lacking rhizines or bearing sparse rhizines. Medulla white. Photobiont green.

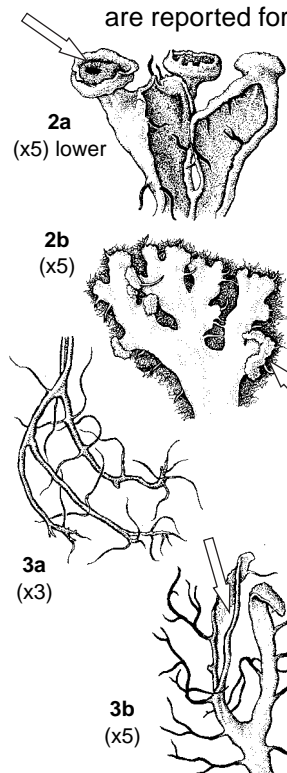
Apothecia located over upper surface, often near lobe tips, disc brown; spores 2-celled, ellipsoid, brown, 8 per ascus.

**Over trees.**

References: Kurokawa (1962, 1973); Culberson (1966); Goward (1984); Trass (1992).

Common Name: Descriptive of the elongate lobes and cilia that line the lobe margins in most species.

Notes: *Heterodermia* is primarily a genus of temperate latitudes. Of the approximately 80 species worldwide, 21 are reported for North America and three for B.C.



**Key to *Heterodermia* and Similar Lichens**

- 1a Lobes short or only slightly elongate; marginal cilia at most averaging to 0.5–2 mm long; soredia restricted to urn-shaped structures over upper surface or if located over lower surface, then positioned near lobe tips ..... 2
- 2a Upper surface strongly convex; soredia lacking on lower surface, restricted to urn-shaped structures over upper surface(←) ..... ***Heterodermia sitchensis***
- 2b Upper surface plane to at most weakly convex; soredia located partly over lower surface near lobe tips(←) ..... ***Heterodermia speciosa***
- 1b Lobes distinctly elongate; marginal cilia averaging to 2–5 mm long; soredia mostly broadcast over lower surface, or soredia absent ..... 3
- 3a Soredia absent; apothecia usually present; over base-enriched trees in inland localities  
***Anaptychia setifera***
- 3b Soredia present(←); apothecia unknown in B.C. material; over trees in hypermaritime localities ..... ***Heterodermia leucomelos***

***Heterodermia leucomelos* (L.) Poelt**

Map 34

(Syn. *Heterodermia "leucomelaena"* (L.) Poelt)

Elegant centipede

Habitat/Range: Infrequent over conifers in open hypermaritime localities; incompletely circumpolar, N to BC, S to CA.

Reactions: Cortex K+ yellow; medulla K+ yellow becoming reddish, PD+ yellowish.

Contents: Atranorin, salazinic acid, zeorin (and various unknown substances).

***Heterodermia sitchensis* Goward & Noble**

Map 35

Seaside centipede

Habitat/Range: Rare over spruce in open, but somewhat sheltered seaside sites in hypermaritime localities; western N Am, known only from BC.

Reactions: Cortex K+ yellow; medulla K+ yellow, PD+ orange.

Contents: Atranorin, zeorin and various unknown substances.

Notes: The type locality is in Pacific Rim National Park, Vancouver Island, B.C.

***Heterodermia speciosa* (Wulfen) Trevisan**  
(Syn. *Anaptychia speciosa* (Wulfen) Massal.)

Map 36

Powdered centipede

Habitat/Range: Rare over deciduous trees and conifers in open boreal and hypermaritime localities; western N Am – eastern N Am – western Eurasia, N to BC, S to WA.

Reactions: Cortex K+ yellow; medulla K+ yellow, PD+ yellow.

Contents: Atranorin, leucotylin, zeorin and various unknown substances.

Notes: The anomalous distribution reported above raises the possibility that the material included here may actually be heterogeneous.

**HYDROTHYRIA**

***Hydrothyria* J. Russell**

**The Waterfan Lichen**

Small to occasionally medium **nonstratified foliose lichens (gelatinous when wet)**, **corticate above and below**, lacking soredia and isidia, lobes loosely attached, 0.3–1 cm wide, thin (except thicker when moist). Upper surface bluish black. Lower surface dark, **veined**. Medulla absent. **Photobiont blue-green**.

Apothecia located over upper surface, disc reddish brown; spores simple, ellipsoid, 8 per ascus.

**Over rock in mountain streams.**

References: Fink (1935); McCune (1984); Feige et al. (1989).

Common Name: Conveys the fan-shaped appearance of the lobes and the aquatic habitat.

Notes: *Hydrothyria* is a monotypic genus known only from the middle latitudes of North America. For points of distinction with similar lichens, see the key under *Collema*.

***Hydrothyria venosa* J. Russell**

Map 37



(x2.5) lower

Waterfan (North American lichen, underwater lichen)

Habitat/Range: Rare over permanently submerged rock in open subalpine streams; western N Am – eastern N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: (Methyl gyrophorate, methyl lecanorate).

Notes: *Leptogium rivale* Tuck., another rock-dwelling lichen of streams and waterways, is reported in the Cascade Range of Washington and may eventually be found in British Columbia. It is much smaller than *Hydrothyria venosa* (lobes averaging to 1 mm wide), is tightly appressed, and lacks the veined lower surface characteristic of that species.

**HYPOCENOMYCE**

***Hypocenomyce* M. Choisy**

**The Turtle Lichens**

**Minute stratified squamulose lichens**, corticate above, corticate or not below, **sorediate or not**, squamules closely appressed or more often **attached to substrate at one margin**, the opposite margin weakly raised, short to subrotund, averaging to 0.8–1.5 (–2) mm wide, thin. Upper surface **pale greyish, greenish or dark brown**, shiny or not. Lower surface pale or darkening, **lacking rhizines**. Medulla white. Photobiont green.

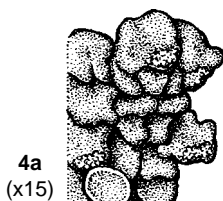
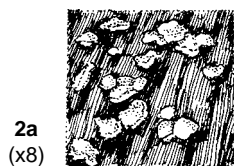
Apothecia usually located along lobe margins, **disc plane or occasionally convex**, brown or black; spores simple, ellipsoid to spindle-shaped, colourless, 8 per ascus.

**Over (fire-blackened) trees.**

Reference: Timdal (1984).

Common Name: Describes the shell-like habit of the species.

Notes: *Hypocenomyce* is primarily a temperate and boreal genus consisting of ten species worldwide. Of the eight species reported for North America, four are known to occur in B.C. *Hypocenomyce* was formerly treated within *Psora*. The taxonomy of the western North American species has not been entirely elucidated; the following treatment is preliminary, pending further study.

Key to *Hypocenomyce* and Similar Lichens

- 1a Soredia absent ..... 2
- 2a Lobes weakly lobulate, lobules never distinctly longer than broad; upper surface sometimes strong brown; apothecia rare, disc brownish ... *Hypocenomyce castaneocinerea*
- 2b Lobes strongly lobulate, lobules in part distinctly longer than broad; upper surface never strong brown; apothecia abundant or absent, disc black ..... 3
- 3a Upper surface whitish, minute; lobes averaging to 0.3 (–0.4) mm long; over oak in maritime localities ..... (*Bacidia rubella*)
- 3b Upper surface pale greenish, larger; lobes averaging to more than 0.5 mm long; over old conifers in humid climates throughout ..... *Hypocenomyce friesii*
- 1b Soredia present on lobe margins ..... 4
- 4a Lobes hemispherical/helmet-shaped (resembling *Physcia adscendens*); spores 15–21  $\mu$  long, at maturity 3-septate; over oak in CDF zone ..... *Waynea californica*
- 4b Lobes concave to convex or, if helmet-shaped, then apparently never over oak; spores less than 14  $\mu$  long, usually 1-septate ..... 5
- 5a Lobes erect, averaging to slightly longer than wide; soredia C- ..... (*Cladonia parasitica*)
- 5b Lobes appressed to ascending, but rarely erect, averaging to slightly wider than long; soredia C+ red or C- ..... 6
- 6a Upper surface sometimes strong brown; apothecia, if present, brown; soredia C- .... 7
- 7a Lobes white-edged, more or less concave when young; medulla PD+ orange or PD- ..... [*Hypocenomyce anthracophila*] (see *H. castaneocinerea*)
- 7b Lobes brown-edged, more or less convex when young; medulla PD- ..... *Hypocenomyce castaneocinerea* (see lead 2a)
- 6b Upper surface never strong brown; apothecia, if present, black; soredia C+ red ..... 8
- 8a Lobes small, whitish, appressed (crustose), averaging to less than 0.8 (–1.0) mm across; over deciduous trees and shrubs; soredia K+ yellow ..... *Hypocenomyce leucococca*
- 8b Lobes larger, usually greenish, somewhat loosely attached (squamulose), averaging to more than 0.8 mm across; over deciduous trees and conifers; soredia K- ..... *Hypocenomyce scalaris*

*Hypocenomyce castaneocinerea* (Räsänen) Tindal

Charcoal turtle

Habitat/Range: Common over fire-blackened conifer bark and wood in coastal and intermontane (ICH zone) forests; tentatively western N Am – western Eurasia, S to AZ.

Reactions: All spot tests negative, but medulla UV+ white.

Contents: Various unknown lichen substances.

Notes: The local material was previously assigned to *H. anthracophila*, though that species should have a PD+ red medulla. Much of the B.C. material lacks soredia.*Hypocenomyce friesii* (Ach.) P. James & G. Schneider

Map 38

(Syn. *Lecidea friesii* Ach.; *Psora friesii* (Ach.) Hellbom)

Old-growth turtle

Habitat/Range: Infrequent over conifers, especially redcedar, in humid coastal and intermontane forests; western N Am – eastern N Am – eastern Eurasia, S to CA and AZ.

Reactions: All spot tests negative, but medulla UV+ white.

Contents: A single unknown UV+ compound.

**Hypocenomyce leucococca R. Sant. in Moberg**

Map 39

Alder turtle

Habitat/Range: Rare (overlooked?) over deciduous trees and shrubs in humid, intermontane forests; western N Am – western Eurasia, N to AK.

Reactions: Cortex and soredia K+ yellow, KC+ pink, PD+ yellow, UV+ white.

Contents: Alectorialic acid.

Notes: This is a crustose species.

**Hypocenomyce scalaris (Ach.) M. Choisy**

(Syn. *Lecidea scalaris* (Ach.) Ach.; *Psora scalaris* (Ach.) Hooker

Common shingle

Habitat/Range: Frequent over charred or uncharred bark or wood throughout; circumpolar, S to CA.

Reactions: Cortex and soredia C+ red, KC+ red.

Contents: Lecanoric acid.

**HYPOGYMNIA**

**Hypogymnia (Nyl.) Nyl.**

**The Bone Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, sorediate or rarely isidiate or not, lobes rather loosely appressed to semi-erect or pendulous, **hollow**, occasionally perforate, 0.5–5 mm wide. Upper surface usually **pale greyish**, occasionally brownish. Lower surface blackish, shiny, wrinkled, **lacking rhizines**. Medulla white. Photobiont green.

Apothecia located over upper surface, often stalked/stipitate, disc usually concave, brown; spores simple, spherical to ellipsoid, colourless, 8 per ascus.

References: Krog (1968); Ohlsson (1973); Pike and Hale (1982); Goward (1988); Goward and McCune (1993).

Common Name: Stresses the hollow lobes of the species and the pale, often whitish, upper cortex.

Notes: *Hypogymnia* is essentially a temperate genus of about 50 species worldwide. Twenty species occur in North America and 17 in B.C. The western Hypogymniae display a highly varied chemistry and spot tests are helpful in distinguishing between species. Note that what is usually referred to as a PD- medullary reaction in *Hypogymnia* may sometimes actually be discerned as PD+ pale yellow. In this case, however, the coloration is usually restricted to the upper portion of the medulla, while the lower portion remains white. By contrast, a “true” PD+ pale yellow reaction (e.g., as for *H. rugosa*) registers across the entire medulla, from top to bottom. Applying as little reagent as possible will help avoid ambiguity.

*Brodoa oroarctica* was formerly treated within *Hypogymnia*.

2a, 3a (x2.5)

3b (x2.5)

4a (x2.5)

5a (x2.5)

2b (x2.5)

1a Soredia present (check lobe tips) ..... 2

2a Soredia located on inner surface of burst lobe tips(←) ..... 3

3a Upper surface usually partly brownish; medullary ceiling darkening toward thallus centre; medulla PD-; humid localities ..... ***Hypogymnia vittata***

3b Upper surface not at all brownish; medullary ceiling white throughout (rarely darkening); medulla PD+ orange; widespread ..... ***Hypogymnia physodes***

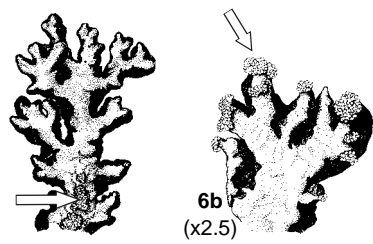
2b Soredia located on upper surface (including upper surface of lobe tips) ..... 4

4a Lobes distinctly swollen, bearing (basally constricted) marginal lobules(←); lobe tips often perforate; medulla PD+ yellow becoming bright orange; essentially coastal ..... ***Hypogymnia oceanica***

4b Lobes not distinctly swollen, lacking basally constricted marginal lobules (lobules may, however, sometimes be present over upper surface); lobe tips generally not perforate; medulla PD-; variously distributed ..... 5

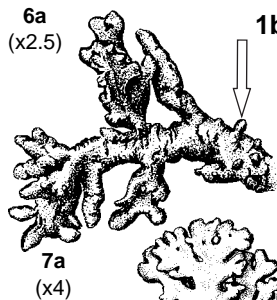
5a Lobes stiffly suberect, elongate, divergent; upper surface convex; soralia located on or very near lobe tips(←); widespread ..... ***Hypogymnia tubulosa***

5b Lobes appressed to substrate, elongate to more often rather short, usually crowded; upper surface plane; soralia variously positioned; inland ..... 6



**6a** Outermost soralia generally small and loosely packed with coarsely granular soredia(←); soredia also usually well developed over upper surface, often arising from coarse, pustular “isidia”; over bark, wood and rock; common ..... *Hypogymnia austerodes*

**6b** Outermost soralia larger, densely packed with finely granular/farinose soredia(←); soredia rare toward thallus centre, arising through disintegration of upper cortex; over bark; infrequent ..... *Hypogymnia bitteri*



**1b** Soredia absent ..... 7

**7a** Upper surface dark brownish, usually bearing lobules and/or isidia(←); over soil and mossy rock; alpine, mostly northern ..... *Hypogymnia subobscura*

**7b** Upper surface pale brownish or more often whitish grey; lobules, if present, along margins; isidia absent; over bark and wood; variously distributed ..... 8

**8a** Medullary ceiling distinctly dark almost throughout ..... 9

**9a** Upper surface more or less plane or at least not strongly convex, never swollen, often weakly concave near lobe tips; lobe tips rarely perforate; (basally constricted) marginal lobules absent; medulla PD-; essentially inland ..... *Hypogymnia metaphysodes*

**9b** Upper surface distinctly and strongly convex throughout (including near lobe tips), also often swollen; basally constricted marginal lobules present or absent ..... 10

**10a** Lobes usually ascending; lobe tips mostly tapered and broadly pointed; perforations absent or restricted to lower surface; strictly coastal ..... 11

**11a** Lobes evenly fork-branching/dichotomous(←) or at least not strongly and irregularly side-branched; medulla PD-; common ..... *Hypogymnia inactiva*

**11b** Lobes strongly and irregularly side-branched(←); medulla PD+ yellow becoming bright orange; rare ..... *Hypogymnia heterophylla*

**10b** Lobes appressed or pendulous; lobe tips mostly hemispherical, perforate or not; variously distributed ..... 12

**12a** Basally constricted marginal lobules sparse or more often absent; medulla PD- or PD+ pale yellow ..... 13

**13a** Upper surface smooth or weakly wrinkled toward thallus centre; lobes short or long, longest usually somewhat “knobby”(←) (i.e., swollen at regular intervals); medulla PD-; mostly coastal ..... *Hypogymnia apinnata*

**13b** Upper surface strongly wrinkled toward thallus centre(←); lobes generally short, never knobby; medulla PD+ pale yellow throughout; inland ..... *Hypogymnia rugosa*

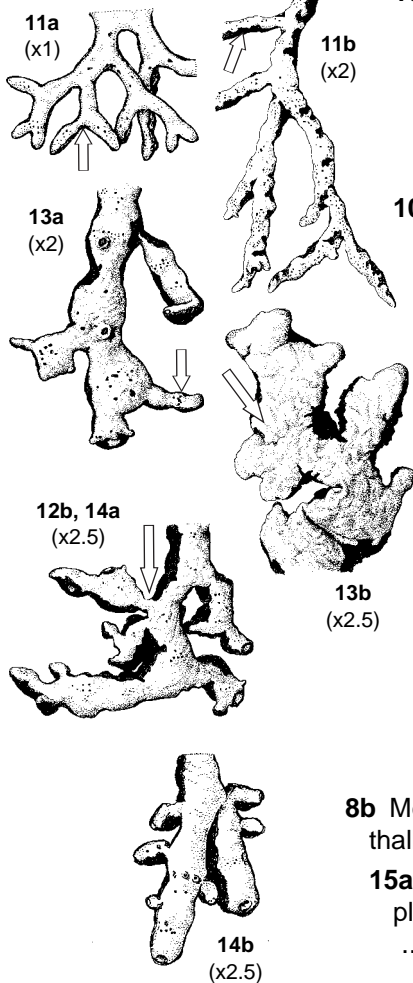
**12b** Basally constricted marginal lobules more or less abundant(←); medulla PD- or PD+ yellow becoming bright orange ..... 14

**14a** Lobes averaging to 1.5–2.5 (–3.5) mm across, never knobby; medulla PD-; mostly inland ..... *Hypogymnia occidentalis*

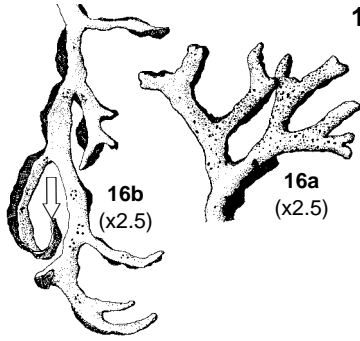
**14b** Lobes averaging to 3–4 mm across, longest ones often weakly knobby; medulla PD+ bright yellow becoming orange, or occasionally PD-; essentially coastal ..... *Hypogymnia enteromorpha*

**8b** Medullary ceiling predominantly white (or at least not distinctly dark: check toward thallus centre) ..... 15

**15a** Lobes closely appressed to substrate, usually short and crowded; upper surface plane or concave at lobe tips, never strongly convex; medulla PD-; inland ..... *Hypogymnia metaphysodes* (see lead 9a)







- 15b** Lobes raised or at least not closely appressed, elongate; upper surface sometimes strongly convex at lobe tips; medulla PD+ yellow becoming bright orange; distribution various ..... 16
- 16a** Lobes typically raised and rather stiff; upper surface often brownish; lower surface not much expanded, scarcely visible from above; widespread ..... *Hypogymnia imshaugii*
- 16b** Lobes distinctly pendent (except turned up at tips(←)); upper surface whitish; lower surface often much expanded and clearly visible from above; essentially coastal ..... *Hypogymnia duplicata*

***Hypogymnia apinnata* Goward & McCune**

Beaded bone

Habitat/Range: Common over trees, especially conifers, in coastal forests at lower elevations; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

***Hypogymnia austerodes* (Nyl.) Räsänen**

Powdered bone

Habitat/Range: Common over trees, especially conifers, in open inland forests, also infrequent over mossy rock in alpine localities; circumpolar, S to MX.

Reactions: Cortex K+ yellow; medulla KC+ red.

Contents: Atranorin, oxyphysodic acid (and physodic acid).

***Hypogymnia bitteri* (Lyngé) Ahti**

Powdered bone

Habitat/Range: Frequent over conifers in open forests in boreal regions, infrequent in intermontane; circumpolar, S to MX.

Reactions: Cortex K+ yellow; medulla KC+ red.

Contents: Atranorin and physodic acid.

***Hypogymnia duplicata* (Sm. ex Ach.) Rass.**

Tickertape bone

Habitat/Range: Common over trees, especially conifers, in open coastal forests at lower elevations; western N Am, N to AK, S to OR.

Reactions: Cortex K+ yellow; medulla PD+ orange.

Contents: Atranorin, diffractaic, physodalic and protocetraric acids.

***Hypogymnia enteromorpha* (Ach.) Nyl.**

Beaded bone

Habitat/Range: Frequent over trees, especially conifers, in coastal forests at lower elevations, also rare in humid intermontane (ICH zone); western N Am – probably eastern Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla PD+ orange.

Contents: Atranorin, physodalic, physodic and protocetraric acids (and diffractaic acid).

***Hypogymnia heterophylla* Pike**

Map 40

Seaside bone

Habitat/Range: Infrequent over conifers, especially shore pine (*Pinus contorta*), in open coastal localities, western N Am, N to BC, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD+ yellow becoming red.

Contents: Atranorin, physodalic acid, physodic acid and protocetraric acid.

***Hypogymnia imshaugii* Krog**

Forking bone (forking tube)

Habitat/Range: Common over trees, especially conifers, in open forests throughout, except rare (absent?) in hypermaritime localities and in boreal regions; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD+ red.

Contents: Atranorin, physodalic and protocetraric acids (and physodic and diffractaic acids).

Notes: A PD- form of *H. "imshaugii"* has been detected in Montana and may occur also in adjacent parts of British Columbia. This may represent a distinct taxon. The type locality of *H. imshaugii* is Mt. Rabbit, near Tulameen, B.C.***Hypogymnia inactiva* (Krog) Ohlsson**

Forking bone

Habitat/Range: Frequent over trees, especially conifers, in open coastal forests; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ red.

Contents: Atranorin and physodic acid.

***Hypogymnia metaphysodes* (Asah.) Rass.**

Deflated bone

Habitat/Range: Frequent over trees, especially conifers, in inland forests, rare in open maritime forests; western N Am – eastern Eurasia, N to AK, S to WA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD- (occasionally PD+ yellow).

Contents: Atranorin, physodic acid and (physodalic and protocetraric acids).

Notes: The material here assigned to *H. metaphysodes* is apparently heterogeneous and probably represents two distinct species. Further work is in progress.***Hypogymnia occidentalis* Pike**

Lattice bone

Habitat/Range: Frequent over trees in open to shady intermontane (ICH zone) forests; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla KC+ red.

Contents: Atranorin and physodic acid.

***Hypogymnia oceanica* Goward**

Lattice bone

Habitat/Range: Infrequent over conifers in open to shady coastal forests at lower elevations, rare in humid intermontane forests (ICH zone); western N Am, N to AK, S to WA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD+ orange.

Contents: Atranorin, physodic, physodalic and protocetraric acids.

Notes: The type locality is near Sutton Pass on southern Vancouver Island, B.C.

***Hypogymnia physodes* (L.) Nyl.**

Monk's-hood (dark crottle, heather rags, hooded tube, puffed shield)

Habitat/Range: Common over trees and rare over acid rock throughout; circumpolar, S (at least) to CA.

Reactions: Cortex K+ yellow; medulla KC+ rose, PD+ orange.

Contents: Atranorin, physodalic, physodic and protocetraric acids.

***Hypogymnia rugosa* (Merr.) Pike ex Hale**

Puckered bone

Habitat/Range: Infrequent over conifers in open coastal and especially intermontane forests, usually at upper elevations (ESSF zone); western N Am, N to BC, S to WA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD+ slowly pale yellow.

Contents: Atranorin, hypoprotocetraric acid (and physodic acid).

Notes: The type locality is MacLeod Lake, north of Prince George, B.C.

**Hypogymnia subobscura (Vainio) Poelt**

Map 41

Heath bone

Habitat/Range: Infrequent over mossy soil in windblown northern alpine localities, especially in north; circumpolar, S to CO.

Reactions: Cortex K+ yellow (check pale areas); medulla KC+ red.

Contents: Atranorin, physodic and vittatolic acids (and paraphysodic acid).

**Hypogymnia tubulosa (Schaerer) Hav.**

Dog bone

Habitat/Range: Frequent over trees in open forests throughout; incompletely circumpolar, S (at least) to CA.

Reactions: Cortex K+ yellow; medulla KC+ red, PD- (except soralia PD+ slowly yellow).

Contents: Atranorin, oxyphysodic, paraphysodic and physodic acids.

**Hypogymnia vittata (Ach.) Gas.**

Monk's-hood

Habitat/Range: Infrequent over conifers and mossy rock in humid coastal and intermontane forests; incompletely circumpolar, S to OR.

Reactions: Cortex K+ yellow; medulla KC+ red.

Contents: Atranorin, oxyphysodic and physodic acids (and vittatolic acid).

**HYPOTRACHYNA****Hypotrachyna (Vainio) Hale****The Loop Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, **sorediate** (ours), lobes loosely appressed to **loosely attached**, short to elongate, averaging to (0.7–) 1–5 mm wide, thin. Upper surface **greenish or greyish**, somewhat shiny. **Lower surface black**, shiny, bearing **forked rhizines**. Medulla white. Photobiont green.

Apothecia unknown in B.C. material.

Over bark and rock.

Reference: Hale (1975).

Common Name: Describes the conspicuously rounded axils of the lobes.

Notes: *Hypotrachyna* is primarily a tropical genus consisting of about 80 species worldwide. Twenty-three of these occur in North America, though only two species are known in B.C.

**Key to *Hypotrachyna* and Similar Lichens**

**1a** Upper surface distinctly yellowish green; lobes mostly elongate-linear; cilia absent over margins ..... 2

**2a** Lobes loosely appressed to semi-erect; rhizines strongly fork-branched(←); coastal; medulla K+ yellow becoming reddish ..... ***Hypotrachyna sinuosa***

**2b** Lobes strongly appressed; rhizines rarely or not at all fork-branched; distribution various; medulla K+ yellow or K- ..... 3

**3a** Over rock; upper surface generally somewhat shiny throughout; coastal; medulla K+ yellow ..... ***Xanthoparmelia mougeotii***

**3b** Over bark (very rare over rock); upper surface generally dull towards thallus centre; widespread; medulla K- ..... ***Parmeliopsis ambigua***

**1b** Upper surface greyish, bluish or if somewhat greenish, then not yellowish green; lobes proportionately rather short and broad; cilia sometimes present at margins ..... 4

**4a** Soralia broad, diffuse, loosely packed with soredia(←); cilia absent or very sparse, less than 1 mm long; rhizines progressively better developed toward thallus centre; medulla C+ reddish ..... ***Hypotrachyna revoluta***

**4b** Soralia narrow or head-shaped, sharply delimited, densely packed with soredia(←); most cilia more than 2 mm long; rhizines often abruptly longer toward thallus centre; medulla C- ..... ***Parmotrema***

***Hypotrachyna revoluta* (Flörke) Hale**

(Syn. *Parmelia revoluta* Flörke)

Grey loop

Habitat/Range: Frequent over trees and acid rock in open to somewhat sheltered hypermaritime sites; incompletely circumpolar, N to BC, S to WA.

Reactions: Cortex K+ yellow; medulla C+ reddish, KC+ reddish.

Contents: Atranorin and gyrophoric acid.

***Hypotrachyna sinuosa* (Sm.) Hale**

(Syn. *Parmelia sinuosa* (Sm.) Ach.)

Green loop

Habitat/Range: Frequent over trees and shrubs in open coastal forests at lower elevations, especially in hypermaritime localities; tentatively circumpolar, N to AK, S to MX.

Reactions: Medulla K+ yellow becoming reddish, PD+ orange.

Contents: Salazinic and usnic acids (and norstictic and stictic acids).

**IMSHAUGIA**

***Imshaugia* S. F. Meyer**

**The Starburst Lichens**

**Small** to medium **stratified foliose lichens**, corticate above and below, **isidiate** (ours), lobes **closely appressed**, elongate, averaging to 1–2 mm wide, thin. Upper surface **whitish, shiny**. Lower surface whitish to pale brown, bearing short, simple rhizines. Medulla white. Photobiont green.

Apothecia located over upper surface, disc brownish; spores simple, **ellipsoid**, colourless, 8 per ascus.

Over conifer bark.

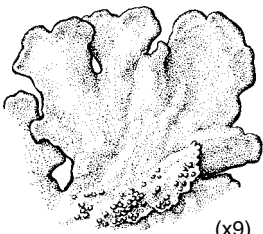
References: Meyer (1982, 1985).

Common Name: Describes the centrifugal growth pattern characteristic of the species.

Notes: *Imshaugia* is a temperate-boreal genus with two species worldwide. Both occur in North America, though only one occurs in B.C. *Imshaugia* was formerly treated within *Parmeliopsis*. For points of distinction with similar species in other genera, see the key under that genus.

***Imshaugia aleurites* (Ach.) S. F. Meyer**

(Syn. *Parmeliopsis aleurites* (Ach.) Nyl.)



(x9)

Salted starburst (grizzly shield)

Habitat/Range: Infrequent over trees, especially pines, in open inland localities at lower elevations, also rare over pines in coastal bogs; circumpolar, N to AK, S to NM.

Reactions: Cortex K+ yellow; medulla PD+ yellow becoming reddish.

Contents: Atranorin and thamnolic acid.

**KOERBERIA**

***Koerberia* Massal.**

**The Brownette Lichens**

**Minute stratified foliose lichens**, corticate above and below, isidiate or not, lobes **closely appressed** or occasionally in part loosely appressed, **elongate**, averaging to **0.1–0.2 mm wide**, thin. Upper surface **dark olive-brown**, somewhat shiny, smooth to longitudinally striate. Lower surface pale, bearing scattered, short, simple rhizines. Medulla white. **Photobiont blue-green**.

Apothecia unknown in B.C. material.

**Over rock** (ours).

Reference: Henssen (1963b).

Common Name: Stresses both the miniature size and the superficial resemblance to certain species of “brown” lichens (i.e., *Melanelia* and *Neofuscelia*).

Notes: *Koerberia* consists of two species worldwide, both occur in North America, though only one is known from B.C. For points of distinction with similar species, see the key under *Placynthium*. Chemistry is of no diagnostic value in this genus.

**Koerberia sonomensis (Tuck.) Henssen**

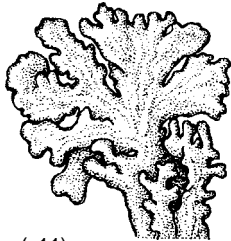
Map 42

(Syn. *Pannaria sonomensis* Tuck.)

Brownette

Habitat/Range: Infrequent over acid rock in open coastal sites, especially near ocean, probably restricted in BC to CDF zone; western N Am – western Eurasia, N to BC, S to CA.

Notes: *Koerberia sonomensis* is known to occur as far east as Montana; it may yet be found in the intermontane area of southern British Columbia.



(x11)

**LASALLIA**

**Lasallia Mérat**

**The Rocktripe Lichens**

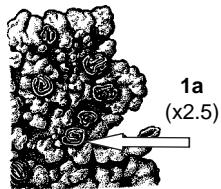
**Medium to large stratified foliose lichens**, corticate above and below, lacking isidia (ours), lobes **attached to substrate by a more or less central holdfast**, usually **rotund**, rather thin, thallus averaging to 6–15 (–25) cm across. Upper surface **dark brown, blistered/pustulate**. **Lower surface black** (ours), papillate, lacking rhizines. Photobiont green.

Apothecia located over upper surface, disc black; spores multi-celled, ellipsoid, brownish, 1 (rarely 2) per ascus.

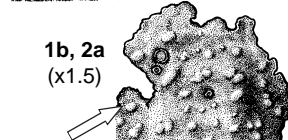
References: Llano (1950); Posner et al. (1991).

Common Name: Traditional, reflecting the strict occurrence of the species over rock and the apparent use of a species of the related genus *Umbilicaria* as food during famine.

Notes: *Lasallia* is primarily a temperate genus; of the eight species described worldwide, three occur in North America and one in B.C.



1a  
(x2.5)



1b, 2a  
(x1.5)

**Key to Lasallia and Similar Lichens**

- 1a Upper surface densely packed with blisters/pustules and ridges; apothecial disc concentrically fissured(←) ..... ***Umbilicaria hyperborea***
- 1b Upper surface bearing well-spaced, discrete blisters/pustules(←), ridges absent; apothecial disc plane ..... 2
- 2a Lower surface black, distinctly textured ..... ***Lasallia pensylvanica***
- 2b Lower surface pale brown, not at all textured ..... [***Lasallia papulosa***] (see ***Lasallia pensylvanica***)

**Lasallia pensylvanica (Hoffm.) Llano**

Map 43

(Syn. *Umbilicaria pensylvanica* Hoffm.)

Blistered rocktripe (Pennsylvania rocktripe)

Habitat/Range: Rare (but locally abundant) over vertical acid rock in open intermontane boulderbeds; western N Am – eastern N Am – eastern Eurasia, S to MX.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Gyrophoric and ovoidic acids, with traces of lecanoric and hiascic acids (umbilicinic acid).

Notes: *Lasallia papulosa* is also reported for B.C., though the record is questionable. See the remarks under "Excluded Species."

## LEIODERMA

**Leioderma Nyl.****The Treepelt Lichens**

**Small stratified foliose lichens**, corticate above, **noncorticate below**, **sorediate** (ours), lobes loosely attached, rotund (ours), averaging to 3 mm wide, somewhat thick. Upper surface greyish, **bearing minute, appressed woolly hairs**. Lower surface whitish, **lacking veins**, bearing short to rather long rhizines restricted to vicinity of margins or scattered throughout. Medulla white. **Photobiont blue-green**.

Apothecia unknown in B.C. material.

**Over conifer branches.**

Reference: Galloway and Jørgensen (1987).

Common Name: Reflects the strict occurrence over bark and the superficial resemblance to certain pelt lichens (*Peltigera*).

Notes: *Leioderma* is primarily a subtropical to temperate genus of the southern hemisphere. It consists of five species, only one of which occurs in North America. For points of distinction with similar genera, see the keys under *Pannaria* and *Peltigera*.

**Leioderma sorediatum D. Galloway & P.M. Jørg.**

Map 44



(x6)

Treepelt

Habitat/Range: Rare over mossy conifer branches in open hypermaritime forests; western N Am – eastern Eurasia.

Reactions: All spot tests negative.

Contents: (Ursolic acid.)

Notes: This essentially South Pacific lichen is known in only two localities in North America — Vancouver Island and coastal Oregon.

## LEPTOCHIDIUM

**Leptochidium Choisy****The Tarpaper Lichen**

A small to medium **nonstratified foliose lichen (gelatinous when wet)**, **corticate above and below**, **isidiate**, lobes loosely attached, 3–5 mm wide, thick. Upper surface **blackish brown**, dull, bearing **minute white hairs on margins**. Lower surface dark, **white-tomentose**, rhizines absent. Medulla absent. **Photobiont blue-green**.

Apothecia located over upper surface, disc orangish brown; spores 2-celled, ellipsoid to pointed-ellipsoid, colourless, 8 per ascus.

Over mossy soil.

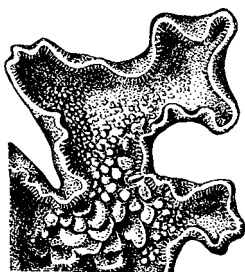
Reference: Thomson (1984).

Common Name: Emphasizes the typically dark upper surface, as well as the unstratified thallus, in which a pale medulla is lacking.

Notes: *Leptochidium* is a monotypic genus. For points of distinction with similar lichens, see the key under *Collema*.

**Leptochidium albociliatum (Desmaz.) M. Choisy**

(Syn. *Polychidium albociliatum* (Desmaz.) Zahlbr.)



(x8)

Whiskered tarpaper

Habitat/Range: Frequent over (mossy) rock or occasionally over soil in open or somewhat sheltered sites at lower elevations throughout, except absent from boreal regions; western N Am – eastern N Am – western Eurasia, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

LEPTOGIUM

**Leptogium (Ach.) Gray**

**The Vinyl Lichens**

Minute to medium *nonstratified foliose or occasionally fruticose lichens (gelatinous when wet), corticate above*, usually corticate below, isidiate or not, lobes closely appressed to semi-erect or erect, averaging to 0.2–5 (–10) mm wide, usually thin. Upper surface *bluish grey, greyish brown or dark brown*, often *somewhat shiny*. Lower surface dark, lacking rhizines, though sometimes white-tomentose. Medulla absent. *Photobiont blue-green*. Apothecia located over upper surface or at margins, with a thalline margin, disc reddish brown to black; spores multi-celled, ellipsoid to spindle-shaped or acicular, colourless, (4–) 8 per ascus.

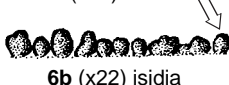
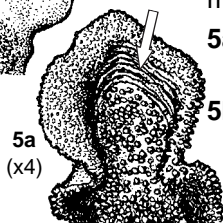
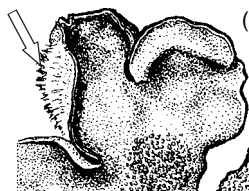
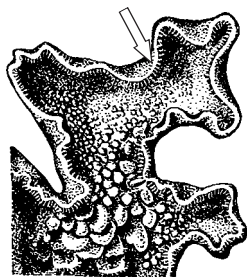
Over bark, earth and rock.

References: Sierk (1964); Jørgensen (1975); Jørgensen and James (1983); Jørgensen and Goward (1994).

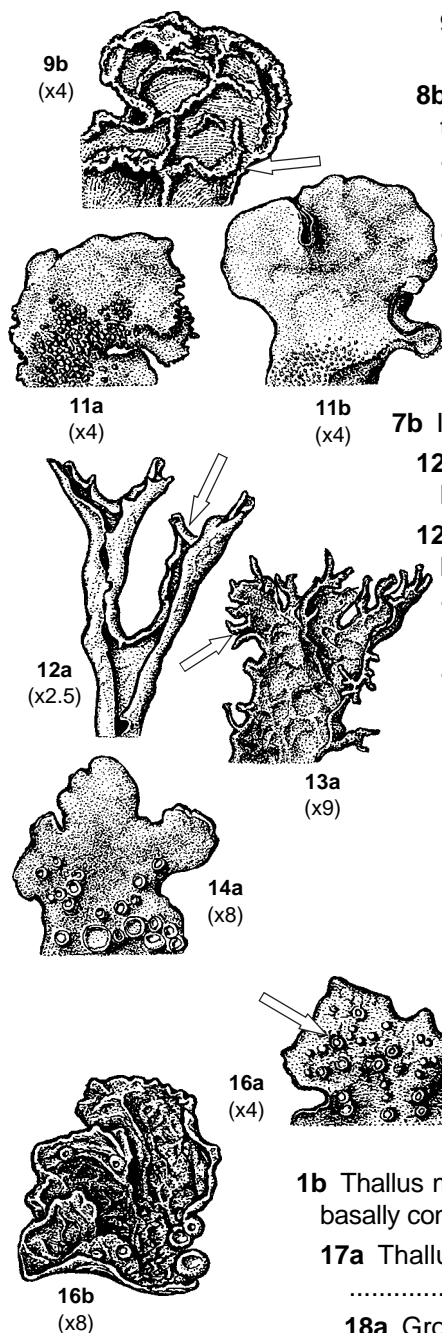
Common Name: Conveys the dark, often somewhat shiny lobes characteristic of this genus.

Notes: *Leptogium* is a cosmopolitan genus comprising more than 150 species, most of which are restricted to tropical and subtropical regions. Approximately 50 species occur in North America, with 16 of these reported for B.C. The western species need taxonomic revision. Chemistry is of no diagnostic value and is omitted in the following species accounts.

**Key to *Leptogium* and Similar Lichens**

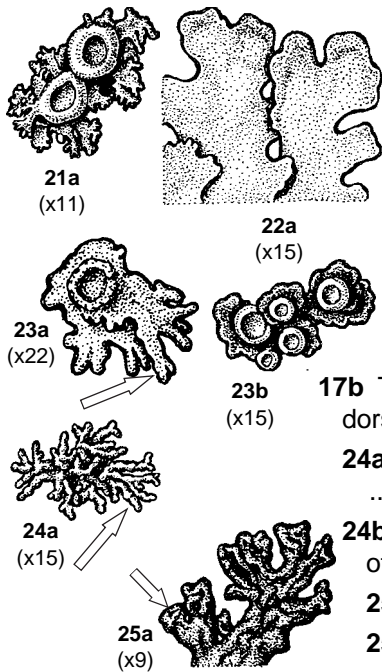


- 1a Thallus small to medium but not minute; lobes averaging to more than 1.5 mm wide, always dorsiventral; isidia present or absent (Note: all lichens having a distinctly wrinkled upper surface key here) ..... 2
- 2a Lobe margins and/or isidia bearing minute, erect white hairs(←) ..... *Leptochidium albociliatum*
- 2b Lobe margins naked; isidia, if present, naked (upper surface, however, occasionally hairy in *Leptogium burnetiae*) ..... 3
- 3a Lobes narrow, proportionately elongate, more or less erect and bearing distinctly swollen tips; lobe tips averaging to 0.4 mm thick when moist, often strongly collapsed-wrinkled when dry(←); over soil in arid inland localities ..... *Leptogium schraderi*
- 3b Lobes broad or, if elongate, then never both erect and terminating in distinctly swollen tips; lobe tips averaging to less than 0.2 mm thick when moist, seldom strongly wrinkled when dry; habitat and distribution various ..... 4
- 4a Lower surface densely white-woolly throughout(←) (except often naked along lobe margins) ..... 5
- 5a Upper surface at least in part minutely wrinkled(←); isidia strongly collapsed-dimpled at tips; coastal ..... *Leptogium furfuraceum*
- 5b Upper surface smooth or rarely in part bearing few scattered wrinkles; isidia not at all dimpled at tips; distribution various ..... 6
- 6a Upper surface distinctly greyish (check sheltered lobes), sometimes in part covered in short whitish hairs; mature isidia cylindrical or branched/coralloid(←) ..... *Leptogium burnetiae*
- 6b Upper surface olive brownish to blackish, naked; mature isidia usually (but not always) remaining globose(←) ..... *Leptogium saturninum*
- 4b Lower surface naked or bearing scattered tufts of hair at points of attachment, never distinctly woolly ..... 7
- 7a Isidia and/or lobules present over upper surface ..... 8
- 8a Thallus distinctly thick, averaging to more than 0.15 mm thick when moist; strictly coastal ..... 9
- 9a Upper surface finely wrinkled; isidia coarse, lobulate, scattered(←) ..... *Leptogium platynum*



- 9b** Upper surface very strongly ridged-wrinkled; isidia fine, granular, often arranged in lines along ridges and lobe margins(←) ..... *Leptogium brebissonii*
- 8b** Thallus distinctly thin, averaging to less than 0.1 mm thick when moist; distribution various ..... 10
- 10a** Isidia partly flattened and lobulate at maturity .....  
..... *Leptogium californicum* aggregate
- 10b** Isidia cylindrical throughout ..... 11
- 11a** Upper surface partly brownish; over (mossy) rock; widespread in rather arid localities; frequent ..... *Leptogium subaridum*
- 11b** Upper surface bluish grey throughout; over trees (rare over mossy rock); restricted to humid localities; rare ..... *Leptogium cyanescens*
- 7b** Isidia and lobules absent over upper surface ..... 12
- 12a** Lobes elongate, margins distinctly turned under and tapering to more or less horn-shaped tip(←) ..... *Leptogium corniculatum*
- 12b** Lobes short or elongate, margins not at all turned under; lobe tips not at all horn-shaped ..... 13
- 13a** Upper surface bearing strongly raised wrinkles; lobe margins strongly lobulate to finely divided-isidiate(←) ..... *Leptogium lichenoides*
- 13b** Upper surface only weakly wrinkled; lobe margins even to weakly lobulate ..... 14
- 14a** Growing directly over maritime rocks above intertidal zone; cellular cortex absent ..... *Collema fecundum*
- 14b** Ecology not as above; cellular cortex present ..... 15
- 15a** Lobes distinctly elongate; upper surface mostly smooth; apothecia rare; over mossy rock in hypermaritime sites .....  
..... *Leptogium californicum* aggregate
- 15b** Lobes short or elongate; upper surface wrinkled or smooth; apothecia usually abundant; habitat and distribution various ..... 16
- 16a** Over bark or among mosses over bark; apothecia crowded(←), somewhat sunken; spores 4 per ascus; coastal ..... *Leptogium polycarpon*
- 16b** Over soil or mossy rock; apothecia scattered, not sunken; spores 8 per ascus; widespread ..... *Leptogium gelatinosum*
- 1b** Thallus minute; lobes averaging to less than 1 mm wide, occasionally cylindrical; true (i.e., basally constricted) isidia absent (Exception: isidia occasionally present in *L. schraderi*) ... 17
- 17a** Thallus entirely or largely consisting of dorsiventral lobes (check basal primary lobes) ..... 18
- 18a** Growing over soil at base of *Peltigera venosa* .....  
..... (blue-green phototype of) *Peltigera venosa*
- 18b** Not associated with *Peltigera venosa* ..... 19
- 19a** Upper surface usually somewhat wrinkled; thallus consisting of non-cellular interior surrounded by cellular outer cortex ..... 20
- 20a** Lobe margins strongly lobulate to finely divided-isidiate .....  
..... *Leptogium lichenoides* (see lead 13a)
- 20b** Lobe margins even to weakly lobulate .....  
..... *Leptogium gelatinosum* (see lead 16b)
- 19b** Upper surface sometimes angular, but generally not at all wrinkled; thallus cellular (paraplectenchymatous) throughout ..... 21





- 21a Thallus mostly erect-cylindrical ..... *Leptogium tenuissimum* aggregate
- 21b Thallus flattened/dorsiventral more or less throughout ..... 22
- 22a Growing directly over rock in or near running water ..... [*Leptogium rivale*]
- 22b Over trees, moss or soil ..... 23
- 23a Lobes distinctly elongate(←), appressed throughout (except occasionally weakly ascending near lobe tips), averaging to less than 0.1 mm wide; over decaying wood or moss ..... *Leptogium subtile*
- 23b Lobes short to elongate, mostly somewhat ascending and overlapping, often averaging to more than 0.1 mm wide; over soil or bark .....  
..... *Leptogium minutissimum*
- 17b Thallus entirely or at least primarily erect-cylindrical (primary lobes may be partly dorsiventral) ..... 24
- 24a Over bark in humid climates; terminal lobes distinctly constricted at intervals(←) ....  
..... *Leptogium teretiusculum*
- 24b Over soil (also rarely over bases of trees), often in semi-arid localities; terminal lobes often somewhat contorted, but never distinctly constricted at intervals ..... 25
- 25a Lobe tips in part strongly wrinkled(←) ..... *Leptogium schraderi*
- 25b Lobe tips not wrinkled ..... *Leptogium tenuissimum* aggregate (see lead 21a)

***Leptogium brebissonii* Mont.**

Map 45

Jellied vinyl

Habitat/Range: Rare over mossy trees and shrubs in open hypermaritime forests at lower elevations; western N Am – western Eurasia.

Notes: In North America, *L. brebissonii* is known to occur only in B.C. (Goward et al. 1994a).

***Leptogium burnetiae* Dodge**

Map 46

Peppered vinyl

Habitat/Range: Infrequent over trees and rare over mossy outcrops in sheltered intermontane forests, also rare in maritime localities; incompletely circumpolar, N to AK, S to OR and NM.

Notes: Specimens having minute white hairs over the upper surface can be referred to var. *hirsutum* (Sierk) P.M. Jørg.

***Leptogium californicum* Tuck.**

Peppered vinyl

Habitat/Range: Infrequent over (mossy) rock in open, dry maritime (CDF zone) and intermontane localities; western N Am, N to AK, S to CA.

Notes: As defined here, *L. californicum* unites both isidiate and nonisidiate forms. It also appears to freely intergrade with *L. lichenoides* which is typically a much more wrinkled and lacerate species. Further work is needed.

***Leptogium corniculatum* (Hoffm.) Minks**

(Syn. *Leptogium palmatum* (Hudson) Mont. in Webb & Berth.)

Antlered vinyl

Habitat/Range: Common over soil, moss and thin soil over rock in open coastal sites at lower elevations; western N Am – western Eurasia – eastern Eurasia, N to AK, S to CA.

***Leptogium cyanescens* (Rabenh.) Körber**

Map 47

Blue vinyl

Habitat/Range: Rare over trees at lower elevations in sheltered humid, intermontane forests; incompletely circumpolar, N to AK, S to CO.

Notes: Although Sierk (1964) claims that *L. cyanescens* “is the most common species of *Leptogium* in North America,” it is obviously very rare in B.C.

***Leptogium furfuraceum* (Harm.) Sierk**

Map 48

Peppered vinyl

Habitat/Range: Infrequent over deciduous trees, especially Garry oak, in open maritime (CDF zone) and intermontane (BG, PP zones) localities; western N Am – western Eurasia, S to CA.

***Leptogium gelatinosum* (With.) Laundon**(Syn. *Leptogium sinuatum* (Hudson) Massal.)

Petalled vinyl

Habitat/Range: Frequent over mossy outcrops in open to somewhat sheltered sites throughout; circumpolar, N to AK, S to CA and NM.

Notes: Some specimens of *L. gelatinosum* have tattered lobes and may be difficult to distinguish from *L. lichenoides*.

***Leptogium lichenoides* (L.) Zahlbr.**

Tattered vinyl (brown cushion lichen)

Habitat/Range: Frequent over soil and especially over mossy rock outcrops at lower elevations throughout, also rare over bases of trees; circumpolar, N to AK, S to CA.

Notes: See comments under *L. californicum*.

***Leptogium minutissimum* auct., non (Flörke) Fr.**

Lilliput vinyl (mackerel lichen)

Habitat/Range: Apparently rare over (mossy) soil in open inland localities at lower elevations; circumpolar, N to AK, S to CA.

***Leptogium platynum* (Tuck.) Herre**

Map 49

Butterfly vinyl

Habitat/Range: Infrequent over mossy rock in open coastal forests, especially in CDF zone; western N Am, S to CA.

Notes: The local material differs from typical *L. platynum* in being thinner than average (i.e., less than 0.2 mm thick) and consistently bearing lobulate isidia over the upper surface.

***Leptogium polycarpon* P.M. Jørg. & Goward**

Map 50

Peacock vinyl

Habitat/Range: Rare over (deciduous) trees in sheltered coastal forests at lower elevations; apparently western N Am, N to BC, S to OR.

**[*Leptogium rivale* Tuck.]**

Streamside vinyl

Habitat/Range: Over rock in or close to water; western N Am, N to OR, S to CA and CO.

Notes: *Leptogium rivale* has not been found in B.C., but is expected to occur. The species does occur in the Cascade Mountains of Oregon.

***Leptogium saturninum* (Dickson) Nyl.**

Peppered vinyl (mouse lichen)

Habitat/Range: Infrequent over trees and mossy rock in sheltered inland and maritime localities, especially at lower elevations; circumpolar, N to AK, S to CA and NM.

***Leptogium schraderi* (Ach.) Nyl.**

Map 51

Wrinkled vinyl

Habitat/Range: Rare (possibly overlooked) over soil in arid intermontane localities (BG zone) at lower elevations; apparently western N Am – western Eurasia.

Notes: The local material might be referred to *L. turgidum* Nyl., though according to P.M. Jørgensen (Bergen, pers. comm., 1993) that species appears to be merely a growth form of *L. schraderi*.

***Leptogium subaridum* P.M. Jørg. & Goward**

Pincushion vinyl

Habitat/Range: Infrequent over soil and mossy rock in open sites in dry intermontane localities at lower elevations, also rare in similar sites in CDF zone; apparently western N Am, N to BC, S to OR.

**Leptogium subtile (Schrad.) Torss.**

Map 52

(Syn. *Leptogium minutissimum* (Flörke) Fr.)

Appressed vinyl

Habitat/Range: Rare over decaying bark and mossy rock in humid intermontane localities (ICH zone) at lower elevations; apparently western N Am – western Eurasia.

Notes: *Leptogium subtile* was subsumed under *L. tenuissimum* by Sierk (1965), though other authors (e.g., Santesson 1984) recognize it as a distinct species.

**Leptogium tenuissimum (Wallr.) Körber auct.**

Lilliput vinyl (brown turf lichen)

Habitat/Range: Infrequent over trees and mossy soil in open localities at lower elevations throughout; circumpolar, N to AK, S to CA.

Notes: The material assigned to *L. tenuissimum* is heterogeneous and may represent two or more different taxa. *Leptogium tenuissimum* itself may not occur in B.C.

**Leptogium teretiusculum (Wallr.) Arnold**

Shrubby vinyl

Habitat/Range: Rare over trees (and soil?) in humid forests at lower elevations throughout, except probably absent in boreal regions; probably incompletely circumpolar, N to BC, S to MT.

Notes: The local material assigned to this species may be heterogeneous.

**LOBARIA**

**Lobaria Schreber**

**The Lung Lichens**

Medium to **large stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, sometimes bearing internal cephalodia, lobes **loosely attached, short to subrotund** or occasionally elongate, averaging to (0.6–) 1–20 (–30) mm wide, thin. Upper surface greyish, greenish or brownish, shiny to dull, often net-ridged/reticulate. **Lower surface tomentose, tomentum often interrupted by white naked patches.** Medulla white. **Photobiont green and/or blue-green.**

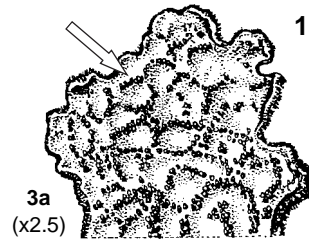
Apothecia located near lobe margins, disc usually reddish brown; spores (2–) multi-celled, spindle-shaped to needlelike, usually colourless when mature, 8 per ascus.

**Over trees**, rarely over rock.

References: Yoshimura (1971); Jordan (1973).

Common Name: Traditional, based on the resemblance of certain species to lung tissue.

Notes: *Lobaria* is a cosmopolitan genus consisting of approximately 80 species. Eleven of these occur in North America and six in B.C.



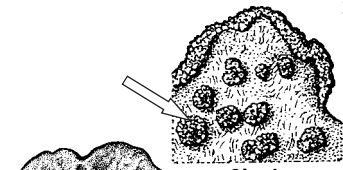
**1a** Photobiont a dark blue-green cyanobacterium; upper surface usually greyish or brownish (except pale greenish in *L. scrobiculata*, which has textured/scabrid upper surface) ..... 2

**2a** Isidia and soredia absent; over mossy rocks; coastal ... [*Lobaria pseudopulmonaria*]

**2b** Isidia or soredia present; ecology and distribution various ..... 3

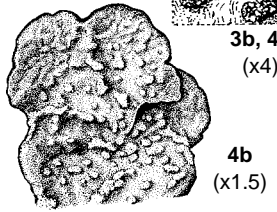
**3a** Isidia present(←); soredia absent; upper surface dark, usually distinctly shiny, not at all textured/scabrid ..... *Lobaria retigera*

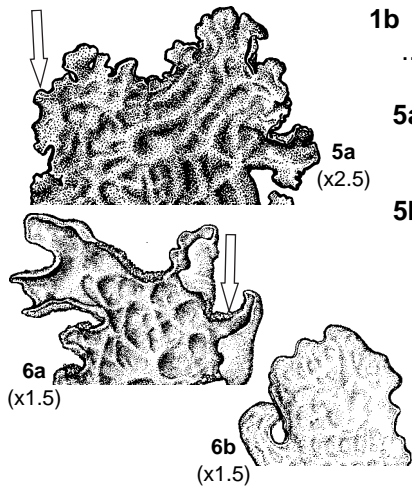
**3b** Isidia absent; soredia present(←); upper surface usually pale, dull, often textured/scabrid ..... 4



**4a** Upper surface greyish or at least not obviously greenish, often (but not always) covered in minute erect hairs, K+ strong yellow; medulla KC- ..... *Lobaria hallii*

**4b** Upper surface pale milky greenish (rarely greyish), hairless or at least not strongly covered in minute erect hairs, K- (or occasionally K+ pale yellow); medulla KC+ reddish ..... *Lobaria scrobiculata*





- 1b Photobiont a grass-green alga; upper surface usually greenish, never textured/scabrid ..... 5
- 5a Upper surface distinctly yellowish green; lobe margins more or less fringed with lobules(←); essentially coastal ..... **Lobaria oregana**
- 5b Upper surface bluish green or at least not distinctly yellowish green; lobe margins not at all lobulate; widespread in humid localities ..... 6
- 6a Isidia and/or soredia present(←); medulla K+ yellow or orange ..... **Lobaria pulmonaria**
- 6b Isidia and soredia absent; medulla K- ..... **Lobaria linita**

**Lobaria hallii (Tuck.) Zahlbr.**

Iron lung

Habitat/Range: Infrequent over conifers in open to somewhat shady forests at lower elevations in humid regions throughout, except possibly absent in hypermaritime localities; western N Am – western Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Various unknown substances.

**Lobaria linita (Ach.) Rabenh.**

Cabbage lung (veined lichen)

Habitat/Range: Frequent over mossy rocks in snowy districts at higher elevations throughout, and common in coastal localities over bases of conifers in humid old-growth forests at lower elevations; incompletely circumpolar, S to OR.

Reactions: All spot tests negative.

Contents: Methyl evernate, methyl gyrophorate, tenuiorin, and various unknown substances (Maass 1975).

Notes: Two varieties of dubious taxonomic status occur in B.C.:

- 1a Apothecia absent; over mossy rocks at higher elevations ..... var. **linita**
- 1b Apothecia present; over bases of conifers at lower elevations ..... var. **tenuior (Hue) Asah.**

**Lobaria oregana (Tuck.) Müll. Arg.**

Lettuce lung

Habitat/Range: Frequent over conifers in open to somewhat shady coastal old-growth forests, usually most abundant at higher elevations; western N Am, N to AK, S to CA.

Reactions: Medulla K+ yellow, PD+ orange.

Contents: Constrictic, cryptostictic, norstictic, stictic and usnic acids and one unknown.

**[Lobaria pseudopulmonaria Gyelnik]**

Smoker's lung

Habitat/Range: Over mosses and mossy rock in open coastal sites; western N Am – eastern Eurasia, N to AK.

Reactions: Medulla K+ yellow or red, PD+ yellow or orangish, tomentum K+ blue-green.

Contents: Norstictic acid, various triterpenoids, (stictic and constrictic acids), and thelephoric acid in tomentum and rhizines.

Notes: Not yet recorded from B.C., but known to occur in southern coastal Alaska.

**Lobaria pulmonaria (L.) Hoffm.**

Lungwort

Habitat/Range: Frequent over trees and mossy rocks in open to shady forests in humid localities at lower elevations throughout, except essentially absent from boreal regions; incompletely circumpolar, S to CA.

Reactions: Medulla K+ yellow, PD+ orange.

Contents: Constrictic, norstictic and stictic acids and one unidentified substance.

**Lobaria retigera (Bory) Trevisan**

Map 53

Smoker's lung

Habitat/Range: Rare over trees and mossy logs in rather shady coastal and intermontane (ICH zone) old-growth forests at lower elevations; western N Am – eastern Eurasia, N to AK, S to BC.

Reactions: Tomentum K+ blue-green.

Contents: Thelophoric acid in tomentum and various unknowns.

**Lobaria scrobiculata (Scop.) DC. in Lam. & DC.**

Textured lung

Habitat/Range: Frequent over trees and mossy outcrops in open forests, throughout, usually absent from boreal regions; circumpolar, S to CA.

Reactions: Cortex K+ pale yellow or (more often) K-; medulla K+ pale yellow or orangish, KC+ red, PD+ orange (rarely PD-).

Contents: Constrictic, norstictic, stictic, and usnic acids, scrobiculin, and one unknown.

**MASONHALEA**

**Masonhalea Kärnefelt**

**The Tumbleweed Lichen**

Small to occasionally medium **stratified foliose lichen**, corticate above, corticate and partly noncorticate below, lacking soredia and isidia, lobes **unattached to substrate, elongate**, averaging to 2–5 (–20) mm wide, thin to somewhat thick. Upper surface **dark brown**, dull or shiny, smooth. **Lower surface dark brown, except decorticate patches whitish, lacking rhizines**. Medulla white. Photobiont green.

Apothecia unknown in B.C. material.

**Growing unattached over soil and duff.**

Reference: Kärnefelt (1977).

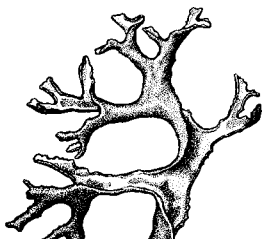
Common Name: Reflects the tendency of the species, which grows unattached, to be blown about in the wind.

Notes: *Masonhalea*, a monotypic genus, is restricted to arctic-alpine localities at northern latitudes. It was formerly treated within *Cetraria*.

**Masonhalea richardsonii (Hook.) Kärnef.**

Map 54

(Syn. *Cetraria richardsonii* Hook.)



(x1.5)

Arctic tumbleweed (tumble lichen)

Habitat/Range: Infrequent and growing unattached over open soil or duff in northern inland alpine localities; western N Am – eastern Eurasia, S to northern BC.

Reactions: Medulla KC+ red, UV+ bluish.

Contents: Alectoronic acid.

**MASSALONGIA**

**Massalongia Körber**

**The Mouse Lichens**

**Small to medium stratified foliose or squamulose lichens**, corticate above and below, **more or less isidiate**, lobes/squamules closely appressed or loosely appressed, elongate or subrotund, averaging to 0.1–1.5 (–2) mm wide, thin. Upper surface **medium brown**, dull, smooth. Lower surface whitish or brown, bearing scattered brown rhizines. Hypothallus absent. Medulla white. **Photobiont blue-green**.

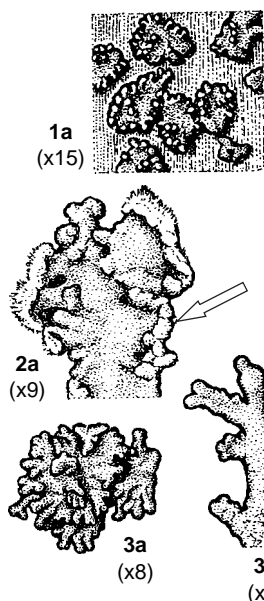
Apothecia located near margins, disc reddish brown; spores 2–4-celled, ellipsoid to spindle-shaped, colourless, 8 per ascus.

Over mossy rocks and soil.

Reference: Henssen (1963a).

Common Name: Reflects the miniature size of the lobes and their dull greyish brown colour.

Notes: *Massalongia* is primarily a temperate genus consisting of two species worldwide. Both of these occur in B.C.



**Key to Massalongia and Similar Lichens**

- 1a Thallus resting on conspicuous black hypothallus; lobes mostly scalelike/isodiametric; over bark or moss; humid climates ..... ***Parmeliella triptophylla***
- 1b Hypothallus absent or inconspicuous; lobes scalelike or elongate; habitat and distribution various, but never over bark ..... 2
- 2a Upper surface of exposed lobes greyish brown to almost black; lobe tips and/or “isidia” often soft-corticate or pale-felted(←); forming dense mats that completely obscure substrate; spores 1-celled ..... ***Pannaria praetermissa***
- 2b Upper surface of exposed lobes dark medium brown (never greyish or blackish); lobe tips and “isidia” hard-corticate, never pale-felted; forming loose mats that usually do not completely obscure substrate; spores 2-celled or more ..... 3
- 3a Lobes mostly scalelike/isodiametric, averaging to less than 2 mm long, less than two times longer than broad; over soil; arid climates; rare ***Massalongia cf. microphylliza***
- 3b Lobes mostly elongate, often averaging to more than 2 mm long, usually more than two times longer than broad; over moss (rare over rock); widespread; frequent ..... ***Massalongia carnosa***

**Massalongia carnosa (Dickson) Körber**

Bluff mouse

Habitat/Range: Common over moss and mossy rock in open sites throughout; also rare directly over acid rock; circumpolar, S to CA and CO.

Reactions: All spot tests negative, except hymenium I+ strong blue.

Contents: No lichen substances reported.

**Massalongia cf. microphylliza (Nyl. ex Hasse) Henssen**

Map 55

Soil mouse

Habitat/Range: Rare over soil in open, semi-arid intermontane localities; western N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: The report is tentative, pending detection of apothecia. The material may represent an undescribed species.

MELANELIA

**Melanelia Essl.**

**The Brown Lichens**

Small to occasionally medium **stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, pseudocyphellate or not, lobes **closely appressed** to rather loosely appressed, **short to elongate**, 0.4–4 (–7) mm wide, thin or sometimes rather thick. Upper surface **brown**, K-, **HNO<sub>3</sub>-** (ours), pruinose or not. Lower surface pale to blackish, bearing short, simple rhizines. Medulla white. Photobiont green. Apothecia located over upper surface, disc brown; spores simple, ellipsoid, colourless, 8 (–32) per ascus. Over bark or rock.

References: Ahti (1966); Kristinsson (1974); Esslinger (1977a, 1978a).

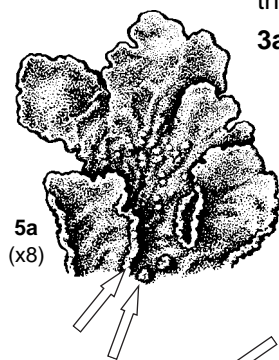
Common Name: Describes the colour of the upper surface in this genus.

Notes: *Melanelia* is primarily a temperate and boreal genus consisting of about 35 species worldwide. Twenty-three of these occur in North America and 17 in B.C. *Melanelia* was one of several genera recently segregated from the classic genus *Parmelia*.

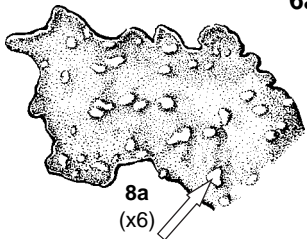
Two keys are provided. The first key emphasizes vegetative characters, while the second key stresses chemical characters.

**Key to *Melanelia* and Similar Lichens Stressing Vegetative Characters**

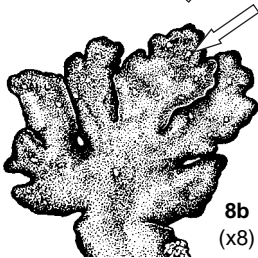
- 1a Soredia and/or isidia present ..... 2
  - 2a Thallus sorediate, soredio-isidiate (i.e., isidia with “soft” appearance) or, if strictly isidiate, then isidia coloured differently from upper surface ..... 3
    - 3a Thallus sorediate or if isidiate, then mature isidia either distinctly associated with soralia or strictly cylindrical; over bark, wood or rock; upper surface HNO<sub>3</sub>- ..... 4
      - 4a Soralia arising through gradual disintegration of upper cortex, tending to be diffuse, not tightly packed with soredia (or isidia); over bark or wood (rare over mossy rock) . ..... 5
        - 5a Soralia located both along lobe margins and over upper surface(←), arising mostly from wart-like outgrowths of upper cortex; lobe tips loosely appressed to ascending, often bearing sparse, minute, colourless cortical hairs; “isidia” granular; rare; intermontane ..... ***Melanelia subargentifera***
        - 5b Soralia located over upper surface, usually arising directly from upper cortex; lobes more or less appressed throughout; cortical hairs absent; isidia cylindrical at maturity(←); widespread and frequent ..... ***Melanelia subaurifera***
      - 4b Soralia distinctly delimited and generally tightly packed with soredia (or isidia); habitat various ..... 6
        - 6a Upper surface generally dark brown or blackening; lobes closely appressed; over rock (very rare over wood) ..... 7
          - 7a Upper surface bearing distinct scattered pseudocyphellae throughout; lobes typically more than 1.5 mm wide; medulla C+ reddish ..... 8
            - 8a Pseudocyphellae often more than 0.5 mm across(←), generally raised above upper surface; lobes concave to plane; apothecia absent; coastal ..... ***Punctelia stictica***
            - 8b Pseudocyphellae less than 0.3 mm across(←), impressed or occasionally lying in same plane as upper surface; lobes convex when mature; apothecia often present; inland ..... ***Melanelia tominii***
          - 7b Upper surface without pseudocyphellae or, if pseudocyphellae present, then these located along margins; lobes typically less than 1.5 mm wide; medulla C- ..... 9



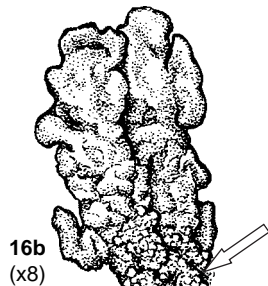
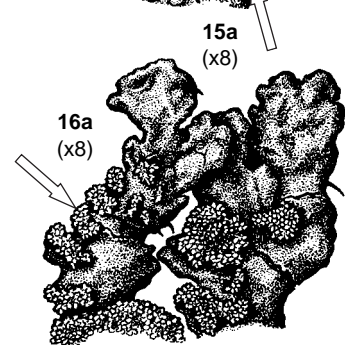
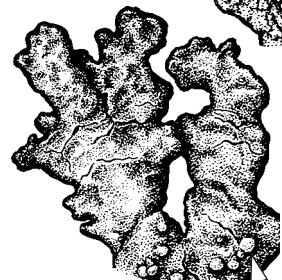
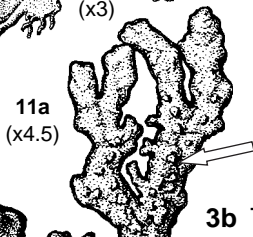
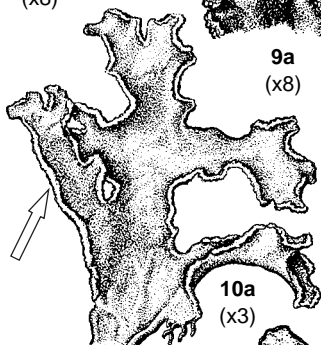
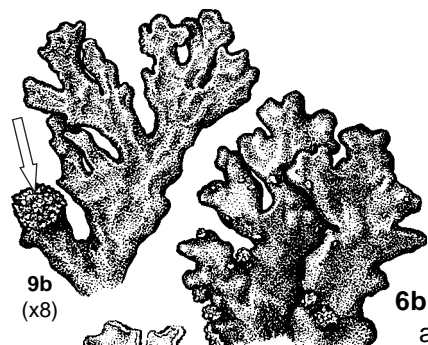
5a (x8)  
5b (x22) isidia



8a (x6)

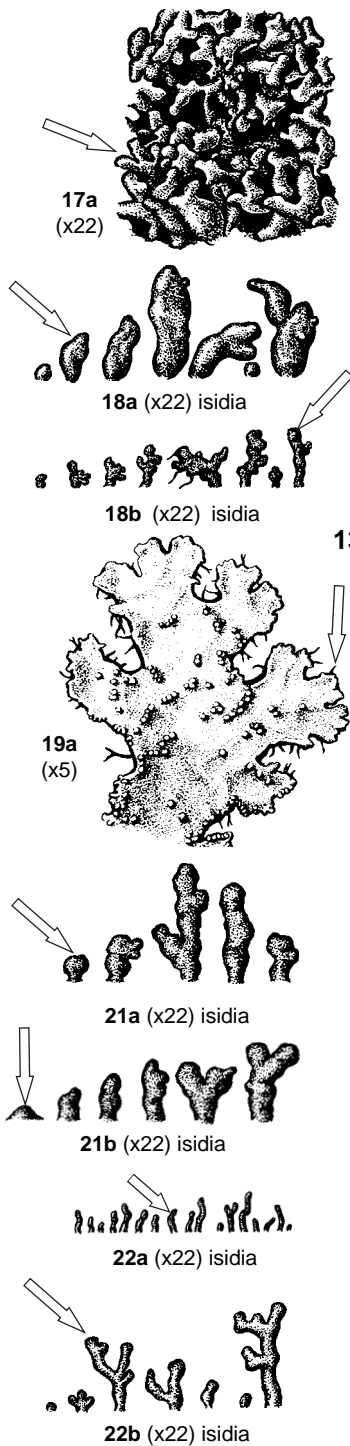


8b (x8)

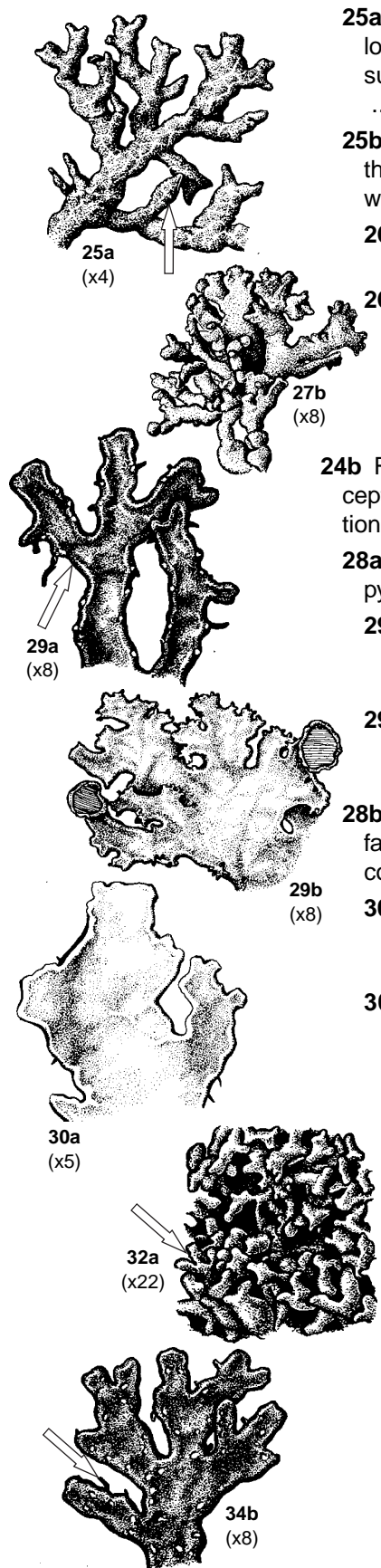


- 9a** Soralia discrete or coalescing, located over upper surface, often near lobe margins, generally not elevated above upper surface; upper surface with distinct or inconspicuous pseudocyphellae located near lobe margins; lobes rather short and tending to broaden at tips; upper surface generally shiny ..... ***Melanelia disjuncta***
- 9b** Soralia discrete (never coalescing), located mostly on tips of small, raised lateral lobes(←); pseudocyphellae absent; lobes generally elongate-linear; upper surface dull ..... ***Melanelia sorediata***
- 6b** Upper surface medium brownish; lobes closely appressed to often loosely appressed; over bark, wood or mossy rock ..... 10
- 10a** Lobes usually linear-elongate; lower surface pale; soralia restricted to lobe margins(←); widespread; frequent ..... ***Cetraria chlorophylla***
- 10b** Lobes usually short; lower surface blackening; soralia marginal and/or over upper surface; rare ..... 11
- 11a** Soralia restricted to upper surface(←), circular in outline, often very small; medulla C-; boreal ..... ***Melanelia olivaceoides***
- 11b** Soralia partly located along lobe margins, elongate; medulla C+ rose; intermontane ..... 12
- 12a** Soralia exclusively located along lobe margins; upper surface rarely white-pruinose; over aspen ..... [***Melanelia albertana***]
- 12b** Soralia located along lobe margins and over upper surface; upper surface often white-pruinose; over conifers, deciduous trees, or mossy rock ..... ***Melanelia subargentifera*** (see lead 5a)
- 3b** True soredia absent; isidia or soredio-isidia present, these never clearly associated with soralia (Note: some may, however, be heaped in coralloid masses that resemble soralia); mature isidia often enlarged and globular, but never cylindrical; over rock; upper surface HNO<sub>3</sub>+ blue-green ..... ***Neofuscelia*** (see lead 15a)
- 2b** Thallus bearing distinctly corticate isidia, these coloured alike with upper surface; soredia absent ..... 13
- 13a** Mature isidia predominantly globular, barrel-shaped or elongate-dorsiventral, sometimes also in part granular or narrow-cylindrical, sometimes hollow ..... 14
- 14a** Mature isidia at most globular (never rhizinate), often partly heaped in coralloid masses; upper surface often transversely wrinkled or cracked; over rock; cortex HNO<sub>3</sub>+ blue-green ..... 15
- 15a** Upper surface yellowish brown to reddish brown (occasionally darker); lobe tips often distinctly pale checkered-maculate above; larger isidia generally more than 0.2 mm wide(←), often pale-checked; medulla KC+ rose becoming dingy orange ..... ***Neofuscelia loxodes***
- 15b** Upper surface medium brown to dark brown; lobe tips weakly pale-checked to more often not at all checkered; larger isidia generally less than 0.2 mm wide, never pale-checked; medulla KC- or KC+ pale yellow or rose-red (not becoming dingy orange) ..... 16
- 16a** Isidia often partly heaped in coralloid masses(←), these sometimes darker than upper surface; widespread in southern regions; medulla K-, PD- ..... ***Neofuscelia verruculifera***
- 16b** Isidia scattered to clustered(←), but not heaped in coralloid masses, coloured alike with upper surface; mostly intermontane; medulla K+ yellow becoming slowly orange, PD+ slowly pale orange ..... ***Neofuscelia subhosseana***

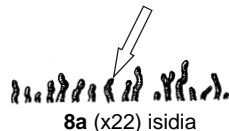
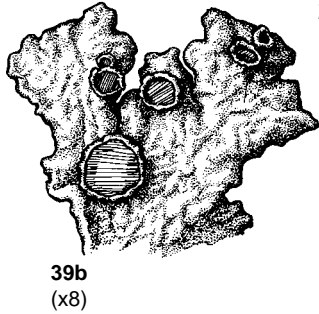
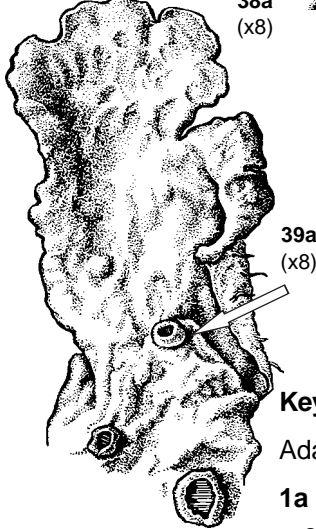
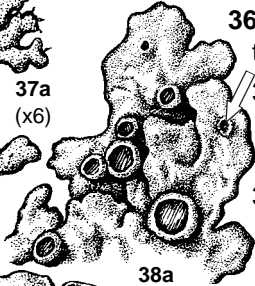
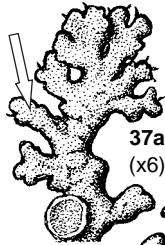
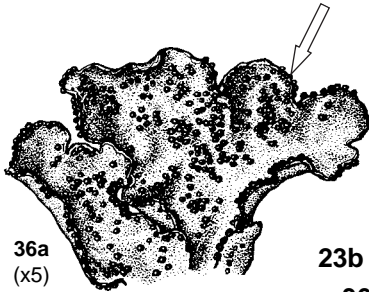




- 14b** Mature isidia barrel-shaped or elongate-dorsiventral, lower surface (of dorsiventral isidia) generally bearing rhizines; isidia occasionally branched, but not heaped in coralloid masses; upper surface not distinctly transversely wrinkled or cracked; over bark, wood or rock; cortex  $\text{HNO}_3^-$  ..... 17
- 17a** Mature isidia loosely appressed and lobe-like( $\leftarrow$ ), never inflated; over rock .....  
..... ***Melanelia panniformis***
- 17b** Mature isidia partly erect and cylindrical or barrel-shaped, inflated or not; over bark or wood (rare over rock) ..... 18
- 18a** Isidia hollow-inflated and barrel-shaped( $\leftarrow$ ), only rarely dorsiventral, with distinct greasy lustre above; lobes often rather loosely appressed toward thallus periphery, rarely white-pruinose ..... ***Melanelia exasperatula***
- 18b** Isidia never hollow-inflated: either upright and long-cylindrical( $\leftarrow$ ) or if more or less appressed, then soon dorsiventral, often somewhat shiny above, but without greasy lustre; lobes usually closely appressed throughout, often weakly white-pruinose ..... ***Melanelia subelegantula***
- 13b** Mature isidia either strictly granular and unbranched or strictly narrow-cylindrical (in the latter case sometimes branched), never globular, barrel-shaped or elongate-dorsiventral (immature isidia, however, may occasionally be globular), never hollow .... 19
- 19a** Lobe tips generally somewhat angular in outline( $\leftarrow$ ); upper surface pale checkered-maculate and/or checkered-pseudocyphellate (check lobe tips); medulla K+ yellow becoming orange-red, PD+ bright orange ..... ***Parmelia saxatilis***
- 19b** Lobe tips generally rounded in outline; upper cortex lacking pale-checking and pseudocyphellae; medulla K-(or K+ violet), PD- ..... 20
- 20a** Neither isidia nor upper cortex readily abrading; medulla generally not exposed in patches; upper surface often white-pruinose (check lobe tips); lower surface pale throughout or blackening; arid or dry inland localities; medulla C-, KC- ..... 21
- 21a** Isidia arising as small hemispherical and globular warts( $\leftarrow$ ) (these often basally constricted)( $\leftarrow$ ) at various stages of development near thallus centre; over rock ..... ***Melanelia infumata***
- 21b** Isidia arising as small conical to hemispherical warts( $\leftarrow$ ) (not basally constricted) progressively better developed toward thallus centre; over bark, wood or rock .....  
..... ***Melanelia elegantula***
- 20b** Isidia and/or upper cortex in part readily abraded to reveal whitish medullary patches; upper surface rarely white-pruinose; lower surface blackening; distribution various; medulla C+ red, KC+ red ..... 22
- 22a** Upper surface often dull (except shiny near lobe tips); isidia short, less than 0.3 mm long, generally unbranched( $\leftarrow$ ); medulla white throughout; widespread .....  
..... ***Melanelia subaurifera***
- 22b** Upper surface usually shiny throughout; isidia elongate (generally more than 0.3 mm long) with age, often heavily branching( $\leftarrow$ ); medulla usually bearing scattered orange patches (check near lower cortex); generally coastal .....  
..... ***Melanelia fuliginosa***
- 1b** Soredia and isidia absent (Note: low, white-tipped conical warts/papillae may develop over upper surface of some species) ..... 23
- 23a** Over rock or (rarely) soil ..... 24
- 24a** Rhizines absent (sparse, peg-like cortical outgrowths may, however, be present); lobes strongly convex throughout; alpine or subalpine ..... 25



- 25a** Upper surface partly checkered-maculate(←), K+ yellow (check near lobe tips); lobes in part raised, sparsely branched, seldom completely obscuring substrate; lower surface apparently somewhat white-pruinose; medulla PD+ orange or PD- ..... ***Brodoa oroarctica***
- 25b** Upper surface not at all checkered-maculate, K- throughout; lobes usually appressed throughout, densely branched, generally obscuring substrate; lower surface not at all white-pruinose; medulla PD+ strong yellow or PD- ..... 26
- 26a** Upper surface bearing numerous pseudocyphellae, these sometimes sunken; medulla KC- ..... (rare form of) ***Melanelia stygia*** (see lead 34b)
- 26b** Upper surface lacking pseudocyphellae; medulla KC+ reddish ..... 27
- 27a** Lower surface mostly pale brownish; coastal in alpine and subalpine localities; medulla K-, PD- ..... ***Allantoparmelia almquistii***
- 27b** Lower surface mostly black; widespread in alpine localities; medulla K+ pale yellow, PD+ strong yellow ..... ***Allantoparmelia alpicola***
- 24b** Rhizines present below (check near lobe tips); lobes in part concave to plane, (except convex throughout in rare specimens of *Melanelia stygia*, see lead 35a); distribution various ..... 28
- 28a** Pseudocyphellae and pycnidia present, located primarily along lobe margins, pycnidia protruding and barrel-shaped to elongate-cylindrical ..... 29
- 29a** Lobe margins more or less distinctly rimmed(←); lower surface typically blackening; pseudocyphellae restricted to vicinity of lobe margins (but not actually marginal); medulla KC- ..... ***Cetraria hepaticon***
- 29b** Lobe margins not distinctly rimmed; lower surface typically rather pale or at least not blackening; pseudocyphellae more or less strictly marginal (i.e., positioned at right angles to upper surface); medulla KC+ rose (flash) ..... ***Cetraria commixta***
- 28b** Pseudocyphellae and pycnidia absent or, if present, then scattered over upper surface, pycnidia either somewhat sunken or at most slightly protruding above upper cortex ..... 30
- 30a** Upper surface greyish and K+ yellow (check sheltered lobes), white-pruinose or not; pseudocyphellae, when present, soon elongate-angular, especially near lobe tips; medulla K+ yellow becoming orange-red ..... ***Parmelia omphalodes***
- 30b** Upper surface brownish or blackish throughout, K-, never white-pruinose; pseudocyphellae, when present, spot-like or at least not elongate-angular; medulla K- (except often K+ orange in *Melanelia tominii*) ..... 31
- 31a** Pseudocyphellae absent (or apparently absent) over upper surface ..... 32
- 32a** Lobes mostly less than 1 mm wide, generally densely lobulate toward thallus centre(←); apothecia uncommon; medulla KC- ..... ***Melanelia panniformis***
- 32b** Lobes mostly more than 1 mm wide, not densely lobulate; apothecia often present; medulla KC+ rose or rose-red ..... (rare nonsorediate form of) ***Melanelia tominii*** (see lead 8b)
- 31b** Pseudocyphellae distinct over upper surface (check in vicinity of lobe tips) ..... 33
- 33a** Lower surface blackening (check toward thallus centre); medulla KC+ reddish or PD+ strong orange ..... 34
- 34a** Rhizines broadcast over lower surface; medulla KC+ reddish, PD- ..... (rare nonsorediate form of) ***Melanelia tominii*** (see lead 8b)
- 34b** Rhizines essentially restricted to margins of lower surface(←); medulla KC-, PD+ strong orange ..... ***Melanelia stygia***

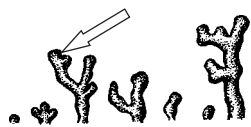


- 33b** Lower surface primarily pale brown to medium brown (or black in localized areas); medulla KC- or KC+ pale orangish, PD- ..... 35
- 35a** Lobes strongly convex; pseudocyphellae averaging to less than 0.2 mm long; medulla KC- ..... **Melanelia stygia**
- 35b** Lobes concave or weakly convex (check near lobe tips); pseudocyphellae averaging to more than 0.3 mm long; medulla KC+ finally orange or KC- ..... **"Cetraria" agnata** (see page 81)
- 23b** Over bark or wood ..... 36
- 36a** Thallus loosely appressed to semi-erect; lobe margins generally bearing pycnidia and/or cilia(←); apothecia located primarily along lobe margins ..... **Cetraria**
- 36b** Thallus more or less closely appressed, never semi-erect; lobe margins bearing neither pycnidia nor cilia; apothecia located over upper surface ..... 37
- 37a** Lobes mostly elongate-linear, less than 1.5 mm wide; upper surface generally convex(←); lower surface often strongly net-ridged (older specimens); spores 16–32 per ascus; inland ..... **Melanelia trabeculata**
- 37b** Lobes short to more or less elongate, broadest averaging to more than 1.5 mm wide; upper surface convex to concave; lower surface smooth to wrinkled, but never net-ridged; spore number and distribution various ..... 38
- 38a** Apothecia often well developed almost to lobe tips(←); essentially boreal; medulla PD+ orange or rarely PD- (check apothecia margins); spores 8 per ascus .... **Melanelia septentrionalis**
- 38b** Apothecia usually well developed only toward thallus centre(←); coastal and/or intermontane; medulla PD- (check apothecia margins); spores sometimes more than 8 per ascus ..... 39
- 39a** Over conifers and deciduous trees and shrubs in dry intermontane forests; spores 8 per ascus ..... **Melanelia subolivacea**
- 39b** Over deciduous trees and shrubs in humid coast and intermontane forests; spores more than 8 per ascus ..... **Melanelia multispora**

**Key to Melanelia and Similar Lichens Stressing Chemical and Spore Characters**

Adapted in part from Esslinger (1977a).

- 1a** Isidia and/or soredia present ..... 2
- 2a** Isidia present, these sometimes pustular and fragmenting into soredia-like masses; true soredia absent ..... 3
- 3a** Medulla K+ yellow becoming orangish ..... **Neofuscelia subhosseana**
- 3b** Medulla K- or K+ very faint ..... 4
- 4a** Medulla PD+ orangish red; containing fumarprotocetraric and protocetraric acids ..... **Melanelia olivaceoides**
- 4b** Medulla PD-; lacking fumarprotocetraric and protocetraric acids ..... 5
- 5a** Medulla C+ reddish ..... 6
- 6a** Upper surface HNO<sub>3</sub>+ blue-green ..... 7
- 7a** Glomelliferic, glomellic and perlatolic acids present .... **Neofuscelia loxodes**
- 7b** Divaricatic (or very rarely stenosporic) acid present ..... **Neofuscelia verruculifera**
- 6b** Upper surface HNO<sub>3</sub>- ..... 8
- 8a** Isidia averaging to less than 0.3 mm long, usually unbranched(←) ..... **Melanelia subaurifera**



8b (x22) isidia



13a (x22) isidia



13b, 14a (x22) isidia



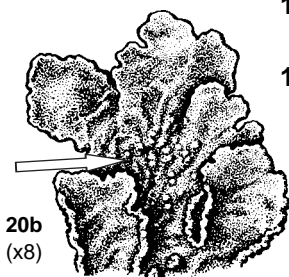
14b (x22) isidia



15a (x22)

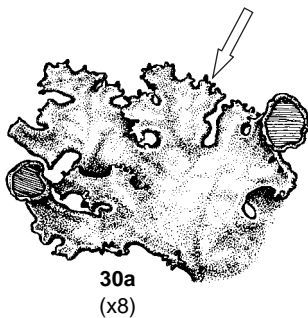
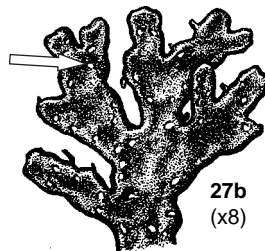
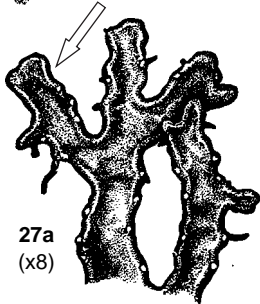
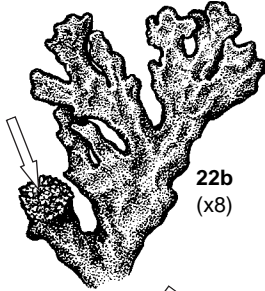
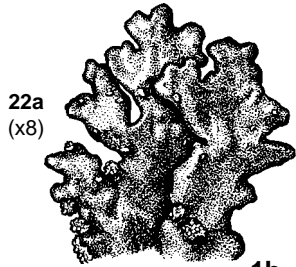


16a (x22) isidia



20b (x8)

- 8b Isidia averaging to more than 0.3 mm long, often branched(←) ..... **Melanelia fuliginosa**
- 5b Medulla C- ..... 9
- 9a Medulla KC+ reddish ..... 10
- 10a Medulla KC+ rose, usually fading fast, containing divaricatic acid (or rarely stenosporic acid) ..... **Neofuscelia verruculifera**
- 10b Medulla KC+ reddish becoming dingy orange, containing glomelliferic, glomellic and perlatolic acids ..... **Neofuscelia loxodes**
- 9b Medulla KC- ..... 11
- 11a Upper surface HNO<sub>3</sub>+ blue-green; medulla containing divaricatic acid ..... **Neofuscelia verruculifera**
- 11b Upper surface HNO<sub>3</sub>- or HNO<sub>3</sub> slightly reddish ..... 12
- 12a Isidia distinctly cylindrical ..... 13
- 13a Isidia arising as small conical to hemispherical papillae(←) with (sometimes obscure) pseudocyphellae at tip ..... **Melanelia elegantula**
- 13b Isidia arising as small spherical to hemispherical papillae(←) without pseudocyphellae at tip ..... 14
- 14a Over rock; isidia upright or somewhat appressed, but not dorsiventral ..... **Melanelia infumata**
- 14b Mostly over bark; isidia developing into somewhat appressed dorsiventral lobules when mature(←) ..... **Melanelia subelegantula**
- 12b Isidia not distinctly cylindrical ..... 15
- 15a Upper surface more or less covered in small, overlapping lobules; over rock ..... **Melanelia panniformis**
- 15b Upper surface not covered in small, overlapping lobules; mostly over bark ..... 16
- 16a Isidia barrel-shaped(←), hollow; no substances present ..... **Melanelia exasperatula**
- 16b "Isidia" more or less granular, never hollow; fumarprotocetraric and protocetraric acids present or absent ..... **Melanelia olivaceoides**
- 2b True soredia present, sometimes accompanied by isidia ..... 17
- 17a Medulla C+ reddish ..... 18
- 18a Soralia located strictly along lobe margins ..... [**Melanelia albertana**]
- 18b Soralia located over upper surface and sometimes also along lobe margins ..... 19
- 19a Pseudocyphellae conspicuous over upper surface; over rock; lecanoric acid absent ..... **Melanelia tominii**
- 19b Pseudocyphellae absent or obscure; mostly over bark; lecanoric acid present ..... 20
- 20a Soralia located strictly over upper surface, arising through disintegration of upper cortex; true isidia usually also present ..... **Melanelia subaurifera**
- 20b Soralia located over upper surface and along lobe margins, those over upper surface arising from small "warts"/pustules(←); true isidia absent ..... **Melanelia subargentifera**
- 17b Medulla C- ..... 21
- 21a Mostly over bark; medulla lacking perlatolic and stenosporic acids ..... **Melanelia olivaceoides**



- 21b Over rock; medulla containing perlatolic and stenosporic acids ..... 22
- 22a Upper surface often rather shiny, bearing obscure to conspicuous pseudocyphellae; soralia located over upper surface and along lobe margins, arising partly from pseudocyphellae ..... **Melanelia disjuncta**
- 22b Upper surface usually rather dull, lacking pseudocyphellae; soralia mostly terminal on main lobes and/or on small, often somewhat erect lateral branches(←), arising by gradual disintegration of cortex ..... **Melanelia soredata**
- 1b Isidia and soredia absent ..... 23
- 23a Medulla PD+ yellow or orangish ..... 24
- 24a Lower surface lacking rhizines (peg-like rhizines, however, sometimes present); medulla PD+ bright yellow, containing alectoralic and barbatolic acids ..... **Allantoparmelia alpicola**
- 24b Lower surface bearing rhizines; medulla PD+ orangish or if PD+ yellow, then norstictic and/or salazinic acid present; alectoralic and barbatolic acids absent ..... 25
- 25a Over bark or wood ..... 26
- 26a Medulla K+ yellow becoming orangish, PD+ yellow, containing norstictic and salazinic acid ..... **Melanelia trabeculata**
- 26b Medulla K- or K+ pale dingy orange, PD+ orangish red, containing fumarprotocetraric and protocetraric acids, or (rarely) lichen acids absent ..... **Melanelia septentrionalis**
- 25b Over rock or (rarely) wood ..... 27
- 27a Pseudocyphellae usually restricted to lobe margins(←); medulla usually rather thin, PD+ slowly pale orange, containing stictic and norstictic acids ..... **Cetraria hepaticon**
- 27b Pseudocyphellae scattered freely over upper surface of lobes(←); medulla usually distinctly thick, PD+ rapidly strong orange, containing fumarprotocetraric acid ..... **Melanelia stygia**
- 23b Medulla PD- ..... 28
- 28a Medulla KC+ reddish ..... 29
- 29a Lower surface lacking rhizines (peg-like outgrowth, however, sometimes present); medulla containing olivetoric acid ..... **Allantoparmelia almqvistii**
- 29b Lower surface bearing distinct rhizines (these, however, occasionally restricted to lobe margins); medulla containing gyrophoric, alectoronic and/or alpha-collatolic acid ..... 30
- 30a Pycnidia numerous, restricted to lobe margins(←), usually elongate-cylindrical. .... **Cetraria commixta**
- 30b Pycnidia usually absent or sparse, positioned partly over upper surface, globular ..... 31
- 31a Rhizines mostly restricted to lobe margins; medulla containing alectoronic acid ..... "**Cetraria**" **agnata** (see below)
- 31b Rhizines freely scattered over entire lower surface; medulla containing gyrophoric acid ..... (a rare nonsorediate form of) **Melanelia tominii**
- 28b Medulla KC- ..... 32
- 32a Central portions of upper surface bearing numerous small, overlapping lobules ..... 33
- 33a Upper surface bearing conspicuous pseudocyphellae ..... **Melanelia stygia**
- 33b Upper surface lacking pseudocyphellae or occasionally with very inconspicuous pseudocyphellae ..... **Melanelia panniformis**

- 32b Overlapping lobules absent over upper surface ..... 34
- 34a Over bark or wood ..... 35
- 35a Spores 8 per ascus ..... *Melanelia subolivacea*
- 35b Spores more than 8 per ascus ..... *Melanelia multispora*
- 34b Over rock ..... 36
- 36a Upper surface strongly convex, often minutely pitted with “sunken” pseudocyphellae ..... (rare form of) *Melanelia stygia*
- 36b Upper surface more or less concave (check near lobe tips), not at all pitted ..... “*Cetraria*” *agnata* (see below)

**“*Cetraria*” *agnata* (Nyl.) H. Krist.**

Map 56

Leather brown

Habitat/Range: Rare over acid rock in exposed outcrops in inland alpine and subalpine localities; possibly incompletely circumpolar, S to BC.

Reactions: Medulla C- or C+ slowly pale yellow, KC- or KC+ slowly pale yellow or orange.

Contents: (Alectoronic acid and various unknowns.) (Often lacking chemical substances.)

Notes: Though presently placed in *Cetraria*, this species is more closely related to *Melanelia*, especially to *M. stygia*. Kristinsson (1974) stated that “*Cetraria*” *agnata* lacks chemical substances. However, a few specimens (including Hale No. 306, cited in Kristinsson 1974) have subsequently been found to contain alectoronic acid.

**[*Melanelia albertana* (Ahti) Essl.]**

(Syn. *Parmelia albertana* Ahti)

Powdered brown

Habitat/Range: Over deciduous trees in open forests at lower elevations in central N Am, N to NWT, S to CO.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Lecanoric acid.

Notes: Not yet reported from B.C., but present in western Alberta near the B.C. border.

***Melanelia disjuncta* (Erichsen) Essl.**

(Syn. *Melanelia granulosa* (Lyngé) Essl.; *Parmelia disjuncta* Erichsen; *Parmelia granulosa* Lyngé)

Powdered brown (black starburst)

Habitat/Range: Frequent over acid rock in open sites throughout, though probably absent from hypermaritime localities; circumpolar, S to CA.

Reactions: Medulla KC- or rarely KC+ faint rose.

Contents: Perlatolic and stenosporic acids (and various unknown substances).

***Melanelia elegantula* (Zahlbr.) Essl.**

(Syn. *Melanelia incolorata* (Parr.) Essl.; *Parmelia elegantula* (Zahlbr.) Szat.)

Elegant brown

Habitat/Range: Common over trees and shrubs, infrequent over mossy rock, in open dry intermontane forests, also infrequent in dry maritime forests; (western) N Am – western Eurasia, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia exasperatula* (Nyl.) Essl.**

(Syn. *Parmelia exasperatula* Nyl.)

Lustrous brown

Habitat/Range: Frequent over trees and shrubs in open to somewhat sheltered inland forests; circumpolar, S to NM.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia fuliginosa* (Fr. ex Duby) Essl.**

(Syn. *Melanelia glabratula* (Lamy) Essl.; *Parmelia glabratula* (Lamy) Nyl.)

Abraded brown

Habitat/Range: Infrequent over bark or rock in open to somewhat sheltered coast forests at lower elevations, also rare in humid intermontane old-growth forests; circumpolar, S to CA.

Reactions: Medulla C+ red, KC+ red.

Contents: Lecanoric acid and one unknown.

***Melanelia infumata* (Nyl.) Essl.**

(Syn. *Parmelia infumata* Nyl.)

Elegant brown

Habitat/Range: Infrequent over acid rock in open to somewhat sheltered inland sites; N Am – western Eurasia, S to CO.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia multispora* (A. Schneider) Essl.**

(Syn. *Parmelia multispora* A. Schneider)

Eyed brown

Habitat/Range: Frequent over deciduous trees and shrubs in coastal and humid intermontane forests (especially the ICH zone); western N Am, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia olivaceoides* (Krog) Essl.**

Map 57

(Syn. *Parmelia olivaceoides* Krog)

Powdered brown

Habitat/Range: Rare over bark and (possibly) sometimes rock in open boreal regions; western N Am, N to AK, S to BC.

Reactions: Medulla PD+ reddish or PD-.

Contents: (Fumarprotocetraric and protocetraric acids.)

***Melanelia panniformis* (Nyl.) Essl.**

(Syn. *Parmelia panniformis* (Nyl.) Vainio)

Lattice brown

Habitat/Range: Frequent over acid rock in open sites throughout; circumpolar, S to CO.

Reactions: Medulla KC- or rarely KC+ dingy rose.

***Melanelia septentrionalis* (Lyngé) Essl.**

Map 58

(Syn. *Parmelia septentrionalis* (Lyngé) Ahti)

Northern brown

Habitat/Range: Infrequent over deciduous trees and shrubs in open boreal forests, also rare in intermontane localities (ICH zone) at lower elevations; circumpolar, S to BC.

Reactions: Medulla K- or rarely pale yellowish, PD+ orangish or rarely PD-.

Contents: (Fumarprotocetraric and protocetraric acids.)

***Melanelia sorediata* (Ach.) Goward & Ahti**

(Syn. *Melanelia soresiosa* (Almb.) Essl.; *Parmelia sorediata* (Ach.) Th. Fr.; *Parmelia soresiosa* Almb.)

Powdered brown (crape lichen)

Habitat/Range: Infrequent over acid rock in open inland sites; circumpolar, S to CO.

Reactions: Medulla KC- or rarely KC+ faint rose.

Contents: Perlatolic and stenosporic acids (and various unknown substances).

***Melanelia stygia* (L.) Essl.**(Syn. *Parmelia stygia* (L.) Ach.)

Leather brown

Habitat/Range: Frequent over acid rock in open inland sites; circumpolar, S to WA.

Reactions: Medulla PD+ orangish or PD-

Contents: (Caperatic, fumarprotocetraric and protocetraric acids and various unknown substances; occasionally lacking lichen substances.)

Notes: The material assigned to this species is morphologically diverse and may represent two or more taxa.

***Melanelia subargentifera* (Nyl.) Essl.**

Map 59

(Syn. *Parmelia subargentifera* Nyl.)

Powdered brown

Habitat/Range: Infrequent among moss over base-rich outcrops in open to somewhat sheltered dry intermontane forests, also rare over trees; incompletely circumpolar, N to BC, S to CA.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Lecanoric acid.

***Melanelia subaurifera* (Nyl.) Essl.**(Syn. *Parmelia subaurifera* Nyl.)

Abraded brown

Habitat/Range: Common over trees in open to somewhat sheltered forests at lower elevations throughout; incompletely circumpolar, S to CA.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Lecanoric acid.

***Melanelia subelegantula* (Essl.) Essl.**(Syn. *Parmelia subelegantula* Essl.)

Subelegant brown

Habitat/Range: Frequent over trees and shrubs mostly in open dry intermontane forests; western N Am, N to southern BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia subolivacea* (Nyl. in Hasse) Essl.**(Syn. *Parmelia subolivacea* Nyl. in Hasse)

Eyed brown

Habitat/Range: Frequent over trees and shrubs in open dry intermontane forests, also reported once in CDF zone; western N Am – eastern N Am – western Eurasia, N to southern BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Melanelia tominii* (Oxner) Essl.**(Syn. *Melanelia substygia* (Räsänen) Essl.; *Parmelia saximontana* R. Anderson & W. Weber; *Parmelia substygia* Räsänen)

Powdered brown

Habitat/Range: Frequent over acid rock in open inland sites in dry regions; circumpolar, S to NM.

Reactions: Medulla C+ reddish, KC+ reddish.

Contents: Gyrophoric acid and two unknown substances.

***Melanelia trabeculata* (Ahti) Essl.**

Map 60

(Syn. *Parmelia trabeculata* Ahti)

Baby brown

Habitat/Range: Infrequent over trees and shrubs, especially deciduous, in open intermontane (ICH zone) and especially boreal forests; N Am, N to AK, S to BC.

Reactions: Medulla K- or K+ yellow becoming orange, PD- or PD+ pale yellow or orange.

Contents: (Norstictic acid.)



**MENEGAZZIA**

**Menegazzia Massal.**

**The Treeflute Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, sorediate (ours), lobes rather closely appressed, **hollow**, averaging to 1–2 mm wide. Upper surface **pale greyish, perforate**. Lower surface black, shiny, wrinkled, **lacking rhizines**. Medulla white. Photobiont green.

Apothecia unknown in the B.C. material.

**Over deciduous trees.**

Reference: Santesson (1943).

Common Name: Describes the hollow lobes and perforated upper surface characteristic of this genus.

Notes: *Menegazzia*, with approximately 30 species worldwide, is primarily a genus of temperate latitudes in the southern hemisphere; only one species occurs in North America.

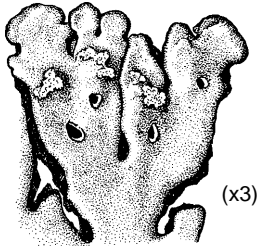
**Menegazzia terebrata (Hoffm.) Massal.**

Magic treeflute

Habitat/Range: Infrequent over deciduous trees and shrubs in open to somewhat shady coast forests at lower elevations; incompletely circumpolar, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla K+ yellow, PD+ slowly orange.

Contents: Atranorin, constictic and stictic acid.



**NEOFUSCELIA**

**Neofuscelia Essl.**

**The Brown Lichens**

Small to medium **stratified foliose lichens** (ours), corticate above and below, nonsorediate, isidiate or not, non-pseudocyphellate, lobes **closely appressed** (ours), short to elongate, averaging to 1–3 (–5) mm wide, thin. Upper surface **brown, K-, HNO<sub>3</sub>+ blue-green**, dull to shiny. Lower surface black (ours), shiny, bearing short, simple rhizines. Medulla white. Photobiont green.

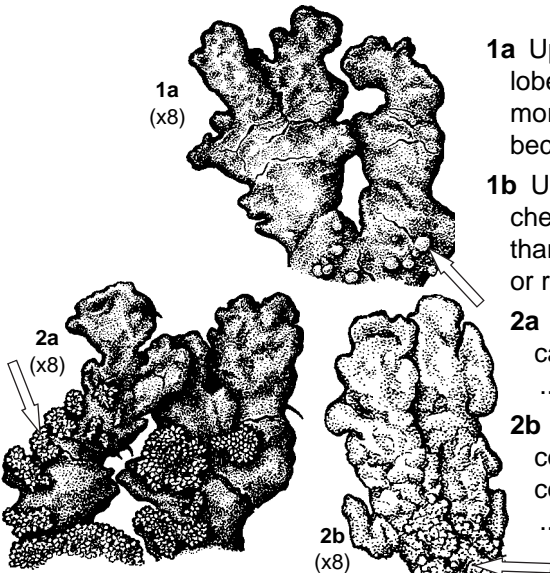
Apothecia unknown in B.C. material.

**Over rock**, or rarely over mosses on rock.

References: Esslinger (1977a, 1978a).

Common Name: Describes the colour of the upper surface in this genus.

Notes: *Neofuscelia* is primarily a temperate genus consisting of approximately 60 species worldwide. Ten species occur in North America and three in B.C. *Neofuscelia* was formerly treated within *Parmelia*. For points of distinction with similar species in other genera, see the key under *Melanelia*.



**1a** Upper surface yellowish brown to reddish brown (occasionally darker); lobe tips often distinctly pale checkered/maculate above; isidia averaging to more than 0.2 mm wide(←), often pale checkered; medulla KC+ reddish becoming dingy orange ..... **Neofuscelia loxodes**

**1b** Upper surface medium brown to dark brown; lobe tips not at all pale checkered/maculate to at most weakly checkered; isidia averaging to less than 0.2 mm wide, never pale checkered; medulla KC- or KC+ pale yellow or reddish (but never dingy orange) ..... **2**

**2a** Isidia often partly heaped in branching/coralloid masses(←), these occasionally darker than upper surface; widespread; medulla K-, PD- ..... **Neofuscelia verruculifera**

**2b** Isidia scattered to clustered(←), but not heaped in coralloid masses, coloured alike with upper surface; mostly inland; medulla K+ yellow becoming slowly orange, PD+ slowly pale orange ..... **Neofuscelia subhosseana**

**Neofuscelia loxodes (Nyl.) Essl.**

Map 61

(Syn. *Parmelia loxodes* Nyl.)

Blistered brown

Habitat/Range: Infrequent over rock in open arid to dry inland sites at lower elevations, also rare over mossy rock and grassland shrubs; western N Am – western Eurasia, N to southern B.C., S to CA.

Reactions: Cortex  $\text{HNO}_3+$  pale to dark blue-green; medulla C- or C+ slowly yellow, KC+ reddish to becoming orangish.

Contents: Glomellic, glomelliferic, perlatolic (and gyrophoric acids).

**Neofuscelia subhosseana (Essl.) Essl.**

Map 62

(Syn. *Parmelia subhosseana*) Essl.

Blistered brown

Habitat/Range: Rare over rock in open arid inland sites at lower elevations, especially in BG zone; western N Am, N to southern BC, S to CA.

Reactions: Cortex  $\text{HNO}_3+$  dark blue-green; medulla K+ yellow becoming red, PD+ very pale orange.

Contents: Various unidentified substances.

**Neofuscelia verruculifera (Nyl.) Essl.**(Syn. *Parmelia verruculifera* Nyl.)

Powdered brown

Habitat/Range: Frequent over rock in open coastal and inland sites at lower elevations, especially in CDF, BG and PP zones; western N Am – western Eurasia, N to southern BC, S to CA.

Reactions: Cortex  $\text{HNO}_3+$  dark blue-green; medulla KC- or KC+ reddish.

Contents: Divaricatic acid (and stenosporic acid, gyrophoric acid and two unknown substances).

**NEPHROMA****Nephroma Ach.****The Paw Lichens**

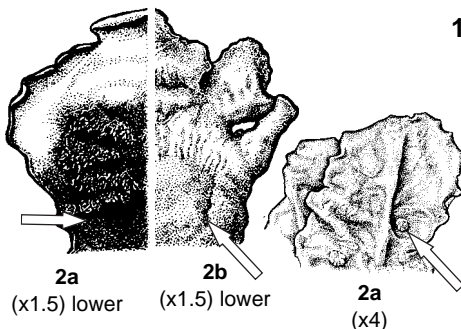
Small to **medium or large stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes loosely appressed to loosely attached, short to elongate, averaging to 0.5–2 (–3) cm wide, thin. Upper surface greenish, greyish or brownish, dull or shiny. Lower surface pale to dark, naked or more or less covered in dense woolly tomentum, occasionally also tuberculate, **lacking rhizines**. Medulla white (yellow to orange). **Photobiont green and/or blue-green.**

**Apothecia appressed over lower surface near lobe tips**, disc brown; spores 4-celled, spindle-shaped, pale brown, 8 per ascus.

Over trees, logs, mossy rocks.

References: Wetmore (1960, 1980); James and White (1987); White and James (1988); Goward and Goffinet (1993).

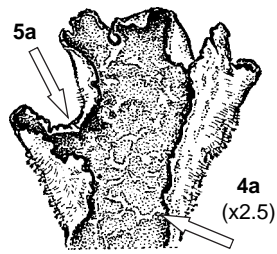
Common Name: Alludes to the presence of brown, paw-like apothecia on the lower surface; in all other genera the apothecia are located over the upper surface or along the lobe margins.

Notes: *Nephroma* is a cosmopolitan genus of about 40 species worldwide. Nine are known from North America and all occur in B.C. Although thin-layer chromatography has been used successfully in the elucidation of some *Nephroma* species (see for example James and White 1987), spot tests are of little taxonomic value in this genus.

**1a** Photobiont a grass-green alga; upper surface usually at least in part greenish (especially when wet: check sheltered lobes); soredia and isidia absent; over mossy rock or decaying logs; restricted to cool, snowy districts ..... 2

**2a** Upper surface more or less shiny, mostly yellowish green; internal cephalodia visible from above as scattered darker patches(←); lower surface blackening toward thallus centre(←); apothecia common ..... ***Nephroma arcticum***

**2b** Upper surface dull, greenish to brownish; internal cephalodia not visible from above; lower surface dark brown toward thallus centre(←); apothecia rare ..... ***Nephroma expallidum***



**1b** Photobiont a dark blue-green cyanobacterium; upper surface brownish, greyish, or if greenish, then also sorediate or isidiate; ecology and distribution various ..... 3

**3a** Lower surface distinctly and more or less evenly covered in dense, woolly hairs, these tending to obscure the fine details of the surface wrinkles; soredia absent ..... 4

**4a** Upper surface greyish, sparsely covered in minute, linear white markings/maculae(←); lower surface pale; rare ..... 5

**5a** Lower surface pale lemon yellow; lobe margins tattered/lacerate(←); over branches of conifers in old-growth forests ..... ***Nephroma silvae-veteris***

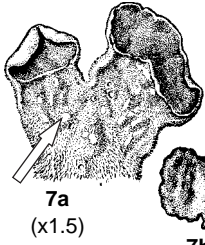
**5b** Lower surface whitish; lobe margins even; over mossy logs or ground ..... (blue-green phototype of) ***Nephroma arcticum***



**4b** Upper surface brownish, not at all maculate; lower surface dark brownish ..... 6

**6a** Upper surface ridged and isidiate, isidia clustered and branched(←), usually restricted to ridges ..... ***Nephroma isidiosum***

**6b** Upper surface more or less plane; isidia absent or, if isidia-like lobules present, then these usually occurring singly ..... 7



**7a** Lower surface sparsely "warty"/papillate(←) (check fertile lobes); backs of apothecia broadly wrinkled and often covered in minute erect hairs; lobe margins usually (but not always) lacking lobules ..... ***Nephroma resupinatum***

**7b** Lower surface lacking "warts"/papillae; backs of apothecia occasionally rough-textured, never hairy; lobe margins distinctly lobulate(←) ..... ***Nephroma helveticum***



**3b** Lower surface naked(←) or minutely woolly, "woolliness" not obscuring fine details of surface wrinkles; soredia present or absent ..... 8

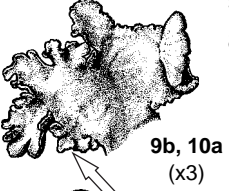
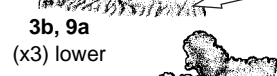
**8a** Thallus lobulate, but lacking soredia or isidia (Note: lobules may, however, occasionally appear isidia-like; in this case "isidia" are usually borne singly) ..... 9

**9a** Lobe margins and upper surface usually not at all lobulate(←); upper surface naked; medulla white, K- (or occasionally K+ pale yellow); apothecia present; over bark and rock ..... ***Nephroma bellum***

**9b** Lobe margins and/or upper surface usually lobulate; upper surface naked or minutely woolly; medulla white or orange, K- or K+ reddish; apothecia present or absent; generally over rock ..... 10

**10a** Medulla at least in part orange, K+ reddish; coastal .... ***Nephroma laevigatum***

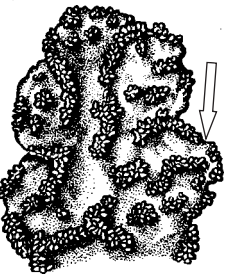
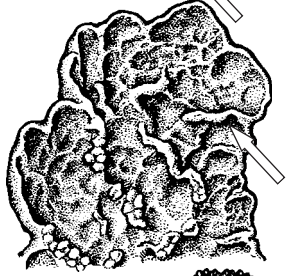
**10b** Medulla white throughout, K-; widespread ..... ***Nephroma helveticum*** (see lead 7b)



**8b** Thallus sorediate or, if apparently isidiate, then "isidia" densely clustered(←) ..... 11

**11a** Upper surface yellowish green, more or less net-ridged/reticulate(←); restricted to old-growth forests; rare ..... ***Nephroma occultum***

**11b** Upper surface brownish or greyish, plane to weakly wrinkled, but never reticulate; widespread and common ..... ***Nephroma parile***



***Nephroma arcticum* (L.) Torss.**

Green paw (arctic kidney lichen)

Habitat/Range: Frequent over moss and mossy rocks and logs in open upland sites throughout, especially in snowy districts; circumpolar, S to BC.

Reactions: All spot tests negative.

Contents: Both phototypes: nephroarctin, phenarctin, usnic acid, zeorin (and methyl gyrophorate).

Notes: *Nephroma arcticum* contains internal cephalodia that may occasionally develop into separate thalli of medium size. These thalli represent the blue-green phototype of *Nephroma arcticum*, which was recently detected in B.C. in humid intermontane forests (ICH zone) at lower elevations. Though closely resembling *Nephroma silvae-veteris*, it differs in having a chemistry identical to that of green *N. arcticum* (medulla K-, PD-) and in being attached to typical lobes of *N. arcticum*.

***Nephroma bellum* (Sprengel) Tuck.**

Cat paw

Habitat/Range: Frequent over trees and mossy rocks in open to somewhat shaded forests throughout, except possibly absent from boreal regions; circumpolar, S to AZ.

Reactions: All spot tests negative.

Contents: Zeorin and various other triterpenoids.

***Nephroma expallidum* (Nyl.) Nyl.**

Alpine paw

Habitat/Range: Infrequent over moss in open inland sites at higher elevations, especially in AT zone; circumpolar, S to BC.

Reactions: All spot tests negative.

Contents: Zeorin and various other triterpenoids (also various other substances).

***Nephroma helveticum* Ach.**

Dog paw (Swiss lichen)

Habitat/Range: Frequent over trees and mossy rocks in open to shady forests at lower elevations throughout; incompletely circumpolar, S to MX.

Reactions: All spot tests negative.

Contents: Various triterpenoids.

Notes: Two varieties occur in B.C.:

**1a** Marginal lobules minute, 0.1–0.4 mm in length, generally dorsiventral; mostly over rock ..  
..... ssp. *helveticum*

**1b** Marginal lobules varying in size, but generally 0.3–0.5 (–1.5) mm in length, often cylindrical; over bark and (occasionally) over mossy rock ..  
..... ssp. *sipeanum* (Gyelnik) Goward & Ahti

***Nephroma isidiosum* (Nyl.) Gyelnik**

Map 63

Pepper paw

Habitat/Range: Infrequent over mossy rocks and conifers in humid intermontane forests at lower elevations; incompletely circumpolar, S to BC.

Reactions: All spot tests negative.

Contents: Methyl gyrophorate, various triterpenes (and gyrophoric acid).

***Nephroma laevigatum* Ach.**

(Syn. *Nephroma lusitanicum* Schaerer)

Seaside paw (smooth Swiss lichen)

Habitat/Range: Frequent over rock and occasionally deciduous trees and shrubs in open coastal localities; incompletely circumpolar, S to CA.

Reactions: Medulla K+ reddish.

Contents: Various triterpenoids, an orange anthraquinone and various other substances.

***Nephroma occultum* Wetm.**

Cryptic paw

Habitat/Range: Infrequent over conifers in open old-growth maritime and intermontane (ICH zone) forests at lower elevations; western N Am, N to B.C., S to OR.

Reactions: All spot tests negative.

Contents: Nephroarctin, phenarctin, usnic acid, zeorin and an unidentified triterpenoid.

***Nephroma parile* (Ach.) Ach.**

Powder paw (chocolate-coloured nephroma, powdery Swiss lichen)

Habitat/Range: Common over trees and mossy rocks in open to shaded inland forests at lower elevations, especially humid regions; circumpolar, S to AZ.

Reactions: All spot tests negative.

Contents: Zeorin and other triterpenoids (and also various other substances).

Notes: The material included here appears to be heterogeneous.

***Nephroma resupinatum* (L.) Ach.**

Blister paw (black-fruited lichen)

Habitat/Range: Frequent over trees, infrequent over rock, in open to somewhat shady forests at lower elevations throughout, except probably absent in boreal regions; circumpolar, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Nephroma silvae-veteris* Goward & Goffinet**

Map 64

Old-growth paw

Habitat/Range: Rare over conifers in open transition coast-intermontane old-growth forests at lower elevations; western N Am, N to B.C., S to WA.

Reactions: Medulla K+ yellow, PD+ pale orange.

Contents: Constrictic, cryptostictic, norstictic, stictic and usnic acids and one unknown.

Notes: See comments under *Nephroma arcticum*.

**NORMANDINA**

***Normandina* Nyl.**

**The Elf-ear Lichen**

A **minute stratified squamulose lichen**, weakly corticate above, noncorticate below, **sorediate**, thallus **attached to substrate at one edge**, rotund "ear-shaped," averaging to 1–2 (–3) mm across. Upper surface **greenish to pale bluish grey**, often with distinct **raised rim**. Lower surface whitish, lacking rhizines. Medulla white. Photobiont green. Apothecia unknown.

Over trees and mossy outcrops in sheltered sites.

References: Culberson and Hale (1966); Aptroot (1991).

Common Name: Describes the tiny, rimmed, ear-shaped lobes characteristic of the species.

Notes: *Normandina* is a monotypic genus of temperate distribution.

***Normandina pulchella* (Borr.) Nyl.**

Elf-ear (confetti lichen)

Habitat/Range: Infrequent (overlooked?) over moss, mossy bark, or over other lichens in humid, sheltered lowland sites throughout, except absent in boreal regions; probably incompletely circumpolar, S to AZ and NM.

Reactions: All spot tests negative.

Contents: No lichen substances reported.



## PANNARIA

**Pannaria Delise in Bory****The Mouse Lichens**

**Minute to small** or occasionally medium **stratified squamulose, foliose or occasionally crustose lichens**, corticate above, **noncorticate below**, sorediate or (apparently) isidiate or not, rarely pruinose, lobes closely appressed, subrotund to elongate, averaging to 1–3 (–4) mm wide, thin to thick. Upper surface **pale tan to greyish blue or dark brownish** (lobe margins often whiter), smooth to slightly roughened. Lower surface pale and often **resting on dark hypothallus**. Medulla white. **Photobiont blue-green**.

Apothecia located over upper surface, disc usually reddish brown; spores simple, ellipsoid to somewhat spindle-shaped, colourless, 8 per ascus.

Over bark, rock, moss and soil.

Common Name: Reflects the miniature size of the lobes and the dull greyish brown colour of the upper surface in many species.

References: Ohlsson (1973); Jørgensen (1978, 1991).

Notes: *Pannaria* is primarily a temperate genus of approximately 80 species worldwide. Of the 17 species reported for North America, seven are known to occur in B.C., while several other possibly undescribed species also occur. The following account is therefore preliminary, pending further study of the western species.

**Key to Pannaria and Similar Lichens**

1a Photobiont a grass-green alga ..... **Psoroma**

1b Photobiont a dark (greenish) blue to dark greyish blue cyanobacterium ..... 2

2a Thallus sorediate, soredia usually originating on undersides of lobes, but marginal when mature ..... 3

3a Upper surface bearing stiffly erect or appressed-tomentose hairs (check carefully); hypermaritime, rare ..... 4

4a Upper surface partly covered in dense minute, stiffly erect hairs(←); medulla PD+ orange ..... **Erioderma sorediatum**

4b Upper surface partly covered in sparse appressed woollen hairs/tomentum; medulla PD- ..... **Leioderma sorediatum**

3b Upper surface lacking hairs (except a few cobwebby hairs rarely present at lobe tips in *Pannaria mediterranea*); distribution and frequency status various ..... 5

5a Lower surface distinctly veined; thallus more than 4 cm in diameter ..... **Peltigera collina**

5b Lower surface lacking veins; thallus usually less than 2 cm in diameter ..... 6

6a Upper surface somewhat roughened/scabrid; soredia usually brownish grey; over trees; lobes rather elongate, often more than 2 mm long; coastal ..... **Pannaria ahlneri**

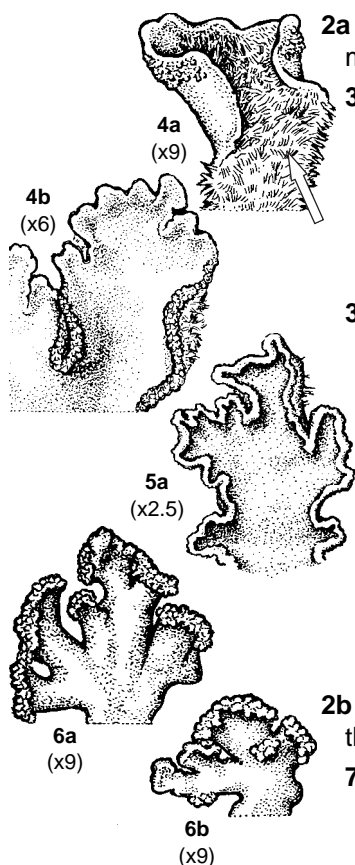
6b Upper surface smooth; soredia usually bluish grey; over trees or moss; lobes scale-like/isodiametric, less than 1 (–1.5) mm long; widespread in humid sites ..... **Pannaria mediterranea**

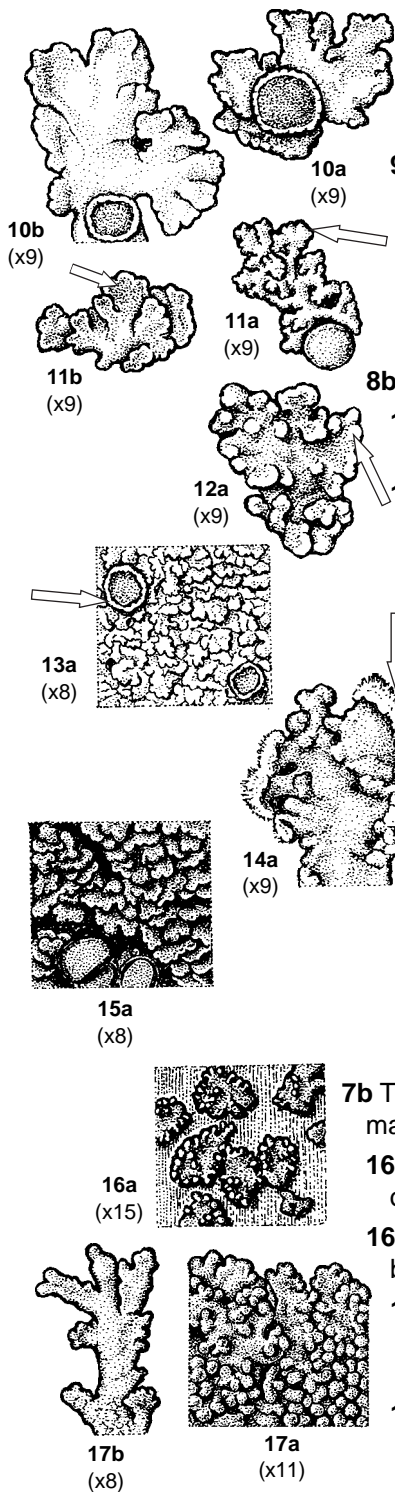
2b Thallus lacking true soredia (Note: Soredia-like “isidia” may sometimes be present, but these never originate on undersides of lobes) ..... 7

7a Thallus lacking isidia (Note: Some species may produce flattened, isidia-like lobules, though these usually lie in same plane as lobes) ..... 8

8a Over bark or wood (or over moss on bark or wood); coastal ..... 9

9a Upper surface somewhat roughened/scabrid, especially toward lobe margins; marginal lobes usually radiating, flattened to concave, usually broader than central lobes; apothecial rim thalline (i.e., coloured alike with upper surface of lobes), “warty,” often covered below in minute white hairs ..... 10





- 10a Marginal lobes averaging to less than 1.2 mm wide; medulla PD- ..... *Pannaria leucostictoides*
- 10b Marginal lobes usually averaging to more than 1.5 mm wide; medulla PD+ orange or yellow (rarely PD-) ..... *Pannaria rubiginosa*
- 9b Upper surface smooth throughout; marginal lobes not radiating, similar in size to central lobes; apothecial rim thalline or not, never warty or hairy ..... 11
- 11a Upper surface of lobes distinctly dull, strongly convex(←); apothecial rim never thalline ..... *Pannaria "saubinetii"*
- 11b Upper surface of lobes somewhat shiny, predominantly plane(←); apothecial rim often thalline ..... *Pannaria laceratula*
- 8b Over soil or rock (or over moss on soil or rock); distribution various ..... 12
- 12a Lobes tips strongly white- or blue-felted(←); upper surface dark brown; coastal, most common in rock crevices near ocean ..... *Pannaria maritima*
- 12b Lobe tips white-felted or not (never blue-felted); upper surface pale or dark; habitat and distribution various ..... 13
- 13a Thallus usually forming tight crust; apothecia abundant, disc generally plane or at most weakly convex, rimmed by distinct thalline margin(←); spores distinctly warted ..... *Pannaria pezizoides*
- 13b Thallus looser, lobes to some extent overlapping; apothecia sparse or abundant, disc plane or hemispherical, rimmed or not with thalline margin; spores apparently smooth ..... 14
- 14a Peripheral lobes averaging to more than 0.8 mm wide, convex upper surface; lobe margins often strongly white-felted ..... (shade form of) *Pannaria praetermissa*
- 14b Peripheral lobes averaging to less than 0.6 mm wide; upper surface plane or convex; lobe margins never strongly white-felted ..... 15
- 15a Growing directly over rock; upper surface convex; inland ..... *"Parmeliella" cheiroloba* (see page 91)
- 15b Over bark or mossy rock; upper surface predominantly plane; hypermaritime ..... *Pannaria laceratula* (see lead 11b)
- 7b Thallus isidiate or apparently isidiate; isidia erect and granular or long-cylindrical when mature ..... 16
- 16a Thallus resting on conspicuous black hypothallus; lobes mostly scalelike/isodiametric; over bark or moss in humid regions ..... *Parmeliella triptophylla*
- 16b Hypothallus absent or inconspicuous; lobes scalelike or elongate; habitat and distribution various, but never over bark ..... 17
- 17a Upper surface pale greyish brown to almost black; lobe tips and/or "isidia" often soft-corticate or pale-felted (check sheltered lobes); forming dense mats completely obscuring substrate; spores 1-celled ..... *Pannaria praetermissa* aggregate
- 17b Upper surface pale to more often dark medium brown (never blackish); lobe tips and "isidia" hard-corticate, never pale-felted; forming loose mats not usually completely obscuring substrate; spores 2-, 3- or 4-celled ..... *Massalongia*

***Pannaria ahlneri* P.M. Jørg.**

Map 65

Roughened mouse

Habitat/Range: Infrequent over conifers in humid transition coast–intermontane forests at lower elevations; incompletely circumpolar, in N Am known only in BC.

Reactions: All spot tests negative.

Contents: Terpenoids and unknown fatty acids (Jørgensen 1991).

**“*Parmeliella*” *cheiroloba* Müll. Arg.**

Map 66

Rock mouse

Habitat/Range: Rare over exposed base-rich outcrops in intermontane localities at lower elevations; western N Am, N to BC, S to MT.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: The combination to *Pannaria cheiroloba* has yet to be made. The B.C. material is very similar to some forms of *Pannaria praetermissa* and may possibly be conspecific.

***Pannaria laceratula* Hue**

Map 67

Cushion mouse

Habitat/Range: Infrequent over mossy conifers and mossy rock in open hypermaritime localities; tentatively western N Am – eastern Eurasia, N to AK, S to BC.

Reactions: All spot tests negative, except hymenium I+ pale blue, gradually fading.

Contents: Atranorin and various unknown fatty acids and terpenoids (P.M. Jørgensen, Bergen, pers. comm., 1993)

Notes: The spores range in size to 18–20 x 10  $\mu$ .

***Pannaria leucostictoides* Ohlsson**

Map 68

Petalled mouse

Habitat/Range: Infrequent over conifers and deciduous trees in open coastal forests; western N Am, N to AK, S to CA.

Reactions: All spot tests negative, except hymenium I+ pale blue, partly fading or becoming orange.

Contents: Atranorin and various unknown fatty acids (Ohlsson 1973) and terpenoids.

Notes: See the comments under *P. rubiginosa*. The type locality of this species is at Skidegate Lake on Moresby Island, B.C.

***Pannaria maritima* P.M. Jørg.**

Seaside mouse

Habitat/Range: Frequent over thin moss and rock in open coastal localities near upper tide mark, also infrequent at inland sites west of coast ranges; western N Am, S to OR.

Reactions: All spot tests negative, except hymenium I+ pale blue, partly fading.

Contents: Atranorin and unknown fatty acids (Jørgensen 1978).

Notes: The type locality is at Terrace Beach, near Ucluelet, B.C. Though originally described as a strictly maritime lichen, material similar to *P. maritima* has been seen from several localities west of the coast ranges. The delimitation of *P. maritima* and *P. praetermissa* warrants further study.

***Pannaria mediterranea* Tavares**

Map 69

Blue-edged mouse

Habitat/Range: Infrequent over conifers and mossy rock or soil in sheltered intermontane and maritime localities at lower elevations; tentatively western N Am – western Eurasia, S to Or.

Reactions: All spot tests negative.

Contents: Terpenoids and unknown fatty acids (Jørgensen 1991).

Notes: Soil-dwelling specimens from the semi-arid intermontane are often abundantly covered in blue soredia and may be referred to *P. cyanolepra* Tuck. The taxonomic distinctness of this material is, however, questionable.

***Pannaria pezizoides* (G.H. Weber) Trevisan**

Peacock mouse (auburn lichen)

Habitat/Range: Common over moss in open sites throughout; circumpolar, S to CA, NM.

Reactions: All spot tests negative, except hymenium I+ persistently strong blue.

Contents: No lichen substances reported.



**Pannaria praetermissa** Nyl. in Chyd. & Furuhj. aggregate

Moss mouse

Habitat/Range: Infrequent over (base-rich) mossy rock in open sites throughout, except apparently absent in hypermaritime regions; circumpolar, S to CA.

Reactions: All spot tests negative, except hymenium I+ pale blue, partly fading.

Contents: Terpenoids and unknown fatty acids (Jørgensen 1991).

Notes: The B.C. material assigned here to *P. praetermissa* is heterogenous and probably includes two or more taxa.

**Pannaria rubiginosa** (Ach.) Bory

Map 70

Petalled mouse

Habitat/Range: Rare over conifers in open coastal forests at lower elevations; incompletely circumpolar, S to NM.

Reactions: Medulla PD+ orange or yellow, or rarely PD-; hymenium I+ persistently strong blue.

Contents: (Pannarin.)

Notes: PD- strains of *P. rubiginosa* lack chemical substances altogether. The similar *P. leucostictoides*, though also PD-, contains atranorin and various fatty acids and terpenoids.

**Pannaria "saubinetii"** (Mont.) Nyl.

Map 71

Pink-eyed mouse

Habitat/Range: Infrequent over conifers and deciduous trees in open, but humid, coastal forests at lower elevations; western N Am – western Eurasia, S to CA.

Reactions: All spot tests negative, except hymenium I+ pale blue, partly fading.

Contents: No lichen substances reported.

Notes: The spores in the B.C. material range to 18–21 x 7.5–10 μ and are thus larger than European reports for this species: 15–17 x 5–6 μ (Jørgensen 1978). Probably a distinct taxon.

**PARMELIA**

**Parmelia** Ach.

**The Shield Lichens**

**Medium stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, checkered-pseudocyphellate (ours), lobes **loosely attached to rather closely appressed, elongate**, averaging to 1.5–10 mm wide, thin. Upper surface **whitish or pale greyish blue**, somewhat shiny. **Lower surface blackening, shiny**, bearing short or rather long, simple or branched rhizines. Medulla white. Photobiont green.

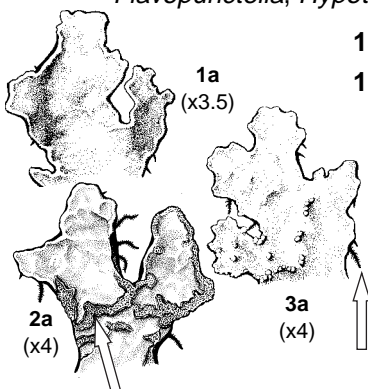
Apothecia located over upper surface, disc brown; spores simple, ellipsoid, colourless, 8 per ascus.

**Over rock and trees.**

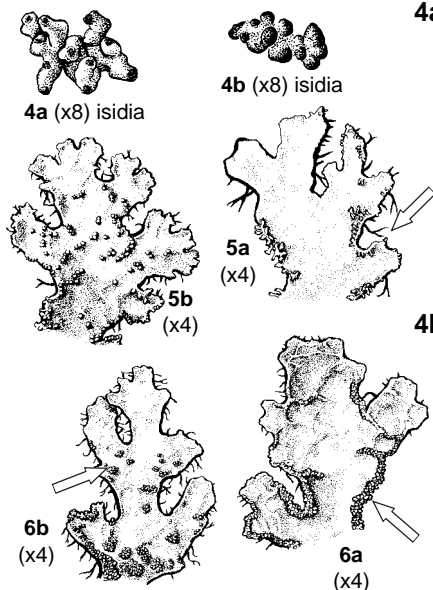
Common Name: Traditional.

References: Goward and Ahti (1983); Hale (1987); Skult (1987).

Notes: *Parmelia* is primarily a boreal and temperate genus consisting of 39 species worldwide. Eight of these are reported for North America and seven occur in B.C. As originally circumscribed by Acharius in 1803, *Parmelia* encompassed an enormous assemblage of foliose lichens, including *Lobaria*, *Pannaria* and *Xanthoria*. Beginning in the latter half of the 19th century, and apparently concluding only in the past decade, lichenologists have divided *Parmelia* into dozens of new genera, most of which are now widely accepted. Local species accommodated until recently in *Parmelia* are now dispersed among the following genera: *Ahtiana*, *Arctoparmelia*, *Flavopunctelia*, *Hypotrachyna*, *Melanelia*, *Neofuscelia*, *Punctelia*, and *Xanthoparmelia*.



- 1a Soredia and isidia absent; over rock ..... ***Parmelia omphalodes***
- 1b Soredia and/or isidia present (rarely sparse); ecology various ..... 2
- 2a Thallus sorediate; soredia dull, confined to discrete soralia(←) .... ***Parmelia sulcata***
- 2b Thallus isidiate; isidia hard and shiny or occasionally with soft, cottony appearance but never associated with soralia ..... 3
- 3a Rhizines side-branched/squarrose(←) when mature; restricted to coastal localities ..... ***Parmelia squarrosa***
- 3b Rhizines unbranched or at most sparsely forking/dichotomous; distribution various ..... 4



- 4a** Isidia distinctly hard-corticate, often somewhat shiny, granular to long-cylindrical (in doubtful cases, check young isidia); medulla K- or K+ yellow becoming orange ..... 5
- 5a** Lobes more or less closely appressed, seldom overlapping; rhizines rather freely forking/dichotomous(←); over bark; medulla K- ..... ***Parmelia pseudosulcata***
- 5b** Lobes often rather loosely attached and overlapping; rhizines mostly unbranched; over rock (rare over bark); medulla K+ yellow becoming orange ..... ***Parmelia saxatilis***
- 4b** Isidia “soft”, not at all hard-corticate, never shiny, generally short and granular (but occasionally elongate in *P. hygrophila*); medulla K+ yellow becoming orange ..... 6
- 6a** Upper surface faintly yellowish; isidia mostly marginal(←), densely clustered; over rock; inland ..... ***Parmelia fraudans***
- 6b** Upper surface pale bluish grey to more often greenish; isidia mostly restricted to upper surface(←), only rather weakly clustered; over bark (rare over rock); widespread in humid regions ..... ***Parmelia hygrophila***

***Parmelia fraudans* (Nyl.) Nyl.**

Green shield

Habitat/Range: Frequent over acid rock in cool, somewhat sheltered inland localities; incompletely circumpolar, S to AZ.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange.

Contents: Atranorin, protolichesterinic acid, salazinic acid, usnic acid (soredia only).

***Parmelia hygrophila* Goward & Ahti**

Salted shield

Habitat/Range: Common over trees in coastal and intermontane (ICH zone) forests, also rare over base-rich rock; western N Am, N to AK, S to OR.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange.

Contents: Atranorin and salazinic acid.

Notes: The type locality is at Kokanee Creek, near Nelson, B.C.

***Parmelia omphalodes* (L.) Ach.**

Unsalted shield (black crottle, corks, smoky shield lichen)

Habitat/Range: Infrequent over acid rock in open sites throughout; circumpolar, S to MT.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange.

Contents: Atranorin, protolichesterinic acid, salazinic acid.

Notes: The B.C. material can be assigned to ssp. *omphalodes* (Skult 1987).

***Parmelia pseudosulcata* Gyelnik**

(Syn. *Parmelia kerguelensis* auct., non Wilson)

Salted shield

Habitat/Range: Infrequent over conifers in lowland coastal forests, also rare in intermontane forests (ICH zone); western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow, medulla PD+ orange to red.

Contents: Atranorin, lobaric acid and protocetraric acid.

***Parmelia saxatilis* (L.) Ach.**

Salted shield (crottle, boulder lichen, stane-raw)

Habitat/Range: Common over acid rock in open sites throughout, also infrequent over conifers in open coastal forests; widespread; circumpolar.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange to red.

Contents: Atranorin, lobaric acid and salazinic acid.

Notes: Included under *Parmelia saxatilis* are two rather distinct morphologies that may deserve separate taxonomic recognition. These are distinguished as follows:

- 1a Upper surface pale bluish grey (brownish where exposed), generally pale or concave; pseudocyphellae in netlike patterns throughout; isidia generally originating in part over upper surface ..... ***Parmelia saxatilis***
- 1b Upper surface greenish (but turning yellowish in herbarium), often convex; pseudocyphellae generally confined to area of lobe tips; isidia tending at first to arise along lobe margins (though later also developing over upper surface) ..... ***Parmelia* sp. 1**

***Parmelia squarrosa* Hale**

Map 72

Salted shield

Habitat/Range: Infrequent over conifers in open coastal forests at lower elevations; incompletely circumpolar, S to CA.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange.

Contents: Atranorin and salazinic acid.

***Parmelia sulcata* Taylor**

Powdered shield (furrowed shield lichen, waxpaper lichen)

Habitat/Range: Common over trees throughout, also infrequent over acid rock, circumpolar, N to AK, S to CA.

Reactions: Cortex K+ yellow, medulla K+ yellow becoming red, PD+ orange.

Contents: Atranorin and salazinic acid.

**PARMELIELLIA**

***Parmeliella* Müll. Arg.**

**The Mouse Lichens**

**Minute to small stratified squamulose lichens** (ours), corticate above, **noncorticate below, isidiate** (ours), squamules closely appressed, subrotund to elongate, averaging to 0.5–1 mm wide (ours), thin. Upper surface **greyish brown**, smooth. Lower surface pale, **resting on dark hypothallus**. Medulla white. **Photobiont blue-green**.

Apothecia unknown in B.C. material.

Over trees and mossy rock.

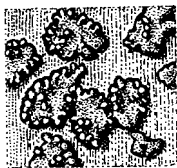
Reference: Jørgensen (1978).

Common Name: Reflects the minute size and dull greyish brown colour of the species.

Notes: Of the nine species of *Parmeliella* reported for North America, only one is known to occur in B.C. *Parmeliella* is closely related to *Pannaria* and differs primarily in the character of the apothecial rim, which is non-thalline (i.e., coloured differently from the upper surface) in the former genus and thalline in the latter. The taxonomic value of this distinction, however, is questionable. For points of distinction with similar lichens, see the key under *Pannaria*.

***Parmeliella triptophylla* (Ach.) Müll. Arg.**

Map 73



(x15)

Fingered mouse

Habitat/Range: Infrequent over trees and seasonally moistened mossy rock in humid localities at low elevations throughout, except probably absent from boreal regions; circumpolar, S to OR.

Reactions: All spot tests negative, except hymenium I+ strong blue.

Contents: No lichen substances present (P.M. Jørgensen, Bergen, pers. comm., 1993).

**PARMELIOPSIS**

**Parmeliopsis (Nyl.) Nyl.**

**The Starburst Lichens**

**Small stratified foliose lichens**, corticate above and below, **sorediate**, lobes **closely appressed, elongate-linear** to elongate, averaging to 1–2 mm wide, thin. Upper surface **whitish grey or pale yellowish green**, more or less **shiny**, especially at lobe tips. Lower surface pale brown to blackening, bearing short, simple rhizines. Medulla white. Photobiont green.

Apothecia located over upper surface, disc brown; spores simple, **sausage-shaped**, colourless, 8 per ascus.

Reference: Meyer (1982).

Common Name: Describes the centrifugal growth pattern characteristic of the species.

Notes: *Parmeliopsis* is a boreal–temperate genus consisting of three species worldwide. All of these occur in North America, though only two are present in B.C.

**Key to *Parmeliopsis* and Similar Lichens**

1a Upper surface yellowish or yellowish green; soredia present ..... 2  
 2a Over rock; upper surface generally shiny throughout; coastal; medulla K+ yellow, PD+ orange ..... ***Xanthoparmelia mougeotii***  
 2b Over bark (very rare over rock); upper surface generally dull toward thallus centre when mature; widespread; medulla K-, PD- ..... ***Parmeliopsis ambigua***  
 1b Upper surface whitish; soredia present or absent ..... 3  
 3a Isidia present over upper surface(←); soredia absent; over bark ..... ***Imshaugia aleurites***  
 3b Isidia absent; soredia present; over bark or rock ..... 4  
 4a Upper surface somewhat shiny near lobe tips; over acid bark; medulla KC+ rose. .... ***Parmeliopsis hyperopta*** (see lead 2b)  
 4b Upper surface dull near lobe tips; over base-rich bark or rock; medulla KC- ..... ***Physcia***

***Parmeliopsis ambigua* (Wulfen in Jacq.) Nyl.**

(Syn. *Foraminella ambigua* (Wulfen in Jacq.) S.F. Meyer)

Green starburst (sulphur-dust lichen)

Habitat/Range: Common over trees and shrubs, especially conifers, also rare over rock, in open to shady forests throughout, except perhaps absent from hypermaritime localities; circumpolar, N to AK, S to NM.

Reactions: Cortex KC+ yellow.

Contents: Divaricatic and usnic acids.

***Parmeliopsis hyperopta* (Ach.) Arnold**

(Syn. *Foraminella hyperopta* (Ach.) S.F. Meyer)

Grey starburst (chalky shield lichen)

Habitat/Range: Common over trees and shrubs, especially conifers, also rare over acid rock in open to shady forests throughout; circumpolar, N to AK, S to CO.

Reactions: Cortex K+ yellow.

Contents: Atranorin and divaricatic acid.

**PARMOTREMA**

**Parmotrema Massal.**

**The Scatter-rug Lichens**

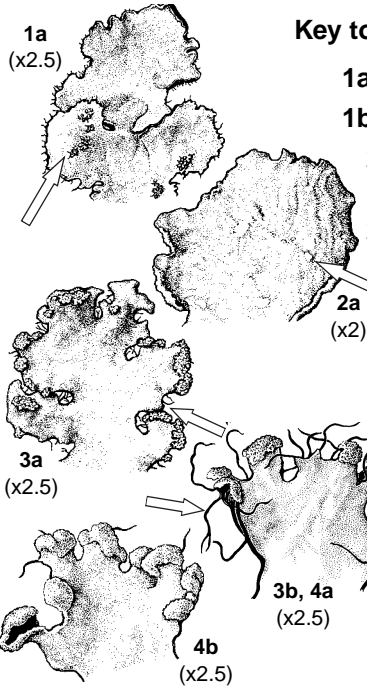
**Medium stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, sparsely **ciliate** (ours), lobes **loosely attached to partly semi-erect**, short to somewhat elongate, averaging to 5–10 mm wide, thin. Upper surface **whitish to pale greyish**, smooth. Lower surface blackening, shiny, bearing numerous simple rhizines, but **marginal area lacking rhizines**. Medulla white. Photobiont green. Apothecia unknown in B.C. material.

**Over trees**, rarely over rock.

References: Hale (1965b, 1974).

Common Name: Alludes to the broad lobes and ciliate margins characteristic of the species.

Notes: *Parmotrema* is primarily a temperate and tropical genus consisting of approximately 100 species (excluding *Rimelia* Hale and Fletcher). Thirty-six of these occur in North America and only three in B.C. *Parmotrema* was formerly treated as a subgenus within *Parmelia*.



**Key to *Parmotrema* and Similar Lichens**

- 1a Thallus isidiate(←), isidia frequently bearing black cilia ..... ***Parmotrema crinitum***
- 1b Thallus sorediate; cilia restricted to lobe margins ..... 2
- 2a Upper surface bearing tiny white pseudocyphellae(←); lobe margins lacking cilia ....  
..... ***Cetrelia cetrarioides***
- 2b Upper surface lacking pseudocyphellae; lobe margins ciliate or not ..... 3
- 3a Soralia broad, diffuse, loosely packed with soredia; cilia very sparse, less than 1 mm long(←); rhizines progressively better developed toward thallus centre; medulla C+ rose ..... ***Hypotrachyna revoluta***
- 3b Soralia narrow to more often head-shaped, sharply delimited, densely packed with soredia; cilia usually more than 2 mm long(←); rhizines often abruptly longer toward thallus centre; medulla C- ..... 4
- 4a Cilia more or less evenly distributed, usually averaging to more than 3 mm long; soredia often brownish when mature; medulla K-, KC+ reddish .....  
..... ***Parmotrema arnoldii***
- 4b Cilia unevenly distributed, usually less than 2 mm long; soredia usually pale when mature; medulla K+ yellow, KC- ..... ***Parmotrema chinense***

***Parmotrema arnoldii* (Du Rietz) Hale**

(Syn. *Parmelia arnoldii* Du Rietz)

Powdered scatter-rug

Habitat/Range: Frequent over trees and shrubs in open coastal forests at lower elevations, especially in hypermaritime localities; western N Am – eastern N Am – western Eurasia, N to AK, S to MX.

Reactions: Cortex K+ yellow; medulla KC+ reddish.

Contents: Alectoronic and atranorin acid (and rhodophyscin).

***Parmotrema chinense* (Osbeck) Hale & Ahti**

Map 74

(Syn. *Parmelia perlata* Ach. [nom. illeg.]; *Parmotrema perlatum* Hale [nom. illeg.]; *Parmelia coniocarpa* Laurer)

Powdered scatter-rug (broad shield)

Habitat/Range: Rare over trees and shrubs in open hypermaritime forests at lower elevations; incompletely circumpolar, N to BC, S to MX.

Reactions: Cortex K+ yellow; medulla K+ yellow, PD+ orangish.

Contents: Atranorin and stictic acid.

**Parmotrema crinitum (Ach.) Hale**

(Syn. *Parmelia crinita* Ach.)

Salted scatter-rug (granulated shield)

Habitat/Range: Infrequent over trees and shrubs in open hypermaritime forests at lower elevations, also rare over oceanside rock; incompletely circumpolar, N to BC, S to MX.

Reactions: Cortex K+ yellow; medulla K+ yellow, PD+ orangish.

Contents: Atranorin and stictic acid.

**PELTIGERA**

**Peltigera Massal.**

**The Pelt Lichens**

Small to **large stratified foliose lichens**, corticate above, **noncorticate below**, isidiate, sorediate or lobulate or not, cephalodiate or not, lobes **loosely attached**, short to subrotund, averaging to 1–3 (–4) cm wide, thin or thick. Upper surface greenish, greyish or brownish, smooth or somewhat roughened, naked or tomentose. Lower surface pale or dark, usually **veined**, bearing numerous rhizines, these short or long, slender or tufted. Medulla white.

**Photobiont green and/or blue-green.**

Apothecia appressed on upper surface near margins, often **saddle-shaped**, disc brownish; spores 4-celled to multi-celled, ellipsoid or needlelike/acicular, colourless or brown at maturity, (2–) 8 per ascus.

**Over soil and moss**, occasionally over trees.

References: Brodo and Richardson (1978); Tønsberg and Holtan-Hartwig (1983); Vitikainen (1985); Holtan-Hartwig (1988, 1993); Goffinet (1992); Goward et al. (1994b).

Common Name: Echoes the genus name and describes the general resemblance of the species to various animal skins.

Notes: All but one of the 30 *Peltigera* species reported for North America are known to occur in B.C. *Peltigera* is a taxonomically rather difficult genus containing a number of species groups that are not yet satisfactorily elucidated. Chemistry is highly variable in this group; though thin-layer chromatography may help to identify some species, spot test reactions do not.

**Key to *Peltigera* and Similar Lichens**

**1a** Photobiont a lime-green to grass-green alga; upper surface generally greenish, especially when wet (Note: check sheltered lobes); wart-like cephalodia sometimes present over upper or lower surface ..... 2

**2a** Cephalodia present over upper surface(←) ..... 3

**3a** Lower surface darkening abruptly inward of lobe tips(←); undersides of apothecia green-corticate throughout; veins generally either indistinct or absent ..... 4

**4a** Mature cephalodia peltate(←) (i.e., slightly raised and free at margins: check sheltered lobes), usually flat or concave, frequently detached when mature, leaving white scars, occasionally enlarging into distinct bluish lobes; humid localities at lower elevations ..... ***Peltigera britannica***

**4b** Mature cephalodia closely appressed throughout(←), not at all peltate, never detaching or enlarging; widespread ..... ***Peltigera aphthosa***

**3b** Lower surface darkening only gradually inward of lobe tips(←), and/or undersides of apothecia patchy-corticate, noncorticate areas appearing whitish; veins sometimes well developed ..... 5

**5a** Undersides of apothecia green-corticate throughout(←); lobes rather few; lobe margins even or weakly crisped; restricted to snowy districts, usually at higher elevations ..... ***Peltigera* sp. 1**

**5b** Undersides of apothecia patchy-corticate(←); many lobes; lobe margins often strongly crisped; widespread ..... ***Peltigera leucophlebia***

2a, 4b (x.5)

3a, 4b (x.5) lower

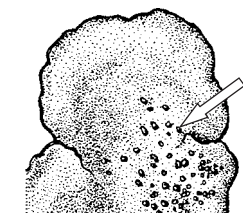
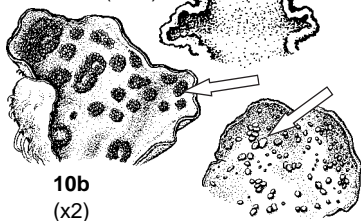
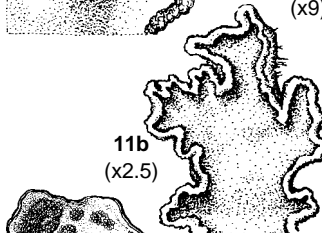
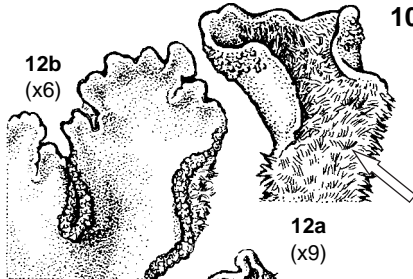
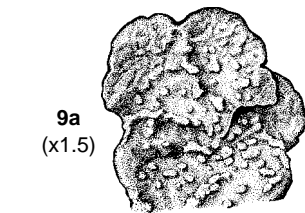
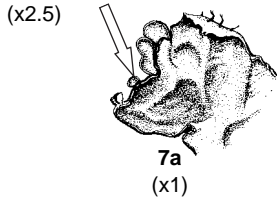
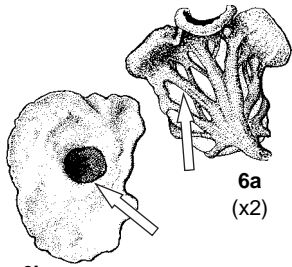
4a (x11) cephalodia

4b (x11) cephalodia

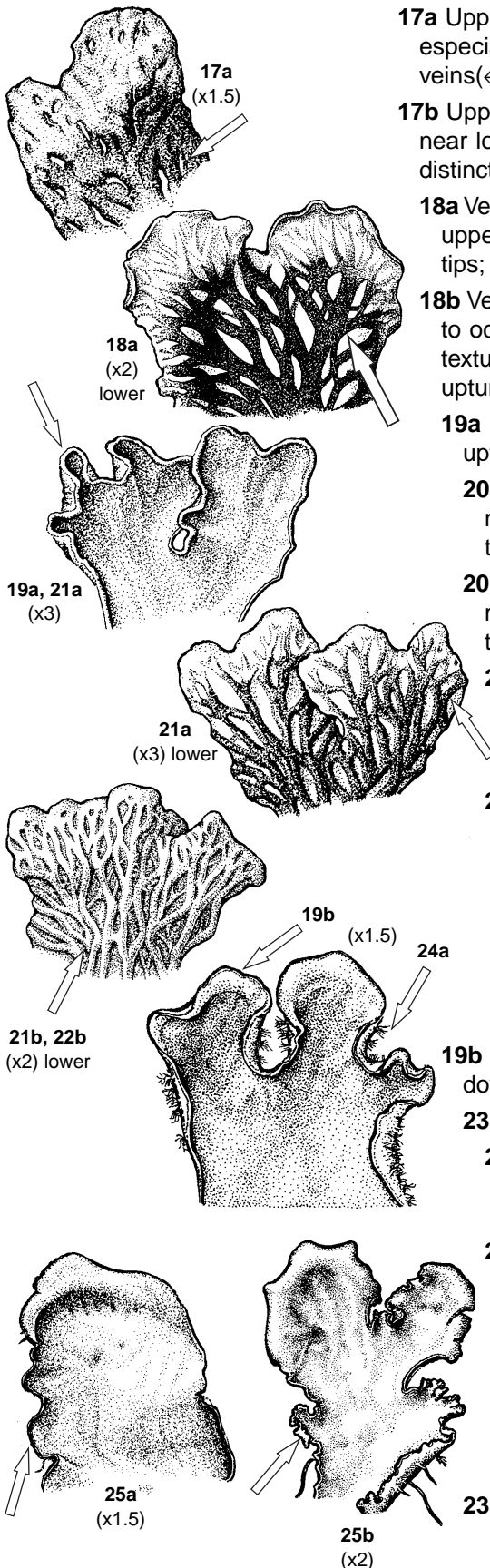
3b, 5b (x.5) lower

5a (x1.5) apothecium

5b (x1.5) apothecium

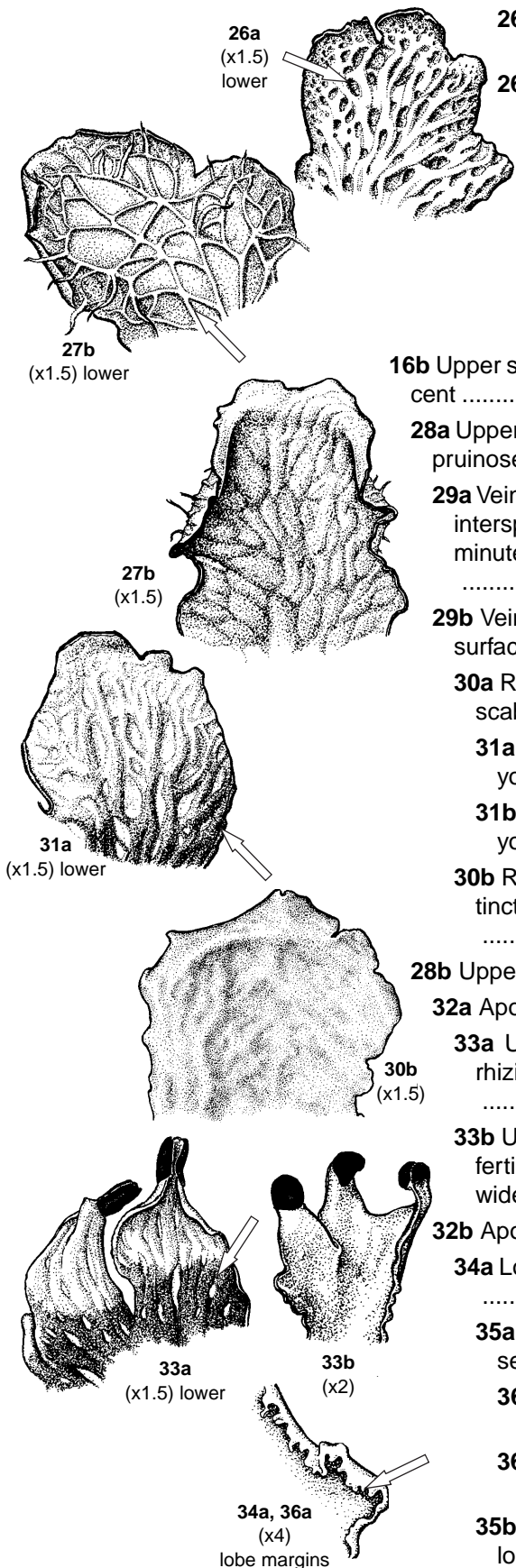


- 2b Cephalodia absent over upper surface; upper surface smooth ..... 6
- 6a Thallus attached to substrate at single point along margin; veins darkening, generally highly contrastive with pale interspaces(←); apothecia present, situated near lobe margins, never sunken ..... **Peltigera venosa**
- 6b Thallus broadly and more or less centrally attached to substrate; veins indistinct or at most only moderately contrastive with interspaces; apothecia present or absent, situated near thallus centre, usually somewhat sunken(←) ..... **Solorina**
- 1b Photobiont a greyish blue to dark blue cyanobacterium; upper surface generally greyish to bluish or brownish, never bright green when wet; cephalodia absent (Note: all species bearing soredia, isidia or marginal lobules key here) ..... 7
- 7a Growing attached to *P. aphthosa* aggregate (i.e., including *P. britannica* and *P. leucophlebia*); upper surface bluish grey (turning brownish in herbarium), bearing scattered greenish lobules(←), these minutely hairy; restricted to humid sites in humid regions ..... (blue-green phototypes of) **Peltigera aphthosa, P. britannica, P. leucophlebia**
- 7b Not attached to *Peltigera aphthosa* aggregate. .... 8
- 8a Soredia present over lobe margins or upper or lower surface ..... 9
- 9a Rhizines absent; veins densely covered in minute erect hairs; upper surface K+ yellow or K- ..... **Lobaria**
- 9b Rhizines present; veins cottony, but not covered in minute erect hairs; upper surface K- ..... 10
- 10a Soredia essentially confined to lobe margins ..... 11
- 11a Lower surface usually lacking veins; upper surface sometimes bearing minute erect hairs; over trees in hypermaritime localities; rare ..... 12
- 12a Upper surface partly covered in dense, minute, stiffly erect hairs(←); medulla PD+ orange ..... **Erioderma sorediatum**
- 12b Upper surface partly covered in sparse appressed woollen hairs/tomentum; medulla PD- ..... **Leioderma sorediatum**
- 11b Lower surface more or less distinctly veined; upper surface lacking hairs; over various substrates; widespread; infrequent ..... **Peltigera collina**
- 10b Soredia essentially confined to upper surface(←) ..... **Peltigera didactyla**
- 8b Soredia absent ..... 13
- 13a Isidia and/or regeneration lobules well developed over upper surface; inland ..... 14
- 14a Isidia scalelike/dorsiventral, more or less appressed(←); lobes averaging to less than 0.8 cm wide at maturity; lobe tips conspicuously upturned; usually over soil; infrequent ..... **Peltigera lepidophora**
- 14b Isidia short-cylindrical(←) or rarely scalelike/dorsiventral, but always erect; lobes averaging to 1 cm or more wide at maturity; lobe tips often downturned; over moss in sheltered sites; rare ..... **Peltigera evansiana**
- 13b Isidia and lobules absent or lobules occasionally present along stress cracks and/or lobe margins ..... 15
- 15a Upper surface bearing scattered greenish lobules (= *P. aphthosa* aggregate), these minutely hairy and containing green algae; restricted to humid regions ..... (blue-green phototype of) **Peltigera aphthosa, P. britannica, P. leucophlebia** (see lead 7a)
- 15b Greenish lobules absent; distribution various ..... 16
- 16a Upper surface minutely woolly/pubescent, hairs closely appressed or erect and feltlike (Note: In *P. malacea* and *P. kristinssonii*, hairs are often confined to immediate vicinity of lobe tips and may be difficult to observe) ..... 17

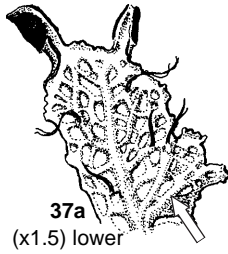


- 17a** Upper surface dark greenish when wet, bearing minute, erect, feltlike hairs, especially near lobe tips; lower surface lacking veins or with few and very broad veins(←); medulla thick ..... *Peltigera malacea*
- 17b** Upper surface bluish or greyish when wet, bearing appressed or erect hairs near lobe tips; lower surface more or less veined; medulla thin or at least not distinctly thick ..... 18
- 18a** Veins low, very dark brown at maturity, highly contrastive with interspaces(←); upper surface partly textured/scabrid, bearing minute erect hairs near lobe tips; lobe tips mostly downturned ..... *Peltigera kristinssonii*
- 18b** Veins more or less raised, pale or dark at maturity, moderately contrastive to occasionally highly contrastive with the interspaces; upper surface rarely textured, generally covered in appressed tomentum near lobe tips; lobe tips upturned or downturned ..... 19
- 19a** Lobes averaging to less than 1.5 cm wide at maturity; lobe tips mostly upturned(←) ..... 20
- 20a** Apothecia averaging to 3–5 (–6) mm long at maturity; thallus consisting mostly of fertile lobes; sterile lobes, when present, frequently bearing distinct orbicular “scars” over upper surface ..... *Peltigera didactyla*
- 20b** Apothecia averaging to 4–8 (12) mm long (smaller in depauperate specimens); thallus consisting of at least some sterile lobes, occasionally entirely sterile; upper surface lacking scars ..... 21
- 21a** Rhizines partly growing together/confluent and mat-forming; veins appearing soft, rather feltlike (←), uniformly (and often abruptly) darkening inward of lobe tips, mostly forming netlike pattern ..... *Peltigera rufescens*
- 21b** Rhizines mostly discrete; veins appearing hard, compact(←), pale throughout or more often irregularly darkening, often apparently overlapping ..... 22
- 22a** Lobe margins and/or stress cracks usually bearing “regeneration” lobules (check mature lobes); upper surface often somewhat broadly blistered/pustulate ..... *Peltigera praetextata* (see lead 25b)
- 22b** Lobules absent; upper surface even or at least not pustulate ..... *Peltigera ponojensis*
- 19b** Lobes averaging to more than 1.5 cm wide at maturity; lobe tips mostly downturned(←) ..... 23
- 23a** Veins lacking erect hairs ..... 24
- 24a** Rhizines somewhat tufted(←) and/or growing together/confluent and mat-forming, especially toward thallus centre; upper surface often (but not always) tomentose throughout ..... *Peltigera canina*
- 24b** Rhizines generally slender and discrete; upper surface usually (but not always) abruptly hairless inward of lobe tips ..... 25
- 25a** Veins distinctly rusty cinnamon toward thallus centre; lobe margins more or less even(←); lobules absent ..... *Peltigera cinnamomea*
- 25b** Veins pale or darkening to brown, but apparently never distinctly cinnamon; lobe margins more or less wavy/cripsed(←), often bearing tiny “regeneration” lobules, these sometimes also present along stress cracks (check mature lobes) ..... *Peltigera praetextata*
- 23b** Veins densely and usually conspicuously covered in minute, erect hairs ..... 26

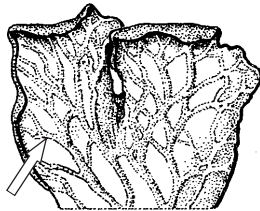




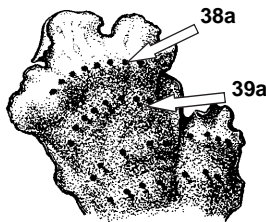
- 26a** Veins broad, raised, overlapping; interspaces deeply pitted, mostly oval in outline(←); rhizines thickish; boreal ..... *Peltigera retifoveata*
- 26b** Veins narrow, raised or not, generally netlike; interspaces not deeply pitted, polygonal to more often lens-shaped/lenticular; rhizines slender; distribution various ..... 27
- 27a** Lobules usually developed along margins and/or stress cracks (check mature lobes); interspaces mostly lens-shaped/lenticular; veins raised or more often rather low .....  
..... *Peltigera praetextata* (see lead 25b)
- 27b** Lobules absent; interspaces lens-shaped/lenticular to polygonal(←); veins distinctly raised ..... *Peltigera membranacea*
- 16b** Upper surface occasionally textured or white-pruinose, but never woolly/pubescent ..... 28
- 28a** Upper surface in part conspicuously textured/scabrid, apparently never white-pruinose ..... 29
- 29a** Veins very dark toward thallus centre, strikingly and sharply contrastive with interspaces; upper surface apparently hairless/glabrous, but actually bearing minute erect hairs near lobe tips (check sheltered lobes) .....  
..... *Peltigera kristinssonii* (see lead 18a)
- 29b** Veins dark or pale, not at all strikingly contrastive with interspaces; upper surface hairless/glabrous ..... 30
- 30a** Rhizines short and stout; upper surface uniformly and distinctly textured/scabrid; inland ..... 31
- 31a** Lower surface dark toward thallus centre(←); rhizines dark, even when young ..... *Peltigera scabrosa*
- 31b** Lower surface pale toward thallus centre; rhizines pale at least when young (check lobe tips) ..... [*Peltigera scabrosella*] (see *P. scabrosa*)
- 30b** Rhizines elongate and slender; upper surface irregularly and often indistinctly textured/scabrid; widespread in humid localities .....  
..... *Peltigera neopolydactyla*
- 28b** Upper surface smooth or at most white-pruinose (check lobe tips) ..... 32
- 32a** Apothecia distinctly black ..... 33
- 33a** Upper surface distinctly shiny; veins usually indistinct(←); outermost rhizines typically dark; generally over mossy ground; inland .....  
..... *Peltigera neckeri*
- 33b** Upper surface usually rather dull; veins rather narrow and distinct (check fertile lobes); outermost rhizines typically pale; often over (mossy) trees; widespread in humid localities ..... *Peltigera collina*
- 32b** Apothecia brownish or apothecia absent ..... 34
- 34a** Lobe margins and/or margins of stress cracks bearing distinct lobules(←) ..... 35
- 35a** Veins low, often abruptly darkening inward of lobe tips; interspaces absent or at most sparse and oval ..... 36
- 36a** Outermost rhizines generally aligned in concentric rows; inland .....  
..... *Peltigera elisabethae* (see also lead 39a)
- 36b** Outermost rhizines unaligned; coastal .....  
..... *Peltigera lactucifolia* (see lead 46a)
- 35b** Veins somewhat raised, darkening only gradually (if at all) inward of lobe tips; interspaces mostly numerous and lens-shaped/lenticular ... 37



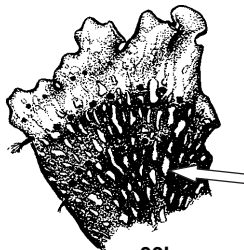
37a  
(x1.5) lower



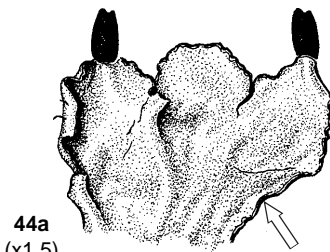
37b  
(x1.5) lower



(x1.5) lower

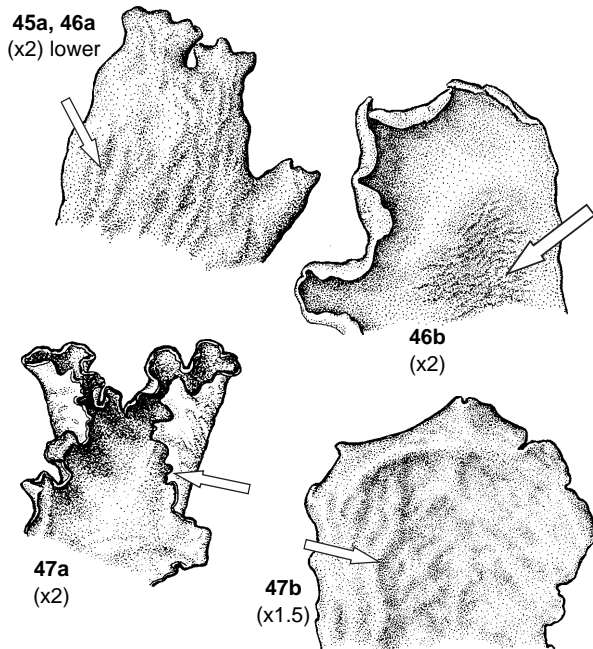


39b  
(x1.5) lower



44a  
(x1.5)

- 37a** Marginal lobules well developed; rhizines darkening abruptly inward of lobe tips; veins rather broad, thick(←) ..... ***Peltigera pacifica***
- 37b** Marginal lobules poorly developed, indistinct; rhizines darkening only gradually inward of lobe tips; veins narrow-linear, rather thin(←) .....  
..... ***Peltigera degenii***
- 34b** Lobe margins even to occasionally wavy/cripsed, but never distinctly lobulate; margins of stress cracks not lobulate ..... 38
- 38a** Outermost rhizines stout, generally aligned in concentric rows(←); apothecia, if present, horizontally oriented, disc more or less plane ..... 39
- 39a** Upper surface generally bearing numerous stress cracks; veins indistinct or more often absent(←); interspaces, when present, sparse and circular .....  
..... ***Peltigera elisabethae***
- 39b** Upper surface continuous or at least not bearing numerous stress cracks; veins present and distinct to occasionally rather indistinct; interspaces more or less numerous and oval to elongate(←) .....  
..... ***Peltigera horizontalis***
- 38b** Outermost rhizines stout or slender, unaligned; apothecia, if present, vertically oriented and vertically folded at maturity ..... 40
- 40a** Veins narrow and more or less distinctly raised (occasionally also “overlapping” in *P. ponojensis*); veins and rhizines covered or not in minute erect hairs ..... 41
- 41a** Veins and rhizines partly covered in distinct minute erect hairs .....  
..... (hairless/glabrous form of) ***Peltigera membranacea*** (see lead 27b)
- 41b** Veins and rhizines lacking minute erect hairs ..... 42
- 42a** Upper surface dull; lobe tips upturned; veins often partly “overlapping”; restricted to dry sites; frequent in inland localities, infrequent in coastal localities .....  
..... (hairless/glabrous form of) ***Peltigera ponojensis*** (see lead 22b)
- 42b** Upper surface distinctly shiny; lobe tips downturned; veins not at all “overlapping”; restricted to humid sites; rare both in coastal and inland localities ..... ***Peltigera degenii*** (see lead 37b)
- 40b** Veins broad, low, never overlapping; veins and rhizines never erect-tomentose ..... 43
- 43a** Veins very dark at maturity (check thallus centre), highly contrastive with interspaces; upper surface apparently hairless/glabrous, but actually bearing minute hairs near lobe tips (check sheltered lobes); inland .....  
..... ***Peltigera kristinssonii*** (see lead 18a)
- 43b** Veins pale or dark, never highly contrastive with interspaces; upper surface hairless/glabrous throughout; distribution various ..... 44
- 44a** Lobes distinctly thick; upper surface often partly white-pruinose (check lobe tips); stress cracks frequent(←); interspaces usually sparse; inland .....  
..... ***Peltigera neckeri*** (see also lead 33a)
- 44b** Lobes thin or at least not distinctly thick; upper surface not at all white-pruinose; stress cracks uncommon; interspaces numerous or sparse; widespread in humid climates ..... 45



- 45a** Rhizines short, stout, sparse, poorly developed; veins indistinct(←), interspaces sparse; restricted to open sites ..... 46
- 46a** Upper surface smooth; outermost rhizines usually tapering to point, pale; maritime, mostly over sheltered mossy outcrops along coast ..... ***Peltigera lactucifolia***
- 46b** Upper surface in part minutely wrinkled(←); outermost rhizines usually tufted, dark; primarily inland (absent along outer coast); usually in open sites, in bogs and at mossy edges of ponds and alpine tarns ..... ***Peltigera occidentalis***
- 45b** Rhizines short to more often elongate, slender, abundant, well developed; veins usually (but not always) distinct; interspaces more or less numerous; usually restricted to sheltered sites ..... 47
- 47a** Lobe margins tattered/lacerate or at least very strongly crisped(←); main lobes averaging to 5–10(–12) mm wide; upper surface plane or variously wrinkled, but never broadly blistered/pustulate ..... ***Peltigera polydactylon***
- 47b** Lobe margins not lacerate or strongly crisped; lobes averaging to more than 12 mm wide; upper surface even or somewhat broadly blistered/pustulate(←) .....  
..... ***Peltigera neopolydactyla***

***Peltigera aphthosa* (L.) Willd.**

Freckle pelt (freckled lichen, studded leather lichen)

Habitat/Range: Common over soil, moss, duff, logs and rock in open to somewhat shady inland localities, also rare in maritime localities; circumpolar, S to CA and NM.

Contents: Both phototypes: gyrophoric acid, methyl gyrophorate, tenuiorin, (phlebic acid A and B), and various unknowns.

Notes: Like other members of the *P. aphthosa* group (i.e., including *P. britannica* and *P. leucophlebia*), *P. aphthosa* may occasionally give rise, through its cephalodia, to discrete blue-green thalli. Such thalli, first reported from Norway by Tønsberg and Holtan-Hartwig (1983), represent *P. aphthosa*'s blue-green phototype. Recently this phototype was detected in inland B.C. (Goward et al. 1994b) where, together with that of *P. leucophlebia*, it appears to be very rare. The blue-green phototype of *P. britannica* has also been reported from B.C. (Brodo and Richardson 1978), but seems not uncommon in humid lowland localities in the southern half of the province. All three phototypes have a bluish grey upper surface that is flecked with thin, white, angular markings/maculae. These taxa are most reliably distinguished from one another on the basis of the associated green thalli (i.e., whether *P. aphthosa*, *P. britannica* or *P. leucophlebia*). See also notes under *Peltigera* sp. 1.

***Peltigera britannica* (Gyelnik) Holtan-Hartwig & Tønsb.**

Freckle pelt

Habitat/Range: Common over moss and mossy logs and rocks in sheltered to somewhat shaded coastal localities at lower elevations, also infrequent in humid intermontane forests (ICH zone); western N Am – western Eurasia, S to OR.

Contents: Both phototypes: phlebic acid A, phlebic acid B, and various unknowns (Tønsberg and Holtan-Hartwig 1983).

Notes: Under humid conditions the cephalodia may grow out into distinct thalli. These represent *P. britannica*'s blue-green phototype. See notes under *P. aphthosa*.

***Peltigera canina* (L.) Willd.**

Dog pelt (ash-coloured ground liverwort, dog tooth lichen, dog lichen)

Habitat/Range: Common over soil, moss, duff or logs in open to somewhat sheltered sites throughout, except probably absent in hypermaritime regions; circumpolar.

Contents: No lichen substances reported.

Notes: The material included here is heterogeneous.

***Peltigera cinnamomea* Goward**

Dog pelt

Habitat/Range: Frequent over moss and mossy rocks and logs in open to somewhat sheltered inland forests, especially in ICH zone, occurring even in the snowiest districts; apparently western N Am, N to BC, S to OR.

Contents: No lichen substances detected.

***Peltigera collina* (Ach.) Schrader**

(Syn. *Peltigera scutata* (Dickson) Duby)

Tree pelt (dusty-margined dog lichen)

Habitat/Range: Infrequent over mossy rocks and conifers in sheltered forests at lower elevations in humid regions throughout; probably incompletely circumpolar, S to CA.

Contents: Tenuiorin and zeorin.

Notes: Some forms of *P. collina* could be mistaken for *Nephroma parile*. In that species, however, the lower surface lacks veins and rhizines.

***Peltigera degenii* Gyelnik**

Frog pelt

Habitat/Range: Infrequent over moss and mossy logs in open to somewhat sheltered forest sites at lower elevations, mostly restricted to humid regions; probably incompletely circumpolar, S to OR.

Contents: No lichen substances reported.

***Peltigera didactyla* (With.) Laundon**

(Syn. *Peltigera spuria* (Ach.) DC.)

Temporary pelt

Habitat/Range: Frequent over soil and moss in open sites throughout, except rare in coastal regions and probably absent from hypermaritime localities; circumpolar, S to CA.

Contents: Var. *didactyla*: lichen substances absent or a few unidentified substances occasionally present in trace amounts. Var. *extenuata*: methyl gyrophorate and gyrophoric acid.

Notes: Two varieties occur in B.C.:

**1a** Rhizines white-woolly in central portions of thallus, but sparse and simple toward margins; mature lobes often deeply concave, typically consisting of single lobe (but occasionally many-lobed), averaging to less than 1 cm wide; medulla KC-; widespread ..... var. ***didactyla***

**1b** Rhizines white-woolly throughout or sometimes disappearing toward thallus centre; mature thallus typically flat to at most weakly concave, more or less lobate, averaging to more than 1 cm wide; medulla KC+ reddish (flash) or KC-; inland ..... var. ***extenuata* (Nyl.) Goffinet & Hastings**

***Peltigera elisabethae* Gyelnik**

Concentric pelt

Habitat/Range: Frequent over soil and mossy (base-rich) rock in open inland forests; probably circumpolar, S to OR.

Contents: Tenuiorin and zeorin.

***Peltigera evansiana* Gyelnik**

Map 76

Peppered pelt

Habitat/Range: Rare over mosses in sheltered forests, especially in boreal regions; N Am, primarily an eastern species.

Contents: No lichen substances detected.

***Peltigera horizontalis* (Huds.) Baumg.**

Concentric pelt (flat dog lichen)

Habitat/Range: Frequent over moss and mossy rocks and logs in open or somewhat sheltered intermontane forests at lower elevations; probably incompletely circumpolar, S to OR.

Contents: Tenuiorin and various unknown substances.

***Peltigera kristinssonii* Vitik.**

(Syn. *Peltigera occidentalis sensu* Krist.)

Dog pelt

Habitat/Range: Infrequent over soil and moss in sheltered boreal and especially intermontane forests, usually at lower elevations; apparently western N Am – western Eurasia, S to CO.

Contents: No constant lichen substances reported (Vitikainen 1985).

***Peltigera lactucifolia* (With.) Laundon**

(Syn. *Peltigera hymenina* (Ach.) Delise ex Duby)

Frog pelt

Habitat/Range: Rare (overlooked?) over sheltered, mossy, seaside outcrops in hypermaritime localities; possibly western N Am–eastern N Am–western Eurasia, S to BC.

Contents: Dolichorrhizin, methyl gyrophorate, peltidactylin, tenuiorin, and zeorin.

Notes: The report is tentative. The B.C. material differs from the usual circumscription of *P. lactucifolia* in having a distinctly dark lower surface, especially toward the thallus centre. This material might more appropriately be referred to *P. occidentalis*, although that species (as currently defined) has a primarily inland distribution.

***Peltigera lepidophora* (Nyl. ex Vainio) Bitter**

Butterfly pelt

Habitat/Range: Infrequent over soil and moss in open sites throughout, except apparently rare in coastal regions; circumpolar, S to CO.

Contents: (Tenuiorin.)

***Peltigera leucophlebia* (Nyl.) Gyelnik**

Freckle pelt

Habitat/Range: Frequent over soil, moss and mossy rocks and logs in open forested sites throughout; circumpolar, S to CA.

Contents: Various unknown substances (Tønsberg and Holtan-Hartwig 1983).

Notes: In humid intermontane regions, the cephalodia in *P. leucophlebia* may enlarge (very rarely) into separate blue-green lobes. These represent the blue-green photobiont of this species. See notes under *P. aphthosa*.

***Peltigera malacea* (Ach.) Funck**

Apple pelt (even dog lichen)

Habitat/Range: Frequent over soil and moss in open, usually dry inland forests and alpine ridges; circumpolar, S to CO.

Contents: (Tenuiorin, zeorin and various unidentified substances [Holtan-Hartwig 1988].)

***Peltigera membranacea* (Ach.) Nyl.**

Dog pelt

Habitat/Range: Frequent over soil, moss, and mossy rocks and logs in humid localities throughout, except essentially absent from boreal regions; incompletely circumpolar, S to CA.

Contents: No lichen substances reported.

***Peltigera neckeri* Hepp ex Müll. Arg.**

Frog pelt

Habitat/Range: Infrequent over soil, mossy rocks and decaying logs in forested inland localities, especially in ICH zone, rare also in steppe communities; probably circumpolar, S to OR.

Contents: Dolichorrhizin, zeorin and various unidentified substances (Holtan-Hartwig 1988).

***Peltigera neopolydactyla* (Gyelnik) Gyelnik**

(Syn. *Peltigera occidentalis* (E. Dahl) Krist.)

Frog pelt

Habitat/Range: Frequent over soil, moss, mossy rocks and logs in humid localities throughout, except apparently absent from boreal regions; probably incompletely circumpolar, S to CA.

Contents: Tenuiorin.

Notes: Small, thickened specimens growing in bogs and other open places may be referred to *P. occidentalis* (E. Dahl) H. Krist. Scabrid material occurring in coastal localities may represent a separate taxon.

***Peltigera occidentalis* (E. Dahl) H. Krist.**

(Syn. *Peltigera neopolydactyla* (Gyelnik) Gyelnik s. lat.)

Frog pelt

Habitat/Range: Infrequent over moss in bogs and at margins of alpine tarns; global distribution unknown.

Contents: Dolichorrhizin, methyl gyrophorate, peltidactylin, tenuiorin and zeorin (and gyrophoric acid).

Notes: See notes under *P. lactucifolia*.

***Peltigera pacifica* Vitik.**

Frog pelt

Habitat/Range: Infrequent over soil, moss, and mossy logs in sheltered to shady coastal forests at lower elevations, also rare in humid intermontane localities (ICH zone); western N Am, S to OR.

Contents: Dolichorrhizin, methyl gyrophorate, peltidactylin, tenuiorin and zeorin (Vitikainen 1985).

Notes: The type locality is 10 km north of Kitsumkalum Lake, near Terrace, B.C.

***Peltigera polydactylon* (Necker) Hoffm.**

Frog pelt (many-fruited dog lichen)

Habitat/Range: Infrequent over soil, moss, mossy rocks and logs in open but humid inland forests; circumpolar, S to OR.

Contents: Tenuiorin, various unknown substances (and gyrophoric acid).

***Peltigera ponojensis* Gyelnik**

Felt pelt

Habitat/Range: Frequent over soil or moss in open inland forests and steppes, especially in dry to arid regions; circumpolar, S to CA.

Contents: No lichen substances reported.

Notes: The B.C. material includes several specimens lacking tomentum over the upper surface. These possibly deserve separate taxonomic recognition.

***Peltigera praetextata* (Flörke ex Sommerf.) Zopf**

Born-again pelt (rough dog lichen)

Habitat/Range: Infrequent over soil, moss, and mossy rocks and logs in open or sheltered forests in humid regions at lower elevations throughout, except rare in coastal localities; circumpolar, S to CA.

Contents: No lichen substances reported.

Notes: The material traditionally assigned to this species is clearly heterogeneous.

***Peltigera retifoveata* Vitik.**

Sponge pelt

Habitat/Range: Infrequent over moss in somewhat sheltered inland forests, especially in boreal regions; western N Am–western Eurasia, N to AK, YU, S to WA.

Contents: Dolichorrhizin, methyl gyrophorate, tenuiorin, zeorin, (gyrophoric acid and one unknown triterpenoid) (Vitikainen 1985).

***Peltigera rufescens* (Weis) Humb.**

Felt pelt

Habitat/Range: Frequent over soil or moss in open, often somewhat exposed sites throughout; circumpolar, S to CA.

Contents: No lichen substances reported.

***Peltigera scabrosa* Th. Fr.**

Toad pelt

Habitat/Range: Infrequent over moss and mossy rock in somewhat open inland sites; circumpolar, S to MT.

Contents: Dolichorrhizin, peltidactylin, zeorin and various unidentified substances (Holtan-Hartwig 1988).

Notes: Northern material should be carefully checked against *P. scabrosella* Holt.-Hartw., recently reported for the Yukon (Goward et al. 1994b), but not yet for B.C. In that species, the outermost rhizines are pale and the lower surface is essentially pale throughout.

***Peltigera venosa* (L.) Hoffm.**

Fan pelt (fan lichen)

Habitat/Range: Frequent over base-rich soil, especially cut banks, in open or somewhat sheltered sites throughout; circumpolar, S to CA.

Contents: Green phototype: phlebic acid A and B, tenuiorin, zeorin and one unidentified substance (Kurokawa et al. 1966); blue-green phototype: no lichen substances reported (Tønnsberg and Holtan-Hartwig 1983).

Notes: The cephalodia of *P. venosa* may become detached and develop into the tiny, *Leptogium*-like lobules often found growing at the base of this species.

***Peltigera* sp. 1.**

(Syn. *Peltigera aphthosa* aggregate)

Freckle pelt

Habitat/Range: Frequent over moss and mossy rocks and logs in sheltered forests, usually at higher elevations, especially in ESSF zone, but also rarely in coastal forests; apparently western N Am – eastern N Am–western Eurasia, N to AK, S to OR.

Contents: Tenuiorin and various unidentified terpenoids.

Notes: The B.C. material is similar to *Peltigera* sp. 1 of Holtan-Hartwig (1993) — from which it differs in having entirely corticate apothecial reverses and in lacking hairs over the inner portions of the upper surface. It is also very similar to the Asiatic species *P. nigripuncta* Bitter. *Peltigera* sp. 1 is tolerant of prolonged snow cover.

**PELTULA**

***Peltula* Nyl.**

**The Rock-olive Lichens**

**Minute, stratified foliose lichens** (ours), **umbilicate**, rotund to subrotund, corticate above and below, **sorediate** (ours), usually without distinct lobes, thallus averaging to 3–10 mm across, rather thick. Upper surface **pale olive-grey**, with down-rolled margins. Lower surface pale brown, lacking rhizines. **Photobiont blue-green**.

Apothecia are unknown in the B.C. material.

**Over vertical rock.**

Reference: Wetmore (1971).

Common Name: Describes the habitat and colour of the upper surface.

Notes: *Peltula*, with approximately 18 species worldwide, occurs primarily at temperate latitudes in arid regions. Of the 15 species reported for North America, only one is known to occur in B.C.

***Peltula euploca* (Ach.) Ozenda & Clauz.**

Map 77

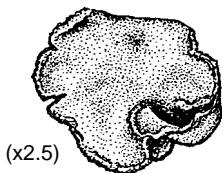
(Syn. *Heppia euploca* (Ach.) Vainio)

Rock-olive

Habitat/Range: Rare over vertical acid rock in open, semi-arid intermontane localities (BG and PP zones); western N Am–eastern N Am – western Eurasia, N to BC, S to MX.

Reactions: All spot tests negative.

Contents: No lichen substances reported.



**PHAEOPHYSCIA**

***Phaeophyscia* Moberg**

**The Shadow Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, isidiate or sorediate or not, lobes closely appressed to semi-erect, **elongate-linear to elongate** (rarely short), averaging to 0.2–1.5 (–3) mm wide, thin. Upper surface usually **brownish, K-** (atranorin absent), dull, lacking pruina and white-spotting. Lower surface dark brown to black, occasionally pale, bearing scattered, short, **simple rhizines**. Medulla white (ours). Photobiont green.

Apothecia located over upper surface, averaging to 1–2.5 mm across, rim occasionally bearing short colourless hairs, disc dark; spores 2-celled, ellipsoid to spindle-shaped, brown, 8 per ascus.

Over rock, bark, moss and other substrates.

References: Esslinger (1977b, 1978b); Moberg (1977).

Common Name: Alludes to the dark colour of the upper surface of most species.

Notes: Of the 19 species of *Phaeophyscia* reported for North America, ten are known to occur in B.C. *Phaeophyscia* was formerly treated within *Physcia*.

**1a** Lobes averaging to more than 2 mm wide; upper surface usually distinctly concave at lobe tips(←); rhizines strongly projecting beyond lobe tips; intermontane; rare ..... *Phaeophyscia hispidula*

**1b** Lobes averaging to less than 1.5 mm wide; upper surface convex to rarely concave at lobe tips; rhizines projecting or not; distribution and status various ..... 2

**2a** Thallus lacking soredia and isidia; apothecia present or absent ..... 3

**3a** Lobes mostly semi-erect; lower surface pale; apothecia rare ..... *Phaeophyscia constipata*

**3b** Lobes mostly appressed; lower surface black toward thallus centre; apothecia often present(←) ..... 4

**4a** Lobes often averaging to less than 0.6 mm wide; over rock (very rare over bark) ..... *Phaeophyscia endococcinea*

**4b** Lobes averaging to more than 0.6 mm wide; over bark (rare over mossy rock) ..... *Phaeophyscia ciliata*

**2b** Thallus sorediate and/or isidiate (check lower surface of lobe margins); apothecia generally absent ..... 5

**5a** Thallus distinctly sorediate, soredia usually finely granular, never coralloid-branched; upper surface pale or brownish, never dark brown ..... 6

**6a** Soralia restricted to lower surface along lobe margins and/or lobe tips(←); rhizines never projecting past lobe tips; semi-arid intermontane; rare ..... *Phaeophyscia hirsuta*

**6b** Soralia variously distributed, but usually in part well developed over upper surface (including along lobe margins); rhizines often distinctly projecting past lobe tips; widespread; common ..... 7

**7a** Soralia mostly finely granular, located primarily over upper surface(←) and near the lobe margins; common; widespread ..... *Phaeophyscia orbicularis*

**7b** Soralia coarsely granular, located mostly over (upper surface of) lobe tips(←) and along lobe margins; rare, in B.C. known only in eastern intermontane localities ..... *Phaeophyscia adiaetola*

**5b** Thallus isidiate (or apparently isidiate), isidia coarsely granular, often branched-coralloid at maturity or, in extreme cases, lobulate; upper surface often dark brown ..... 8

**8a** Lobes averaging to more than 0.8 mm wide; isidia occasionally bearing minute, erect hairs; rhizines generally distinctly protruding beyond lobe tips(←); over bark or mossy rock ..... *Phaeophyscia kairamoi*

**8b** Lobes averaging to less than 0.8 mm wide; isidia never hairy; rhizines generally not distinctly protruding beyond lobe tips; usually over rock, occasionally over mossy rock ..... 9

**9a** Lobes minute, averaging to less than 0.5 mm wide; lower surface pale; southern intermontane; rare ..... *Phaeophyscia nigricans*

**9b** Lobes small, but not minute, averaging to more than 0.5 mm wide; lower surface blackening toward thallus centre; widespread; common ..... *Phaeophyscia sciastra*



***Phaeophyscia adiastrata* (Essl.) Essl.**

Map 78

(Syn. *Physcia adiastrata* Essl.)

Granulated shadow

Habitat/Range: Rare over mossy base-rich rocks and deciduous trees and shrubs in intermontane regions at lower elevations; western N Am – eastern N Am, N to BC, S to AZ.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Phaeophyscia ciliata* (Hoffm.) Moberg**

Map 79

(Syn. *Physcia ciliata* (Hoffm.) Du Rietz)

Starburst shadow

Habitat/Range: Rare over deciduous shrubs in open forests at lowland elevations throughout; probably circumpolar, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Phaeophyscia constipata* (Norrlin & Nyl.) Moberg**

(Syn. *Physcia constipata* Norrlin & Nyl.)

Pincushion shadow

Habitat/Range: Frequent over base-rich moss and mossy rock in open to somewhat sheltered intermontane sites, usually at lower elevations; N Am – western Eurasia, N to AK, S to CO.

Reactions: All spot tests negative, except lower medulla rarely K+ violet.

Contents: No lichen substances reported, except an unidentified anthraquinone rarely present.

***Phaeophyscia endococcina* (Körber) Moberg**

(Syn. *Physcia decolor* Essl.; *Physcia endococcina* (Körber) Th. Fr.)

Starburst shadow

Habitat/Range: Frequent over base-rich rock in open intermontane localities; probably circumpolar, N to AK, S to NM.

Reactions: All spot tests negative.

Contents: Zeorin.

***Phaeophyscia hirsuta* (Mereschk.) Essl.**

Map 80

(Syn. *Physcia hirsuta* Mereschk.)

Powdered shadow

Habitat/Range: Rare over rock and deciduous trees (ornamental) in open semi-arid intermontane localities at lower elevations; probably western N Am – western Eurasia, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: (Zeorin.)

***Phaeophyscia hispidula* (Ach.) Essl.**

Map 81

(Syn. *Physcia hispidula* (Ach.) Frey)

Whiskered shadow

Habitat/Range: Rare over deciduous shrubs and mossy rock in sheltered inland localities at lower elevations; probably incompletely circumpolar, N to BC, S to AZ.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: Two subspecies appear to be present in B.C.:

1a Soredia/isidia restricted to lobe margins ..... ssp. *limbata* Poelt

1b Soredia/isidia located over upper surface near lobe tips ..... ssp. *hispidula*

***Phaeophyscia kairamoi* (Vainio) Moberg**

(Syn. *Physcia kairamoi* Vainio)

Whiskered shadow

Habitat/Range: Infrequent over deciduous shrubs and mossy rock in sheltered inland localities at lower elevations; N Am – western Eurasia, N to BC, S to AZ.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

**Phaeophyscia nigricans (Flörke) Moberg**

Map 82

(Syn. *Physcia nigricans* (Flörke) Stizenb.)

One-horse shadow

Habitat/Range: Rare over base-rich bark or rock in sheltered intermontane localities at lower elevations; western N Am – western Eurasia, N to BC, S to CO.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

**Phaeophyscia orbicularis (Necker) Moberg**

(Syn. *Physcia orbicularis* (Necker) Poetsch)

Granulated shadow

Habitat/Range: Frequent over rock and deciduous trees and shrubs in sheltered sites at lower elevations throughout, except possibly absent from boreal regions; probably incompletely circumpolar, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: (Zeorin.)

Notes: The B.C. material may be heterogeneous.

**Phaeophyscia sciastra (Ach.) Moberg**

(Syn. *Physcia sciastra* (Ach.) Du Rietz)

Five o'clock shadow

Habitat/Range: Common over base-rich rock in open to somewhat sheltered sites throughout; circumpolar, N to AK, S to AZ.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

**PHYLLISCUM**

**Phylliscum Nyl.**

**The Tripe Lichens**

**Minute stratified foliose lichens**, corticate above and below, lacking isidia and soredia, lobes **attached to substrate by a more or less central holdfast**, rotund to subrotund, thallus averaging to 0.8–3.0 mm across, rather thick. Upper and lower surfaces **brownish black**, shiny, lacking rhizines. Medulla white. **Photobiont blue-green**.

Apothecia located over upper surface, immersed, perithecia-like (blackish dots as seen from above); spores simple, oval, colourless, 16 per ascus (ours).

Reference: Henssen (1963e).

Common Name: Alludes to the general resemblance of the species to certain "Rocktripes" of the genus *Umbilicaria*.  
Notes: *Phylliscum* is a primarily temperate genus of approximately six species, only one of which is known to occur in North America.

For points of distinction with similar lichens, see Key B, page 17.

**Phylliscum demangeonii (Moug. & Mont. in Mont.) Nyl.**

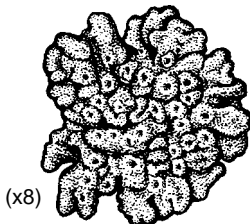
Map 83

Lizard tripe

Habitat/Range: Rare (overlooked?) over rock in somewhat sheltered sites in coastal localities at lower elevations, also reported in the Alberta Rockies; incompletely circumpolar, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.



PHYSICIA

**Physcia (Schreber) Michaux**

**The Rosette Lichens**

**Small** to occasionally medium **stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes closely appressed to loosely attached, elongate-linear to elongate, averaging to **0.5–2 (–3) mm wide**, thin. Upper surface usually **pale whitish grey**, rarely darker, **K+ yellow, white-pruinose or white-spotted, dull**. Lower surface pale to blackish, dull, bearing scattered, short, simple rhizines. Medulla white. Photobiont green. Apothecia located over upper surface, disc white-pruinose to black; spores 2-celled, ellipsoid, brown, 8 per ascus. Over acid or especially **calcium-rich substrates**, including rock, soil, duff, bark and bone.

Reference: Moberg (1977).

Common Name: Describes the centrifugal growth form characteristic of many of the species.

Notes: Thirty species of *Physcia* are reported for North America and 11 of these are known to occur in B.C. *Physcia* has been subdivided into several segregate genera, including *Phaeophyscia* and *Physconia*.

**1a** Lobe margins bearing distinct cilia(←), the longest of these usually averaging to more than 1 mm long; lobe tips more or less raised ..... 2

**2a** Lobe tips lacking isidia and soredia (check lower surface); over trees; coastal; rare ..... *Physcia semipinnata*

**2b** Lobe tips sorediate and/or apparently isidiate; ecology, distribution and status various ..... 3

**3a** Lobe tips isidiate and/or coarsely sorediate; marginal cilia very sparse; over rock; semi-arid intermontane; rare ..... *Physcia callosa* (see lead **7a**)

**3b** Lobe tips finely sorediate; marginal cilia numerous; over trees (rare over rock); widespread; frequent ..... 4

**4a** Upper and lower surface of lobe tips separating, upper surface raised and hood-like when mature (←); soredia developing within the resulting cavity ..... *Physcia adscendens*

**4b** Upper surface of lobe tips never hood-like; lower surface of lobe tips eroding, eventually sorediate(←) ..... *Physcia tenella*

**1b** Lobe margins lacking cilia (Note: marginal rhizines may occur in some species, but these average to less than 0.8 mm long); lobe tips appressed ..... 5

**5a** Thallus sorediate, isidiate or distinctly lobulate ..... 6

**6a** Upper surface distinctly white-pruinose, especially near lobe tips; white-spotting absent or inconspicuous; soredia/isidia originating primarily at lobe tips and along lobe margins, spilling onto the upper surface when mature; usually over bark (rare over rock); semi-arid montane; medulla K- or K+ slowly dingy orange ..... *Physcia dimidiata*

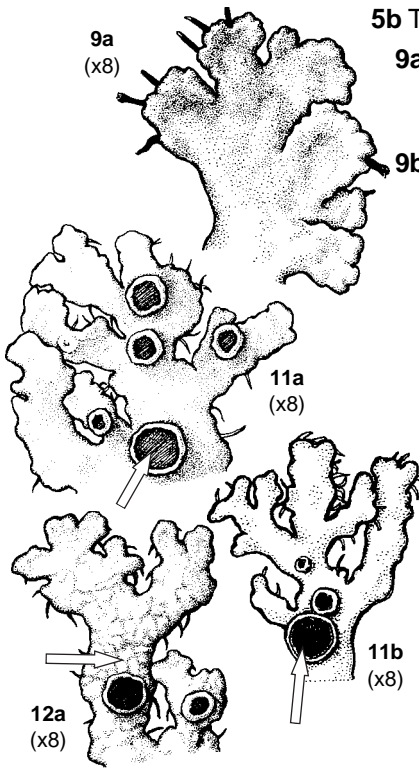
**6b** Upper surface not distinctly white-pruinose; white-spotting conspicuous or not; soredia/isidia variously positioned; usually over rock (rare over bark); distribution and chemistry various ..... 7

**7a** Lobe tips terminating in tiny bead-like isidia(←), these often coarsely sorediate when mature, occasionally massing at lobe tips and along margins; semi-arid intermontane; rare; medulla K- ..... *Physcia callosa*

**7b** Lobe tips often finely sorediate, but never beaded-isidiate; distribution and chemistry various; frequent ..... 8

**8a** Soredia located mostly on lower surface of (somewhat raised) lobe tips(←), sometimes also over lobe margins; white-spotting generally absent or indistinct over upper surface; medulla K- ..... *Physcia dubia*

**8b** Soredia located mostly over upper surface(←), but also occasionally in part as above; upper surface often distinctly white-spotted; medulla K+ yellow ..... *Physcia caesia*



- 5b Thallus lacking soredia, isidia and lobules ..... 9
- 9a Upper surface distinctly white-pruinose throughout, pale, lacking distinct white-spotting; over rock (rare over bark); semi-arid intermontane; medulla K- or occasionally K+ dingy pink ..... **Physcia biziana**
- 9b Upper surface never distinctly white-pruinose throughout (pruina, if present, confined to area of the lobe tips), pale or darkening, often distinctly pale-spotted; ecology, distribution and chemistry various ..... 10
- 10a Over bark; medulla K- or K+ yellow ..... 11
  - 11a Apothecial discs usually (but not always) distinctly white-pruinose(←); widespread; medulla K+ yellow ..... **Physcia aipolia**
  - 11b Apothecial discs usually dark(←); primarily boreal; medulla K- ..... **Physcia stellaris**
- 10b Over other substrates, including rock, bone, mosses over rock; medulla K+ yellow ..... 12
  - 12a Apothecial discs dark, not at all white-pruinose; upper surface often darkening toward thallus centre(←); mature spores usually less than 17 μ long ..... **Physcia phaea**
  - 12b Apothecial discs usually distinctly white-pruinose; upper surface pale throughout; mature spores usually more than 18 μ long ..... **Physcia aipolia** (see lead 11a)

**Physcia adscendens (Fr.) H. Olivier**

Hooded rosette (hood lichen)

Habitat/Range: Common over base-rich trees and rock in open to somewhat shady sites throughout, though mostly at lowland elevations; circumpolar, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

Notes: This species may sometimes intergrade with *P. tenella*.

**Physcia aipolia (Ehrh. ex Humb.) Fűrnr.**

Grey-eyed rosette (goat lichen, hoary rosette)

Habitat/Range: Common over base-rich deciduous trees and shrubs (also rare over rock) in open sites at lower elevations throughout, except probably absent from hypermaritime regions; circumpolar, N to AK, S to MX.

Reactions: Cortex K+ yellow; medulla K+ yellow.

Contents: Atranorin and zeorin.

Notes: Two varieties are reported to occur in B.C., though only var. *alnophila* has been seen by the authors. A few specimens are similar to var. *aipolia* morphologically, but in these the spores are shorter than 22 μ. See also notes under *Physcia phaea*.

1a Apothecia present almost to lobe tips, gradually larger toward thallus centre; spores usually less than 22 μ long ..... var. **alnophila (Vainio) Lyngbe**

1b Apothecia restricted to central portions of thallus, intermixed large and small; spores usually more than 22 μ long ..... var. **aipolia**

**Physcia biziana (Massal.) Zahlbr.**

Map 84

Frosted rosette

Habitat/Range: Frequent over base-rich rock (rare over bark) in open semi-arid intermontane sites at lower elevations; western N Am – western Eurasia, N to BC, S to MX.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

Notes: Specimens having a K+ finally pinkish medullary reaction may be referred to *P. magnussonii* Frey.

***Physcia caesia* (Hoffm.) Fűrnr.**

Powered rosette (blue-grey blister lichen)

Habitat/Range: Frequent over base-rich rock (rare over bark) in open to somewhat sheltered sites throughout; circumpolar, N to AK, S to AZ.

Reactions: Cortex K+ yellow; medulla K+ yellow.

Contents: Atranorin and zeorin.

Notes: Forms of *P. caesia* with soredia located primarily at the lobe tips are sometimes recognized as a separate species, *P. wainioi* Räsänen.

***Physcia callosa* Nyl.**

Map 85

Beaded rosette

Habitat/Range: Rare over base-rich rock in open to somewhat sheltered semi-arid intermontane localities at lower elevations; western N Am, N to BC, S to AZ.

Reactions: Cortex K+ yellow; medulla K-.

Contents: Atranorin.

***Physcia dimidiata* (Arnold) Nyl.**

Map 86

Frosted rosette

Habitat/Range: Infrequent over shrubs in open to somewhat sheltered sites at lower elevations in the semi-arid intermontane, also rare over base-rich rock; western N Am – western Eurasia, N to BC, S to CO.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

***Physcia dubia* (Hoffm.) Lettau**

Powdered rosette

Habitat/Range: Frequent over base-rich rock in open sites throughout; circumpolar, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

***Physcia phaea* (Tuck.) Thomson**

Black-eyed rosette

Habitat/Range: Infrequent over acid rock in open inland sites at lower elevations, also rare in lowland maritime localities; N Am – western Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla K+ yellow.

Contents: Atranorin and zeorin.

Notes: Pale, coastal forms of *P. phaea* with inconspicuous white-spotting are sometimes referred to *P. cascadenis* Magnusson. The spores in *P. phaea* are smaller than those in the closely related *P. aipolia*. This character is sometimes difficult to apply because of overlap in spore size. Typical spore lengths in the B.C. material are 16–18 (–20)  $\mu$  for *P. phaea* and 17–25  $\mu$  for *P. aipolia*.

***Physcia semipinnata* (J.F. Gmelin) Moberg**

Map 87

(Syn. *Physcia leptalea* (Ach.) DC.)

Fringed rosette

Habitat/Range: Rare over conifers in sheltered coast forests at lower elevations; western N Am – eastern N Am – western Eurasia, N to BC, S to NM.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

Notes: Known to occur in a single locality in the lower Fraser Valley (Goward and Thor 1992).

***Physcia stellaris* (L.) Nyl.**

Map 88

Black-eyed rosette (grey star lichen)

Habitat/Range: Rare over (base-rich) deciduous trees in open intermontane and especially boreal regions; circumpolar, N to BC, S to MX.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

**Physcia tenella (Scop.) DC in Lam. & DC.**

Fringed rosette

Habitat/Range: Frequent over (base-rich) trees and shrubs (infrequent over rock) in open to somewhat sheltered coastal sites, also rare in intermontane localities; probably incompletely circumpolar, N to BC, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin.

**PHYSCONIA**

**Physconia Poelt**

**The Frost Lichens**

**Medium stratified foliose lichens**, corticate above and below (ours), sorediate or isidiate or not, lobes appressed to loosely attached, elongate, averaging to 0.5–2 (–3) mm wide, thin. Upper surface brownish, except often **heavily white-pruinose**, K-, dull to somewhat shiny. Lower surface pale to more often blackish, dull, bearing numerous **squarrose rhizines**. Medulla white or occasionally pale yellow. Photobiont green.

Apothecia located over upper surface, disc white-pruinose; spores 2-celled, ellipsoid, brown, 8 per ascus.

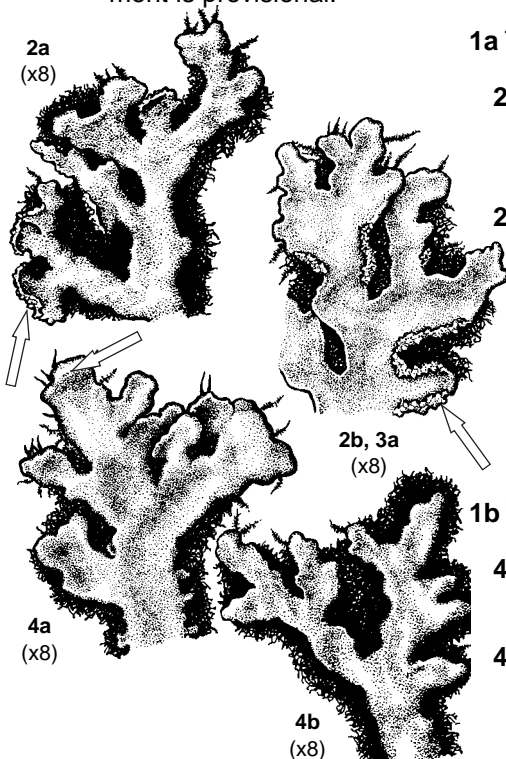
Over **calcium-rich substrates**, including rock, soil, duff, bark and bone.

Reference: Moberg (1977).

Common Name: Alludes to the characteristic presence of white pruina over the upper surface of the species.

Notes: Seven species of *Physconia* are reported for North America and five of these are known to occur in B.C.

Chemistry is of little taxonomic importance in this genus, with the exception of the K+ yellow medullary reaction of *P. enteroxantha*. See, however, the notes under that species. The species currently assigned to *Physconia* were formerly treated within *Physcia*. The genus is under taxonomic review by T. Esslinger; the following treatment is provisional.



- 1a Thallus bearing soredia and/or isidia (check lobe tips) ..... 2
- 2a Soredia/isidia mostly confined to lower surface, especially at lobe tips(←); lobe tips upturned; lower surface pale, darkening only gradually toward thallus centre ..... **Physconia perisidiosa**
- 2b Soredia/isidia mostly confined to marginal soredia(←), these not reaching lobe tips; lobe tips more or less appressed; lower surface darkening abruptly toward thallus centre ..... 3
- 3a Medulla pale yellowish, K+ yellow; upper surface generally strongly pruinose, dull ..... **Physconia enteroxantha**
- 3b Medulla white, K-; upper surface at most only weakly pruinose, often somewhat shiny ..... **Physconia detera**
- 1b Thallus lacking soredia and isidia ..... 4
- 4a Over bark or wood; lobe tips generally appressed(←); apothecia usually present; rare ..... **Physconia distorta**
- 4b Over soil, duff or mosses (rare also over bark at bases of shrubs); lobe tips often somewhat upturned; apothecia rare; common ..... **Physconia muscigena**

**Physconia detera (Nyl.) Poelt**

Map 89

Bottlebrush frost

Habitat/Range: Rare over coniferous and probably deciduous trees in open sites at lower elevations in boreal localities; probably incompletely circumpolar, N to AK, S to CO.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: See notes under *P. enteroxantha*.

***Physconia distorta* (With.) Laundon**

Map 90

(Syn. *Physconia pulverulenta* auct. non (Schreber) Poelt; *Physconia pulverulacea* Moberg in Gunnerb. & Moberg)

Grey-eyed frost

Habitat/Range: Rare over base-rich deciduous shrubs in open transition maritime–intermontane forests at lower elevations; probably western N Am – western Eurasia, N to BC, S to AZ.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Physconia enteroxantha* (Nyl.) Poelt**

Bordered frost

Habitat/Range: Frequent over deciduous trees, shrubs and (mossy) base-rich rocks in open maritime and intermontane sites at lower elevations; probably incompletely circumpolar, N to AK, S to CA.

Reactions: Medulla K+ yellow.

Contents: One unidentified lichen substance.

Notes: The K+ yellow reaction is spotty and difficult to demonstrate in a small percentage of the specimens examined. Such material would key out as *P. detersa*, though the upper surface of that species is usually rather shiny and not heavily white-pruinose as in *P. enteroxantha*. *Physconia detersa* also appears to have a strictly boreal distribution in B.C.

***Physconia muscigena* (Ach.) Poelt**

Ground frost

Habitat/Range: Common over base-rich moss and humic soil and infrequent over base of shrubs, in open to somewhat sheltered inland sites; circumpolar, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Physconia perisidiosa* (Erichsen) Moberg**

Bordered frost

Habitat/Range: Infrequent over deciduous trees, shrubs and (mossy) base-rich rocks at lower elevations in open maritime and intermontane sites; probably incompletely circumpolar, N to BC, S to CO.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

**PLACYNTHIUM**

***Placynthium* (Ach.) Gray**

**The Brownette Lichens**

**Minute** to small **stratified to nonstratified foliose or occasionally squamulose lichens**, corticate above and below, isidiate or not, lobes closely appressed or partly semi-erect, elongate-linear, linear or occasionally short, averaging to (0.1–) 0.2–0.8 (–1.5) mm wide, thin. Upper surface **dark olive-brown** or blackish, smooth or longitudinally striate. Lower surface dark or occasionally pale, bearing **blue-green** or occasionally pale rhizines, these often extending outward from thallus as **prothallus**. Medulla white. **Photobiont blue-green**.

Apothecia located over upper surface, disc dark brown to black; spores 2- to 4-celled, ellipsoid to somewhat spindle-shaped/fusiform, colourless, (4-) 8 per ascus.

**Over rock**, rarely over bark.

Reference: Henssen (1963d).

Common Name: Stresses the miniature size and superficial resemblance to certain species of “brown” lichens (e.g., *Melanelia* and *Neofuscelia*).

Notes: *Placynthium* is primarily a temperate genus, consisting of approximately 25 species worldwide. Of the six species occurring in North America, five are reported from B.C. In this taxonomically rather difficult genus, conclusive identification of some species requires detailed anatomical studies (see Henssen 1963d).

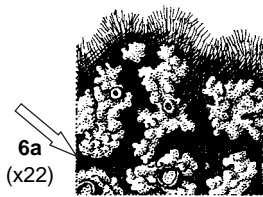
No lichen substances have been reported.

**Key to *Placynthium* and Similar Lichens**

- 1a Thallus umbilicate: attached to substrate by thickened, more or less central holdfast/umbilicus ..... 2
  - 2a Lobes thin or at least not distinctly swollen along margins; over acid rock; coastal ..... (*Spilonema revertens*)
  - 2b Lobes distinctly swollen along margins; over base-rich rock; inland ..... *Collema callopismum*

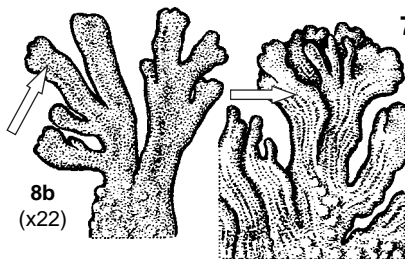
- 1b Thallus broadly or narrowly attached to substrate, but not umbilicate ..... 3
  - 3a Thallus blackish; lobes distinctly swollen; over soil ..... *Collema tenax* var. *corallinum*
  - 3b Thallus brownish; lobes not at all swollen; substrate various ..... 4

- 4a Lobes predominantly erect; over soil or bark ..... *Leptogium*
- 4b Lobes either mostly appressed to substrate or, if erect, then over rock ..... 5
  - 5a Lower surface and rhizines blue-green or blackish ..... 6



- 6a Peripheral lobes scalelike/isodiametric and strongly disjointed(←), usually bordered by distinct, darkened hypothallus which also usually borders the thallus as a whole ..... *Placynthium nigrum*

- 6b Peripheral lobes essentially continuous with thallus, elongate or short, but never scalelike; hypothallus inconspicuous or absent ..... 7



- 7a Over acid rock; lobes occasionally averaging to more than 0.2 mm wide; thallus never forming concentric rings ..... 8

- 8a Peripheral lobes averaging to less than 0.2 mm wide, often shiny and either convex or weakly channelled(←); "isidia," if present, more or less erect, granular to more often elongate-cylindrical ..... *Placynthium asperellum*

- 8b Peripheral lobes averaging to more than 0.2 mm broad, usually dull and either plane or weakly grooved(←); "isidia," if present, more or less appressed, usually granular or flattened (rarely cylindrical) ..... *Placynthium flabellosum*

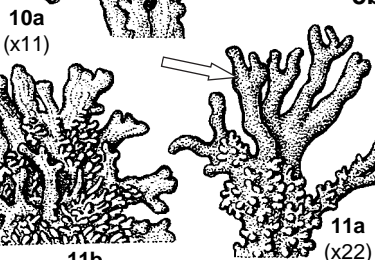
- 7b Over base-rich rock; lobes averaging to 0.2 mm wide or less; thallus sometimes forming concentric rings ..... 9



- 9a Upper surface of peripheral lobes distinctly flattened and usually crowded/contiguous at tips; thallus often ring-forming ..... *Placynthium subradiatum*

- 9b Upper surface of peripheral lobes concave and distinctly longitudinally grooved; lobe tips separate to rarely crowded; thallus usually not ring-forming ..... *Placynthium asperellum* (see lead 8a)

- 5b Lower surface pale ..... 10



- 10a Lowland maritime, probably restricted to CDF zone .... *Koerberia sonomensis*

- 10b Inland or, if occurring west of coast ranges, then restricted to upland localities ... 11

- 11a Peripheral lobes strongly convex(←), averaging to less than 0.2 mm wide; over limestone ..... *Placynthium stenophyllum* var. *isidiatum*

- 11b Peripheral lobes more or less flattened, averaging to more than 0.2 mm wide; over acid or base-rich rock, but never over limestone ..... *Vestergrenopsis*

***Placynthium asperellum* (Ach.) Trev.**

(Syn. *Placynthium aspratile* (Ach.) Henssen)

Brownette

Habitat/Range: Infrequent over seasonally wetted rock in open, inland localities; circumpolar, S to CO.



**Placynthium flabellusum (Tuck.) Zahlbr.**

Map 91

Brownette

Habitat/Range: Rare over seasonally wetted acid rock in open, intermontane localities at lower elevations; probably circumpolar, S to CA.

Notes: The anatomy of this species is unique among North American *Placynthium* species, the thallus being comprised of close-fitted, angular cells. In all other species, the cells are rounded when viewed in longitudinal section (see Henssen 1963d).

**Placynthium nigrum (Hudson) S. Gray**

Map 92

Quilted brownette

Habitat/Range: Frequent over base-rich rock in open localities throughout; circumpolar, S to CA and AZ.

Notes: Only var. *nigrum* has been recorded from B.C., though var. *tantaleum* (Hepp) Arnold is known to occur in Jasper National Park and may yet be found west of the continental divide.

1a Spores 2-, 3- or 4-celled, narrow-ellipsoid, 3.5–5.5 μ wide ..... var. *nigrum*

1a Spores 1- or 2-celled, broad-ellipsoid, 6–8 μ wide ..... [var. *tantaleum* (Hepp) Arn]

**Placynthium stenophyllum (Tuck.) Fink**

Map 93

Brownette

Habitat/Range: Infrequent over base-rich rock in open intermontane localities; western N Am, S to AZ.

Notes: The B.C. material can be assigned to var. *isidiatum* Henssen. The type locality of this variety is near Crown Lake in Marble Canyon, near Lillooet, B.C.

**Placynthium subradiatum (Nyl.) Arn.**

Map 94

Brownette

Habitat/Range: Rare over (seasonally wetted) base-rich rock in open, inland localities; tentatively western N Am – western Eurasia, S to AZ.

Notes: Some specimens can be separated from *P. flabellusum* only on the basis of anatomical studies. See the notes under that species.

**PLATISMATIA**

**Platismatia Culb. & C. Culb.**

**The Rag Lichens**

**Medium to large stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes **loosely appressed to semi-erect**, elongate to short, **often irregular**, averaging to 3–20 mm wide, thin. Upper surface pale green to whitish or whitish blue, pseudocyphellate or not. **Lower surface usually black toward thallus centre**, shiny, bearing sparse, short, simple rhizines. Medulla white. Photobiont green.

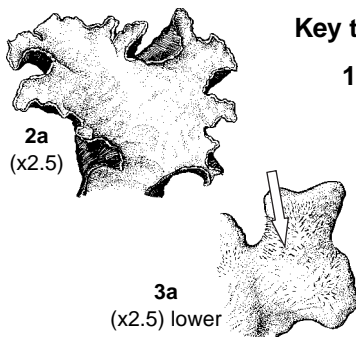
Apothecia located on or near lobe margins, disc brown, often perforate; spores simple, ellipsoid, colourless, 8 per ascus.

Over **trees and shrubs**, occasionally over logs, rarely over rock.

Reference: Culberson and Culberson (1968).

Common Name: Describes the whitish, often somewhat torn or tattered lobes of species.

Notes: *Platismatia* is primarily a temperate genus consisting of about 10 species. Of the six species reported for North America, five occur in B.C.



**Key to *Platismatia* and Similar Lichens**

1a Soredia present, occasionally intermixed with isidia ..... 2

2a Pseudocyphellae absent over upper surface; soredia often intermixed with isidia; widespread; medulla C- ..... ***Platismatia glauca***

2b Upper surface more or less distinctly pseudocyphellate; isidia absent; mostly coastal (rarely intermontane); medulla C+ reddish or C- ..... 3

3a Lower surface and rhizines pale tan to brown throughout(←) ..... ***Punctelia subrudecta***

- 
- 3b Lower surface and rhizines blackening ..... 4
- 4a Upper surface greenish or yellowish; lower surface lacking pseudocyphellae; medulla C+ reddish ..... **Flavopunctelia flaventior**
- 4b Upper surface pale bluish grey or almost white; lower surface pseudocyphellate; medulla C- ..... **Cetrelia cetrarioides**
- 1b Soredia absent; isidia present or absent ..... 5
- 5a Upper surface weakly yellowish; lower surface essentially black throughout; pycnidia located largely over upper surface(←) (check near lobe tips), often numerous; apothecia generally present; isidia absent ..... **Esslingeriana idahoensis**
- 5b Upper surface whitish to very pale bluish or greenish, never yellowish (except specimens sometimes becoming yellowish in herbarium); lower surface often in part pale; pycnidia, if present, located entirely along lobe margins; apothecia generally absent; isidia present or absent ..... 6
- 6a Lobes narrow, averaging to 1–3(–5) mm wide, elongate; upper surface smooth to weakly wrinkled ..... 7
- 7a Isidia present along lobe margins(←) ..... **Platismatia herrei**
- 7b Isidia absent ..... **Platismatia stenophylla**
- 6b Lobes broader, averaging to 6–15 mm wide, short; upper surface smooth to strikingly ridged ..... 8
- 8a Lobe margins more or less lacerate; upper surface smooth to occasionally broadly wrinkled; isidia, if present, irregularly scattered (i.e., not necessarily confined to ridges and/or lobe margins); widespread ..... **Platismatia glauca** (see lead 2a)
- 8b Lobe margins more or less even; upper surface generally deeply wrinkled or ridged at maturity; isidia, if present, restricted to ridges and/or lobe margins; restricted to humid localities; essentially coastal ..... 9
- 9a Upper surface strikingly net-ridged/reticulate, spaces between ridges deep and often bowl-like(←); isidia absent or rarely present along margins; medulla PD+ orangish red ..... **Platismatia lacunosa**
- 9b Upper surface weakly to rather strongly net-ridged/reticulate, interspaces, however, remaining shallow and saucerlike(←); isidia generally present and located both over the upper surface ridges and along lobe margins; medulla PD- ..... **Platismatia norvegica**

**Platismatia glauca (L.) Culb. & C. Culb.**

Ragbag (pale shield)

Habitat/Range: Common over conifers and deciduous trees and shrubs, also infrequent over decaying logs and mossy rocks, in open to somewhat shady forests throughout, except essentially absent in boreal and arid intermontane regions; western N Am – eastern N Am – western Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin and caperatic acid.

**Platismatia herrei (Imsh.) Culb. & C. Culb.**

Tattered rag

Habitat/Range: Frequent over conifers and deciduous trees in open to sheltered coastal forests at lower elevations; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin and caperatic acid.

**Platismatia lacunosa (Ach.) Culb. & C. Culb.**

Crinkled rag (lettuce lichen)

Habitat/Range: Infrequent over conifers, deciduous shrubs (especially alder) and rock in open maritime and especially hypermaritime localities at lower elevations; western N Am, N to AK, S to CA.

Reactions: Cortex K+ yellow; medulla PD+ orangish red.

Contents: Atranorin, caperatic acid and fumarprotocetraric acid.

**Platismatia norvegica (Lyng.) Culb. & C. Culb.**

Laundered rag

Habitat/Range: Frequent over conifers in open coastal forests at lower elevations, also rare in humid intermontane old-growth forests (ICH zone); western N Am – eastern N Am – eastern Eurasia, N to AK, S to CA.

Reactions: Cortex K+ yellow.

Contents: Atranorin and caperatic acid.

**Platismatia stenophylla (Tuck.) Culb. & C. Culb.**

Map 95

Ribbon rag (slender shield)

Habitat/Range: Infrequent over conifers in open coastal forests at lower elevations; western N Am, N to BC.

Reactions: Cortex K+ yellow.

Contents: Atranorin and caperatic acid.

**PSEUDOCYPHELLARIA**

**Pseudocyphellaria Vainio**

**The Specklebelly Lichens**

**Large stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes **loosely attached, short to somewhat elongate**, averaging to 6–20 (–30) mm wide, thin. Upper surface **greyish or brownish**, smooth or reticulate. Lower surface tomentose or not, **bearing pseudocyphellae, lacking rhizines**. Medulla white or occasionally yellow. **Photobiont green or blue-green**.

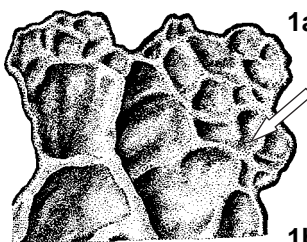
Apothecia located over upper surface or along lobe margins, disc brownish (except black when parasitized); spores 2-celled to multi-celled, spindle-shaped, colourless or brown when mature, 8 per ascus.

**Over bark.**

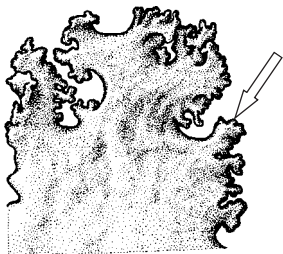
References: Magnusson (1940); Imshaug (1950); Ohlsson (1973).

Common Name: Alludes to the pale specks of pseudocyphellae occurring over the lower surface of the species.

Notes: *Pseudocyphellaria*, with approximately 200 species, is primarily a temperate genus of the southern hemisphere. Of the six species reported for North America, five occur in B.C. Spot tests are of little taxonomic value in this genus and have been omitted in the following species accounts.

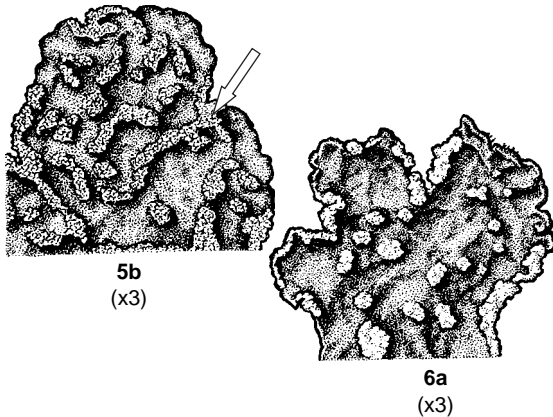


2a  
(x3)



3a  
(x3)

- 1a Soredia and isidia absent ..... 2
- 2a Upper surface distinctly net-ridged/reticulate(←), interspaces deeply pitted; photobiont a dark blue-green cyanobacterium; apothecia common ..... ***Pseudocyphellaria anthraspsis***
- 2b Upper surface more or less plane or at least not net-ridged; photobiont a green alga; apothecia unknown ..... ***Pseudocyphellaria rainierensis*** (see lead 3a)
- 1b Soredia or isidia present ..... 3
- 3a Isidia present, especially along lobe margins(←); soredia absent; medulla white; upper surface pale greenish grey (but turning brown in herbarium) ..... ***Pseudocyphellaria rainierensis***
- 3b Isidia absent; soredia present; medulla white or yellow; upper surface brownish or greyish ..... 4
- 4a Soredia whitish or greyish, never yellow; medulla white ..... 5
- 5a Upper surface strongly net-ridged, interspaces deeply pitted; soralia sparse; apothecia often present; coastal ..... (rare sorediate form of) ***Pseudocyphellaria anthraspsis*** (see lead 2a)



- 5b** Upper surface plane or, if somewhat ridged, then interspaces not deeply pitted, ridges bearing copious soralia(←); apothecia rare; widespread ..... ***Pseudocyphellaria anomala***
- 4b** Soredia and/or pseudocyphellae distinctly yellow; medulla yellow or white ..... 6
- 6a** Photobiont a dark blue-green cyanobacterium; medulla white to strong yellow (check fresh breaks in upper cortex); upper surface naked, greyish or brownish when wet; lobe margins naked ..... ***Pseudocyphellaria crocata***
- 6b** Photobiont a grass-green alga; medulla bright yellow (fresh breaks); upper surface naked or occasionally hairy, distinctly greenish when wet ..... ***Pseudocyphellaria aurata***

***Pseudocyphellaria anomala* Brodo & Ahti**

Netted specklebelly

Habitat/Range: Frequent over deciduous trees and conifers in humid intermontane (ICH zone) and especially coastal forests at lower elevations; western N Am, N to AK, S to CA.

***Pseudocyphellaria anthraxis* (Ach.) Magnusson**

Dimpled specklebelly (ear lichen)

Habitat/Range: Frequent over trees, especially conifers, in open maritime and especially hypermaritime forests at lower elevations; western N Am, N to AK, S to CA.

***Pseudocyphellaria aurata* (Sm.) Vainio**

Yellow specklebelly (rose-and-gold lichen)

Habitat/Range: Rare over deciduous trees in hypermaritime localities; incompletely circumpolar, S to OR.

Notes: The only record for B.C. is that of Benton et al. (1977) from Bamfield. Unfortunately, the specimen on which this report is based could not be located.

***Pseudocyphellaria crocata* (L.) Vainio**

Yellow specklebelly (gold-edge lichen, rags)

Habitat/Range: Infrequent over trees and shrubs in open coastal forests at lower elevations, also rare in intermontane old-growth forests (ICH zone); incompletely circumpolar, N to AK, S to OR.

Notes: Specimens in which the soredia are confined to the lobe margins are sometimes referred to *P. mougeotiana* (Del.) Vainio. See "Excluded Species."

***Pseudocyphellaria rainierensis* Imsh.**

Map 96

Old-growth specklebelly

Habitat/Range: Rare over trees and shrubs in humid coast old-growth forests at lower elevations; western N Am, S to OR.

**PSORA**

***Psora* Hoffm.**

**The Scale Lichens**

**Small stratified squamulose lichens**, corticate above, corticate or not below, nonsorediate, nonisidiate, squamules broadly attached to substrate or more often **attached at one margin**, closely appressed to loosely attached, short to more often subrotund, averaging to 2–5 (–8) mm wide, usually rather thick. Upper surface **pinkish or more often brownish**, somewhat shiny or not, often white-pruinose. Lower surface pale or darkening, **lacking rhizines**. Medulla white. Photobiont green.

Apothecia located over upper surface or along squamule margins, **disc usually convex or hemispherical when mature**, reddish brown to black; spores simple, ellipsoid, colourless, 8 per ascus.

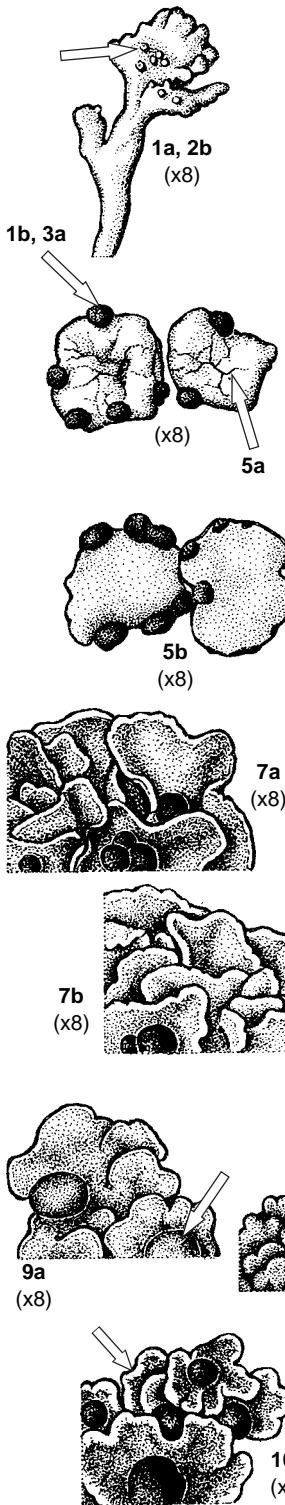
**Over exposed, base-rich soil or rock.**

Reference: Timdal (1986).

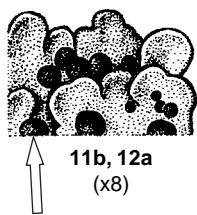
Common Name: Suggested by the tiny, rounded, often somewhat overlapping lobes of the species.

Notes: *Psora* is primarily a genus of semi-arid or arid areas, especially at temperate latitudes. Of the 17 species reported for North America, seven are found in B.C. This is a taxonomically difficult genus in which the species are not always clearly circumscribed.

**Key to *Psora* and Similar Lichens**



- 1a Growing directly over acid rock; lower surface dark, hard-corticate, never cottony; fruiting bodies (perithecia) immersed in upper surface, visible from above as blackish dots(←) ... 2
- 2a Lobes raised or appressed, distinctly thickened; lower surface black towards thallus centre; spores numerous, 1-celled; cortex KC+ reddish or KC- ..... (*Acarospora thamnina*)
- 2b Lobes raised, usually rather thin; lower surface never black; spores 2 per ascus, muriform (i.e., with transverse and longitudinal septa); cortex KC- ..... *Endocarpon pulvinatum*
- 1b Over soil, moss or occasionally base-rich rock; lower surface pale, sometimes cottony; fruiting bodies (apothecia) not immersed, usually hemispherical at maturity(←) ..... 3
- 3a Apothecia black, situated primarily along lobe margins (check young apothecia); lobes closely appressed throughout; upper surface sometimes bright red ..... 4
- 4a Lobes minute, averaging to less than 1 (-1.5) mm wide at maturity; upper surface dark brown, smooth; spores 2-celled ..... (*Arthonia glebosa*)
- 4b Lobes larger, averaging to more than 2.5 mm wide at maturity, upper surface variously coloured, smooth to fissured; spores 1-celled ..... 5
- 5a Upper surface pale (fleshy) brown, often heavily white-pruinose, usually strongly fissured(←); restricted to lowland localities ..... *Psora cerebriformis*
- 5b Upper surface bright red to brownish red, usually not heavily white-pruinose, smooth to occasionally fissured; widespread ..... *Psora decipiens*
- 3b Apothecia reddish brown, brown or black, situated primarily over upper surface of lobes (check young apothecia); lobes appressed or ascending; upper surface never bright red ..... 6
- 6a Lobes distinctly ascending, often partly vertical; upper surface in part greenish (check sheltered lobes); apothecia often compound, black or brownish black ..... 7
- 7a Lobes to 10 mm long (often smaller); upper surface medium green; lower surface white to pale brown; widespread ..... *Psora nipponica*
- 7b Lobes to 4 mm long; upper surface yellowish green (check sheltered lobes); lower surface yellowish; restricted to northern alpine areas ..... *Psora rubiformis*
- 6b Lobes appressed or at most weakly raised, not distinctly ascending; upper surface brownish; apothecia simple, black to reddish brown ..... 8
- 8a Apothecia reddish brown to at most medium brown; upper surface generally pale reddish brown ..... 9
- 9a Apothecia strongly convex(←), usually hemispherical; gyrophoric acid absent; common ..... *Psora tuckermanii*
- 9b Apothecia at most weakly convex(←); gyrophoric acid present; apparently rare ..... *Psora montana*
- 8b Apothecia dark brown to black; upper surface generally dark brownish ..... 10
- 10a Lobes distinctly white-pruinose along margins(←); lower surface white in the vicinity of the margins ..... *Psora himalayana*
- 10b Lobes not or only faintly white-pruinose along margins (but occasionally pruinose on upper surface, especially near margins); lower surface brownish ..... 11
- 11a Apothecia usually only weakly convex at maturity; lobes generally averaging to less than 1 mm wide; upper surface often distinctly pruinose, not at all fissured; medulla KC+ reddish or KC-, containing gyrophoric acid; semi-arid localities ..... *Psora montana* (see lead 9b)



**11b** Apothecia strongly convex(←) (often hemispherical) at maturity; lobes averaging to more than 1 mm wide; upper surface at most weakly pruinose, often distinctly fissured; medulla KC-, lacking gyrophoric acid; distribution various ...  
 ..... 12

**12a** Upper surface with shiny “waxen” appearance, especially near margins, usually dark reddish brown..... *Psora globifera* (including *Psora luridella*)

**12b** Upper surface less shiny, creamy brown to medium brown (rarely dark)  
 ..... *Psora tuckermanii* (see lead **9a**)

***Psora cerebriformis* W. Weber**

Map 97

Fissured scale

Habitat/Range: Infrequent over base-rich soil in open intermontane grassland (BG zone); western N Am, N to AK, S to CA and NM.

Reactions: All spot tests negative.

Contents: Atranorin (norstictic acid).

***Psora decipiens* (Hedwig) Hoffm.**

(Syn. *Lecidea decipiens* (Hedwig) Ach.)

Sockeye scale (white-edged scale)

Habitat/Range: Frequent over base-rich soil in open inland sites, especially in semi-arid BG zone, but also occasionally in alpine; circumpolar, S to MX.

Reactions: All spot tests negative.

Contents: (Norstictic acid.)

***Psora globifera* (Ach.) Massal.**

(Syn. *Lecidea globifera* Ach.)

Blackberry scale

Habitat/Range: Common over base-rich rock, infrequent over soil in open inland sites, especially in semi-arid BG zone; N Am – western Eurasia, N to YU, S to CA, NM.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: Most, if not all, of the B.C. material previously identified as *P. luridella* can be referred to *P. globifera*. A few recent specimens were tentatively assigned to *P. luridella* by E. Timdal who observes, however, that the distinction between these two species is not always clear. The lobes in *P. globifera* should be thicker, more fissured and less closely appressed than those in *P. luridella*. These characters, however, are doubtless subject to considerable environmental modification, leaving open the question whether *P. luridella* really does occur in B.C.

***Psora himalayana* (Church. Bab.) Timdal**

Mountain scale

Habitat/Range: Frequent over base-rich soil and rock in open inland sites throughout; western N Am – eastern Eurasia, N to AK, YU, S to AR and CO.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: Sterile material can be difficult to separate from nonfruiting specimens of *Acarospora glaucocarpa*. In *Psora* the algal layer is continuous, whereas in *A. glaucocarpa* the algae are organized in discrete clumps.

***Psora montana* Timdal**

Map 98

Brown-eyed scale

Habitat/Range: Rare (overlooked?) over base-rich soil (including thin soil over rock) in open semi-arid and dry intermontane localities at lower elevations; western N Am, N to BC, S to UT.

Reactions: Medulla C+ reddish or C-, KC+ reddish or KC-.

Contents: Gyrophoric acid.

Notes: The identity of the B.C. material is problematic: according to E. Timdal (Oslo, pers. comm., 1992), it is morphologically similar to *P. pacifica* Timdal (i.e., with ascendant lobes), but is chemically closer to *P. montana*.

**Psora nipponica (Zahlbr.) G. Schneider**

(Syn. *Lecidea novomexicana* (B. de Lesd.) W. Weber ex R. Anderson; *Psora novomexicana* B. de Lesd.)

Butterfly scale

Habitat/Range: Frequent over acid or base-rich soil and rock in open maritime and intermontane sites; western N Am – eastern Eurasia, N to AK, S to CA.

Reactions: Lower surface C+ rose or C-.

Contents: Gyrophoric acid and lecanoric acid.

**Psora rubiformis (Ach.) Hook.**

Map 99

(Syn. *Lecidea rubiformis* (Ach.) Wahlenb.)

Butterfly scale

Habitat/Range: Rare over base-rich soil (especially thin soil over rock) at alpine elevations in northern intermontane localities; western N Am – eastern N Am – western Eurasia, N to AK, S to CO.

Reactions: Cortex KC+ yellow (or apparently KC-); medulla KC+ reddish or KC-.

Contents: Usnic acid (and gyrophoric acid).

Notes: Earlier reports of *P. rubiformis* from B.C. appear to belong to the more widespread *P. nipponica*. The only authentic specimens known to us were recently collected in the Tatshenshini Valley.

**Psora tuckermanii R. Anderson ex Timdal**

Brown-eyed scale

Habitat/Range: Frequent over base-rich soil and rock in open lowland sites in dry intermontane (BG, PP, IDF zones); western N Am, S to CA and NM.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

Notes: *Psora tuckermanii* occasionally bears blackish apothecia and may be difficult to distinguish from *P. globifera*. Such forms, however, are not known to occur in B.C.

**PSOROMA**

**Psoroma Ach. ex Michaux**

**The Mouse Lichens**

**Small to medium stratified squamulose lichens** (ours), corticate above and below, nonsorediate, nonisidiate, cephalodia external, squamules closely to rather loosely appressed, averaging to 0.2–0.5 mm wide (ours). Upper surface usually **brownish**, smooth. Lower surface pale and resting on a pale hypothallus, lacking rhizines. Medulla white. **Photobiont green**, except with secondary blue-green cephalodia.

Apothecia located over upper surface, disc reddish brown; spores simple, ellipsoid to spherical, colourless, 8 per ascus.

**Over rock, soil and trees.**

References: Jørgensen (1978); Henssen and Renner (1981).

Common Name: Reflects the resemblance of the species to “mouse” lichens of the genus *Pannaria*.

Notes: *Psoroma*, with approximately 35 species worldwide, is primarily a temperate genus of the southern hemisphere. Two species are reported for North America and only one of these occurs in B.C. A second species is not conclusively identified. *Psoroma* is closely related to *Pannaria*, but contains a green algal photobiont. The taxonomic distinctness of these two genera is in question.



1a  
(x6)



1b  
(x15)

**1a** Upper surface orangish brown; hypothallus pale; apothecia frequent(←); widespread ..... **Psoroma hypnorum**

**1b** Upper surface dark olive-green; apothecia unknown in B.C. material; northern; alpine ..... **Psoroma** sp. 1

**Psoroma hypnorum (Vahl) S. Gray**

Green mouse (scurf lichen)

Habitat/Range: Frequent over moist soil or rock in open or sheltered sites throughout; circumpolar, S to NM.

Reactions: All spot tests negative, except hymenium I+ strong blue.

Contents: No lichen substances reported.

Notes: Cephalodia are occasionally present in this species. These are similar in form to the lobes, but are dark and contain a blue-green cyanobacterium.

**Psoroma sp. 1**

Map 100

Olive mouse

Habitat/Range: Rare over exposed acid outcrops in northern intermontane alpine localities; global range unknown.

Reactions: All spot tests negative.

Contents: No data available.

Notes: Included on the basis of a single specimen from the Tatshenshini Valley. The material, though scanty, is distinctive, consisting of small, semi-erect, densely overlapping squamules that average to 0.3–0.7 mm wide, and are intermingled with sparse, convoluted, dark brown cephalodia to 1 mm across. The lower surface is pale and supports a few cottony rhizines, though much of the surface is obscured by a thick, dark hypothallus. Though not closely matching Henssen and Renner's description (1981) of *P. tenue* Henssen var. *borealis* Henssen, the B.C. material may possibly be a shade form of that species. Further studies are in progress.

**PUNCTELIA**

**Punctelia Krog**

**The Speckleback Lichens**

**Small to medium stratified foliose lichens**, corticate above and below, **sorediate** (ours), lobes loosely appressed, elongate, averaging to 2–10 mm wide, thin to somewhat thick. Upper surface **pale greyish to pale greenish, K+ yellow, bearing small, rounded pseudocyphellae**. Lower surface pale or dark, shiny, bearing short, simple rhizines. Medulla white. Photobiont green.

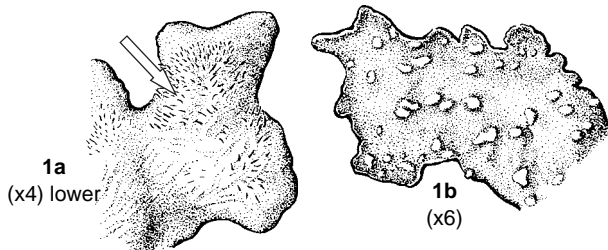
Apothecia unknown in the B.C. material.

Over rock and trees.

References: Hale (1965a); Krog (1982).

Common Name: Suggested by the presence of pale, speckle-like pseudocyphellae over the upper surface.

Notes: *Punctelia* is essentially a temperate and subtropical genus of approximately 18 species worldwide. Eleven of these occur in North America and two in B.C. For points of distinction with similar species in other genera, see the key under *Platismatia*.



- 1a** Lower surface and rhizines pale tan to brown throughout(←); over rock and trees ..... ***Punctelia subrudecta***
- 1b** Lower surface and rhizines blackening; over rock ..... ***Punctelia stictica***

**Punctelia stictica (Duby) Krog**

Map 101

(Syn. *Parmelia stictica* (Duby) Nyl.)

Seaside speckleback

Habitat/Range: Frequent over rock in open coastal outcrops at lower elevations, especially near the ocean; western N Am – eastern N Am – western Eurasia.

Reactions: Cortex K+ yellow; medulla C+ reddish, KC+ reddish.

Contents: Atranorin, gyrophoric acid.



**Punctelia subrudecta (Nyl.) Krog**

Map 102

(Syn. *Parmelia subrudecta* Nyl.)

Forest speckleback

Habitat/Range: Infrequent over rock, trees and shrubs in open maritime forests (CDF zone) at lower elevations; incompletely circumpolar, N to BC, S to CA.

Reactions: Cortex K+ yellow; medulla C+ reddish, KC+ reddish.

Contents: Atranorin, lecanoric acid.

**RHIZOPLACA**

**Rhizoplaca Zopf**

**The Rockbright Lichens**

**Small stratified foliose lichens** (ours), **umbilicate**, rotund, corticate above and below, nonsorediate, nonisidiate, lobes poorly developed, entire thallus averaging to 1–2 cm across, thin to thick. Upper surface **whitish or pale greenish**. Lower surface pale, brownish or blue-black, **lacking rhizines**. Medulla white. Photobiont green.

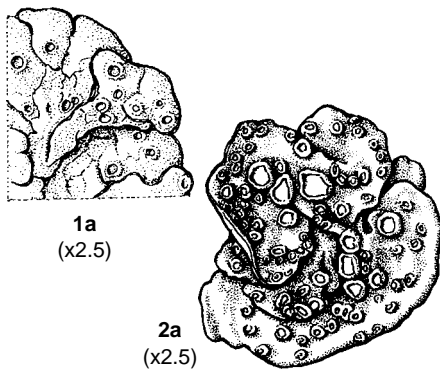
Apothecia located over upper surface, **usually numerous**, disc even, pinkish or brownish to greenish or blackish; spores simple, ellipsoid, colourless, 8 per ascus.

**Over acid or base-rich rock.**

References: Leuckert et al. (1977); McCune (1987).

Common Name: Describes the habitat and brightly coloured upper surface of the species.

Notes: *Rhizoplaca* is primarily a genus of temperate latitudes where it is best represented in semi-arid regions. Of the six species reported for North America, only three occur in B.C.



**1a** Lower surface cracked, cracks generally assuming distinct netlike pattern (check larger thalli); apothecial margins lacking white pruina, discs greenish or more often brownish; medulla PD+ orange (rarely PD+ yellow) .....

..... ***Rhizoplaca peltata***

**1b** Lower surface continuous or, if cracked, then cracks radial (i.e., never forming distinct netlike pattern); apothecial margins often pruinose, discs pinkish orange, greenish, brownish, or rarely black; medulla PD+ yellow or PD- ....

**2a** Apothecial discs at least in part pale or bright orangish or pinkish orange .....

..... ***Rhizoplaca chrysoleuca***

**2b** Apothecial discs pale greenish to olive-brownish or black .....

..... ***Rhizoplaca melanophthalma***

***Rhizoplaca chrysoleuca* (Sm.) Zopf**

(Syn. *Lecanora chrysoleuca* (Sm.) Ach.; *L. rubina* (Vill.) Ach.)

Pink-eyed rockbright

Habitat/Range: Frequent over acid or base-rich rock in open to exposed inland sites, especially in arid or dry climates; circumpolar, S to MX.

Reactions: Medulla PD- or rarely PD+ yellow.

Contents: Usnic, (placodiolic, pseudoplacodiolic and psoromic acids).

***Rhizoplaca melanophthalma* (DC. in Lam. & DC.) Leuck. & Poelt**

(Syn. *Lecanora melanophthalma* (DC. in Lam. & DC.) Ramond)

Black-eyed rockbright

Habitat/Range: Frequent over acid or (occasionally) base-rich rock in open to exposed inland sites, especially in arid or dry climates; circumpolar, S to MX.

Reactions: Medulla PD+ yellow or PD-.

Contents: Usnic, (placodiolic and psoromic acids).

Notes: Some of the B.C. specimens seem to be intermediate between *R. melanophthalma* and *Lecanora muralis* (Schreber) Rabenh.; these possibly represent a distinct taxon.

**Rhizoplaca peltata (Ramond) Leuck. & Poelt**

Map 103

(Syn. *Lecanora peltata* (Ramond) Steudel)

Brown-eyed rockbright

Habitat/Range: Infrequent over base-rich rock in open to exposed, arid intermontane localities, especially the BG zone; western N Am – western Eurasia – eastern Eurasia, S to AZ.

Reactions: Medulla PD+ orange (rarely PD+ yellow or PD-).

Contents: Pannarin, usnic acid, zeorin (and psoromic acid).

**SOLORINA****Solorina Ach.****The Owl Lichens**

Small to medium (rarely minute) **stratified foliose lichens**, corticate above and below, nonsorediate, nonisidiate, bearing cephalodia, lobes closely appressed to more often **loosely appressed**, short to subrotund, averaging to 0.5–3 (–10) mm wide, thin. Upper surface **pale greenish** or occasionally orangish brown, shiny or dull. Lower surface white or, in one species, orange, dull, usually weakly **veined**, often bearing scattered rhizines. Medulla white (orange in one species). **Photobiont green and blue-green**.

Apothecia **immersed in upper surface, disc reddish brown**; spores 2-celled, ellipsoid, brown, 2–8 per ascus.**Over soil and mosses over soil**, usually base-rich sites.

References: Thomson (1984); Thomson and Thomson (1984).

Common Name: Alludes to the typically round, large apothecia, which are usually somewhat sunken below the average level of the upper surface.

Notes: *Solorina* is a boreal–arctic genus consisting of about ten species worldwide. Five species are reported for North America and all occur in B.C. Spot tests are of little taxonomic value in this genus and have therefore been omitted in the following accounts. For points of distinction with similar lichens, see the key under *Peltigera*.

- 
- 1a Medulla bright orange; over acid or base-rich soil in snowy localities; alpine and subalpine ..... ***Solorina crocea***
- 1b Medulla white; over base-rich soil; distribution various ..... 2
- 2a Thallus more or less well developed, at maturity generally more than 1.0 cm wide; upper surface never pruinose, usually continuous; apothecia weakly to sometimes deeply sunken ..... 3
- 3a Upper surface predominantly pale greenish; thallus usually more or less rounded in outline, not lobate; spores 4 per ascus; widespread ..... ***Solorina saccata***
- 3b Upper surface predominantly brownish; thallus lobate, lobes short or elongate (i.e., thallus not rounded in outline); spores 8 per ascus; alpine ..... ***Solorina octospora***
- 2b Thallus often poorly developed, often less than 1.0 cm wide at maturity; upper surface often white-pruinose, chinky-cracked when mature; apothecia deeply sunken ..... 4
- 4a Thallus minute, often consisting primarily of granular cephalodia that form supporting "cushion" around apothecia(←); spores 4 per ascus ..... ***Solorina spongiosa***
- 4b Thallus larger, conspicuous; apothecia not associated with cephalodia; spores 2 per ascus ..... ***Solorina bispora***

***Solorina bispora* Nyl.**

Map 104

Tundra owl

Habitat/Range: Rare over base-rich soil and rock in exposed inland alpine localities; circumpolar, S to NM.

***Solorina crocea* (L.) Ach.**

Chocolate chip (saffron-yellow solorina)

Habitat/Range: Frequent over acid and base-rich soil in seepage sites below late-lying snow patches at alpine and subalpine elevations throughout, except possibly absent from hypermaritime localities; circumpolar, S to NM.

**Solorina octospora (Arnold) Arnold**

Map 105

Tundra owl

Habitat/Range: Infrequent over base-rich soil and rock in exposed inland alpine localities; probably circumpolar, S to NM.

**Solorina saccata (L.) Ach.**

Woodland owl (dimpled lichen)

Habitat/Range: Infrequent over moist base-rich soil, moss and rock in open to somewhat shady localities throughout, except rare in maritime sites and probably absent from the arid intermontane; circumpolar, S to OR.

Notes: Cephalodia are occasionally developed over the upper surface in the B.C. material.

**Solorina spongiosa (Ach.) Anzi**

Map 106

Fringed owl

Habitat/Range: Rare over moist base-rich soil and moss in exposed intermontane and especially boreal alpine localities; probably circumpolar, S to NM.

**STICTA**

**Sticta (Schreber) Ach.**

**The Moon Lichens**

Small to medium **stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes **loosely attached** to semi-erect, elongate to more often rotund, averaging to 1–2 cm wide, often single-lobed or few-lobed. Upper surface usually dark brownish, greyish brown or nearly black, rarely pale green. Lower surface pale or dark, naked or more often bearing minute woolly hairs, and **bearing cyphellae**. Medulla white (ours). Photobiont blue-green or green.

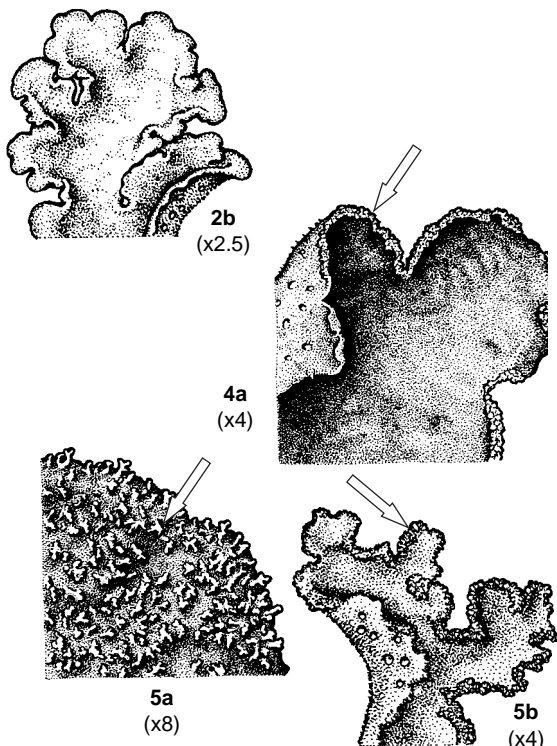
Apothecia not seen in the B.C. material.

**Over bark**, rarely also over mossy rock.

Reference: Galloway (1985).

Common Name: Suggested by the presence of numerous tiny, sunken cyphellae (“craters”) over the lower surface.

Notes: *Sticta*, with about 200 species worldwide, is primarily a tropical and temperate genus of the southern hemisphere. Only eight species are reported for North America and five have been documented in B.C.



- 1a Photobiont a green alga; upper surface pale green; rare ..... 2
- 2a Growing attached to *Dendroscopula intricatum* (Nyl.) Henssen (i.e., a small, black, shrubby lichen); upper cortex K+ yellow ..... *Sticta* sp. 1
- 2b Not growing attached to *D. intricatum*; upper cortex K- ..... *Sticta wrightii*
- 1b Photobiont a dark blue-green cyanobacterium; upper surface dark or at least never pale green; status various ..... 3
- 3a Isidia and soredia absent; over mosses and mossy rocks in alpine zone ..... [*Sticta arctica*]
- 3b Isidia or soredia present; over trees or mossy rocks at lower elevations ..... 4
- 4a Thallus sorediate (except older soredia sometimes somewhat isidiate), soredia essentially restricted to lobe margins(←) ..... *Sticta limbata*
- 4b Thallus isidiate from the first, isidia variously distributed ..... 5
- 5a Isidia more or less scattered over upper surface(←) ..... *Sticta fuliginosa*
- 5b Isidia clustered along lobe margins(←) (also occasionally in clusters over upper surface) ..... *Sticta weigellii*

**[*Sticta arctica* Degel.]**

Arctic moon

Habitat/Range: Over mosses and mossy rocks in alpine localities; N Am – eastern Eurasia, N to AK, S to OR.

Reaction: All spot tests negative.

Contents: No lichen substances reported.

Notes: Not recorded from B.C., but known to occur in southern coastal Alaska only a few kilometres from the B.C. border.

***Sticta fuliginosa* (Hoffm.) Ach.**

Peppered moon (sooty leather lichen)

Habitat/Range: Frequent over deciduous trees and conifers, also over mossy rock, in humid forests at lower elevations throughout, except absent from boreal regions; incompletely circumpolar, N to AK, S to CA.

Reaction: All spot tests negative.

Contents: No lichen substances reported.

***Sticta limbata* (Sm.) Ach.**

Powdered moon

Habitat/Range: Infrequent over deciduous trees and especially mossy rock in open coastal forests at lower elevations, also rare in intermontane (ICH zone); western N Am – eastern N Am – western Eurasia, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Sticta weigellii* (Ach.) Vainio**

Map 107

Fringed moon (Weigel's leather lichen)

Habitat/Range: Rare over trees and shrubs in open coastal forests at lower elevations; western N Am – eastern N Am – eastern Eurasia, N to AK, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Sticta wrightii* Tuck.**

Map 108

Green moon

Habitat/Range: Rare over conifers in semi-shady intermontane old-growth forests at lower elevations; western N Am – eastern Eurasia, N to AK, S to BC.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

***Sticta* sp. 1**

Map 109

Green moon

Habitat/Range: Rare over conifer branches and mossy logs in humid intermontane forests at lower elevations; global distribution unknown.

Reactions: Cortex K+ yellow.

Contents: No data available.

Notes: *Sticta* sp. 1 is the blue-green phototype of *Dendriscoaulon intricatum* (Nyl.) Henssen.**UMBILICARIA*****Umbilicaria* Hoffm.****The Rocktripe Lichens**

Small to **medium stratified foliose lichens, umbilicate**, rotund to subrotund, corticate above and below, isidiate or more often not, thalloconidiate or not, lobes developed or not, thallus averaging to 0.5–7 (–15+) cm across, thin or occasionally thick. Upper surface **greyish to dark brown**. Lower surface tan, brown or black, naked or more or less covered in rhizines, plates and/or papillae. Medulla white. Photobiont green.

Apothecia located over upper surface, **disc even or variously fissured or with central protruding button**, black; spores simple or multi-celled, ellipsoid, colourless or occasionally brown, (1–) 8 per ascus.

References: Llano (1950); Imshaug (1957); Thomson (1984); Hestmark (1990); Wei and Biazrov (1991).

Common Name: Traditional, reflecting both the strict occurrence of the species over rock and (apparently) the use of certain species as food in times of famine.

Notes: *Umbilicaria* is primarily a boreal and arctic genus consisting of approximately 45 species worldwide. Of the 28 species known to occur in North America, 20 are reported for B.C. Earlier authors arranged the species listed below in as many as four genera — *Actinogyra*, *Agyrophora*, *Omphalodiscus* and *Umbilicaria* — though it is now customary to accommodate them in *Umbilicaria*. Strongly pustulate species, however, should be checked for in *Lasallia*. Gyrophoric acid (C+ red) is present in most *Umbilicaria* species, and norstictic and stictic acids also occur on occasion. Chemistry, however, is of little diagnostic value in this genus and is omitted in the following accounts.

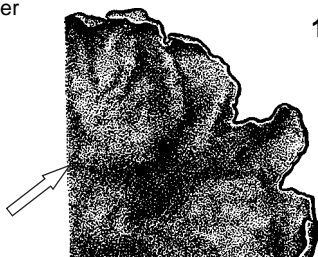
- 
- 1a Minute isidia present over upper surface(←); lower surface naked, often weakly pitted .... *Umbilicaria deusta*
- 1b Isidia absent; lower surface naked or bearing plates or rhizines, pitted or not ..... 2
- 2a Thallus apparently crustose: closely and broadly attached to substrate; upper surface chinky-cracked (i.e., divided into numerous polygonal plates); inland in exposed alpine sites ..... *Umbilicaria lambii*
- 2b Thallus distinctly foliose, attached to substrate by single, more or less central holdfast; upper surface occasionally perforate or segmented, but never chinky-cracked; distribution and ecology various ..... 3
- 3a Lower surface (excluding rhizines) jet black throughout or partly covered in sharply demarcated, black, sooty patches (i.e., thalloconidia present or apparently present) (Note: all specimens having ball-tipped rhizines key here) ..... 4
- 4a Lower surface (or sometimes lobe margins) bearing numerous rhizines and/or plate-like outgrowths ..... 5
- 5a Upper surface very strongly white-pruinose(←); pale cream to occasionally greyish white ..... *Umbilicaria vellea*
- 5b Upper surface at most moderate pruinose; greyish, brownish or blackish ..... 6
- 6a Upper surface abundantly perforate (check near lobe margins) and/or bearing scattered tufts of rhizines ..... 7
- 7a Upper surface ridged and white-pruinose over thallus centre, also generally sparsely rhizinate(←); lower surface partly sooty black (i.e., thalloconidia present); apothecia rare; alpine ..... *Umbilicaria havaasii*
- 7b Upper surface more or less segmented(←), but never distinctly ridged, white-pruinose or rhizinate; lower surface pale to dark, but never sooty black (i.e., thalloconidia absent); apothecia common; widespread ..... *Umbilicaria torrefacta*
- 6b Upper surface lacking perforations or only sparsely perforate; upper surface lacking rhizines (Note: all specimens having ball-tipped rhizines key here) ..... 8
- 8a Rhizines in part distinctly ball-tipped(←) ..... 9
- 9a Lower surface bearing horizontal, platelike outgrowths (check toward thallus centre); alpine; northern; rare ..... *Umbilicaria cinereorufescens*
- 9b Lower surface strictly rhizinate, lacking platelike outgrowths; lowland; coastal; frequent ..... *Umbilicaria polyrrhiza*
- 8b Rhizines not at all ball-tipped ..... 10
- 10a Lower surface with sharply demarcated black sooty patches/thalloconidia(←); rhizines sparse; apothecia rare; alpine; northern; rare ..... *Umbilicaria aprina*
- 10b Lower surface more or less dark, but without sharply demarcated sooty patches; rhizines abundant; apothecia usually abundant; ecology and distribution various; frequent or infrequent ..... 11



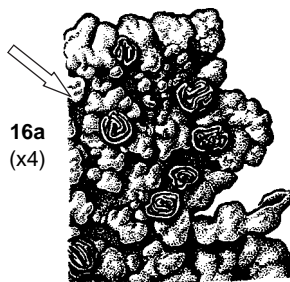
11a  
(x1.5)  
lower



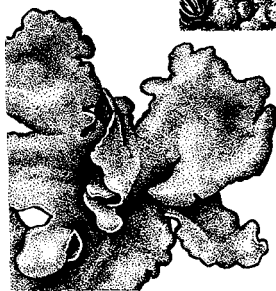
11b  
(x4)



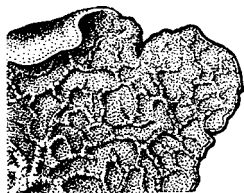
13b, 14a  
(x4) lower



16a  
(x4)



17b  
(x4)



18b  
(x2.5)

**11a** Lower surface generally brownish toward thallus periphery; "rhizines" distinctly grainy textured (graininess visible with hand lens), oriented more or less parallel to lower surface and forming interwoven network(←) over it; apothecia generally rounded in outline ..... *Umbilicaria muehlenbergii*

**11b** Lower surface (excluding rhizines) generally black throughout, rhizines more or less discrete or at least not distinctly netlike; graininess detectable or not over lower surface itself, but rhizines not at all grainy; apothecia generally angular(←) in outline ..... *Umbilicaria angulata*

**4b** Lower surface sometimes minutely textured, but lacking rhizines and plates or bearing a few scattered cylindrical rhizines; lobe margins never rhizinate ..... 12

**12a** Upper surface more or less smooth, sometimes bearing sparse rhizines ..... 13

**13a** Upper surface generally sparsely rhizinate; lower surface pale toward thallus centre and at margins, black, sooty thalloconidia usually confined to portions in between ..... *Umbilicaria havaasii* (see lead 7a)

**13b** Upper surface never bearing rhizines; lower surface black almost throughout(←) ..... 14

**14a** Apothecia absent or at most sparse; upper surface often weakly lobulate ...  
..... *Umbilicaria polyphylla*

**14b** Apothecia usually abundant; upper surface never lobulate .....  
..... *Umbilicaria hyperborea* (see lead 16a)

**12b** Upper surface distinctly ridged, pustulate or grainy textured rhizines absent ..... 15

**15a** Upper surface smooth or pustulate-ridged, more or less uniformly brown (occasionally blackish brown) throughout; white pruina absent or at most weakly developed over thallus centre ..... 16

**16a** Lower surface not distinctly sooty black, generally somewhat shiny (i.e., thalloconidia absent); upper surface usually pustulate-ridged(←); apothecia common ..... *Umbilicaria hyperborea*

**16b** Lower surface dull sooty black almost throughout (i.e., thalloconidia present); upper surface plane to pustulate-ridged; apothecia rare ..... 17

**17a** Upper surface more or less pustulate-ridged, not at all lobulate; thallus usually few-lobed ..... *Umbilicaria nylanderiana*

**17b** Upper surface more or less smooth, often sparsely lobulate; thallus many-lobed ..... *Umbilicaria polyphylla* (see also lead 14a)

**15b** Upper surface net-ridged or grainy textured, usually dark greyish to blackish, except distinctly white-pruinose over thallus centre ..... 18

**18a** Upper surface strongly net-ridged more or less throughout; thallus thick (300–600 μ), rigid; lower surface often with folds radiating from umbilicus; apothecial disc buttoned to apparently much-fissured (omphalodisc to apparently gyrodisc) ..... [*Umbilicaria decussata*]

**18b** Upper surface generally net-ridged only toward thallus centre(←); thallus thinner, somewhat pliant; lower surface without folds radiating from umbilicus; apothecial disc smooth ..... *Umbilicaria lyngei* (see also lead 7a)

**3b** Lower surface (excluding rhizines) pale or brown or, if partly grading to black, then thalloconidia absent (i.e., lacking sharply demarcated black, sooty patches); apothecia usually abundant ..... 19

**19a** Lower surface (or sometimes lobe margins) bearing numerous rhizines and/or platelike outgrowths ..... 20

**20a** Lower surface bearing platelike outgrowths, these often dissected, forming network of interwoven "rhizines" that may in part resemble true rhizines ..... 21

**21a** Upper surface distinctly segmented and/or apparently composed of close-fitting lobes when mature; thallus margins also more or less densely and minutely perforate (as though with pinholes) ..... *Umbilicaria torrefacta* (see lead 7b)

**21b** Upper surface occasionally cracked, but not at all distinctly segmented; thallus margins not perforate when mature .....  
..... *Umbilicaria muehlenbergii* (see lead 11a)

**20b** Lower surface and/or lobe margins more or less rhizinate; platelike outgrowths absent ..... 22

**22a** Upper surface pale, more or less strongly white-pruinose throughout; lower surface pale pinkish to pale brownish; apothecial discs smooth (leiodisc) or variously fissured; alpine ..... 23

**23a** Lower surface pale tan to brownish; lobe margins generally at least in part rhizinate; apothecial discs much-fissured (gyrodisc)(←) .....  
..... *Umbilicaria cylindrica*

**23b** Lower surface pinkish; lobe margins rarely rhizinate (though often appearing so owing to the projection of the rhizines of lower surface beyond thallus periphery); apothecial discs smooth or at most buttoned (omphalodisc)(←) .....  
..... *Umbilicaria virginis*

**22b** Upper surface dark, never strongly white-pruinose throughout (pruina, however, sometimes distinct over thallus centre); lower surface pale greyish; apothecial discs much-fissured; distribution various ..... 24

**24a** Upper surface generally weakly pustulate and/or pustulate-ridged throughout, net-ridged or partly segmented; peripheral portions of thallus continuous, never minutely perforate .....  
..... *Umbilicaria hyperborea* var. *radicula* (see lead 16a)

**24b** Upper surface either in part net-ridged (check thallus centre) or segmented (check thallus periphery), rest of thallus pustulate or not; peripheral portions of thallus sometimes minutely perforate ..... 25

**25a** Upper surface generally net-ridged/reticulate(←) and/or white-pruinose over thallus centre; thallus periphery continuous (i.e., neither segmented nor minutely perforate) ..... *Umbilicaria proboscidea*

**25b** Upper surface neither net-ridged nor distinctly white-pruinose; thallus periphery generally distinctly segmented and minutely perforate(←) .....  
..... *Umbilicaria torrefacta*

**19b** Lower surface sometimes minutely textured, lacking rhizines and plates or at most bearing a few scattered cylindrical rhizines; lobe margins never rhizinate ..... 26

**26a** Lower surface distinctly and evenly grainy textured throughout, graininess readily observed with hand lens ..... 27

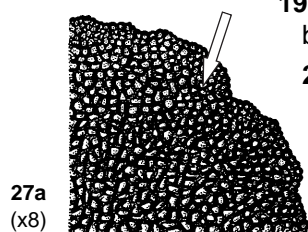
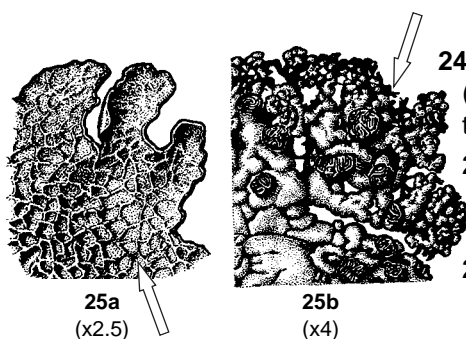
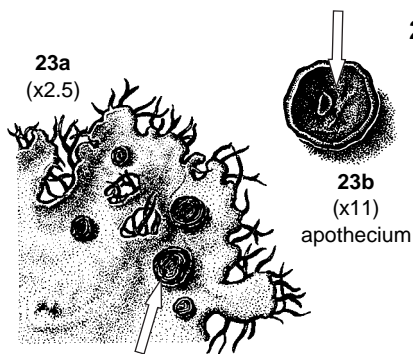
**27a** Upper surface distinctly and more or less evenly grainy textured throughout(←), generally also distinctly white-pruinose over thallus centre; apothecial discs smooth or at most buttoned; alpine ..... *Umbilicaria rigida*

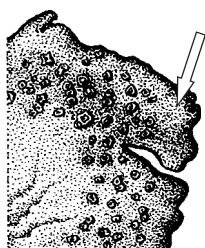
**27b** Upper surface plane to pustulate-ridged or apparently chinky, never distinctly grainy textured, never white-pruinose; apothecia much-fissured; distribution various ..... 28

**28a** Thallus periphery abundantly and minutely perforate .....  
..... *Umbilicaria torrefacta* (see lead 25b)

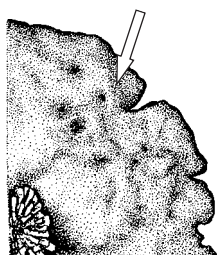
**28b** Thallus periphery never abundantly and minutely perforate ..... 29

**29a** Upper surface more or less blistered/pustulate-ridged; thallus generally irregular in outline ..... *Umbilicaria hyperborea* (see lead 16a)





29b  
(x2.5)



31b  
(x4) lower

- 29b** Upper surface smooth(←) or apparently chinky, never distinctly pustulate; thallus generally somewhat round in outline ..... ***Umbilicaria phaea***
- 26b** Lower surface smooth or at most irregularly and minutely grainy, graininess difficult or impossible to detect with hand lens ..... 30
- 30a** Upper surface usually pustulate-ridged throughout, spaces between pustules often in part darker than pustules themselves; location of holdfast not readily discernable from above; apothecial discs much-fissured .....  
..... ***Umbilicaria hyperborea*** (see lead **16a**)
- 30b** Upper surface pustulate-ridged or not, but generally also in part distinctly net-ridged and/or white-pruinose (check central portions); position of holdfast usually readily discernable from above; apothecial discs much-fissured or not ..... 31
- 31a** Lower surface white-pruinose throughout, smooth to minutely textured; thallus distinctly thick; apothecial disc smooth or at most buttoned; inland .....  
..... ***Umbilicaria krascheninnikovii***
- 31b** Lower surface white-pruinose usually only toward thallus margins(←); thallus not at all distinctly thick; apothecial disc much-fissured; widespread .....  
..... ***Umbilicaria proboscidea***

***Umbilicaria angulata* Tuck.**

(Syn. *Gyrophora angulata* (Tuck.) Herre)

Asterisk rocktripe

Habitat/Range: Frequent over acid rock in exposed outcrop sites throughout, except apparently absent from boreal regions; western N Am – eastern Eurasia, N to AK, S to CA.

***Umbilicaria aprina* Nyl.**

Map 110

Ashen rocktripe

Habitat/Range: Rare over acid rock in open boulderbeds at alpine elevations in boreal regions; western N Am – eastern N Am – western Eurasia.

Notes: The single B.C. specimen, from Summit Lake, bears a narrow band of sparse rhizines near the thallus margin and thus belongs in var. *halei* Llano (Goward et al. 1994a).

***Umbilicaria cinereorufescens* (Schaerer) Frey**

Map 111

Doubtful rocktripe

Habitat/Range: Rare over acid rock in open, northern, inland alpine outcrops; western N Am – eastern N Am – western Eurasia, N to AK, S to AZ.

Notes: This species can be difficult to distinguish from (the more copiously pruinose) *U. vellea* (Goward et al. 1994a).

***Umbilicaria cylindrica* (L.) Delise ex Duby**

(Syn. *Gyrophora cylindrica* (L.) Ach.)

Fringed rocktripe

Habitat/Range: Frequent over acid rock in exposed subalpine and alpine localities throughout; circumpolar, S to CO.

**[*Umbilicaria decussata* (Vill.) Zahlbr.]**

(Syn. *Gyrophora decussata* (Vill.) Zahlbr.; *Omphalodiscus decussatus* (Vill.) Schol.)

Netted rocktripe

Habitat/Range: Over vertical rock in exposed alpine localities; circumpolar, N to AK, S to MX.

Notes: Not reliably reported for B.C.; see notes under “Excluded Species.”

***Umbilicaria deusta* (L.) Baumg.**

(Syn. *Gyrophora deusta* (L.) Ach.)

Peppered rocktripe

Habitat/Range: Common over acid rock (especially in water channels) in open to somewhat sheltered sites throughout; circumpolar, S to AZ.



***Umbilicaria havaasii* Llano**

Ragged rocktripe

Habitat/Range: Frequent over vertical acid rock in exposed alpine localities throughout, also rare in similar sites at lower elevations; western N Am – eastern N Am – western Eurasia, S to WA.

***Umbilicaria hyperborea* (Ach.) Hoffm.**

(Syn. *Gyrophora hyperborea* Ach.)

Blistered rocktripe (northern rocktripe)

Habitat/Range: Common over acid rock in open to exposed localities throughout, though perhaps absent from hypermaritime districts; circumpolar, S to MX.

Notes: Two varieties are known to occur in B.C.:

**1a** Lower surface bearing rhizines; very rare ..... var. ***radicicula* (Zetterst.) Hasselrot**

**1b** Lower surface naked; common ..... var. ***hyperborea***

***Umbilicaria krascheninnikovii* (Savicz) Zahlbr.**

Map 112

(Syn. *Omphalodiscus krascheninnikovii* (Savicz) Schol.)

Netted rocktripe

Habitat/Range: Infrequent over acid rock in exposed, inland alpine localities; circumpolar, S to AZ and CA.

***Umbilicaria lambii* Imsh.**

Map 113

Windward rocktripe

Habitat/Range: Infrequent over vertical acid rock in exposed inland alpine sites; western N Am, S to WA.

Notes: The type locality is at Sunburst Lake, in Mt. Assiniboine Provincial Park, B.C.

***Umbilicaria lyngei* Schol.**

Map 114

(Syn. *Agyrophora lyngei* (Schol.) Llano)

Netted rocktripe

Habitat/Range: Infrequent over acid rock in exposed inland alpine sites; circumpolar, S to OR.

***Umbilicaria muehlenbergii* (Ach.) Tuck.**

Map 115

(Syn. *Actinogyra muehlenbergii* (Ach.) Schol.; *Gyrophora muehlenbergii* Ach.)

Plated rocktripe (Muhlenberg's rocktripe)

Habitat/Range: Infrequent over acid rock in open intermontane and especially boreal localities; western N Am – eastern N Am – eastern Eurasia.

***Umbilicaria nylanderiana* (Zahlbr.) Magnusson**

Map 116

Blistered rocktripe

Habitat/Range: Rare over acid rock in boreal alpine localities; western N Am – eastern N Am – western Eurasia, N to AK, S to CA.

Notes: The B.C. material intergrades with *U. polyphylla* and may be referred more appropriately to that species.

***Umbilicaria phaea* Tuck.**

(Syn. *Gyrophora phaea* (Tuck.) Nyl.)

Emery rocktripe

Habitat/Range: Frequent over rock in open sites at lower elevations, in semi-arid to dry intermontane localities, less common in maritime sites and probably absent from hypermaritime localities; western N Am – eastern Eurasia, N to AK, S to MX.

***Umbilicaria polyphylla* (L.) Baumg.**

(Syn. *Gyrophora polyphylla* (L.) Fink)

Petalled rocktripe (black rocktripe)

Habitat/Range: Frequent over acid rock in open sites throughout, except probably absent from hypermaritime localities; circumpolar, S to CA.

**Umbilicaria polyrrhiza (L.) Fr.**

Map 117

(Syn. *Actinogyra polyrrhiza* (L.) Schol.; *Gyrophora polyrrhiza* (L.) Körber)

Ballpoint rocktripe

Habitat/Range: Frequent over acid rock in open coastal localities at lower elevations; western N Am – eastern N Am – western Eurasia, S to CA.

**Umbilicaria proboscidea (L.) Schrader**

Netted rocktripe (beaked rocktripe)

Habitat/Range: Frequent over acid rock in exposed to somewhat sheltered sites throughout, especially in alpine localities; circumpolar, S to OR.

Notes: Specimens from coastal localities often lack the netlike ridges characteristic of this species.

**Umbilicaria rigida (Du Rietz) Frey**

Map 118

(Syn. *Agyrophora rigida* (Du Rietz) Llano; *Gyrophora anthracina* (Wulfen) Körber, *Umbilicaria coriacea* Imsh.)

Roughened rocktripe

Habitat/Range: Rare over acid rock in exposed boreal alpine localities; probably circumpolar, S to WA.

**Umbilicaria torrefacta (Lightf.) Schrader**

(Syn. *Gyrophora erosa* (G. Weber) Ach.)

Punctured rocktripe

Habitat/Range: Common over acid or base-rich rock in open sites throughout; circumpolar, S to MX.

**Umbilicaria vellea (L.) Ach.**

(Syn. *Gyrophora vellea* (L.) Ach.)

Frosted rocktripe (fleecy rocktripe)

Habitat/Range: Frequent over vertical acid rock in open or somewhat sheltered inland sites; circumpolar, S to MX.

**Umbilicaria virginis Schaerer**

(Syn. *Omphalodiscus virginis* (Schaerer) Schol.)

Blushing rocktripe

Habitat/Range: Frequent over vertical acid rock in exposed inland alpine sites; circumpolar, S to MX.

**VESTERGRENOPSIS**

**Vestergrenopsis Gyelnik**

**The Brownette Lichens**

**Small stratified foliose lichens**, weakly corticate above and below, isidiate or not, lobes **closely appressed, elongate-linear**, averaging to 0.2–0.4 mm wide, thin. Upper surface **dark olive-brown**, somewhat shiny, **longitudinally striate** or rarely smooth. Lower surface pale or dark, bearing scattered, short, simple rhizines. Medulla white. **Photobiont blue-green.**

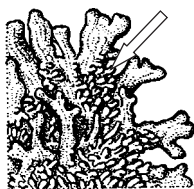
Apothecia located over upper surface, disc brownish, rim thalline, spores simple, ellipsoid, colourless, 12–16 per ascus.

**Over rock.**

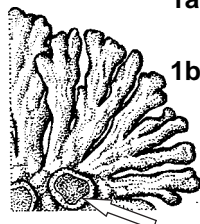
Reference: Henssen (1963c).

Common Name: Stresses the miniature size and superficial resemblance to certain species of “brown” lichens (i.e., *Melanelia* and *Neofuscelia*).

Notes: *Vestergrenopsis* is an arctic-boreal genus consisting of two species worldwide. Both of these occur in B.C. No lichen substances have been reported in this genus. For points of distinction with similar species, see the key under *Placynthium*.



1a  
(x11)



1b  
(x11)

- 1a Upper surface isidiate(←); apothecia rare; widespread ..... **Vestergrenopsis isidiata**
- 1b Upper surface lacking isidia; apothecia common(←); northern ..... **Vestergrenopsis elaeina**

**Vestergrenopsis elaeina (Wahl.) Gyelnik**

Map 119

Eyed brownette

Habitat/Range: Infrequent over intermittently wetted acid rock in open to somewhat sheltered northern inland alpine localities; western N Am – western Eurasia, N to AK, S to BC.

**Vestergrenopsis isidiata (Degel.) E. Dahl**

Map 120

Peppered brownette

Habitat/Range: Infrequent (possibly overlooked) over intermittently wetted acid rock in open to somewhat sheltered sites throughout, except possibly absent in lowland coastal localities; western N Am – eastern N Am – western Eurasia, S to BC.

**VULPICIDA**

**Vulpicida J.-E. Mattsson & Lai**

**The Sunshine Lichens**

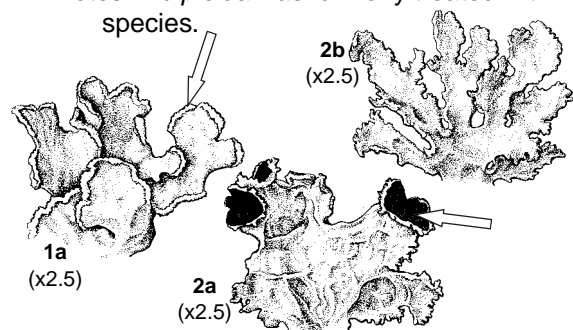
**Medium stratified foliose lichens** (ours), corticate above and below, sorediate or not, lobes loosely appressed to loosely attached, somewhat **elongate**, averaging to **2–7 (–10) mm wide**, moderately thick, sometimes bearing **protruberant marginal** (or occasionally laminal) **pycnidia**. Upper surface **yellowish or yellowish green**; **lower surface coloured alike with upper surface**, except dark toward central portions, sparse rhizines. **Medulla yellow**. Photobiont green.

Apothecia located near lobe margins and over upper surface, disc brown; spores simple, more or less spherical, colourless, 8 per ascus.

References: Mattsson (1993); Mattsson and Lai (1993).

Common Name: Reflects the bright yellow coloration of the species.

Notes: *Vulpicida* was formerly treated within *Cetraria*; see the key to that genus for points of distinction with similar species.



**1a** Soredia present along lobe margins(←) ..... ***Vulpicida pinastri***

**1b** Soredia absent ..... **2**

**2a** Over bark; apothecia often present(←); at lower elevations ..... ***Vulpicida canadensis***

**2b** Over calcium-rich ground; apothecia rare; subalpine and alpine ..... ***Vulpicida tilesii***

***Vulpicida canadensis* (Räsänen) J.-E. Mattsson & Lai**

(Syn. *Cetraria canadensis* (Räsänen) Räsänen)

Brown-eyed sunshine

Habitat/Range: Common over conifers, infrequent over deciduous trees and shrubs, in open forests at lower elevations in coastal and intermontane regions, though absent in hypermaritime; western N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: Pinastric, usnic and vulpinic acids and an unknown fatty acid.

***Vulpicida pinastri* (Scop.) J.-E. Mattsson & Lai**

(Syn. *Cetraria pinastri* (Scop.) S. Gray)

Powdered sunshine (moonshine cetraria, pine lichen)

Habitat/Range: Common over (bases of) conifers and deciduous trees and shrubs in open to somewhat shaded inland forests, also rare over acid rock; circumpolar, N to AK, YU, S to NM.

Reactions: All spot tests negative.

Contents: Pinastric, usnic and vulpinic acids.

***Vulpicida tilesii* (Ach.) J.-E. Mattsson & Lai**(Syn. *Cetraria tilesii* Ach.)

Limestone sunshine (yellow lichen)

Habitat/Range: Frequent over base-rich ground in open inland alpine and subalpine localities; circumpolar, N to AK, YU, S to NM.

Reactions: All spot tests negative.

Contents: Pinastric, usnic and vulpinic acids.

**WAYNEA****Waynea Moberg****The Scale Lichens**

**Minute stratified squamulose lichens**, corticate above, noncorticate below, **sorediate**, squamules **attached to substrate mostly at one margin**, loosely attached at maturity, rotund to elongate, often lobulate, averaging to 0.5 mm wide, thin. Upper surface **yellowish green or bluish green**, smooth. Lower surface pale, lacking rhizines. Medulla white. Photobiont green.

Apothecia located over upper surface, disc greyish or same colour as thallus; **spores 4-celled**, somewhat spindle-shaped, colourless, 8 per ascus.

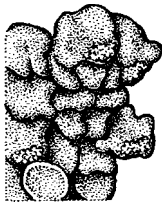
**Over deciduous trees.**

References: Moberg (1990); Roux and Clerc (1991).

Common Name: Suggested by the tiny, rounded, overlapping lobes of the species.

Notes: *Waynea* is a temperate genus consisting of two species worldwide. Only one of these occurs in North America. For points of distinction with similar species, see the key under *Hypocenomyce*.**Waynea californica Moberg**

Map 121



(x15)

Knobbed scale

Habitat/Range: Rare (overlooked?) over deciduous trees, especially Garry oak, in coastal localities, perhaps restricted in BC to CDF zone; western N Am, N to BC, S to CA.

Reactions: All spot tests negative.

Contents: No lichen substances reported.

**XANTHOPARMELIA****Xanthoparmelia Hale****The Rockfrog Lichens**

Small to large **stratified foliose lichens**, corticate above and below, sorediate or isidiate or not, lobes tightly appressed to semi-erect, elongate to elongate-linear, averaging to 0.5–5 mm wide, thin to somewhat thickened. Upper surface **pale yellowish green**, K-, rarely white-maculate, somewhat shiny. Lower surface pale to black, somewhat shiny, bearing scattered short, simple or sparingly branched rhizines. Medulla white (ours). Photobiont green.

Apothecia located over upper surface, disc brown; spores simple, ellipsoid, colourless, 8 per ascus.

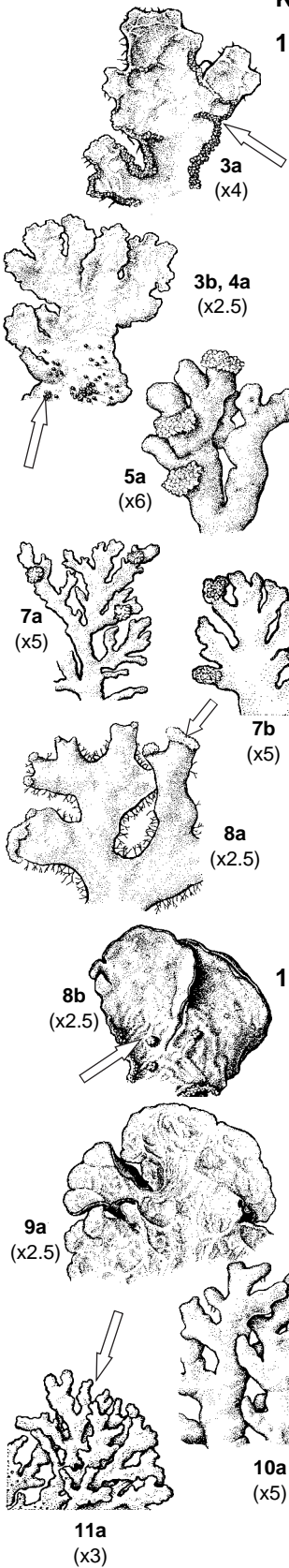
**Over rock**, rarely over soil or moss.

Reference: Hale (1990).

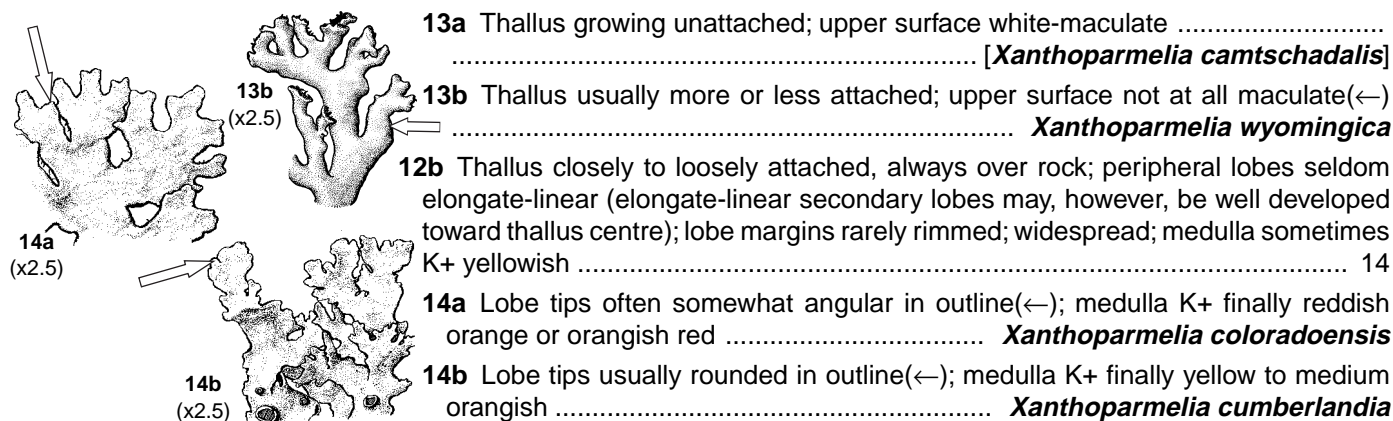
Common Name: Suggested by the greenish colour of the upper surface, as well as the strict association with rock surfaces.

Notes: *Xanthoparmelia* contains about 400 species worldwide, of which 51 species occur in North America and eight in B.C. *Xanthoparmelia* is taxonomically the most difficult of the genera previously united within *Parmelia*. Reliable identification of many species depends on a knowledge of the chemical substances they contain. Though this is most reliably attained through use of thin-layer chromatography, the chemistry of the B.C. species can usually be surmised from the medullary reaction with K. Two character states are recognized: K+ finally reddish orange or orangish red (i.e., salazinic acid present), and K+ finally yellow or medium orange (stictic acid present). The distinction between these two reactions can be subtle, depending on the concentration of the chemical substances. In difficult cases, intensify the reaction by applying a second drop of reagent to the test site.

**Key to *Xanthoparmelia* and Similar Lichens**



- 1a Thallus sorediate or isidiate ..... 2
- 2a Thallus isidiate ..... 3
  - 3a Isidia soft, often soredia-like, located mostly along lobe margins(←); upper surface somewhat checkered/maculate and/or pseudocyphellate; widespread in cool climates ..... ***Parmelia fraudans***
  - 3b Isidia hard-corticate, located mostly over upper surface(←); upper surface not checkered/maculate or pseudocyphellate; southern intermontane ..... 4
  - 4a Medulla K+ finally yellow to medium orangish ..... ***Xanthoparmelia plittii***
  - 4b Medulla K+ finally reddish orange to orangish red ..... ***Xanthoparmelia mexicana***
- 2b Thallus sorediate ..... 5
  - 5a Lower surface dull and apparently weakly white-pruinose; upper surface also dull throughout; medulla KC+ reddish ..... ***Arctoparmelia***
  - 5b Lower surface usually somewhat shiny, not at all white-pruinose; upper surface shiny or dull; medulla KC+ reddish or KC- ..... 6
    - 6a Broadest lobes averaging to less than 1.5 mm wide; rhizines rarely, if ever, branched ..... 7
      - 7a Upper surface generally shiny throughout, transversely cracked when mature; coastal; over rock; medulla K+ finally yellow to medium orange, PD+ pale orange ..... ***Xanthoparmelia mougeotii***
      - 7b Upper surface often dull toward thallus centre, seldom transversely cracked; widespread; mostly over bark and wood; medulla K- and PD- ..... ***Parmeliopsis ambigua***
    - 6b Broadest lobes averaging to more than 2 mm wide; rhizines sometimes abundantly branched ..... 8
      - 8a Lobes elongate; soredia located entirely over lobe tips(←); medulla K+ finally orangish ..... ***Hypotrachyna sinuosa***
      - 8b Lobes proportionately short and broad; soredia located mostly over upper surface(←); medulla K- ..... ***Flavopunctelia flaventior***
- 1b Thallus lacking soredia and isidia ..... 9
  - 9a Lobes proportionately short and broad; rhizines absent; alpine; northern; medulla KC+ reddish ..... **[*Asahinea chrysantha*]**
  - 9b Lobes elongate to elongate-linear; rhizines usually present; distribution various; medulla KC+ reddish or KC- ..... 10
    - 10a Lower surface dull and apparently weakly white-pruinose; upper surface also dull throughout; cool climates; medulla KC+ reddish ..... ***Arctoparmelia***
    - 10b Lower surface somewhat shiny, not at all white-pruinose; upper surface more or less shiny; distribution various; medulla KC- ..... 11
      - 11a Lower surface jet black (except usually brownish near lobe tips); lobes mostly elongate-linear throughout(←), averaging to less than 1 mm wide; dry southern intermontane; rare; medulla K+ finally yellow to medium orange ..... ***Xanthoparmelia planilobata***
      - 11b Lower surface pale tan to brownish (occasionally, however, with scattered black patches); lobes broad to elongate-linear, but usually averaging to more than 1 mm wide; distribution various; common; medulla sometimes K+ finally reddish ..... 12
        - 12a Thallus loosely attached (rarely unattached), occasionally over soil or moss; peripheral lobes mostly elongate-linear; pycnidia absent or sparse over upper surface; lobe margins often distinctly rimmed (check lower surface); dry southern intermontane; medulla K+ finally reddish orange or orangish red ..... 13



**[Xanthoparmelia camtschadalis (Ach.) Hale]**

Vagabond rockfrog

Habitat/Range: Over highly exposed, windblown sites in arid and semi-arid regions; western N Am – western Eurasia – eastern Eurasia.

Reactions: Cortex KC+ yellow; medulla K+ yellow becoming reddish orange or orangish red, PD+ yellowish or orangish.

Contents: Salazinic and usnic acids (and consalazinic acid).

Notes: The unattached habit and white-maculate upper surface are diagnostic. Though *X. camtschadalis* is not known to occur in B.C., Hale (1990) states that it occurs from “Colorado northward into Canada.” It should be looked for in windswept sites at lower elevations in the southern Rockies.

**Xanthoparmelia coloradoensis (Gyelnik) Hale**

(Syn. *Xanthoparmelia taractica* auct., non *Xanthoparmelia taractica* (Krempelhuber) Hale; *Parmelia taractica* auct.)

Questionable rockfrog

Habitat/Range: Frequent over acid rock in open inland sites, except rare at alpine elevations; western N Am, N to YU, S to MX.

Reactions: Cortex KC+ yellow; medulla K+ yellow becoming reddish orange or orangish red, PD+ yellowish or orangish.

Contents: Norsalazinic, norstictic, salazinic and usnic acids (and consalazinic acid).

Notes: The material united here is heterogeneous and appears to represent at least two distinct taxa. The first, *X. coloradoensis* s. str., seems restricted in B.C. to the southern intermontane. This is a rather closely appressed species with smallish primary lobes (averaging to 1–2 mm wide) that usually bear copious secondary lobes toward the thallus centre. The second taxon is more widespread, occurring over much of the province. It is loosely appressed, with comparatively broad lobes (averaging to 2–3.5 mm wide) that seldom, if ever, produce copious secondary lobes. It is most similar to *X. somloensis* (Gyelnik) Hale, though that species has a distinctly maculate upper surface, whereas maculations are lacking in the B.C. material. See also the discussion under *Xanthoparmelia tasmanica* under “Excluded Species.”

**Xanthoparmelia cumberlandia (Gyelnik) Hale**

(Syn. *Parmelia cumberlandia* (Gyelnik) Hale)

Questionable rockfrog

Habitat/Range: Common over acid rock in somewhat sheltered to open coastal and intermontane localities at lower elevations; N Am, N to BC, S to MX.

Reactions: Cortex KC+ yellow; medulla K+ finally yellow to medium orange, PD+ orangish.

Contents: Constictic, norstictic, stictic and usnic acids (and menegazzic acid).

Notes: The material is heterogeneous. Some hypermaritime specimens essentially lack the secondary lobes otherwise characteristic of *X. cumberlandia*. A second variant occurs in the south Okanagan and may represent an undescribed species. While similar in appearance to *X. cumberlandia*, it gives a K+ dingy orangish, PD- medullary reaction.

***Xanthoparmelia mexicana* (Gyelnik) Hale**

Map 122

(Syn. *Parmelia mexicana* Gyelnik)

Salted rockfrog

Habitat/Range: Infrequent over acid rock in open, often somewhat exposed semi-arid intermontane localities at lower elevations; western N Am – eastern Eurasia, N to BC, S to MX.

Reactions: Cortex KC+ yellow; medulla K+ finally reddish orange to orangish red, PD+ orangish.

Contents: Salazinic and usnic acids (and consalazinic and norstictic acids).

***Xanthoparmelia mougeotii* (Schaerer) Hale**(Syn. *Parmelia mougeotii* Schaerer)

Powdered rockfrog

Habitat/Range: Frequent over acid rock in somewhat sheltered coastal localities (CDF zone); western N Am – western Eurasia, N to BC, S to CO.

Reactions: Cortex KC+ yellow; medulla K+ yellowish, PD+ orangish.

Contents: Constictic, norstictic, stictic and usnic acids.

***Xanthoparmelia planilobata* (Gyelnik) Hale**

Map 123

Mini rockfrog

Habitat/Range: Rare over acid rock in open to sheltered semi-arid intermontane localities at lower elevations; western N Am, N to southern BC, S to MX.

Reactions: Cortex KC+ yellow; medulla K+ yellowish, PD+ orangish.

Contents: Constictic, norstictic, stictic and usnic acids (and menegazzic acid).

Notes: See the remarks under *X. hypopsila* in "Excluded Species."***Xanthoparmelia plittii* (Gyelnik) Hale**(Syn. *Parmelia plittii* Gyelnik)

Salted rockfrog

Habitat/Range: Frequent over acid rock in open, semi-arid or dry intermontane localities at lower elevations; western N Am, N to southern BC, S to Mx.

Reactions: Cortex KC+ yellow; medulla K+ finally yellowish to medium orange, PD+ orangish.

Contents: Constictic, norstictic, stictic and usnic acids (and menegazzic acid and one unknown substance).

***Xanthoparmelia wyomingica* (Gyelnik) Hale**(Syn. *Parmelia wyomingica* (Gyelnik) Hale)

Variable rockfrog

Habitat/Range: Frequent over acid rock and mossy earth in open, semi-arid or dry intermontane localities at lower elevations; western N Am, N to BC, S to NM.

Reactions: Cortex KC+ yellow; medulla K+ finally reddish orange or orangish red, PD+ orangish.

Contents: Salazinic and usnic acids (and consalazinic and norstictic acids).

Notes: Hale (1990) states that *X. wyomingica* is commonly pycnidiate, though the B.C. material rarely produces pycnidia.**XANTHORIA*****Xanthoria* (Fr.) Th. Fr.****The Orange Lichens**

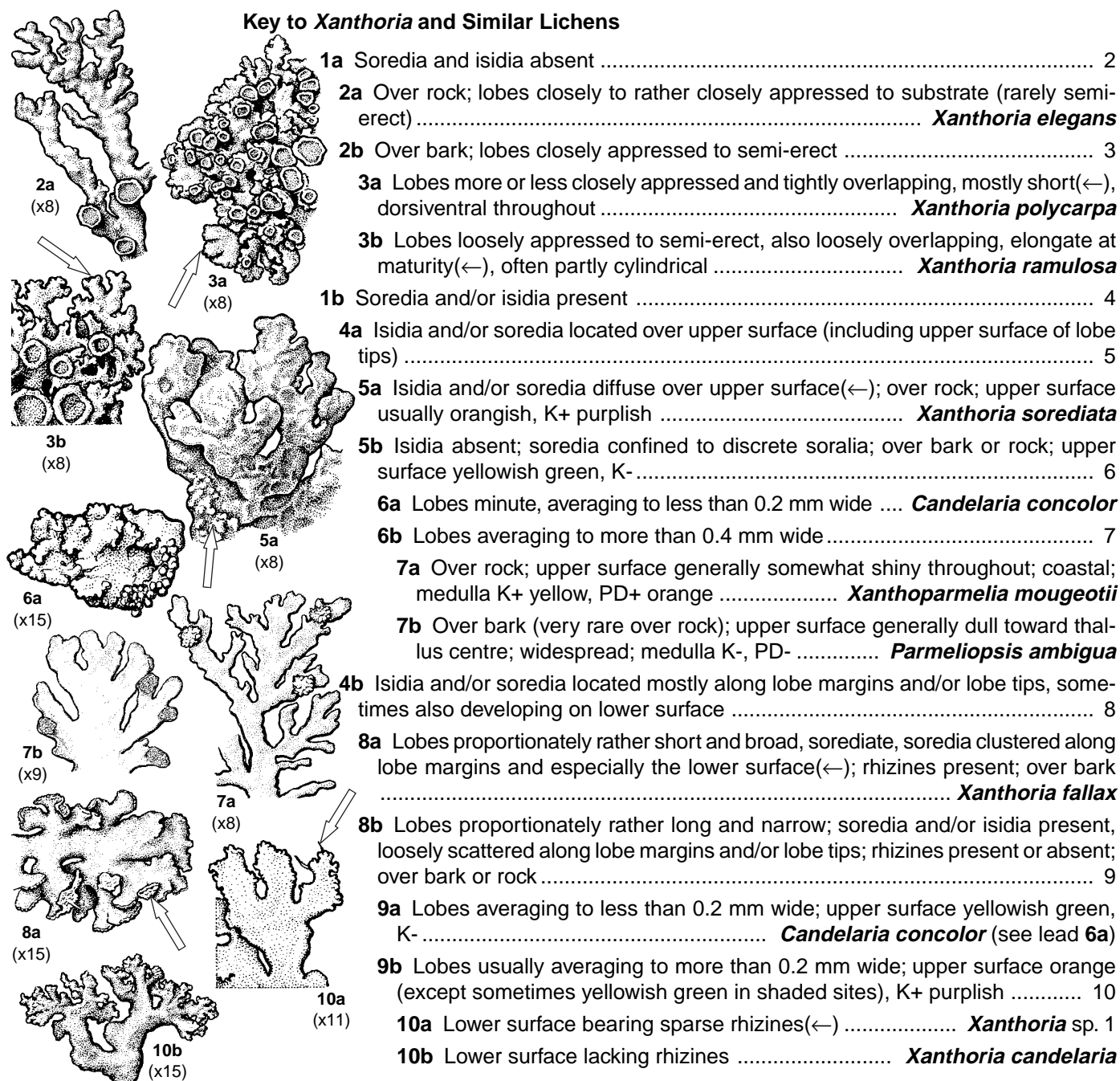
**Minute to small stratified foliose or occasionally fruticose lichens**, corticate above and below, sorediate or isidiate or not, lobes closely appressed to loosely attached or semi-erect, short to more often elongate or elongate-linear, averaging to 0.3–1 (–2) mm wide, thin or somewhat thick. Upper surface **orange or orangish, K+ purple**. Lower surface pale, often whitish, often bearing scattered, short, simple rhizines. Medulla white. Photobiont green. Apothecia located over upper surface, disc orange; spores 2-celled, ellipsoid, colourless, 8 per ascus.

**Over base-rich rock and bark**, occasionally over bone.

Reference: Thomson (1984).

Common Name: Reflects the basic colour of the species.

Notes: *Xanthoria* is primarily a temperate genus consisting of approximately 15 species worldwide. Ten are reported for North America and six for B.C. The western Xanthoriae are in need of taxonomic revision; therefore the following account is tentative, pending further study. Chemistry is of little taxonomic value in this genus and is omitted in the following accounts.

Key to *Xanthoria* and Similar Lichens***Xanthoria candelaria* (L.) Th. Fr.**

Shrubby orange

Habitat/Range: Frequent over base-rich (or base-enriched) rock or bark in open sites throughout; circumpolar, S (at least) to NM.

Notes: The material included here is apparently heterogeneous, the lobes being short and proportionately broad in some specimens and elongate and distinctly narrow in others. The former specimens resemble *X. fallax*.***Xanthoria elegans* (Link) Th. Fr.**(Syn. *Caloplaca elegans* (Link) Th. Fr.)

Elegant orange (rock orange)

Habitat/Range: Common over base-rich (or base-enriched) rock in open sites throughout, except probably absent in hypermaritime localities; circumpolar, S (at least) to CA.

Notes: The B.C. material is apparently heterogeneous.



***Xanthoria fallax* (Hepp in Arnold) Arnold**

Powdered orange

Habitat/Range: Frequent over base-rich bark, rare over rock, in open to somewhat shaded sites at lower elevations throughout, except probably absent in hypermaritime and boreal regions; circumpolar, S (at least) to NM.

Notes: See notes under *X. candelaria* and *X. sp. 1*.

***Xanthoria polycarpa* (Hoffm.) Rieber**

Pincushion orange (lumpy shore lichen)

Habitat/Range: Frequent over base-rich bark in open inland sites at lower elevations; circumpolar, S (at least) to NM.

Notes: The material included here is heterogeneous.

***Xanthoria ramulosa* (Tuck.) Herre**

Pincushion orange

Habitat/Range: Frequent over base-rich bark in open coastal sites at lower elevations; western N Am, S to CA.

Notes: Some authors place this material with *X. polycarpa*.

***Xanthoria sorediata* (Vainio) Poelt**

Map 124

Sugared orange

Habitat/Range: Infrequent over base-rich rock in open inland sites at lower elevations; circumpolar, S to UT.

***Xanthoria sp. 1***

Powdered orange

Habitat/Range: Frequent over base-rich bark, less common over rock, in open to somewhat shaded sites at low-land elevations throughout; global distribution unknown.

Notes: *Xanthoria sp. 1* may be characterized as a rhizinate species with narrow, elongate lobes that are distinctly lobulate at the tips (check young lobes). Some forms of *X. candelaria* are similar, but lack rhizines. Also similar is *X. fallax*, in which the lobes are proportionately short and broad and the lobe tips only weakly lobulate.

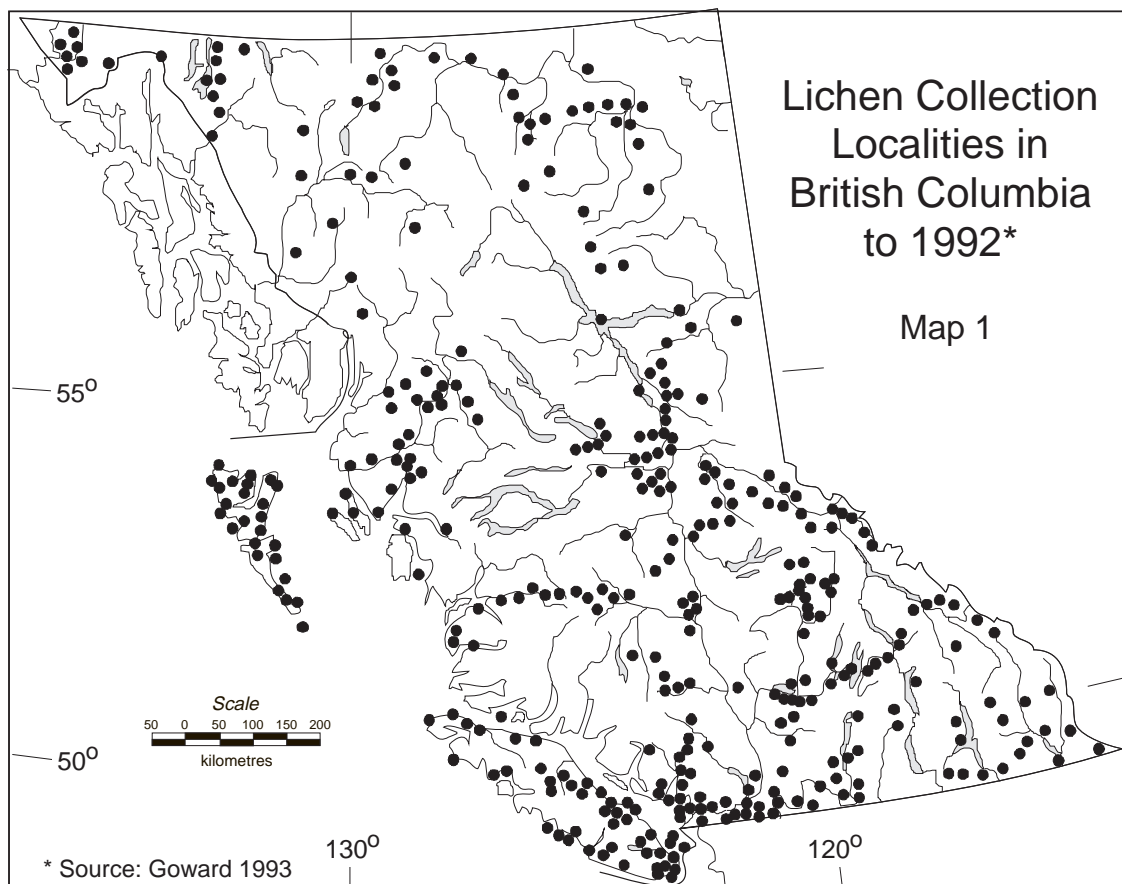
## APPENDIX 1. Distribution maps of rare and infrequent foliose and squamulose lichens in British Columbia

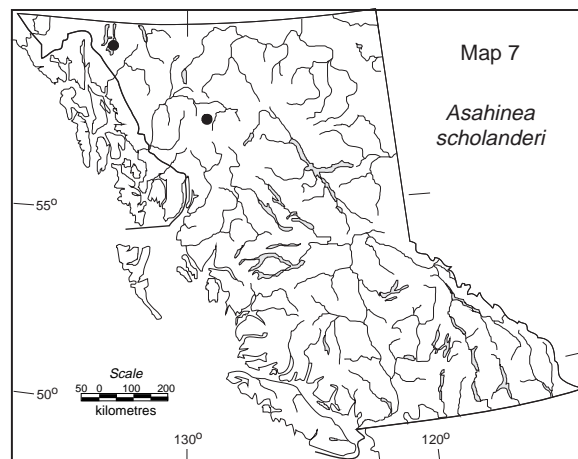
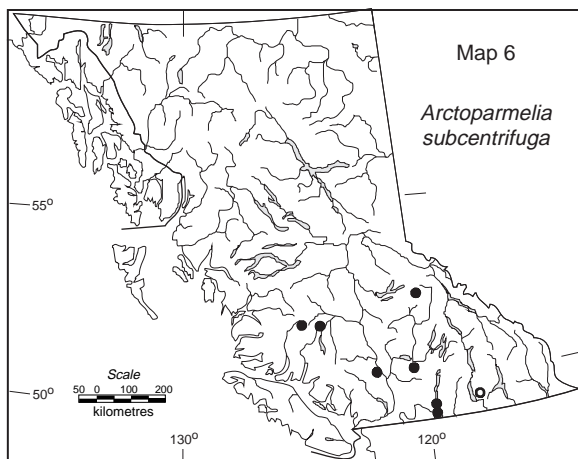
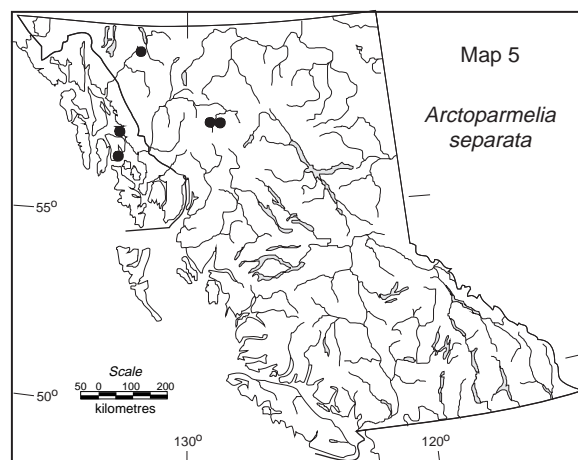
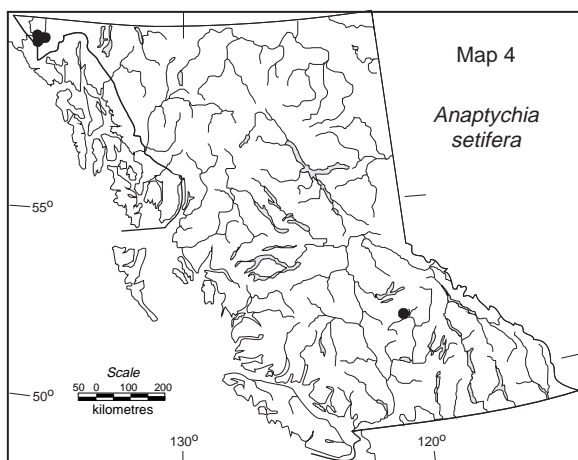
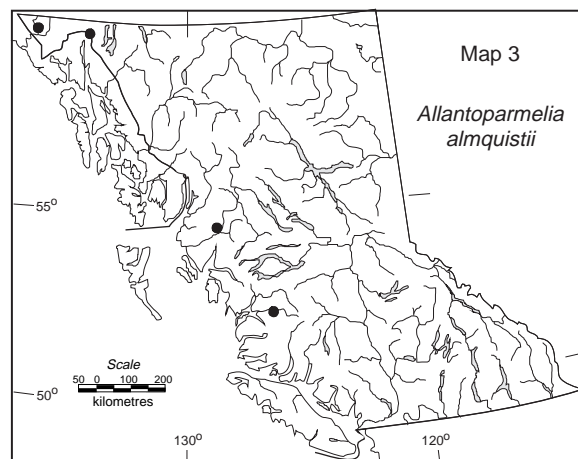
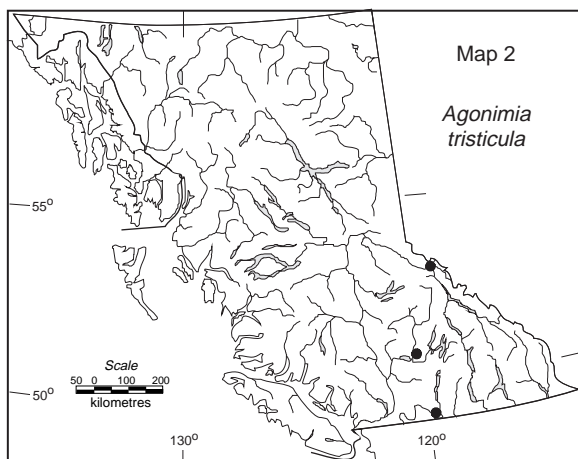
The following maps were prepared primarily from specimens housed at the National Museum of Natural Sciences (CANL) in Ottawa and at the University of British Columbia (UBC) in Vancouver. Authoritative literature provided additional information. Map 1 attempts to summarize the locations of all lichen collections made to 1992. This map should be contrasted with Figure 1 (page 1), which provides a summary of localities at which intensive collection has been undertaken.

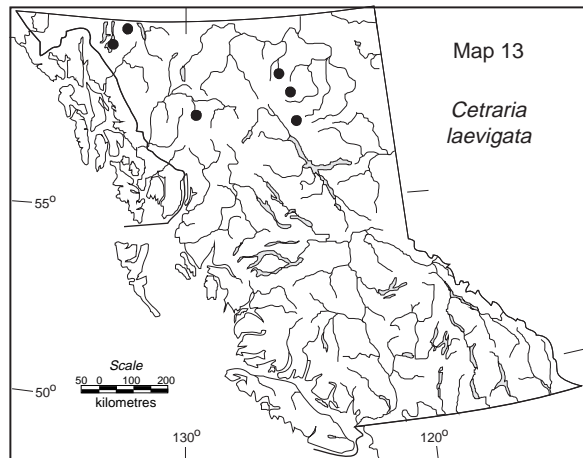
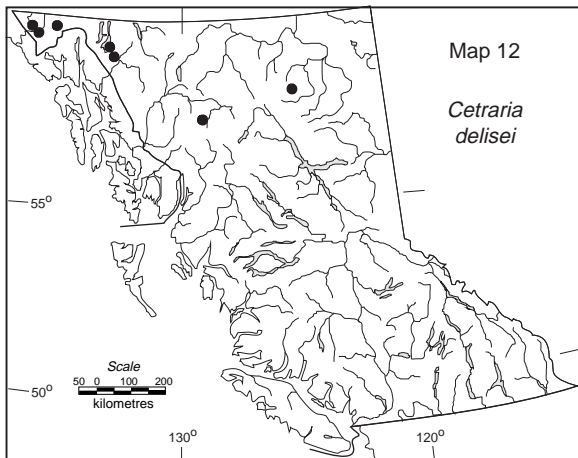
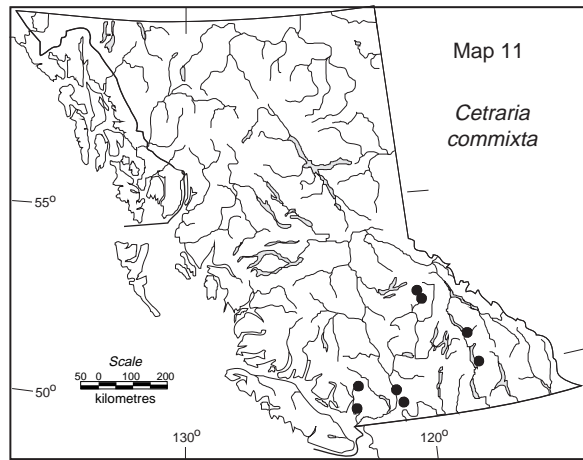
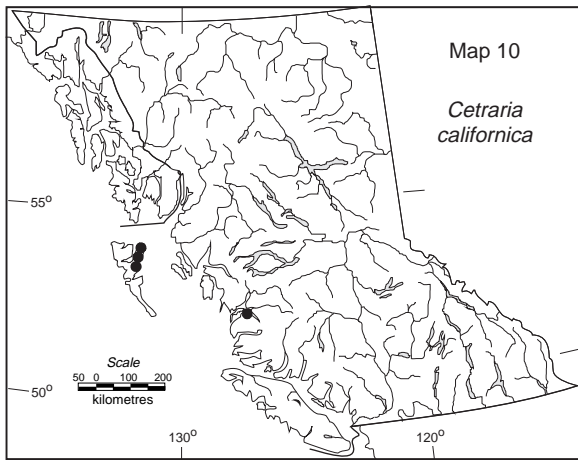
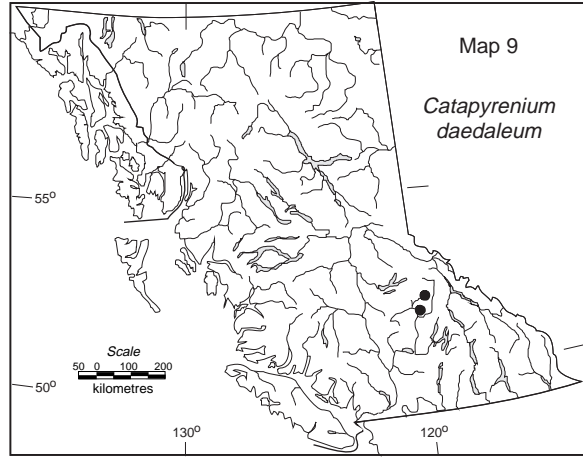
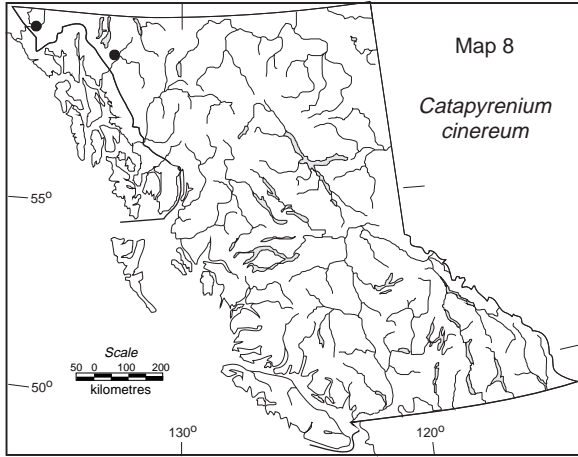
With few exceptions (see below), all species known from fewer than eight to ten British Columbia localities are mapped. Maps have been prepared also for a few species of somewhat more frequent occurrence that are nevertheless considered to be vulnerable to logging, mining, agriculture, urban development or other human activity. It must be stressed, however, that most of these maps are based on inadequate collecting: many lichens are probably more common than the maps would suggest. Others (e.g., species at the northern or southern edge of their range) may be rare or infrequent in British Columbia as a whole, but are locally frequent or even common in some areas of the province. The following species, though judged to be rare or infrequent, have not been mapped, owing to taxonomic problems: *Leptogium minutissimum*, *L. tenuissimum*, *L. tetetiusculum*, *Pannaria maritima*, *Peltigera degenii* and *P. lactucifolia*.

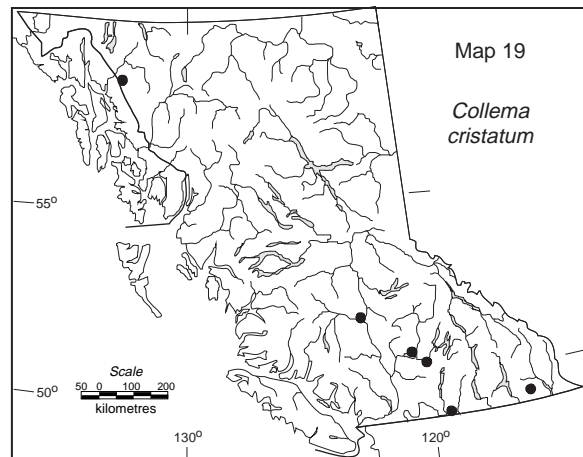
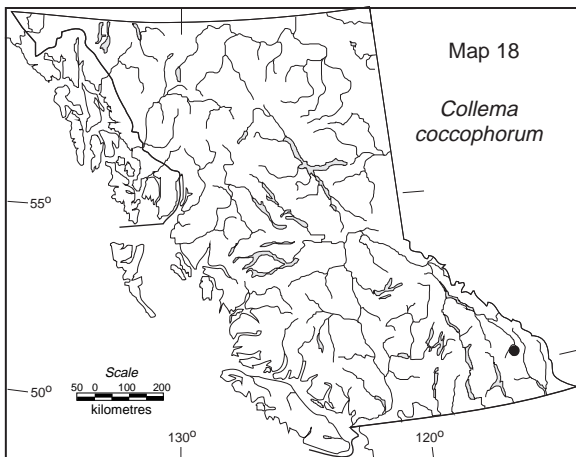
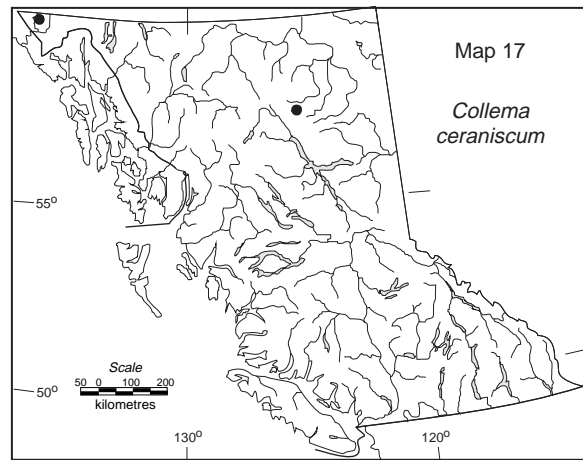
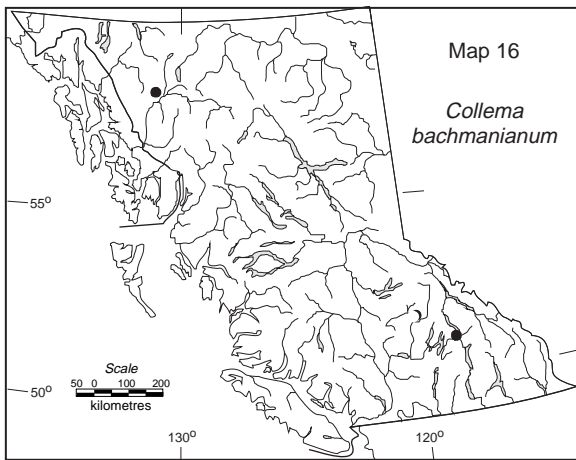
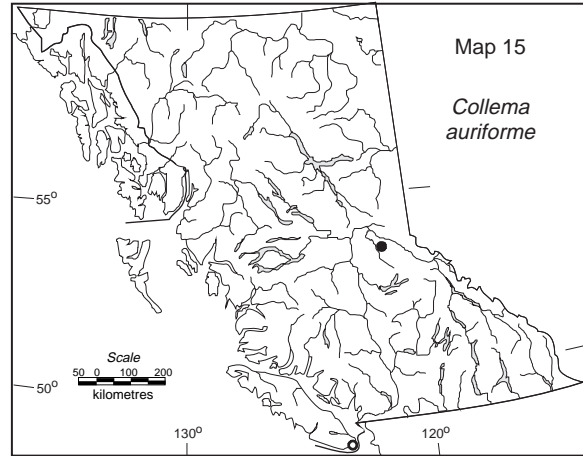
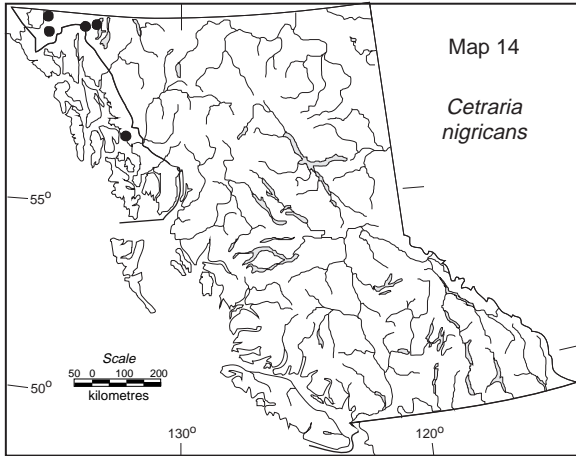
Localities in southeast Alaska are also mapped. These records are based on Geiser et al. (1994), and have been included courtesy of the U.S. Forest Service, Tongass National Forest/Stikine Area. The specimens upon which these records are based have not been examined by the authors.

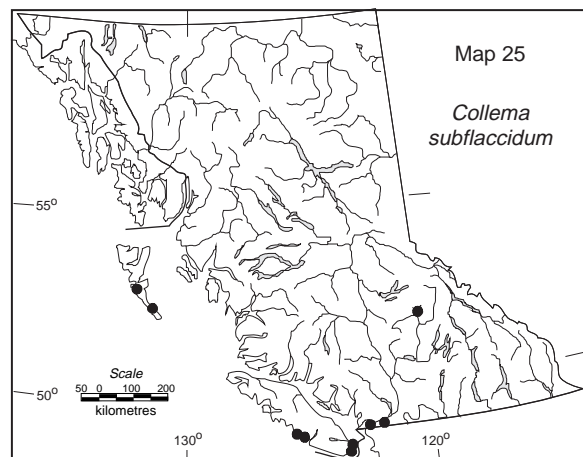
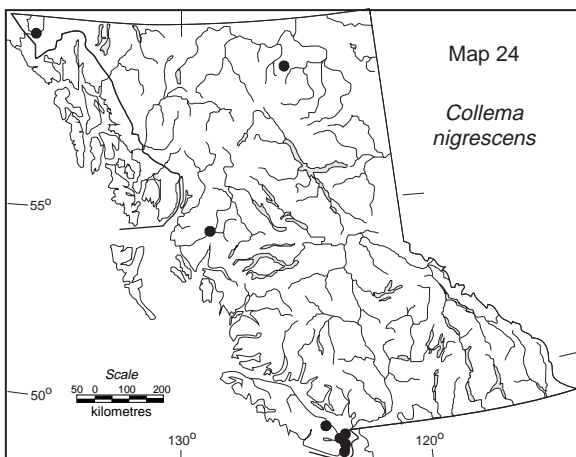
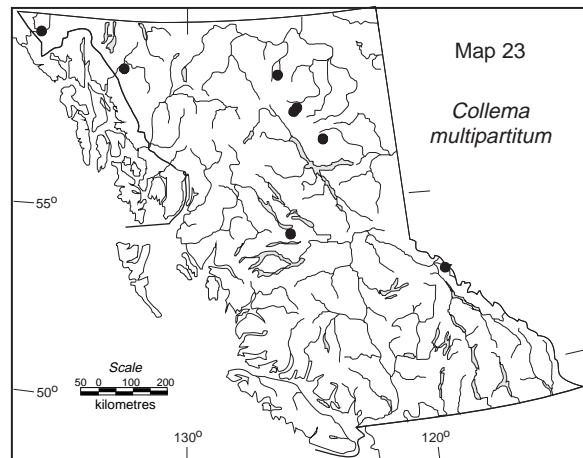
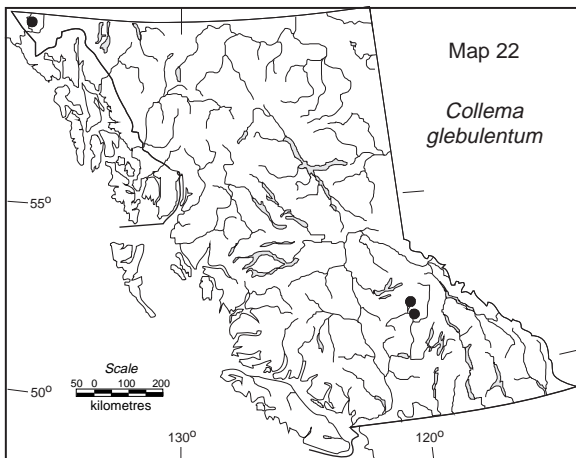
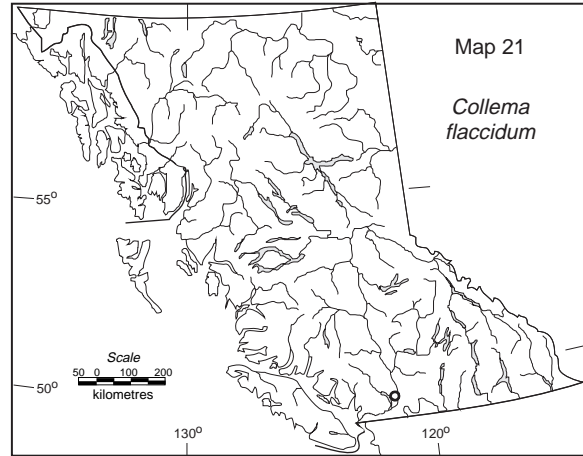
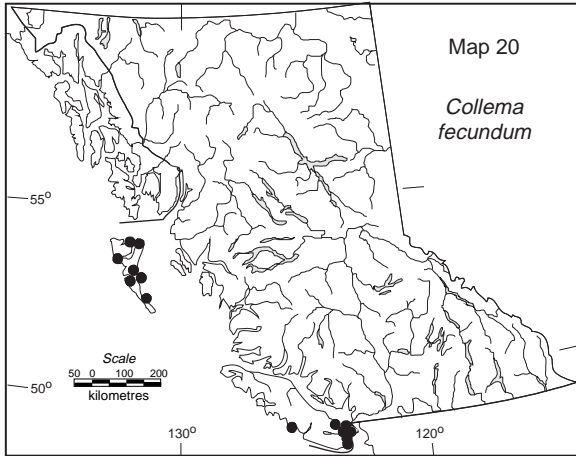
The collections of John Macoun (1831–1920) pose a special problem to mapping because of numerous errors in labelling (Godfrey 1977). Records based on Macoun's specimens are signalled by use of an open circle and should be interpreted with caution.

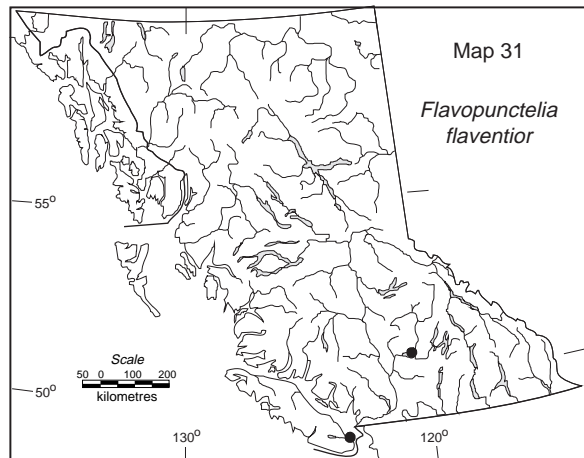
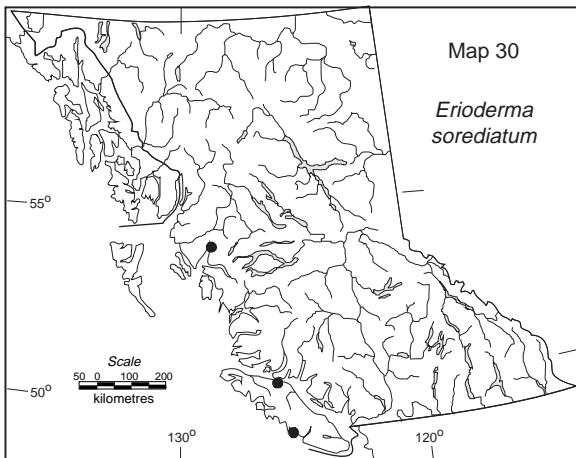
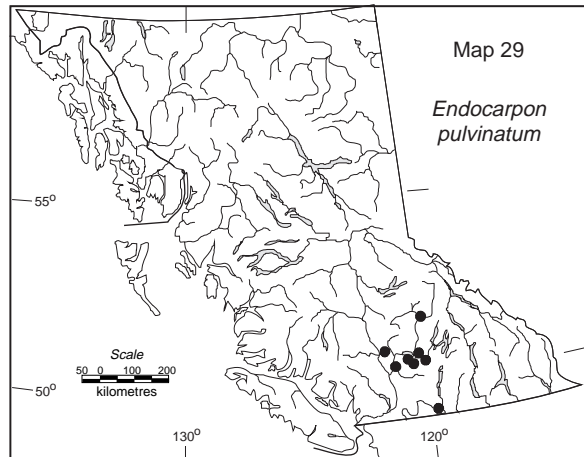
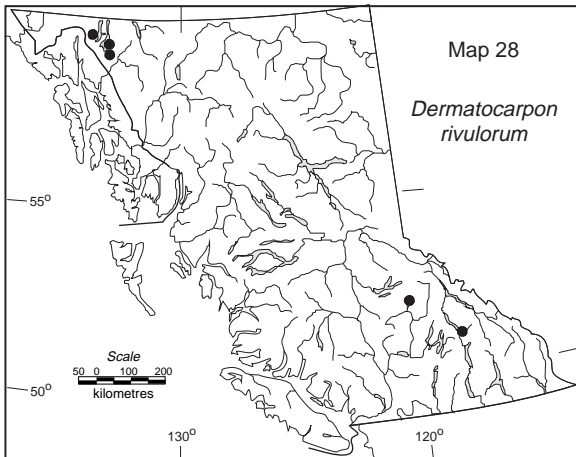
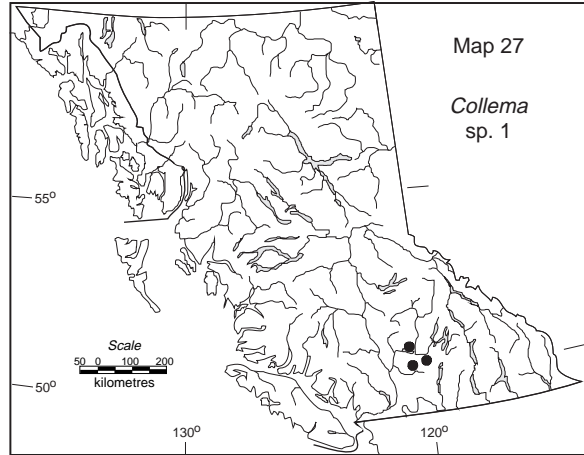
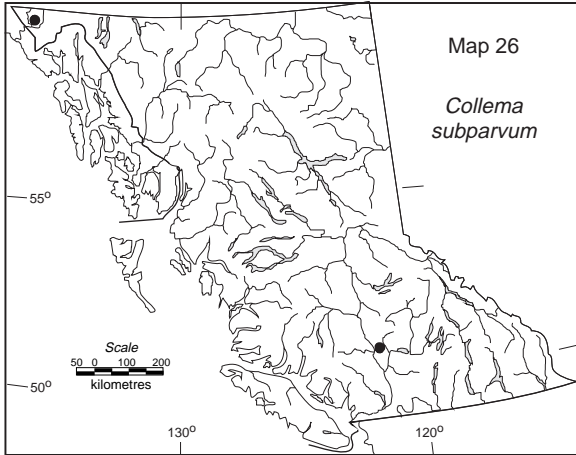


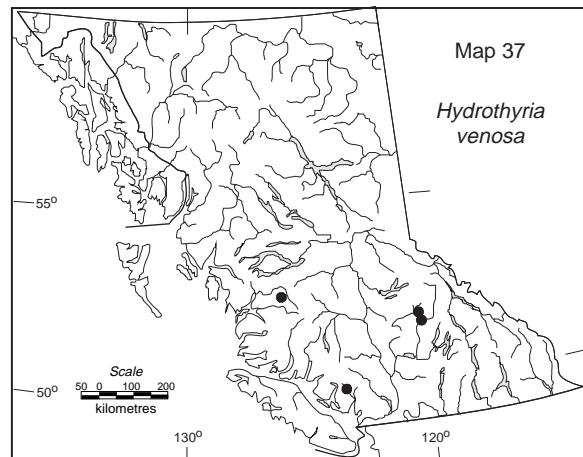
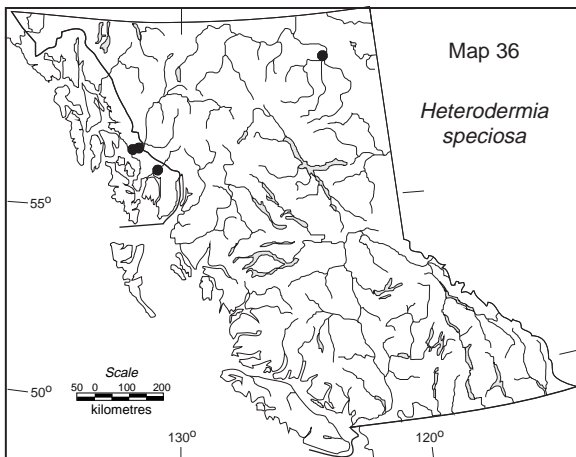
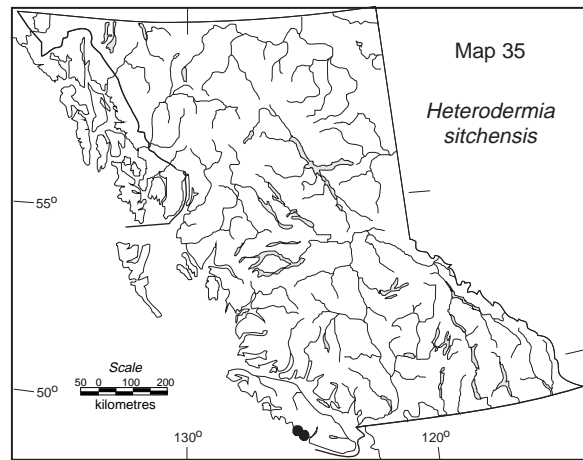
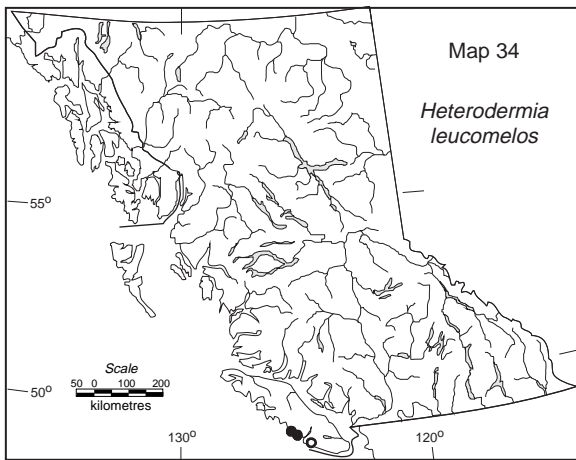
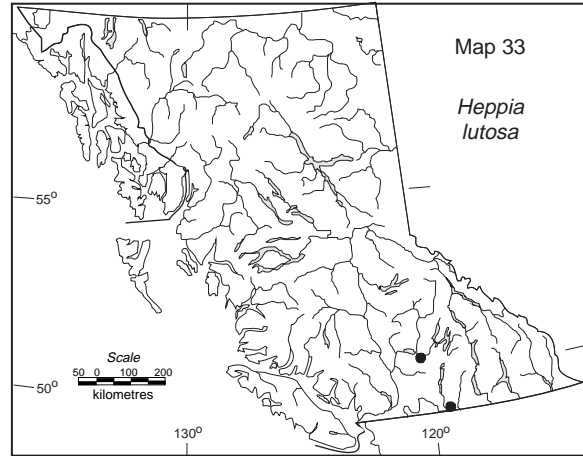
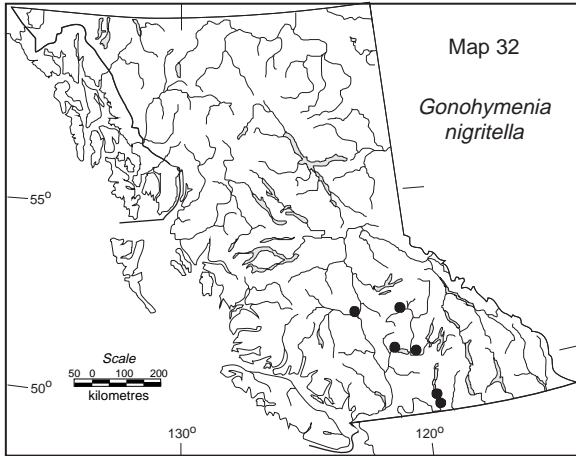




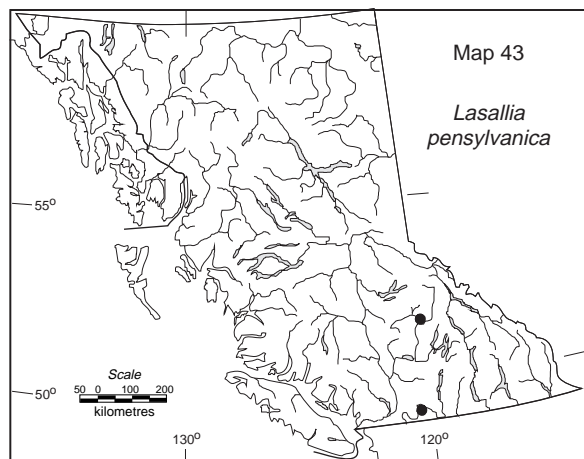
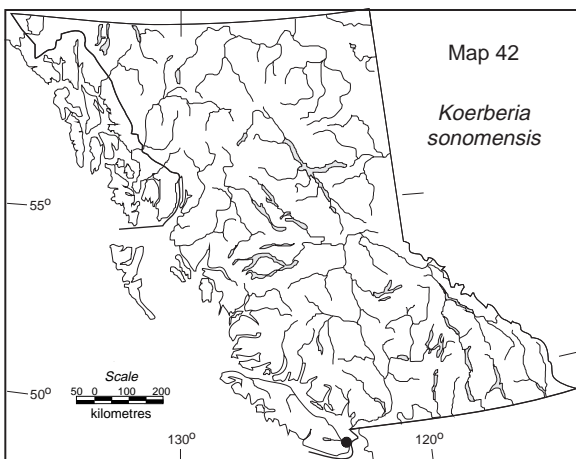
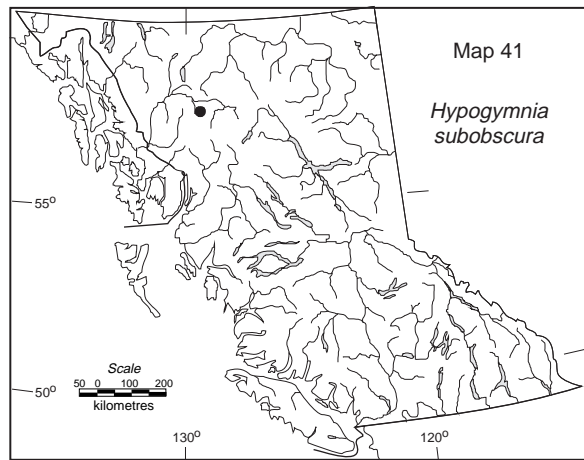
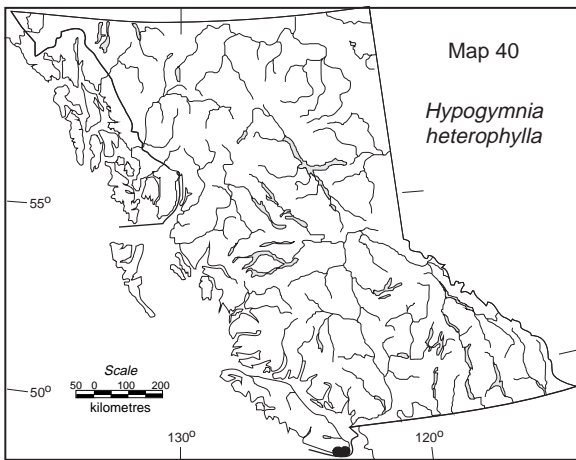
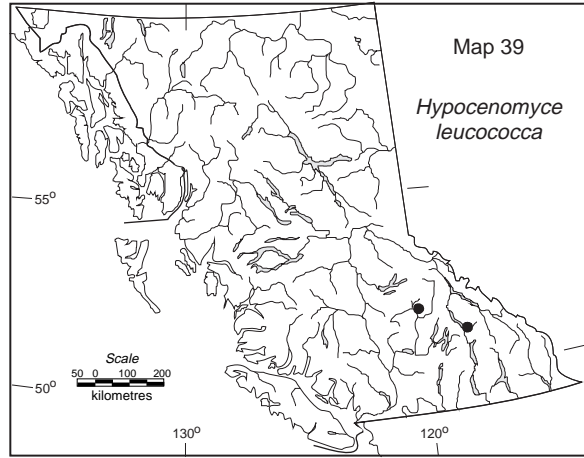
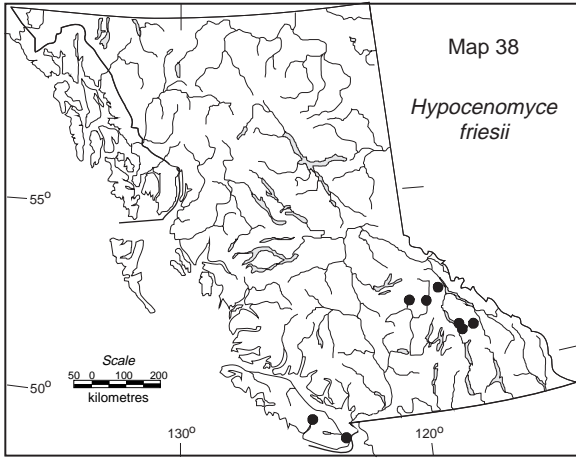


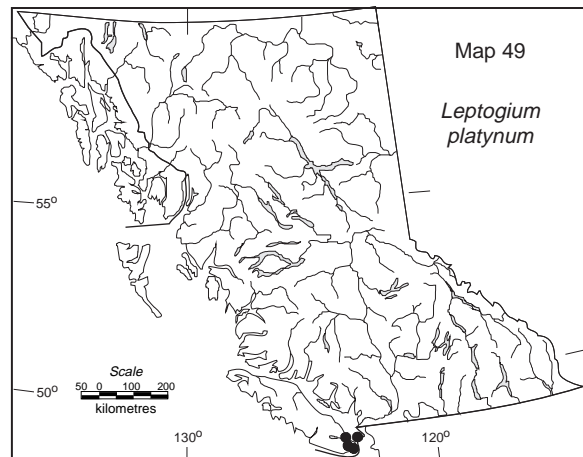
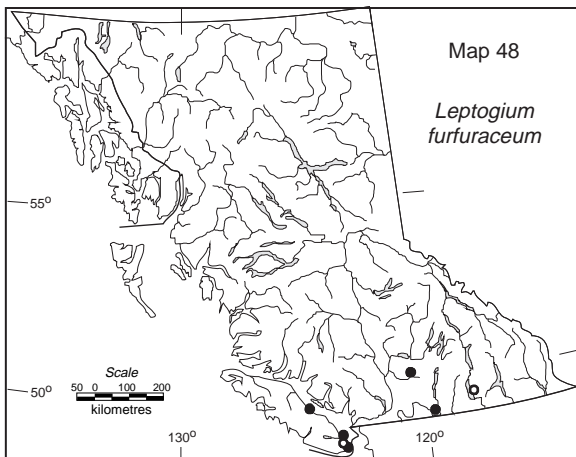
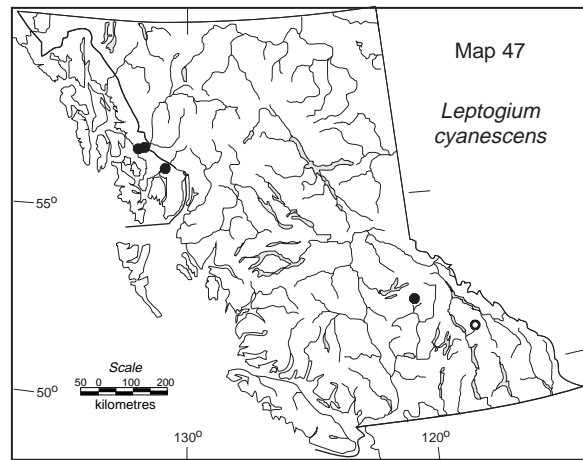
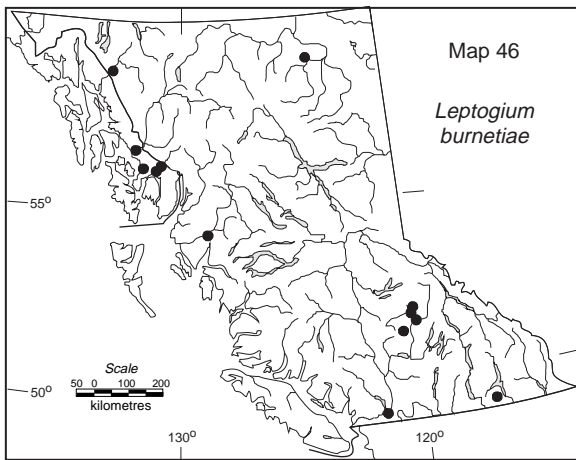
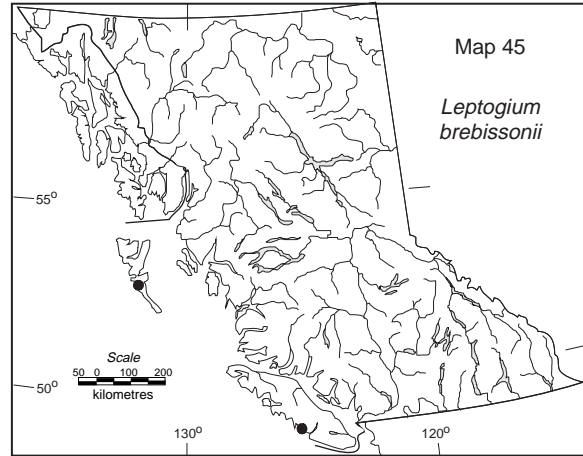
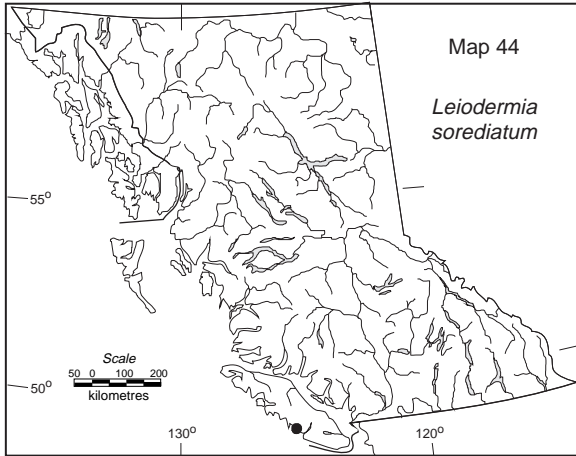


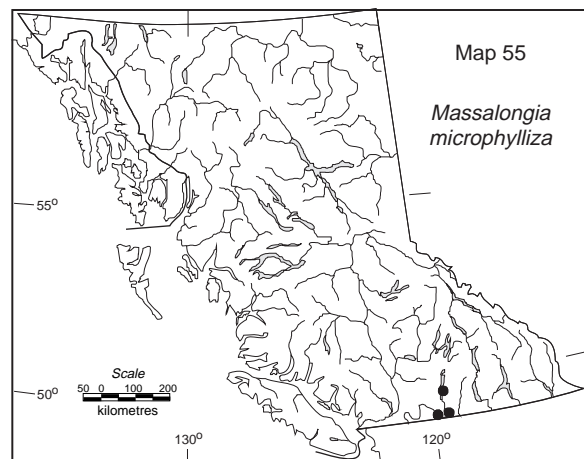
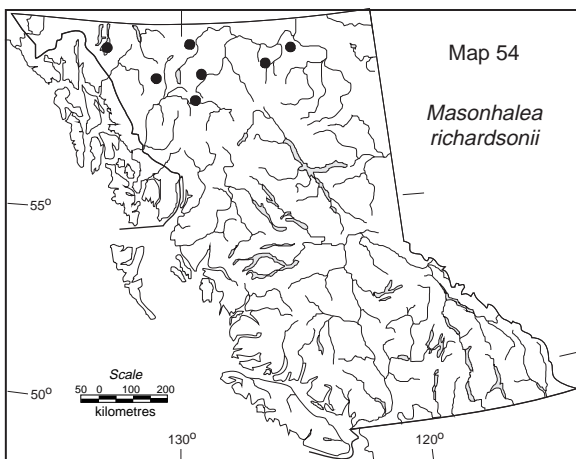
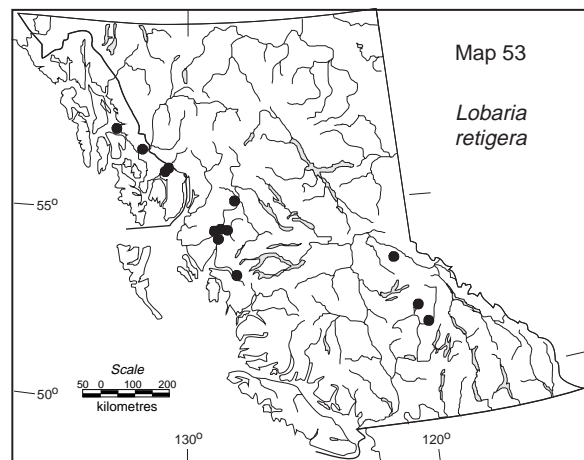
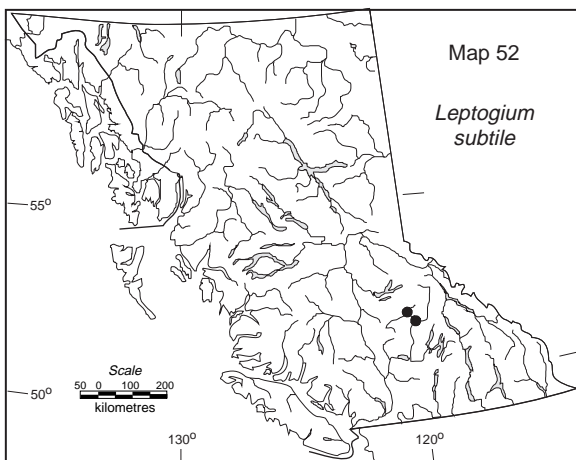
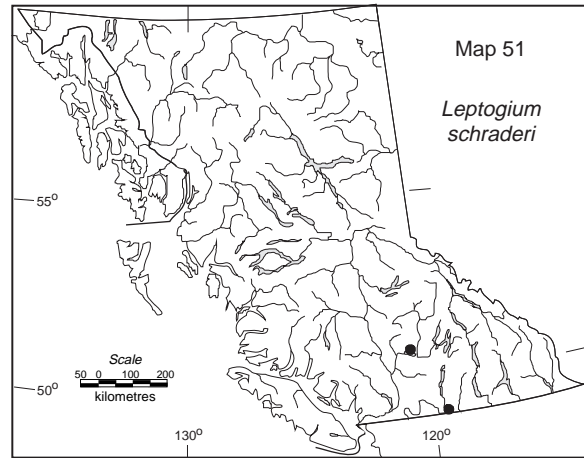
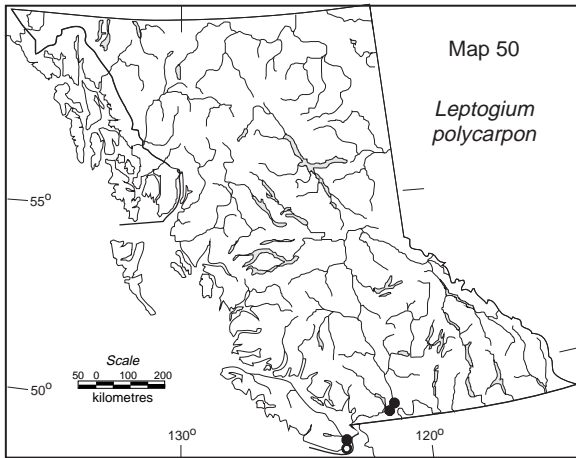


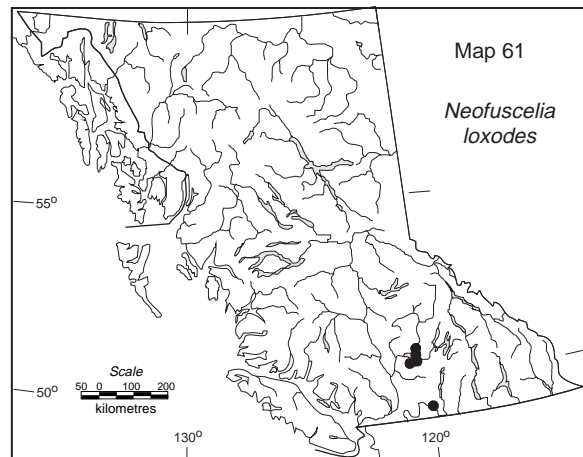
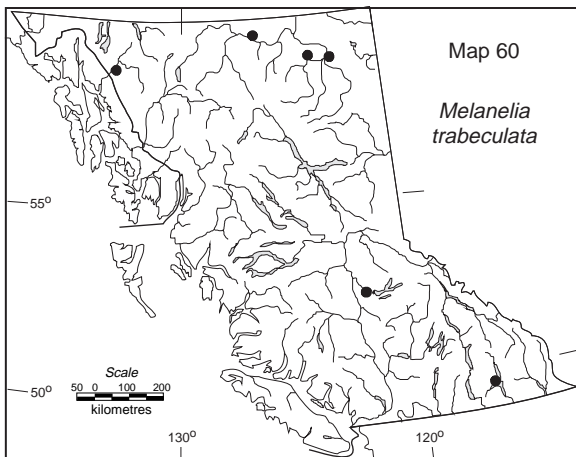
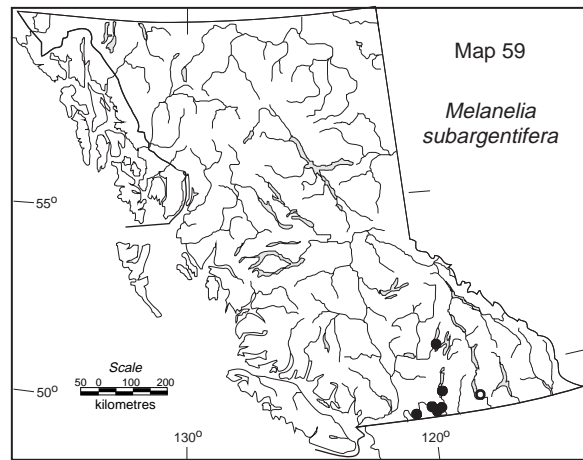
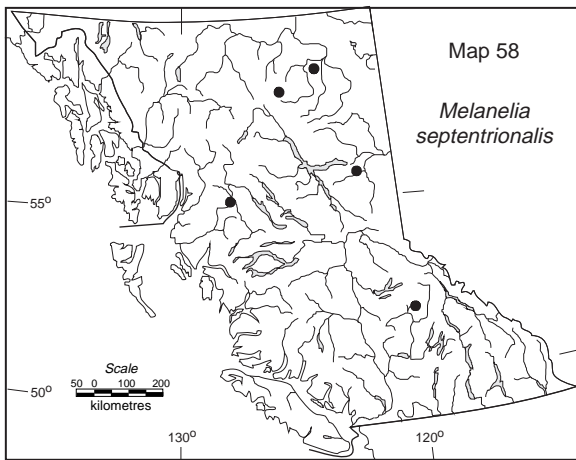
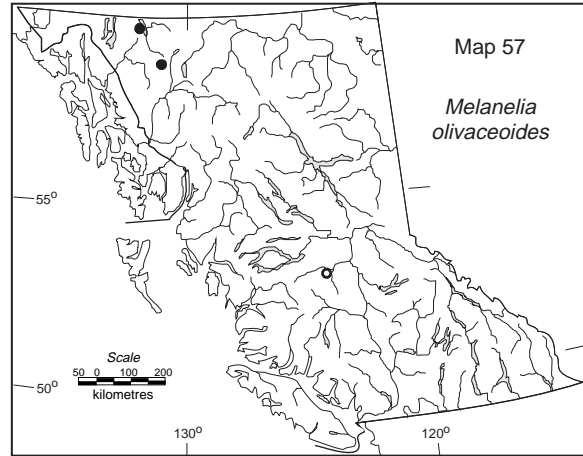
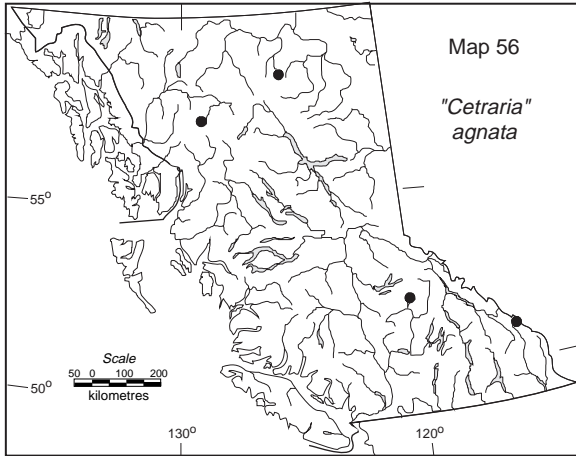


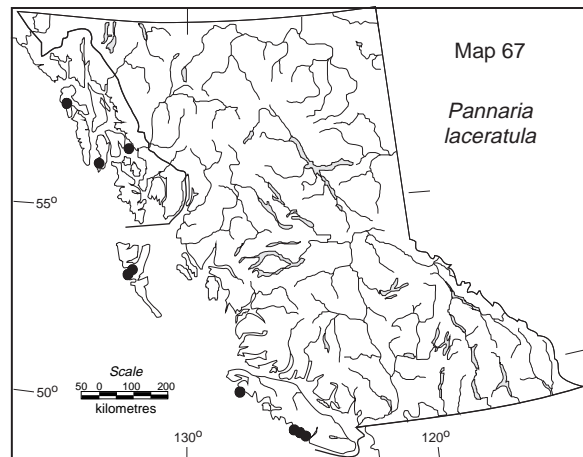
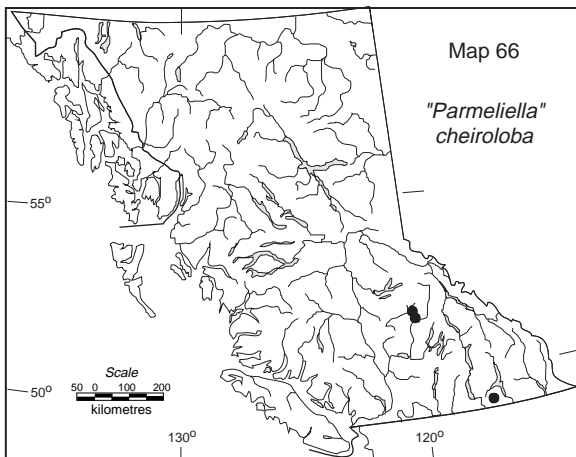
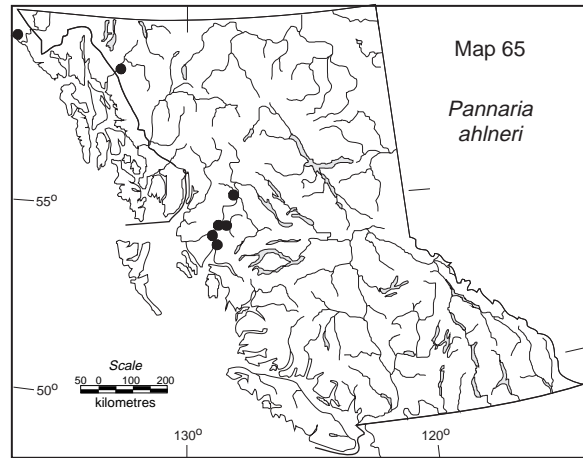
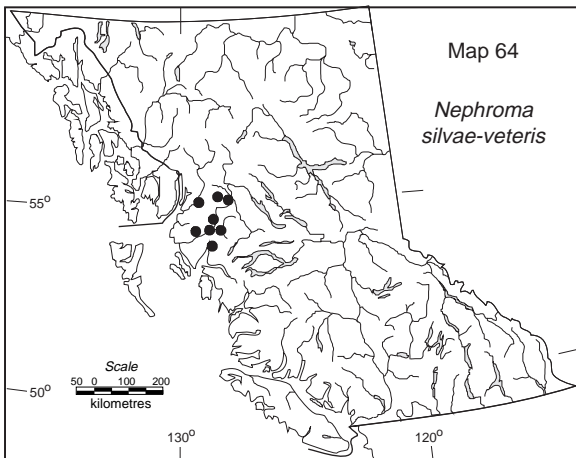
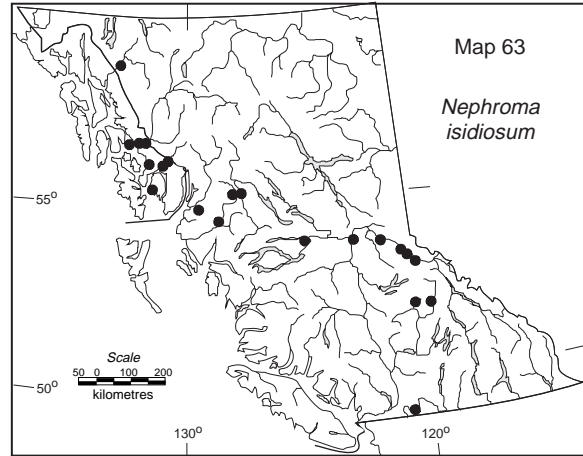
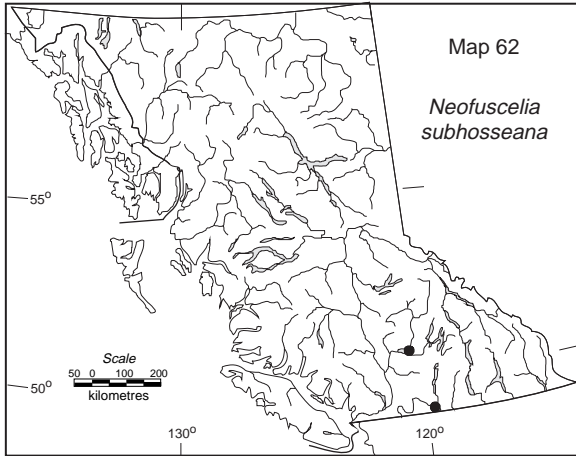


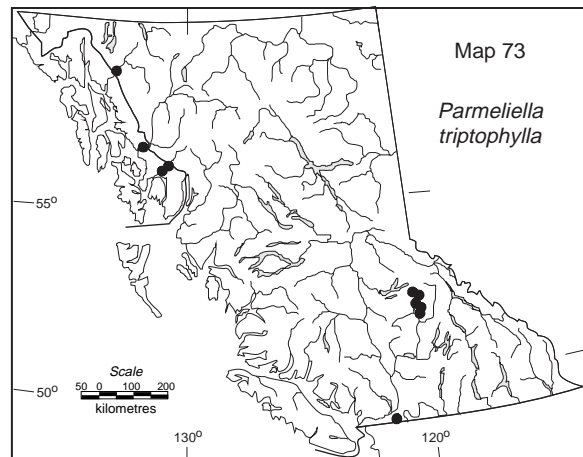
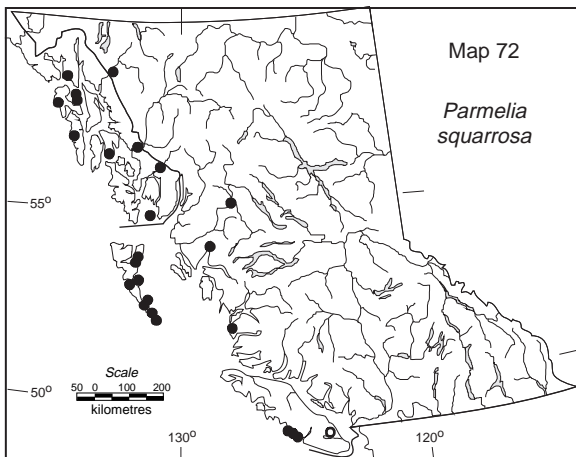
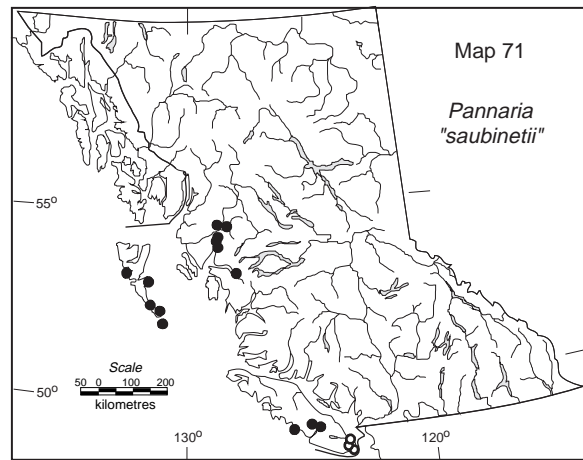
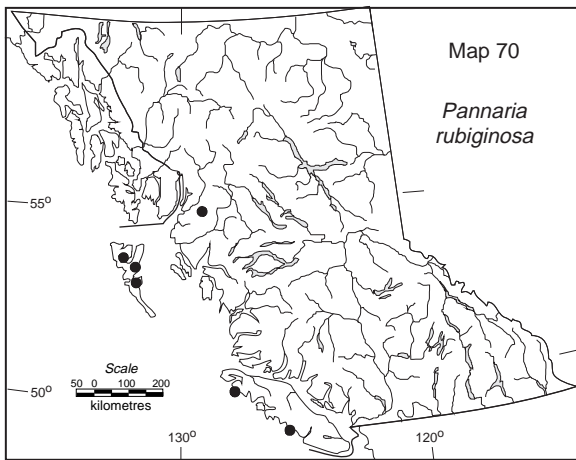
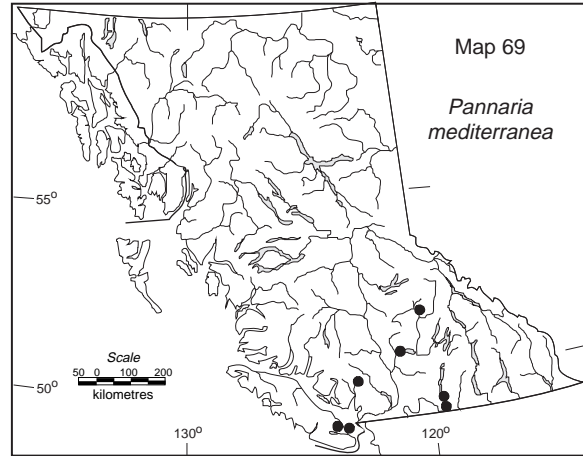
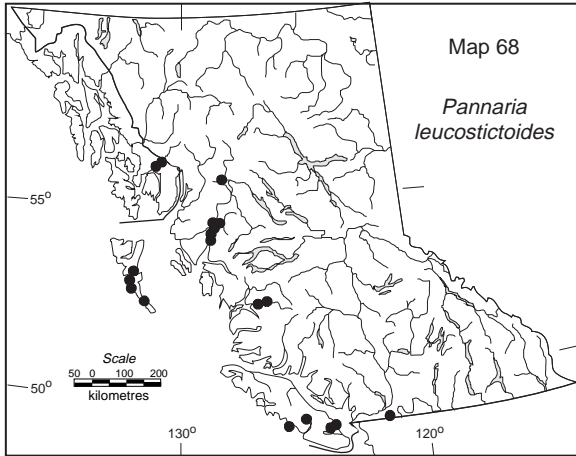


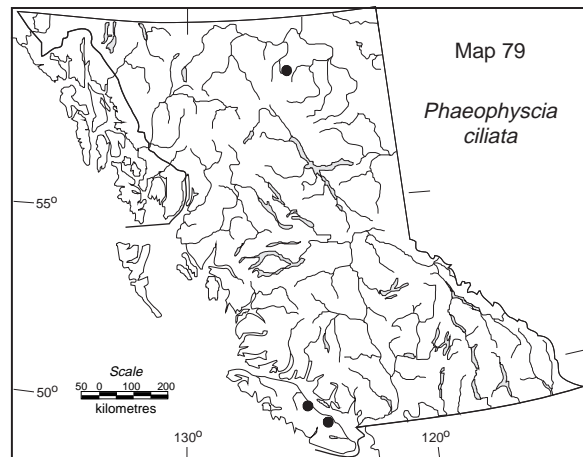
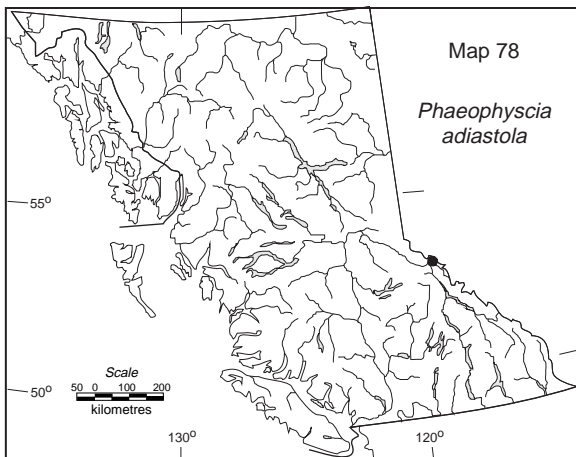
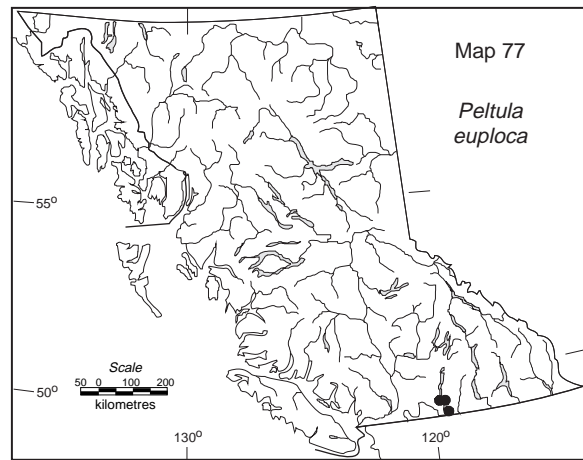
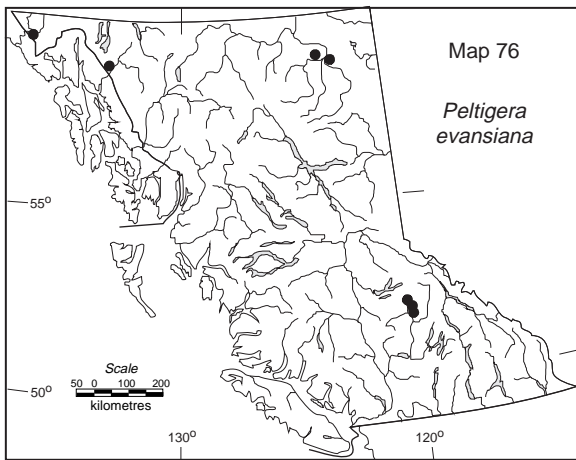
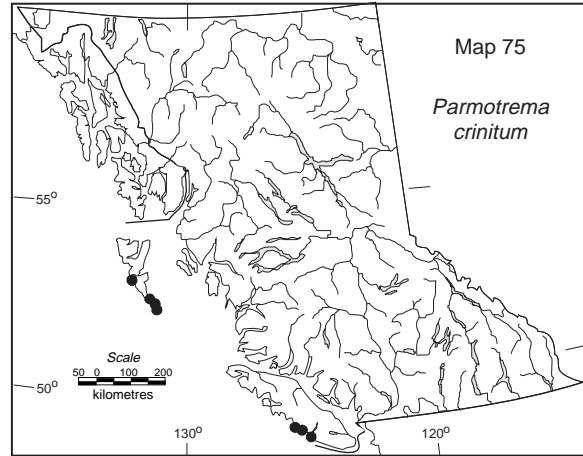
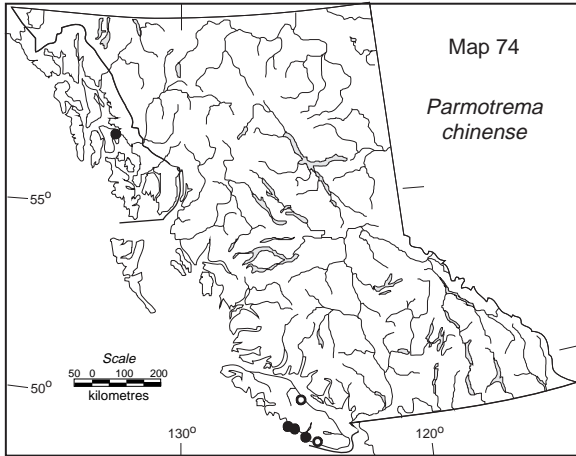


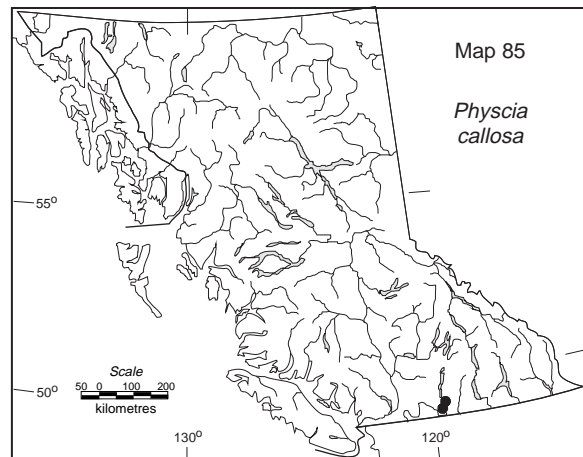
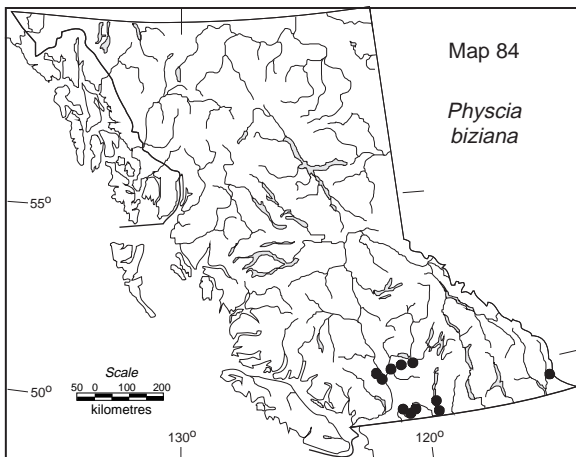
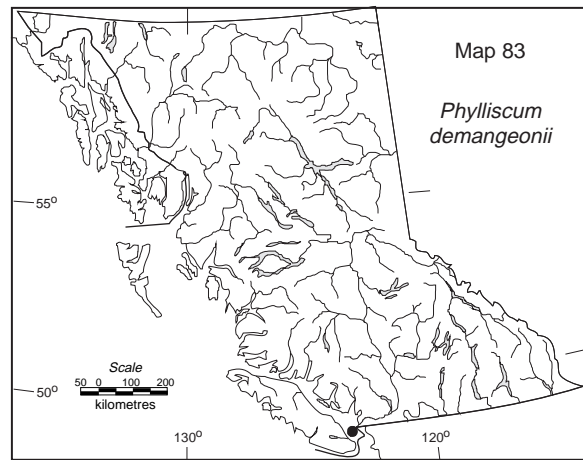
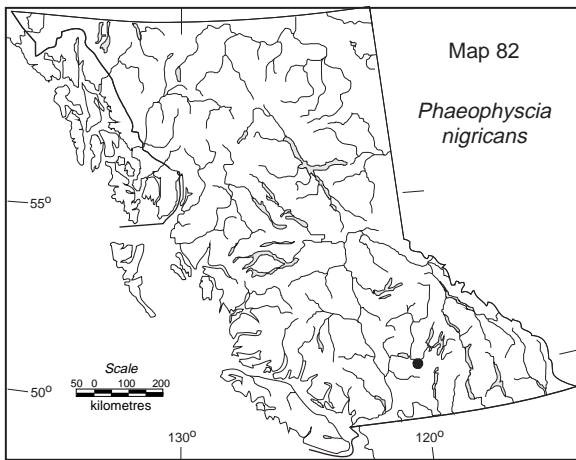
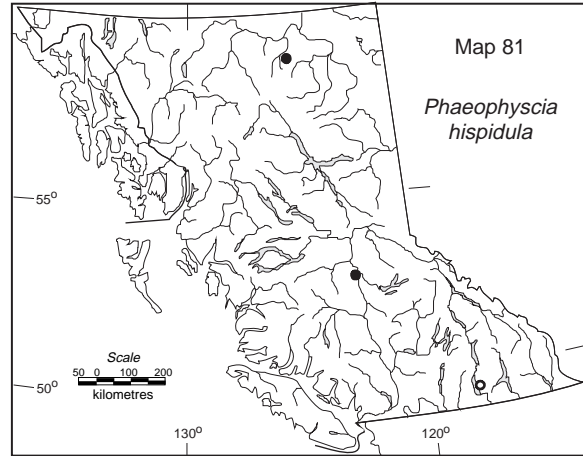
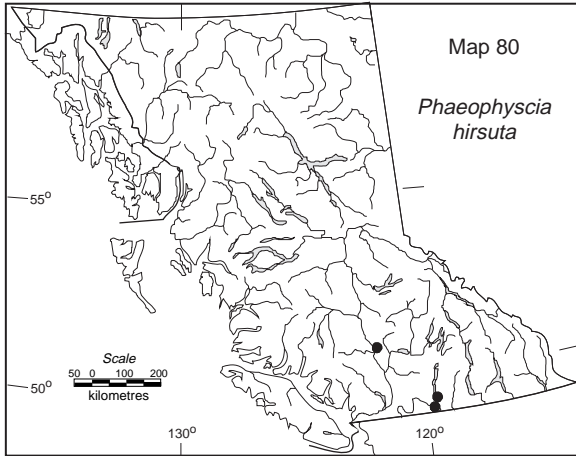




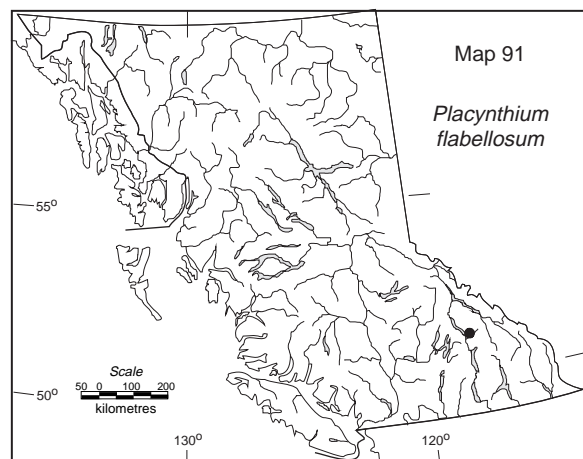
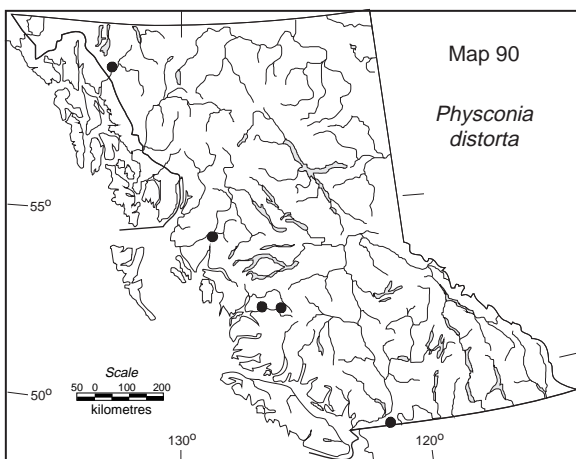
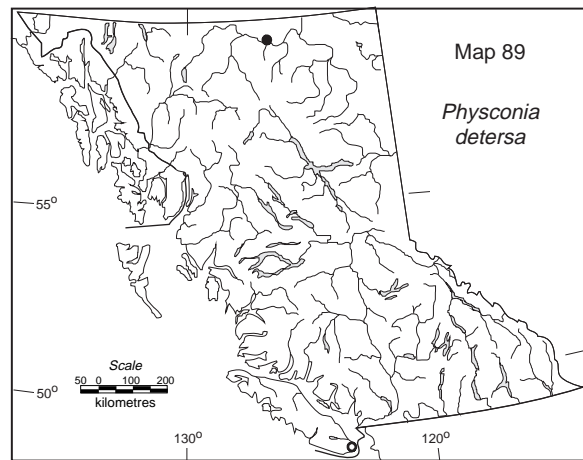
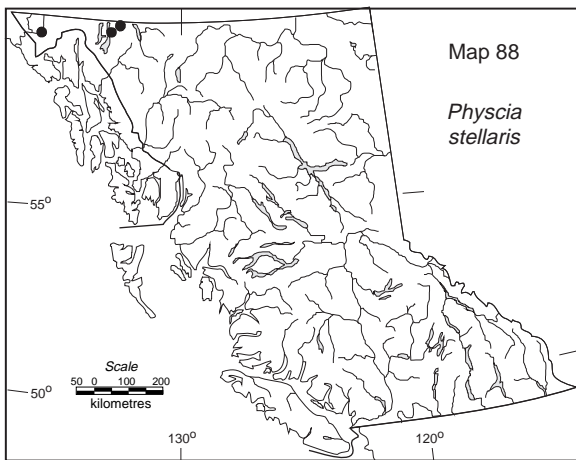
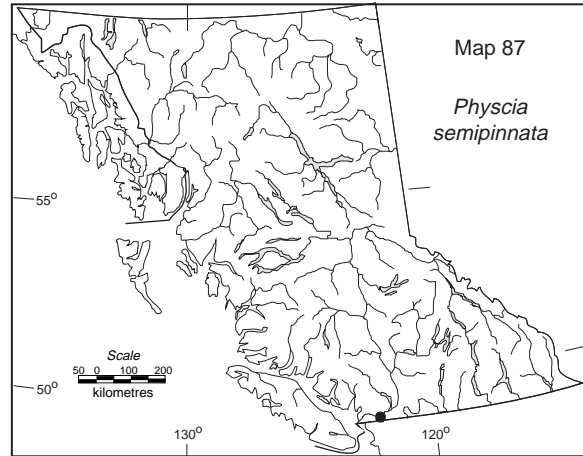
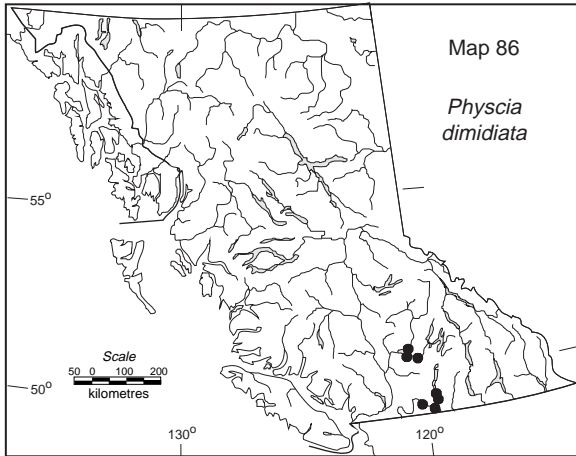


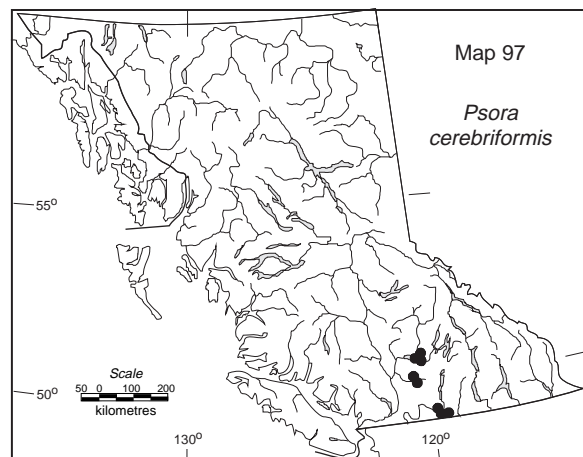
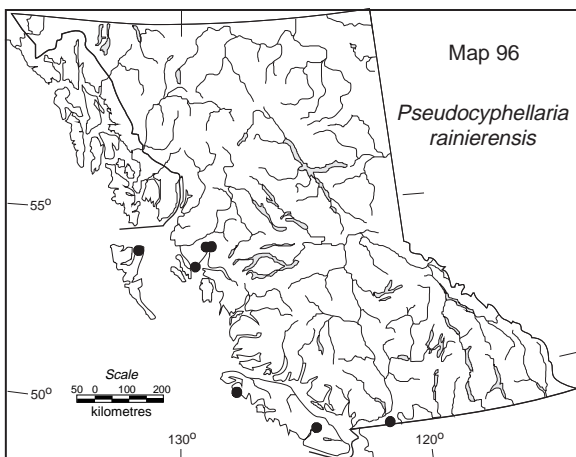
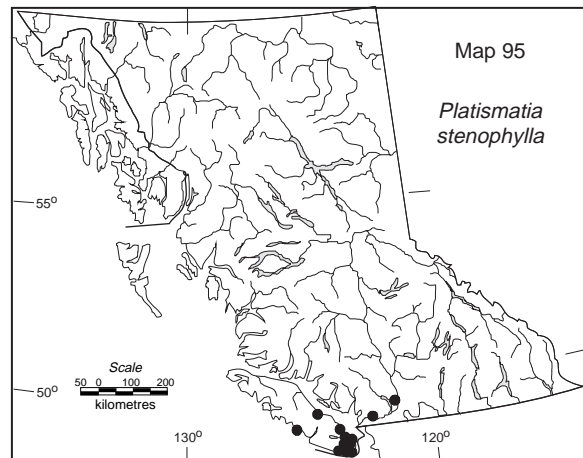
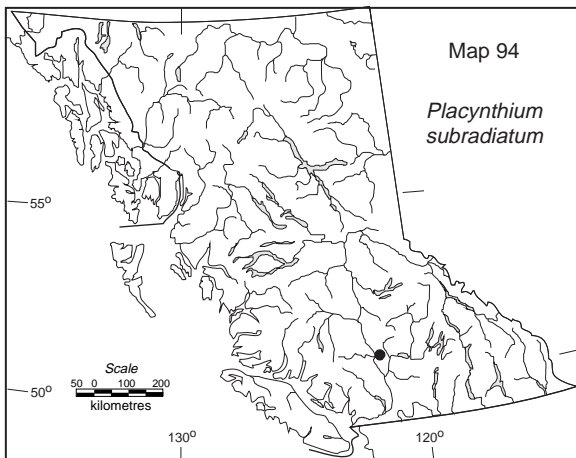
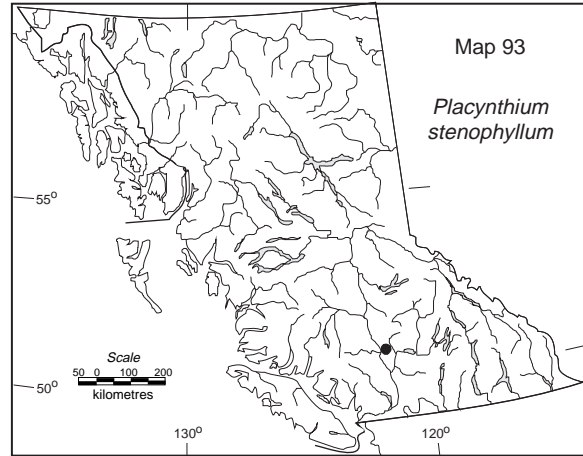
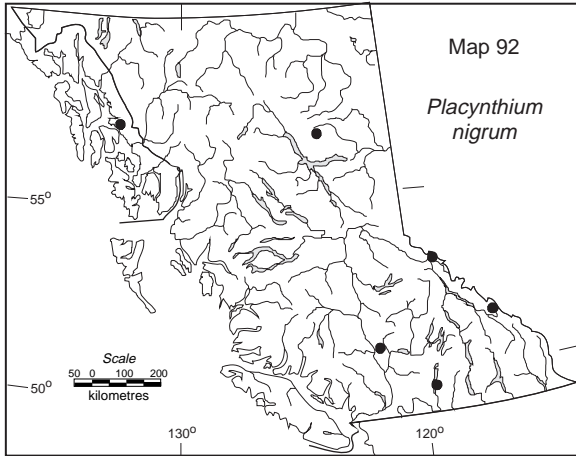


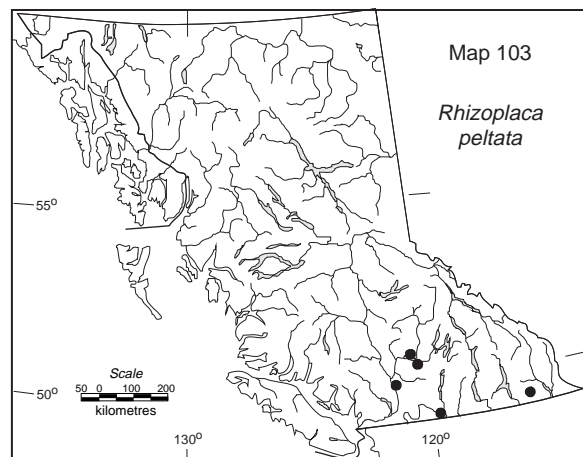
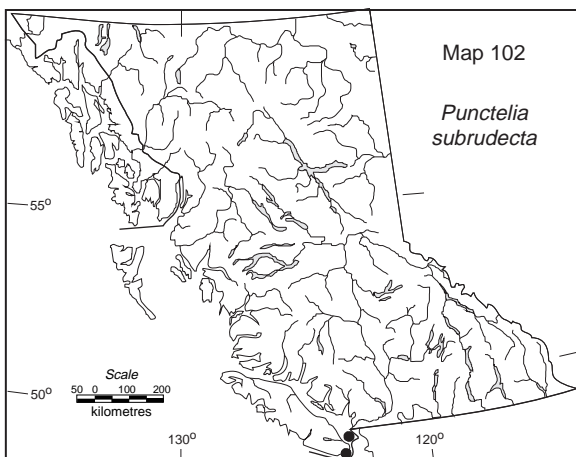
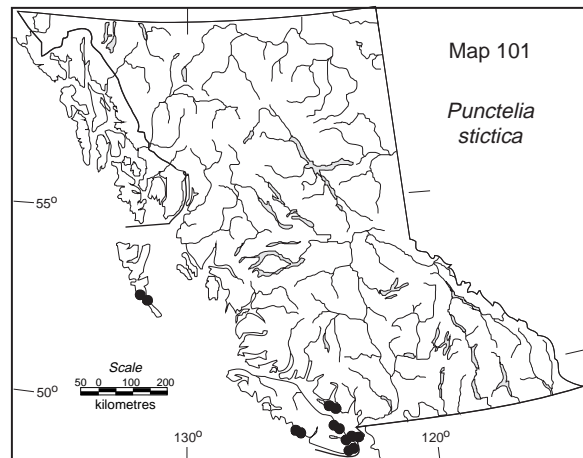
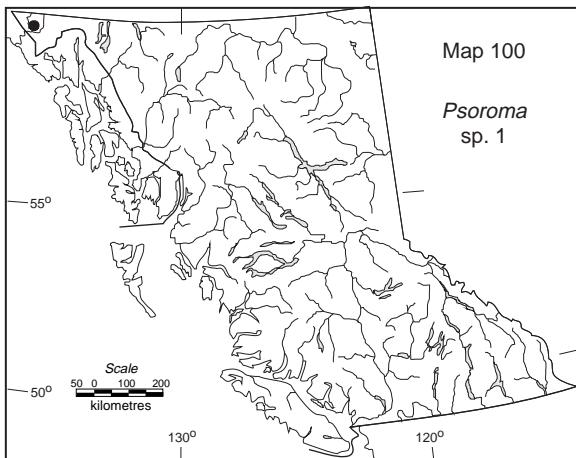
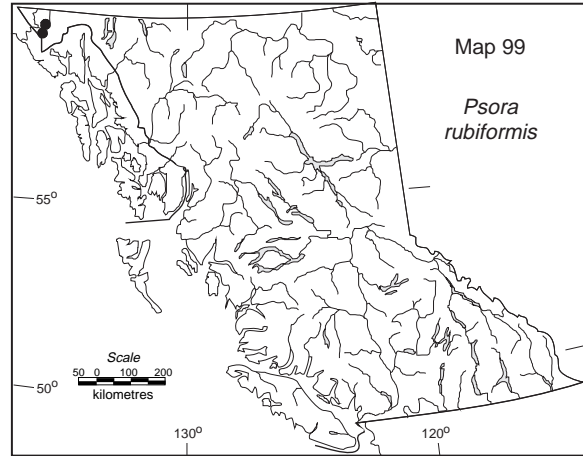
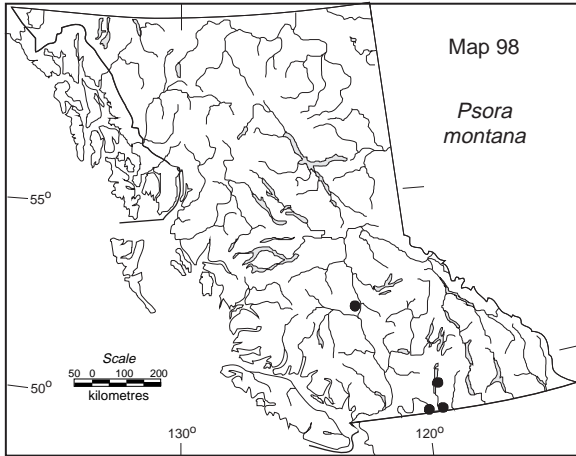


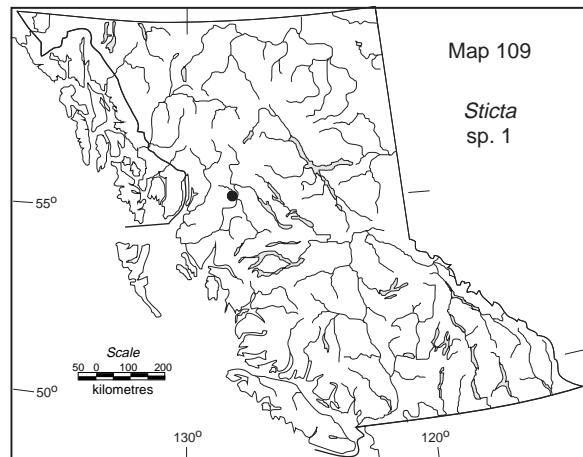
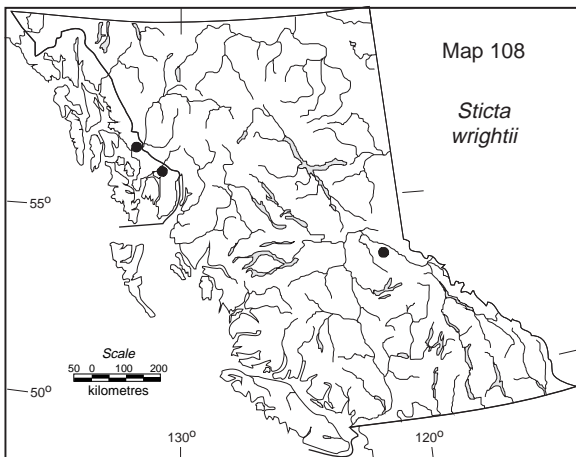
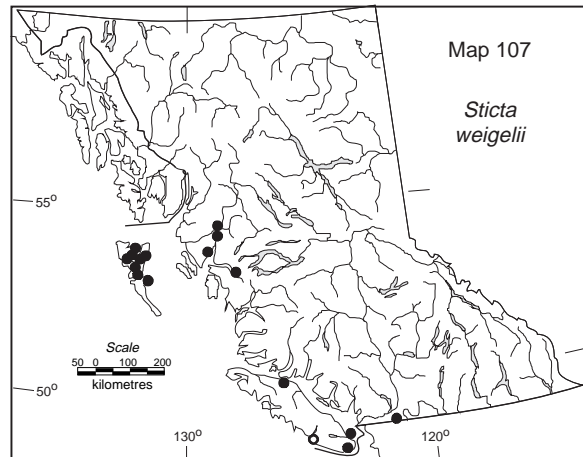
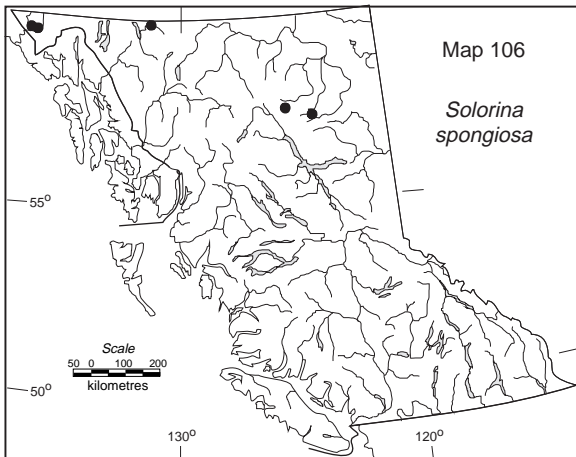
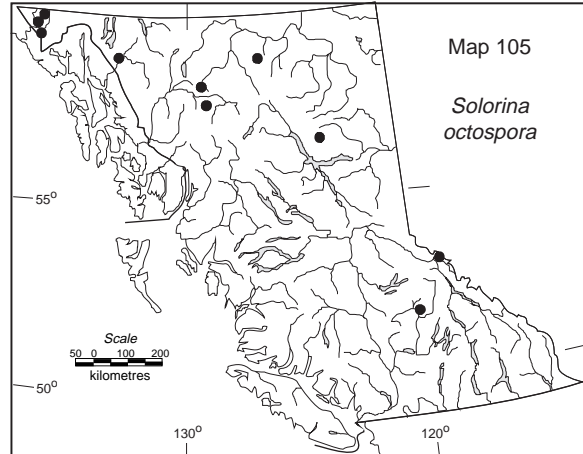
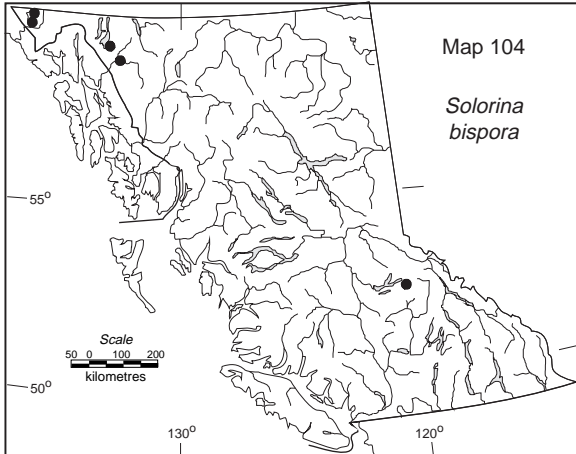


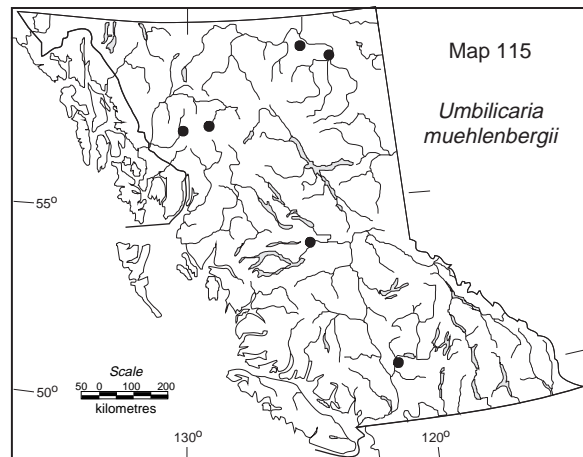
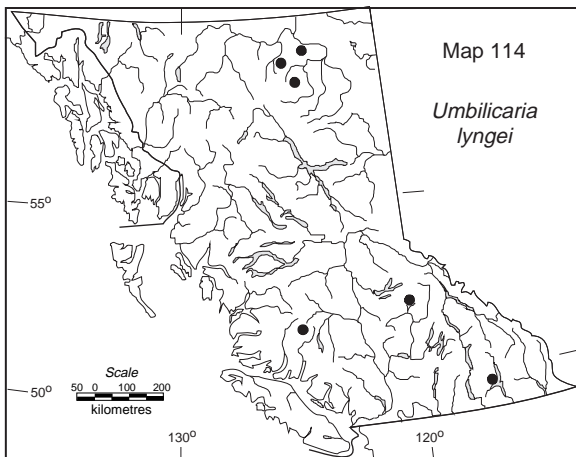
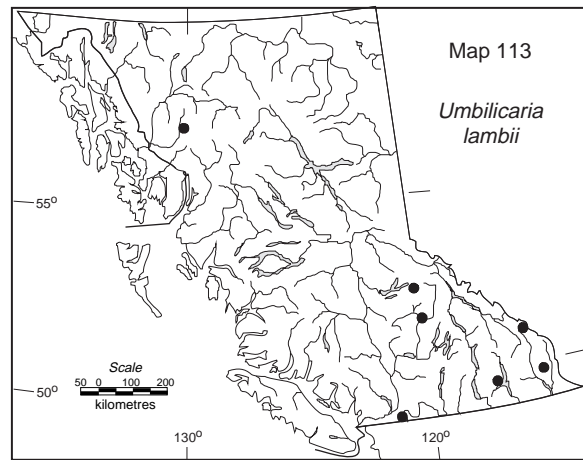
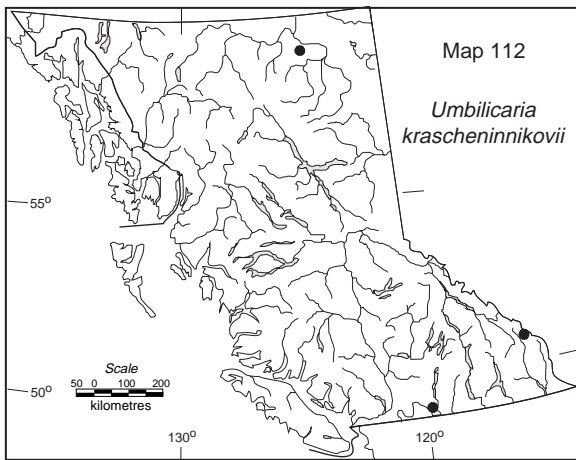
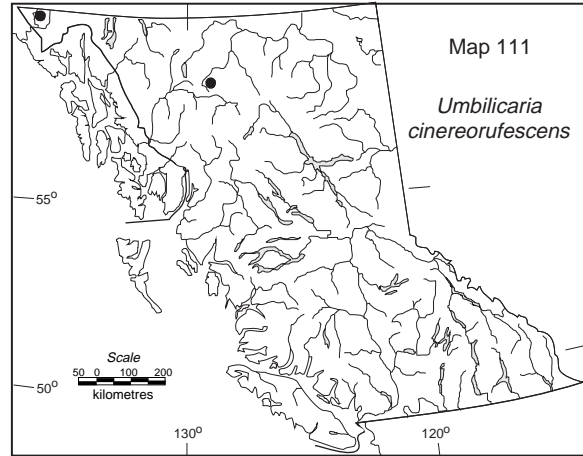
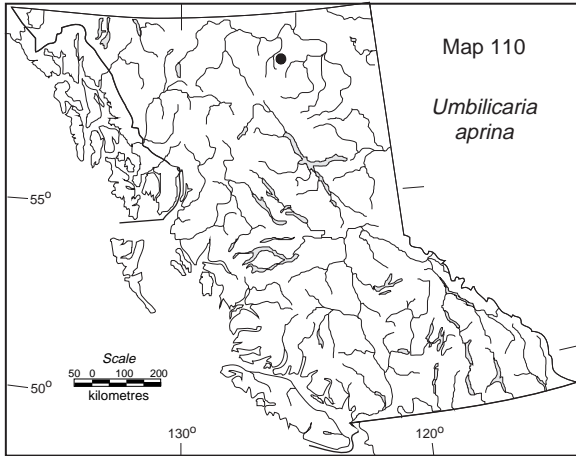


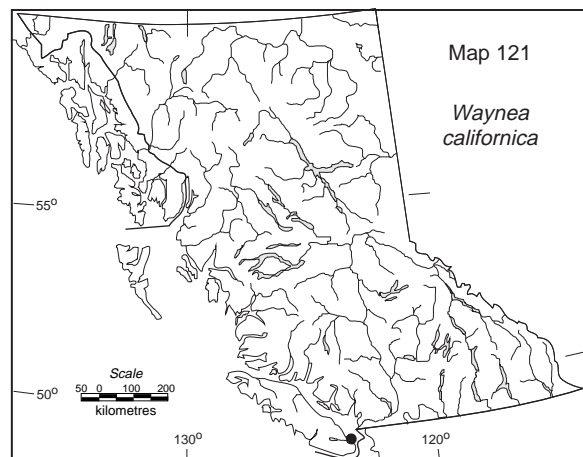
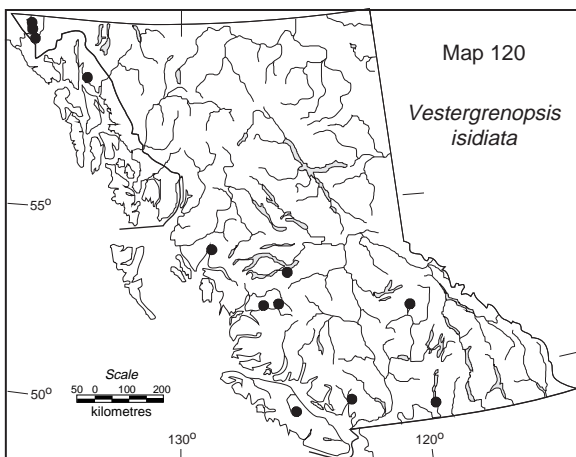
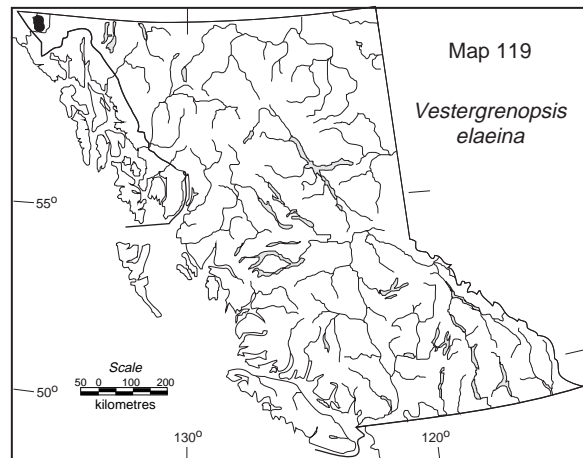
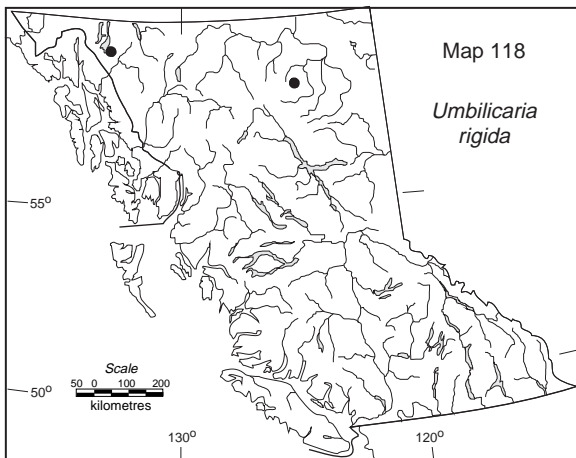
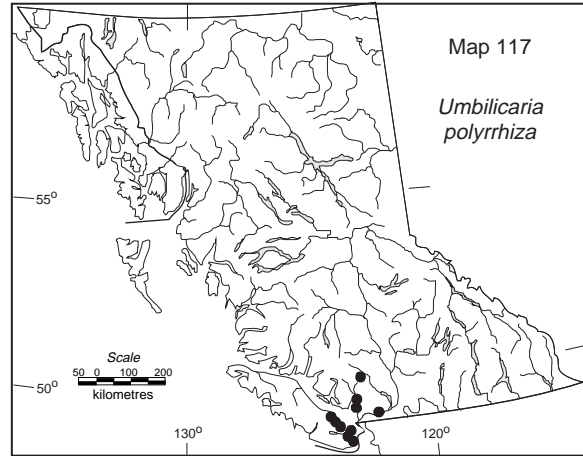
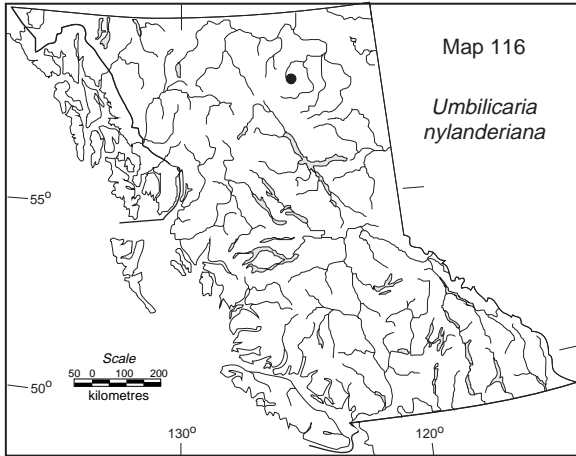


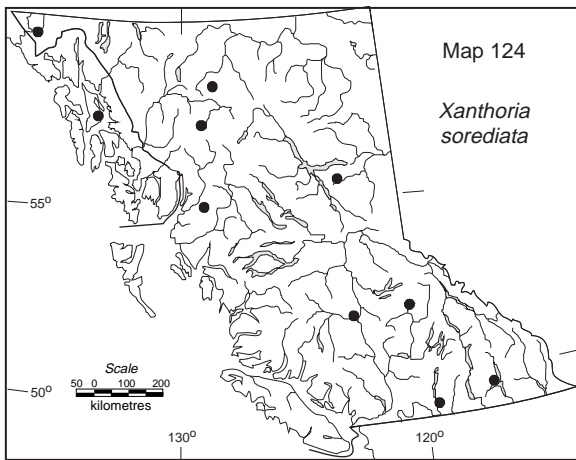
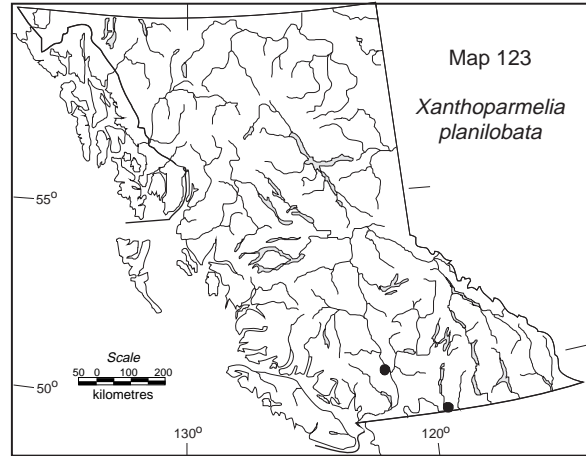
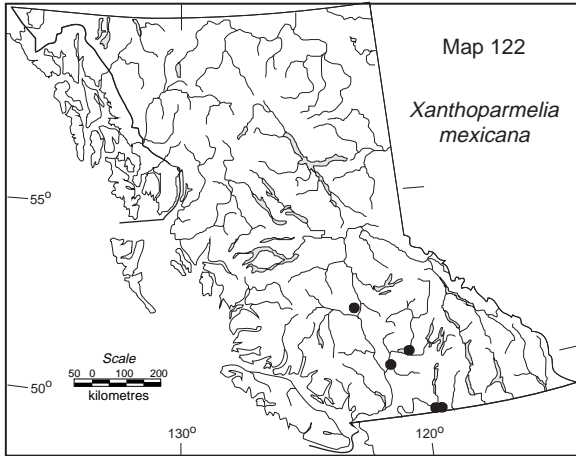












## APPENDIX 2. Excluded species

**Arctomia delicatula** Th. Fr. was reported for B.C. by Noble et al. (1987). Though some forms might be considered foliose, and hence deserving treatment here, its inclusion in the B.C. checklist is apparently based on a misidentification. The specimen in question, Brodo 21313 (CANL), collected from the northern Rocky Mountains, contained mostly *Placynthium asperellum* (Ach.) Trev. and fragments of *Leptogium* cfr. *tenuissimum* (Dicks.) Körber.

**Asahinea chrysantha (Tuck.) Culb. & C. Culb.** was reported by Noble et al. (1987), but no specimens have been located at either CANL or UBC.

**Catapyrenium heppioides (Zahlbr.) Thomson** (Syn. *Dermatocarpon heppioides* Zahlbr.) was reported by Noble (1982), but the specimens upon which this report is based are umbilicate, not rhizoidal, as would be expected in that species (Thomson 1987). The specimens are therefore provisionally referred to *Dermatocarpon intestiniforme* (Körber) Hasse, although the spores are longer (17–23  $\mu$ ) than previously reported for that species (see Imshaug 1957).

**Cetraria islandica (L.) Ach. ssp. orientalis (Asah.) Kärnef.** was reported by Noble et al. (1987), but no authentic specimens of this subspecies have been examined by us.

**Dermatocarpon vagans Imsh.** was reported from B.C. by Goward and Thor (1992) who noted, however, that it may not be taxonomically distinct, intergrading freely with *D. miniatum* (L.) Mann and *D. reticulatum* Magnusson. This point is discussed at greater length by Rosentreter and McCune (1992), who argue that *D. vagans* is an environmental modification of *D. reticulatum*.

**Erioderma mollisimum (G. Sampaio) Du Rietz** was first reported by Noble et al. (1987) based on a single specimen at UBC that, on re-examination, can be referred to the recently described species, *Erioderma solediatum* D. Gallo-way & P.M. Jørg.

**Lasallia papulosa (Ach.) Llano** was included in the B.C. checklist of Noble et al. (1987), based on an early specimen supposedly collected by Macoun from Mt. Benson on Vancouver Island and first reported by Llano (1950). That record is suspect, however, because Macoun was notorious for cross-labelling his specimens. No further B.C. material has been discovered in more than a century. While admitting the possibility that *L. papulosa* may yet be found in B.C. (Llano [1950], for example, reports its occurrence in Oregon and the Yukon), we prefer for the present to exclude it from the B.C. lichen flora.

**Lobaria isidiosa (Bory) Trevisan** has been reported for North America from Alaska (Krog 1968) and B.C. (Noble et al. 1987). Jordan (1973) discussed the earlier report and concluded that the material should actually be referred to *L. retigera* (Bory) Trevisan. Presumably the later report is based on two specimens at CANL, labelled as *L. isidiosa*, and collected by Ohlsson in 1970 near Terrace. Both are in fact *L. retigera*.

**Physcia cascadenis Magnusson** was first reported for B.C. by Noble (1978) and was tentatively included in the B.C. checklist (Noble et al. 1987). We have examined specimens assigned to this species and prefer to place them as merely a pale variant of *P. phaea* (Tuck.) Thomson.

**Physcia wainioi Räsänen** is the name usually given to forms of *P. caesia* (Hoffm.) Fűrnr. in which the soredia are located at the lobe tips. It was first reported for B.C. by Bird and Bird (1973). Noble et al. (1987) include it in the B.C. checklist with the comment: "the delimitation of this species from *P. caesia* needs further study." We agree.

**Pseudocyphellaria mougeotiana (Delise) Vainio** was first reported for B.C. by Ohlsson (1973); it is here treated as a variant of *P. crocata* (L.) Vainio. See the remarks under that species.

**Psora russellii (Tuck.) A. Schneider** (Syn. *Lecidea russellii* Tuck.) was first reported from B.C. by Tuckerman (1888) and most recently by Noble et al. (1987). Timdal (1986), however, has shown that this species is restricted to desert areas of the intermontane United States. Most B.C. specimens previously assigned to *P. russellii* can be referred to *P. tuckermanii* R. Anderson ex Timdal.

**Umbilicaria arctica (Ach.) Nyl.** was reported for B.C. by Noble et al. (1987). The single specimen so labelled at CANL (Brodo 10981, from the Queen Charlotte Islands) seems to fall within the normal range of variation for *U. hyperborea* (Ach.) Ach. Llano (1950) treated *U. arctica* as a morphotype of that species.



***Umbilicaria decussata* (Vill.) Zahlbr.** was first reported for B.C. (as *Omphalodiscus decussata*) by Szczawinski and Krajina (1959) and has been subsequently reported by several other authors. Because, however, no specimens are on deposit at either CANL or UBC, we prefer for the present to exclude this species from the B.C. flora, while admitting the likelihood that it will in fact eventually be found to occur here.

***Xanthoparmelia hypopsila* (Müll. Arg.) Hale** was first reported for B.C. by Noble (1978), though according to Hale (1990) this species is actually restricted to South America; the North American specimens previously attributed to *X. hypopsila* are usually referable to *X. angustiphylla* (Gyelnik) Hale. The B.C. material, however, is closer to *X. planilobata* (Gyelnik) Hale, with elongate-linear lobes that are, at most, sparsely rhizinate.

***Xanthoparmelia lineola* (Berry) Hale** (Syn. *Parmelia lineola* Berry) was reported for B.C. by Noble et al. (1987). However, the B.C. material examined in the course of our study is invariably less closely adnate than typical *X. lineola* and often produces copious secondary lobes in the central portions of the thallus. Such material is more appropriately placed in *X. coloradoensis* (Gyelnik) Hale. A few authentic specimens have, however, been collected from northern Montana.

***Xanthoparmelia somloensis* (Gyelnik) Hale** (Syn. *Parmelia somloensis* Gyelnik) was first reported for B.C. by Ahti et al. (1987), who stated (apparently on the authority of the monographer Mason Hale), that "most reports of *X. taractica* (Gyelnik) Hale in North America and Europe actually refer to this species." Hale later, however, adopted a narrower concept for *X. somloensis*, which he considered to be a maculate narrow-lobed Eurasian and eastern North American species (Hale 1990). The western material, by contrast, is non-maculate and somewhat broader-lobed and can be assigned to *X. coloradoensis* (Gyelnik) Hale. See, however, the notes under that species.

***Xanthoparmelia taractica* (Krempelhuber) Hale** (Syn. *Parmelia taractica* Krempelhuber) is a soil-dwelling lichen widespread in the southern hemisphere and extending northward also into Mexico (Hale 1990). British Columbia specimens previously assigned to *X. taractica* are usually referable to *X. coloradoensis* (Gyelnik) Hale.

***Xanthoparmelia tasmanica* (Hooker & Taylor) Hale** (Syn. *Parmelia tasmanica* Hooker & Taylor) was reported for B.C. by Noble et al. (1987), but is not accepted here. Specimens previously identified as that species have a dark, but never uniformly jet black lower surface and are accordingly assigned here to *X. coloradoensis*.

## GLOSSARY AND ABBREVIATIONS

- acicular:** in lichens, said of spores: needlelike, long, very slender, and pointed.
- acid:** referring to rock or bark lacking free calcium carbonates. Most quartzites are acidic (= siliceous) and most conifers have acid bark. See also **base-rich**.
- AK:** Alaska.
- algae** (sing.: alga): in lichens, tiny photosynthetic cells (also called the **photobiont**) usually grass-green in colour, from which the lichen fungus derives its carbohydrate requirements. In many lichen species the photobiont is a **cyanobacterium**.
- ampulliform:** flask-like and with a narrow neck.
- apothecia** (sing.: -ium): in lichens, the saucer-shaped or button-shaped fruiting bodies (ascomata) in which the sexual **spores** of the fungal partner are produced. Macroscopically, a typical apothecium is comprised of a disc and a rim (see Figure 9a, page 13). See also **perithecia**.
- apothecial rim** (= apothecial margin): the sterile outer portion of an **apothecium**. The apothecial rim is said to be **thalline** when it contains **photobiont** cells and is the same colour as the rest of the cortex.
- apotheciate:** bearing **apothecia**.
- asci** (sing.: ascus): microscopic, saclike structures within the **ascocarp** of an **ascomycete**, in which sexually produced spores are borne.
- ascocarp:** general term for the fruiting body of an **ascomycete** (i.e., the class of fungi to which most lichens belong). **Apothecia** and **perithecia** are both ascocarps.
- ascomycete:** a species belonging to the fungal Class Ascomycetes, in which the spores are produced in saclike **asci**.
- AT:** Alpine Tundra biogeoclimatic zone: a cold, often snowy upland zone occurring at and above treeline throughout British Columbia. See page 5.
- AZ:** Arizona.
- base-rich:** referring to rock or bark containing free calcium carbonates or giving rise to such. Limestone and peralkaline basalt are base-rich rocks, whereas maple and cottonwood are base-rich trees. See also **acid**.
- BC:** British Columbia.
- BG:** Bunchgrass biogeoclimatic zone: a lowland zone of semi-arid **intermontane** regions. See page 5.
- boreal:** in B.C., pertaining to **inland** regions of cool, rather continental climate lying to the east of the Rocky Mountains (see Figure 2, page 4).
- buttoned** (= **omphalodisc**): characterized by a central knob. Refers to an **apothecium** (of the genus *Umbilicaria*) in which the surface of the **disc** is interrupted by a central knob of sterile material.
- C:** in this manual, used as an abbreviation for calcium hypochlorite (in water), a reagent used to perform spot tests in lichens. Such tests reveal the presence of specified chemical substances. See page 13.
- CA:** California.
- cephalodia** (sing.: -ium): small, localized colonies of **cyanobacteria** occurring within or on the surface of lichens in which the primary **photobiont** is otherwise an **alga** (see Figures 4e, 8e, page 10, 12).
- cephalodiate:** bearing **cephalodia**.
- cilia** (sing.: -ium): thin, hairlike appendages usually occurring along the **lobe** margins (see Figure 8g, page 12).
- CO:** Colorado.
- coast:** in B.C., pertaining to areas west of the coast ranges i.e., including **maritime** and **hypermaritime** regions (see Figure 2, page 4). See also **inland**.
- coralloid:** resembling coral: elongate and much-branched; often used in reference to **isidia**.
- cortex:** in lichens, the hardened outer "skin" consisting of closely packed fungal threads (see Figures 4a, d, page 10).
- corticate:** having a **cortex**.
- CDF:** Coastal Douglas-fir biogeoclimatic zone: a lowland zone of dry **maritime** regions. See page 5.
- crustose:** in lichens, pertaining to **thalli** that lack a lower **cortex** and **rhizines** and are so closely applied to the **substrate** as to be virtually inseparable from it (see Figure 7b, page 12).
- CWH:** Coastal Western Hemlock biogeoclimatic zone: a lowland zone of wet **maritime** and **hypermaritime** regions (see page 5).
- cyanobacteria** (sing.: -ium): in lichens, tiny photosynthetic cells (also called the **photobiont**), usually bluish green to bluish grey, from which the lichen fungus derives its carbohydrate requirements. In many lichen species the photobiont is an **alga**, not a cyanobacterium.

- cyphellae** (sing.: -a): rimmed, crater-like pores that open into the medulla via the lower surface; characteristic of the genus *Sticta* (see Figure 8c, page 12).
- decorticate**: formerly **corticate**, but now lacking a **cortex**.
- dichotomous** (= fork-branched): Y-shaped branching (see Figure 6b, page 11).
- disc**: as viewed from above, the central portion of an **apothecium** (excludes the **apothecial rim**).
- dorsiventral**: having an obvious upper and lower surface.
- ESSF**: Engelmann Spruce – Subalpine Fir biogeoclimatic zone: a subalpine zone of **intermontane** regions. See page 5.
- farinose**: powdery, like flour; used in reference to **soredia**.
- fissured** (= **gyrodisc**): characterized by fissures or vertical cracks; in lichens, pertaining to an **apothecium** (of the genus *Umbilicaria*) in which the surface of the **disc** is more or less concentrically ridged.
- foliose**: in lichens, pertaining to leaflike **thalli** in which the lower **cortex** is separable from the substrate (see Figure 7d, page 12).
- foveolate**: more or less irregularly and delicately pitted; usually used in reference to the upper **cortex**.
- fruticose**: in lichens, pertaining to club-like, shrub-like, or hairlike **thalli** that are more or less radially symmetrical in cross-section (see Figures 7e–g, page 12).
- gyrodisc**: an **apothecium** (of the genus *Umbilicaria*) in which the surface of the **disc** is more or less concentrically fissured.
- heteromerous** (= **stratified**): in lichens, pertaining to **thalli** in which the **photobiont** and **medulla** are organized in distinct layers. In such species, the **medulla** is pale (see Figure 4, page 10). See also **homoimerous**.
- HNO<sub>3</sub>**: nitric acid (in water); a reagent used to perform spot tests in lichens. See page 13.
- homoimerous**: (= **nonstratified**): in lichens, pertaining to **thalli** in which the **photobiont** and **medulla** are not organized in distinct layers. In such species, the **medulla** is dark and often gelatinous when moist (see Figure 5, page 10). See also **heteromerous**.
- hymenium**: within the **ascocarps** of fungi, the spore-bearing layer in which the **asci** arise.
- hypermaritime**: in B.C., pertaining to **coast** regions of high oceanity, lying adjacent to the open Pacific Ocean (see Figure 2, page 4).
- hypothallus** (= prothallus): in lichens, a thin, typically dark, tightly appressed weft of fungal threads that in some species develops on the underside of the **thallus**, and may sometimes extend outward from it, so as to be visible when seen from above (see Figure 6g, page 11).
- I**: iodine (in potassium iodide solution); a reagent used to perform spot tests in lichens. A positive reaction indicates the presence of certain kinds of starch. See page 13.
- ICH**: Interior Cedar–Hemlock biogeoclimatic zone: a lowland zone of wet **inland** regions. See page 5.
- ID**: Idaho.
- IDF**: Interior Douglas-fir biogeoclimatic zone: a lowland zone of dry **inland** regions. See page 5.
- inland**: in B.C., pertaining to regions east of the coast ranges; (i.e., including **intermontane** and **boreal** regions). See Figure 2, page 4. See also **coast**.
- intermontane**: in B.C., pertaining to **inland** regions lying between the coast ranges and the Rocky Mountains. See Figure 2, page 4.
- isidia** (sing.: -ium): tiny fingerlike, globular or **coralloid** asexual reproductive structures that contain both fungal threads and **photobiont** cells, are **corticate**, and protrude from the upper **cortex** of many lichen species (see Figure 9g, page 13). See also **soredia**.
- isidiate**: bearing **isidia**.
- isodiametric**: having approximately equal diameters in all directions.
- K**: in this manual, used as an abbreviation for potassium hydroxide (in water), a reagent used to perform spot tests in lichens. Such tests reveal the presence of specified chemical substances. See page 13.
- KC**: in this manual, used as an abbreviation for potassium hydroxide followed by calcium hypochlorite, reagents used to perform spot tests in lichens. Such tests reveal the presence of specified chemical substances. See page 13.
- laminal**: occurring on the (upper) surface of **lobes**. See also **marginal**.
- leiodisc**: an **apothecium** (of the genus *Umbilicaria*) in which the surface of the **disc** is smooth.
- lenticular**: lens-shaped.
- leprose**: in lichens, pertaining to **thalli** composed entirely of granular or more often powdery **soredia** (see Figure 7a, page 12).

**lobe:** a flattened branch or projection.

**lobule:** tiny **lobe**-like, dorsiventral outgrowths, often occurring along the **lobe** margins or stress cracks.

**lobulate:** bearing **lobules**.

**maculae** (sing.: -a): small, pale spots in the upper **cortex** of some lichen species, often caused by differences in the thickness of the cortex or clumping of algae beneath the cortex (see Figure 8b, page 12).

**maculate:** bearing **maculae**.

**marginal:** occurring along the margin of a **lobe** or **apothecium** or other structure.

**maritime:** in B.C., pertaining to **coast** areas of moderate oceanity, usually occurring somewhat inland of the open Pacific Ocean. See page 5.

**medulla:** in lichens, the interior portion of a **thallus**, composed mostly of loose fungal threads. In **stratified** species the medulla is pale, whereas in **nonstratified** species it is dark (see Figure 4c, page 10).

**MH:** Mountain Hemlock biogeoclimatic zone: a forested subalpine zone of **coast** areas. See page 5.

**MT:** Montana.

**muriform:** pertaining to **spores** in which both transverse and longitudinal **septa** are present.

**MX:** Mexico.

**mycobiont:** the fungal partner of a lichen. See also **photobiont**.

**needlelike** (= **acicular**): long, very slender, and pointed.

**NM:** New Mexico.

**nonstratified** (= **homoiomorous**): in lichens, pertaining to **thalli** in which the **photobiont** and **medulla** are not organized in distinct layers. In such species, the **medulla** is dark and often gelatinous when moist (see Figure 5, page 10). See also **stratified**.

**NV:** Nevada.

**omphalodisc:** an **apothecium** (of the genus *Umbilicaria*) in which the surface of the **disc** is interrupted by a central knob of sterile material.

**OR:** Oregon.

**papillae** (sing.: -a): minute, discrete, typically rounded protruberances of the **cortex**.

**papillate:** bearing **papillae**.

**PD:** in this manual, used as an abbreviation for paraphenylenediamine (in alcohol), a reagent used to perform spot tests in lichens. Such tests reveal the presence of specified chemical substances. See page 14.

**peltate:** in lichens, referring to a shield-shaped **thallus** attached to the **substrate** at a single point.

**perithecia** (sing.: -ium): in lichens, the minute, flask-shaped **ascocarps** in which the sexual **spores** of the fungal partner are produced. Macroscopically, a typical perithecium resembles a tiny dot as seen from above (see Figure 9b, page 13). See also **apothecia**, **pycnidia**.

**peritheciate:** bearing **perithecia**.

**photobiont:** the photosynthetic partner in a lichen, consisting of a green **alga**, a blue-green **cyanobacterium** or, in some species, both. The lichen fungus derives its carbohydrate requirements from the photobiont.

**phototype:** a general term designating one of two possible states in lichens containing both an **alga** and a **cyanobacterium** as photobionts: "green" (when the algal partner dominates) or "blue-green" (when the cyanobacterium dominates). The green and blue-green phototypes of a single species are often quite dissimilar in form and colour.

**podetia** (sing.: -ium): the hollow, upright, **ascocarp**-bearing stalks characteristic of the genus *Cladonia* (see Figure 7e, page 12).

**podetiate:** bearing **podetia**.

**PP:** Ponderosa Pine biogeoclimatic zone: a sparsely forested lowland zone of semi-arid **intermontane** regions. See page 5.

**pruina:** in lichens, a thin, white frosting of minute crystals, especially calcium oxalates.

**pruinose:** covered in **pruina**.

**pseudocyphellae** (sing.: -a): tiny, pale, unrimmed pores in the upper or lower **cortex** through which the **medulla** is exposed. In form, pseudocyphellae may be dot-like, angular or irregular (see Figure 8d, page 12).

**pseudocyphellate:** bearing **pseudocyphellae**.

**pubescent:** covered in minute, soft, usually woolly, hairs.

**pustulate:** bearing **pustules**.

**pustule:** blister-like swellings.

**pycnidia** (sing.: -ium): in lichens, minute, flask-shaped, asexual spore-producing structures of the fungus, usually imbedded in the **thallus** and visible from above as a black dot that may occasionally be protruberant (see Figure 9c, page 13).

**pycnidiate**: bearing **pycnidia**.

**pycnoconidia**: in lichens, asexual reproductive **spores** produced by **pycnidia**.

**reagent**: a liquid chemical that, when applied to lichen **thalli**, may cause a colour change. Such changes reveal the presence of specified chemical substances. See also **spot test**.

**reticulate**: pertaining to a netlike, ridged pattern.

**rhizinate**: bearing **rhizines**.

**rhizines**: in lichens, rootlike hairs or bundles of fungal threads that attach the **thallus** to the **substrate** (see Figures 6a–e, page 11).

**rhizoids** (= **rhizines**).

**rim**: see **apothecial rim**.

**scabrid** (= scabrous): having a minutely roughened appearance. In lichens, said of the upper **cortex** of some species.

**scales**: small, rounded, often somewhat overlapping **lobes** (see Figure 7c, page 12). See also **squamules**.

**septum** (pl.: -a): a cross-wall, especially of a cell or a **spore** (see Figures 9d, e, page 13).

**simple**: a) lacking **septa** (usually said of **spores**); or b) unbranched (said of rhizines) (see Figures 6a, 9d pages 11, 13).

**soralia** (sing.: -ium): the organs or regions of a **thallus** in which **soredia** are produced (see Figure 9f, page 13).

**soredia** (sing.: -ium): tiny powdery or granular asexual reproductive structures that lack a **cortex**, contain both fungal threads and **photobiont** cells, and protrude from the upper or lower **cortex** of many lichen species (see Figure 9f, page 13). See also **isidia**.

**spore**: general term for the microscopic sexual or asexual reproductive units of fungi. The sexual spores of most lichens are produced in **asci**, which in turn arise in the **hymenia** of **ascocarps**. **Thalloconidia** represent one form of asexual spore, **pycnoconidia** another (see Figures 9d, e, page 13).

**spot test**: one of several chemical tests for colour reactions obtained by applying liquid **reagents** to a lichen. See page 13.

**squamules**: small, rounded, often somewhat overlapping **lobes**, the lower surface of which typically lack a **cortex** (see Figure 7c, page 12).

**squamulose**: consisting of **squamules**.

**squarrose**: branching by many short perpendicular branches from a single main axis; usually in reference to **rhizines** (see Figure 6c, page 11).

**stratified** (= **heteromerous**): in lichens, pertaining to **thalli** in which the **photobiont** and **medulla** are organized in distinct layers. In such species, the **medulla** is pale (see Figure 4, page 10). See also **nonstratified**.

**submuriform**: pertaining to **spores** in which both transverse and longitudinal **septa** are present, though the latter are sparse or poorly developed (see Figure 9e, page 13). See also **muriform**.

**substrate**: in lichenology, a general term for the surfaces colonized by lichens, whether wood, bark, rock, soil or other.

**thalline margin**: see **apothecial rim**.

**thalloconidia** (sing.: -ium): minute asexual **spores** produced on the cortex of some lichens. In *Umbilicaria*, thalloconidia confer a black, sooty texture to the lower surface and **rhizines** of several species.

**thallus** (pl.: -i): the vegetative body of a lichen (see Figures 4, 5, page 10).

**TLC**: thin-layer chromatography. See page 14.

**tomentose**: bearing **tomentum**.

**tomentum**: a minute, felt-like mat of fungal hyphae covering the upper and/or lower surface of some lichens (see Figure 8a, page 12).

**umbilicate**: bearing an **umbilicus**.

**umbilicus**: a thickened, centrally positioned point of attachment characteristic of some rock-dwelling **foliose** lichens (see Figure 6f, page 11).

**UT**: Utah.

**UV**: ultraviolet light; used in lichenology to detect certain lichen substances. See page 14.

**WA**: Washington State.

**WY**: Wyoming.

**YU**: Yukon.

## REFERENCES

- Ahti, T. 1966. *Parmelia olivacea* and the allied non-isidiate and non-soresidiate corticolous lichens in the northern hemisphere. *Acta Botanica Fennica* 70:1–68.
- Ahti, T. and A. Henssen. 1965. New localities for *Cavernularia hultenii* in eastern and western North America. *The Bryologist* 68:85–89.
- Ahti, T., I.M. Brodo, and W.J. Noble. 1987. Contributions to the lichen flora of British Columbia, Canada. *Mycotaxon* 28:91–97.
- Ainsworth, G.C. 1971. Ainsworth and Bisby's dictionary of the fungi. 6th ed. Commonwealth Mycological Institute, Kew, Surrey, UK. 663 p.
- Alvin, K.A. 1977. The observer's book of lichens. Frederick Warne, London, UK. 188 p.
- Aptroot, A. 1991. A conspectus of *Normandina* (Verrucariaceae, lichenized Ascomycetes). *Willdenowia* 21:263–267.
- Benton, F. and T. Underhill. 1977. Some lichens of B.C. Parks. B.C. Parks, Victoria, B.C. 6 p.
- Benton, F., I.M. Brodo, and D.H.S. Richardson. 1977. Lichens of the Bamfield Marine Station, Vancouver Island, British Columbia. *Canadian Field-Naturalist* 91:305–309.
- Bird, C.D. and R.D. Bird. 1973. Lichens of Saltspring Island, British Columbia. *Syesis* 6:57–80.
- Bland, J. 1971. Forests of Lilliput: the realm of mosses and lichens. Prentice-Hall, Inc., Englewood Cliffs, N.J. 210 p.
- Bolton, E.M. 1960. Lichens for vegetable dyeing. Charles T. Branford Co., Mass. 63 p.
- Breuss, O. 1993. *Catapyrenium* (Verrucariaceae) species from South America. *Plant Systematics and Evolution* 185:17–33.
- British Columbia Ministry of Forests. 1992. Biogeoclimatic zones of British Columbia. Colour map, 1:2 000 000. B.C. Ministry of Forests, Research Branch, Victoria, B.C.
- Brodo, I.M. 1984. Lichenes Canadenses Exsiccati: Fascicle III. *The Bryologist* 87:97–111.
- \_\_\_\_\_. 1988. Lichens of the Ottawa Region. 2nd ed. Ottawa Field-Naturalist Club Special Publication No. 3. 115 p.
- Brodo, I.M. and D.R.S. Richardson. 1978. Chimeroid associations in the genus *Peltigera*. *The Lichenologist* 10:157–170.
- Clayden, S.R. 1992. Chemical divergence of eastern North American and European populations of *Arctoparmelia centrifuga* and their sympatric usnic acid-deficient chemotypes. *The Bryologist* 95:1–4.
- Conrad, V. 1946. Usual formulas of continentality and their limits of validity. *Transactions of the American Geophysical Union* 27:663–664.
- Coppins, B.J. and A.P. Bennell. 1979. Thallus surface features in *Agonimia tristicula*. *The Lichenologist* 11:107.
- Coppins, B.J. and P.W. James. 1978. New or interesting British lichens II. *The Lichenologist* 10:179–207.
- Culberson, W. 1966. Chemistry and taxonomy of the lichen genera *Heterodermia* and *Anaptychia* in the Carolinas. *The Bryologist* 69:472–487.
- Culberson, W. and C.F. Culberson. 1965. *Asahinea*, a new genus in the Parmeliaceae. *Brittonia* 17:182–190.
- \_\_\_\_\_. 1968. The lichen genera *Cetrelia* and *Platismatia* (Parmeliaceae). *Contributions from the U.S. National Herbarium* 34:449–558.
- Culberson, W. and M.E. Hale. 1966. The range of *Normandina pulchella* in North America. *The Bryologist* 69:365–367.
- Degelius, G. 1937. Lichens from southern Alaska and the Aleutian Islands, collected by Dr. E. Hultén. *Meddelanden fran Göteborgs Botaniska Trädgård* 12:105–144.
- \_\_\_\_\_. 1954. The lichen genus *Collema* in Europe. *Symbolae Botanicae Upsalienses* 13:1–499.
- \_\_\_\_\_. 1974. The lichen genus *Collema* with special reference to the extra-European species. *Symbolae Botanicae Upsalienses* 20:1–215.

REFERENCES

- \_\_\_\_\_. 1979. Studies in the lichen family Collemataceae. IV. *Collema fecundum*, a new species from North America. *Botaniska Notiser* 132:569–572.
- Egan, R.S. 1975. New *Xanthoparmelia* (Lichenes: Parmeliaceae) records from New Mexico. *Mycotaxon* 2:217–222.
- \_\_\_\_\_. 1987. A fifth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. *The Bryologist* 90:77–173.
- \_\_\_\_\_. 1989. Changes to the “Fifth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada.” Edition I. *The Bryologist* 92:68–72.
- \_\_\_\_\_. 1990. Changes to the “Fifth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada.” Edition II. *The Bryologist* 93:211–219.
- \_\_\_\_\_. 1991. Changes to the “Fifth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada.” Edition III. *The Bryologist* 94:396–400.
- Elix, J.A. 1979. A taxonomic revision of the lichen genus *Hypogymnia* in Australasia. *Brunonia* 2:175–245.
- Esslinger, T.L. 1971. *Cetraria idahoensis*, a new species of lichen endemic to Western North America. *The Bryologist* 74:364–369.
- \_\_\_\_\_. 1973. Chemical and taxonomic studies on some corticolous members of the lichen genus *Cetraria* in western North America. *Mycologia* 3:602–613.
- \_\_\_\_\_. 1977a. A chemosystematic revision of the brown *Parmeliae*. *Journal of the Hattori Botanical Laboratory* 42:1–211.
- \_\_\_\_\_. 1977b. Studies in the lichen family Physciaceae. I. A new North American species. *Mycotaxon* 5:299–306.
- \_\_\_\_\_. 1978a. A new status for the brown *Parmeliae*. *Mycotaxon* 7:45–54.
- \_\_\_\_\_. 1978b. Studies in the lichen family Physciaceae. II. The genus *Phaeophyscia* in North America. *Mycotaxon* 7:283–320.
- \_\_\_\_\_. 1979. Studies in the lichen family Physciaceae. V. Two species of *Physcia* new to North America. *Mycotaxon* 10:210–212.
- Feige, G.B., M. Geyer, and G. Follmann. 1989. Erster Nachweis flechtenspezifischer Sekundärstoffe in der aquatischen “Gallertflechte” *Hydrothyria venosa* Russ. *Herzogia* 8:69–75.
- Fink, B. 1935. *The lichen flora of the United States*. University of Michigan Press, Ann Arbor, Mich. 426 p.
- Galloway, D.J. 1985. *Flora of New Zealand lichens*. P.D. Hasselberg, Wellington, N.Z. 662 p.
- Galloway, D.J. and P.M. Jørgensen. 1975. *Erioderma solediatum*, a new lichen from New Zealand. *The Lichenologist* 7:139–142.
- \_\_\_\_\_. 1987. Studies in the lichen family Pannariaceae II. The genus *Leioderma* Nyl. *The Lichenologist* 19:345–400.
- Gao, X-G. 1991. Studies in species of the lichen genus *Asahinea*. *Nordic Journal of Botany* 11:483–485.
- Geiser, L., K. Dillman, C. Derr, and M. Stensvold. 1994. *Lichens of southeastern Alaska*. U.S. Department of Agriculture Forest Service, Alaska Region, Juneau, Alaska. R10-TP-45.
- Godfrey, J.D. 1977. Notes on Hepaticae collected by John Macoun in southwestern British Columbia. *Canadian Journal of Botany* 20:2600–2604.
- Goffinet, B. 1992. The North American distribution of *Peltigera retifoveata* Vitik. *Evansia* 9:49–51.
- Goffinet, B. and R.I. Hastings. 1995. Two new solediate taxa in *Peltigera* (lichenized Ascomycetes). *The Lichenologist* 27:43–58.
- Goward, T. 1984. *Heteroderma sitchensis*, a new lichen from the Pacific Northwest of North America. *The Bryologist* 87:366–368.
- \_\_\_\_\_. 1985. *Ahtiana*, a new lichen genus in the Parmeliaceae. *The Bryologist* 88:367–371.
- \_\_\_\_\_. 1986. *Brodoa*, a new lichen genus in the Parmeliaceae. *The Bryologist* 89:219–223.

- \_\_\_\_\_. 1988. *Hypogymnia oceanica*, a new lichen (Ascomycotina) from the Pacific Northwest of North America. *The Bryologist* 91:229–232.
- \_\_\_\_\_. 1993. Lichen inventory requirements for British Columbia. Part II *In* Non-vascular plant inventory requirements for British Columbia (2nd draft). B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. Unpublished report.
- Goward, T. and B. Goffinet. 1993. *Nephroma silvae-veteris*, a new lichen (Ascomycotina) from the Pacific Northwest of North America. *The Bryologist* 96:242–244.
- Goward, T. and B. McCune. 1993. *Hypogymnia apinnata*, a new lichen (Ascomycotina) from the Pacific Northwest of North America. *The Bryologist* 96:450–453.
- Goward, T. and G. Thor. 1992. Notes on the lichens and allied fungi of British Columbia. *The Bryologist* 95:33–37.
- Goward, T. and T. Ahti. 1983. *Parmelia hygrophila*, a new lichen species from the Pacific Northwest of North America. *Annales Botanici Fennica* 20:9–13.
- \_\_\_\_\_. 1992. Macrolichens and their zonal distribution in Wells Gray Provincial Park and its vicinity, British Columbia, Canada. *Acta Botanica Fennica* 147:1–60.
- Goward, T. and W.B. Schofield. 1983. The lichens and bryophytes of Burns Bog, Fraser Delta, southwestern British Columbia. *Syesis* 16:53–69.
- Goward, T., B. Goffinet, and O. Vitikainen. 1995. Synopsis of the genus *Peltigera* (Lichenized, Ascomycetes) in British Columbia, with a key to the North American species. *Canadian Journal of Botany* 73:91–111.
- Goward, T., P. Diederich, and R. Rosentreter. 1994b. Notes on the lichens and allied fungi of British Columbia. II. *The Bryologist* 97:56–62.
- Hale, M.E., Jr. 1965a. Studies on the *Parmelia borrieri* group. *Svensk Botanisk Tidskrift* 59:37–48.
- \_\_\_\_\_. 1965b. A monograph of *Parmelia* subgenus *Amphigymnia*. *Contributions from the U.S. National Herbarium*. 36:193–358.
- \_\_\_\_\_. 1974. New combinations in the lichen genus *Parmotrema* Massalongo. *Phytologia* 28:334–339.
- \_\_\_\_\_. 1975. A revision of the lichen genus *Hypotrachyna* (Parmeliaceae) in Tropical America. *Smithsonian Contributions to Botany* 25:1–73.
- \_\_\_\_\_. 1979. *How to know the lichens*. 2nd ed. William C. Brown Co., Dubuque, Iowa. 246 p.
- \_\_\_\_\_. 1983. *The biology of lichens*. 3rd ed. Edward Arnold, London, UK. 190 p.
- \_\_\_\_\_. 1984. *Flavopunctelia*, a new genus in the Parmeliaceae (Ascomycotina). *Mycotaxon* 20:681–682.
- \_\_\_\_\_. 1986. *Arctoparmelia*, a new genus in the Parmeliaceae (Ascomycotina). *Mycotaxon* 25:251–254.
- \_\_\_\_\_. 1987. A monograph of the lichen genus *Parmelia* Acharius sensu stricto (Ascomycotina: Parmeliaceae). *Smithsonian Contributions to Botany* 66:1–55.
- \_\_\_\_\_. 1990. A synopsis of the lichen genus *Xanthoparmelia* (Vainio) Hale (Ascomycotina, Parmeliaceae). *Smithsonian Contributions to Botany*. 74:1–250.
- Hawksworth, D.L. and D.J. Hill. 1984. *The lichen-forming fungi*. Blackie, London, UK. 158 p.
- Henssen, A. 1963a. The North American species of *Massalongia* and generic relationships. *Canadian Journal of Botany*. 41:1331–1346.
- \_\_\_\_\_. 1963b. A study of the genus *Koerberia*. *Canadian Journal of Botany* 41:1347–1357.
- \_\_\_\_\_. 1963c. A study of the genus *Vestergrenopsis*. *Canadian Journal of Botany* 41:1359–1366.
- \_\_\_\_\_. 1963d. The North American species of *Placynthium*. *Canadian Journal of Botany* 41:1687–1724.
- \_\_\_\_\_. 1963e. Drei neue Arten der Flechtengattung *Phylliscum*. *Svensk Botanisk Tidskrift* 57:145–160.
- Henssen, A. and B. Renner. 1981. Studies in the lichen genus *Psoroma* I. *Psoroma tenue* and *Psoroma cinnamomeum*. *Mycotaxon* 13:433–449.
- Hestmark, G. 1990. Thalloconidia in the genus *Umbilicaria*. *Nordic Journal of Botany*. 9:547–574.



## REFERENCES

- Holtan-Hartwig, J. 1988. Two new species of *Peltigera*. *The Lichenologist* 20:11–17.
- \_\_\_\_\_. 1993. The lichen genus *Peltigera*, exclusive of the *P. canina* group, in Norway. *Sommerfeltia* 15:1–77.
- Imshaug, H.A. 1950. New and noteworthy lichens from Mt. Rainier National Park. *Mycologia* 62:743–752.
- \_\_\_\_\_. 1957. Alpine lichens of western United States and adjacent Canada. I. The macrolichens. *The Bryologist* 60:177–272.
- James, P.W. and F.J. White. 1987. Studies on the genus *Nephroma* I. The European and Macronesian species. *The Lichenologist* 19:215–268.
- Jordan, W.P. 1973. The genus *Lobaria* in North America north of Mexico. *The Bryologist* 76:225–251.
- Jørgensen, P.M. 1975. Contributions to a monograph of the mallotium-hairy *Leptogium* species. *Herzogia* 3:433–460.
- \_\_\_\_\_. 1978. The lichen family Pannariaceae in Europe. *Opera Botanica* 45:1–123.
- \_\_\_\_\_. 1991. On some Fennoscandian *Pannaria* species. *Annales Botanici Fennici*. 28:87–91.
- Jørgensen, P.M. and D.J. Galloway. 1989. Studies in the lichen family Pannariaceae III. The genus *Fuscoderma*, with additional notes and a revised key to *Leioderma*. *The Lichenologist* 21:295–301.
- Jørgensen, P.M. and P.W. James. 1983. Studies on some *Leptogium* species of western Europe. *The Lichenologist* 15:109–125.
- Jørgensen, P.M. and T. Goward. 1994. Two new *Leptogium* species from western North America. *Acta Botanica Fennica* 150:75–78.
- Kärnefelt, I. 1977. *Masonhalea*, a new lichen genus in the Parmeliaceae. *Botaniska Notiser* 130:101–107.
- \_\_\_\_\_. 1979. The brown fruticose species of *Cetraria*. *Opera Botanica* 46:1–150.
- \_\_\_\_\_. 1980. Lichens of western North America with disjunctions in Macronesia and West Mediterranean region. *Botaniska Notiser* 133:569–577.
- \_\_\_\_\_. 1986. The genera *Bryocaulon*, *Coelocaulon* and *Cornicularia* and formerly associated taxa. *Opera Botanica* 86:1–90.
- Kristinsson, H. 1974. Two new *Cladonia* and one *Cetraria* species from Iceland. *The Lichenologist* 6:141–145.
- Krog, H. 1968. The macrolichens of Alaska. *Norsk Polarinstittutt Skrifter* 144:1–180.
- \_\_\_\_\_. 1974. Taxonomic studies in the *Hypogymnia intestiniformis* complex. *The Lichenologist* 6:135–140.
- \_\_\_\_\_. 1982. *Punctelia*, a new lichen genus in the Parmeliaceae. *Nordic Journal of Botany* 2:287–292.
- Kurokawa, S. 1962. A monograph of the genus *Anaptychia*. *Beihefte Nova Hedwigia* 6:1–115.
- \_\_\_\_\_. 1973. Supplementary notes on the genus *Anaptychia*. *Journal of the Hattori Botanical Laboratory* 37:563–607.
- Kurokawa, S., Y. Jinzenji, S. Shibata, and H. Chiang. 1966. Chemistry of Japanese *Peltigera* with taxonomic notes. *Bulletin of The Natural Science Museum, Tokyo, Japan*, 9:101–114.
- Lavender, D.P., R. Parish, C.M. Johnson, G. Montgomery, A. Vyse, R.A. Willis, and D. Winston (editors). 1990. *Regenerating British Columbia's Forests*. University of B.C. Press, Vancouver, B.C. 372 p.
- Lawrey, J.D. 1984. *Biology of lichenized fungi*. Praeger, New York, N.Y. 408 p.
- Leuckert, C., J. Poelt, and G. Hähnel. 1977. Zur Chemotaxonomie der eurasischen Arten der Flechtengattung *Rhizoplaca*. *Nova Hedwigia* 28:71–129.
- Llano, G.A. 1950. A monograph of the lichen family Umbilicariaceae in the western hemisphere. Office of the Naval Reserve, Washington, D.C. 281 p.
- Maass, A. and B. Renner. 1981. Lichen substances VII. Identification of orsellinate derivatives from *Lobaria linita*. *The Bryologist* 78:179–182.
- Maass, W.S.C. 1975. Lichen substances VII. Identification of orsellinate derivatives from *Lobaria linita*. *The Bryologist* 78:178–182.
- McCune, B. 1984. Lichens with oceanic affinities in the Bitterroot Mountains of Montana and Idaho. *The Bryologist* 87:44–50.

- \_\_\_\_\_. 1987. Distribution of chemotypes of *Rhizoplaca* in North America. *The Bryologist* 90:6–14.
- McGrath, J.W. 1977. Dyes from lichens and plants — A Canadian dyer's guide. Van Nostrand Reinhold Ltd., Toronto, Ont. 144 p.
- MacKinnon, A, J. Pojar, and R. Coupé. 1992. Plants of northern British Columbia. Lone Pine Publishing, Edmonton, Alta. 352 p.
- Magnusson, A.H. 1940. Studies in species of *Pseudocyphellaria*. The *crocata* group. *Meddelanden fran Göteborgs Botaniska Trädgård* 14:1–36.
- Mattsson, J.-E. 1993. A monograph of the genus *Vulpicida* (Parmeliaceae, Ascomycetes). *Opera Botanica* 119:1–61.
- Mattsson, J.-E. and M.-J. Lai. 1993. *Vulpicida*, a new genus in the *Parmeliaceae* (lichenized ascomycetes). *Mycotaxon* 46:425–428.
- Meidinger, D. and J. Pojar (compilers and editors). 1991. Ecosystems of British Columbia. B.C. Ministry of Forests, Special Report Series No. 6. 330 p.
- Meyer, S.L.F. 1982. Segregation of the new lichen genus *Foraminella* from *Parmeliopsis*. *Mycologia* 74:592–598.
- \_\_\_\_\_. 1985. The new lichen genus *Imshaugia* (Ascomycotina, Parmeliaceae). *Mycologia* 77:336–338.
- Moberg, R. 1977. The lichen genus *Phyrcia* and allied genera in Fennoscandia. *Symbolae Botanicae Upsaliensis* 22:1–108.
- \_\_\_\_\_. 1986. Lichens selecti exsiccati Upsalienses. Fasc. 1 (Nos. 1–25). *Thunbergia* 2:1–10.
- \_\_\_\_\_. 1990. *Waynea*, a new lichen genus in the Bacidiaceae from California. *The Lichenologist* 22:249–252.
- Nearing, G.G. 1947. The lichen book — handbook of the lichens of northeastern United States. Ridgewood, N.J. 648 p.
- Noble, W.J. 1978. New and noteworthy lichens of British Columbia. *Bryologist* 81:321–323.
- \_\_\_\_\_. 1982. The lichens of the coastal Douglas-fir dry subzone of British Columbia. PhD thesis. University of B.C., Vancouver, B.C. 942 p.
- Noble, W.J., T. Ahti, G.F. Otto, and I.M. Brodo. 1987. A second checklist and bibliography of the lichens and allied fungi of British Columbia. *Syllogeus* 61:1–95.
- Ohlsson, K.E. 1973. New and interesting macrolichens of British Columbia. *The Bryologist* 76:366–387.
- Ott, S. 1988. Photosymbiodemes and their development in *Peltigera venosa*. *The Lichenologist* 20:361–368.
- Perez-Llano, G.A. 1944. Lichens: their biological and economic significance. *Botanical Review*. 10:1–65.
- Pike, L.H. and M.E. Hale. 1982. Three new species of *Hypogymnia* from western North America (Lichenes: Hypogymniaceae). *Mycotaxon* 16:157–161.
- Poelt, J. 1974. Zur Kenntnis der Flechtenfamilie Candelariaceae. *Phyton (Austria)* 16:189–210.
- Pojar, J. and A. MacKinnon. 1994. Plants of coastal British Columbia. Lone Pine Publishing, Edmonton, Alta. 527 p.
- Pojar, J., K. Klinka, and D.V. Meidinger. 1987. Biogeoclimatic ecosystem classification in British Columbia. *Forest Ecology Management* 22:119–154.
- Posner, B., G.B. Feige, and C. Leuckert. 1991. Beiträge zur Chemie der Flechtengattung *Lasallia* Merat. *Zeitschrift für Naturforschung* 46c:19–27.
- Randlane, T. and A. Saag. 1989. Chemical variation and geographical distribution of *Asahinea chrysantha* (Tuck.) Culb. & C. Culb. *The Lichenologist* 21:303–311.
- \_\_\_\_\_. 1992. New combinations of some Cetrarioid lichens (Parmeliaceae). *Mycotaxon* 44:491–493.
- Richardson, D. 1975. The vanishing lichens: their history, biology and importance. David and Charles, Vancouver B.C. 231 p.
- Rosentreter, R. and B. McCune. 1992. Vagrant *Dermatocarpon* in western North America. *The Bryologist* 95:15–19.
- Roux, C. and P. Clerc. 1991. Presence du genre *Waynea* Moberg (*Lichenes*) en Europe. *Bulletin de la Societe Linneenne de Provence* 42:123–130.

## REFERENCES

- Ryan, M.W. 1991. Distribution of bryophytes and lichens on Garry Oak. MSc. thesis, University of Victoria, Victoria, B.C. 192 p.
- Ryvarden, L. 1968. *Umbilicaria aprina* Nyl., a rare lichen. *The Bryologist* 71:366–369.
- Santesson, R. 1943. The South American Menegazziae. *Arkiv för Botanik* 30A:1–35.
- \_\_\_\_\_. 1984. The lichens of Sweden and Norway. Swedish Museum of Natural History. Uppsala, Sweden.
- Schatz, S. 1980. Taxonomic revision of two Pyrenomycetes associated with littoral-marine green algae. *The Bryologist* 72:110–117.
- Sierk, H. 1964. The genus *Leptogium* in North America north of Mexico. *The Bryologist* 67:245–317.
- Skult, H. 1987. The *Parmelia omphalodes* complex in the northern hemisphere. Chemical and morphological aspects. *Annales Botanici Fennici* 24:371–383.
- Smith, A.L. 1921. Lichens. Cambridge University Press, Cambridge, UK. 464 p.
- Szczawinski, A. and V. Krajina. 1959. Lichens. *In* Field Trip I, British Columbia. T.M.C. Taylor (editor), 9th International Botanical Congress, Canada. pp. 14–19.
- Thomson, J.W. 1950. The species of *Peltigera* of North America north of Mexico. *American Midland Naturalist*. 44:1-68
- \_\_\_\_\_. 1984. American arctic lichens 1. The macrolichens. Columbia University Press, New York, N.Y. 504 p.
- \_\_\_\_\_. 1987. The lichen genera *Catapyrenium* and *Placidopsis* in North America. *The Bryologist* 90:27–39.
- \_\_\_\_\_. 1989. Additions and a revised key to *Catapyrenium* in North America. *The Bryologist* 92:190–193.
- Thomson, N.F. and J.W. Thomson. 1984. Spore ornamentation in the lichen genus *Solorina*. *The Bryologist* 87:151–153.
- Timdal, E. 1984. The genus *Hypocenomyce* (Lecanorales, Lecideaceae), with special emphasis on the Norwegian and Swedish species. *Nordic Journal of Botany* 4:83–108.
- \_\_\_\_\_. 1986. A revision of *Psora* (Lecideaceae) in North America. *The Bryologist* 89:253–275.
- Tønberg, T. and J. Holtan-Hartwig. 1983. Phycotype pairs in *Nephroma*, *Peltigera* and *Lobaria* in Norway. *Nordic Journal of Botany* 3:681–688.
- Trass, H. 1992. Synopsis of the lichen genus *Heterodermia* (Ascomycotina, Physciaceae sive Pyxinaceae) *Cryptogamica Estonica* 29:1–41.
- Tuckerman, E. 1888. A synopsis of North American lichens. Part II. New Bedford. 176 p.
- Vitikainen, O. 1985. Three new species of *Peltigera* (lichenized Ascomycetes). *Annales Botanici Fennici* 22:291–298.
- Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. A photographic field guide to the mosses, lichens and ferns of northwest North America. Lone Pine Publishing, Edmonton, Alta. 296 p.
- Wei, J.-C. and L.G. Biazrov. 1991. Some disjunctions and vicarisms in the Umbilicariaceae (Ascomycotina). *Mycosystema* 4:65–72.
- Wetmore, C. 1960. The lichen genus *Nephroma* in north and middle America. Michigan State University Museum Publication (Biology Series) 1:373–452.
- \_\_\_\_\_. 1971 (“1970”). The lichen family Heppiaceae in North America. *Annals of the Missouri Botanical Garden* 57:158–209.
- \_\_\_\_\_. 1980. A new species of *Nephroma* from North America. *The Bryologist* 83:243–247.
- White, F.J. and P.W. James. 1985. A new guide to microchemical techniques for the identification of lichen substances. *British Lichen Society Bulletin (Supplement)* 57:1–41.
- \_\_\_\_\_. 1988. Studies on the genus *Nephroma* II. The southern temperate species. *The Lichenologist* 20:103–166.
- Yoshimura, I. 1971. The genus *Lobaria* of eastern Asia. *Journal of The Hattori Botanical Laboratory* 34:231–364.

## INDEX

Accepted generic names are given in **bold** type; accepted species names appear in roman type; and synonyms in *italic* type. Page references for the primary genus and species accounts are in **bold** type. Genera and species appearing in the keys, but not treated in this manual, are given in parentheses (...). Square brackets [...] denote species expected to occur in British Columbia, but not yet documented. Common names appear in roman type, and are given for genera only.

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