

The Reindeer Lichen: *CLADONIA* P. Browne (formerly in the genus *CLADINA*)

14 species known in North America. 5 species or subspecies known in AB, another 1 species possible.
Species confirmed for Alberta (closest location; online herbarium databases checked):

- arbuscula* (Wallr.) Hale & W. L. Culb. ACIMS
- arbuscula* subsp. *beringiana* (Ahti) N. S. Golubk. ACIMS
- arbuscula* subsp. *mitis* (Sandst.) Hustich Syn. *arbuscula* subsp. *mitis* ACIMS
- rangiferina* (L.) Nyl. ACIMS
- stellaris* (Opiz) Brodo ACIMS
- stygia* (Fr.) Ahti ACIMS

DICHOTOMOUS KEY

- 1a. Branching mainly in fours and fives and generally without distinct main stems; podetia tips densely woolly/tomentose; forming compact, rounded “heads”; northern *Cladonia stellaris*
- 1b. Branching mainly in twos or threes; main stems well developed and conspicuous; distribution various 2
 - 2a. Podetia greyish or greenish, but not at all greenish yellow, usnic acid absent or in very low concentration, KC-, **K+ yellow** or K-, **PD+ orange** 3
 - 3a. Basal portions of podetia greyish or brownish (blackened areas at most scattered); upper portions of podetia generally with a whitish cast (rarely greenish or greyish); pycnidial jelly colourless *Cladonia rangiferina*
 - 3b. Basal portions of podetia uniformly black (check inner wall); upper portions of podetia with a greenish or medium greyish cast (check sheltered branches); patches of thick hyphae on surface, often giving it a knobby, woolly appearance; pycnidial jelly red (scan tips at high magnification) *Cladonia stygia*
 - 2b. Podetia greenish yellow, usnic acid present (**KC+ yellow**) 4
 - 4a. **PD+ orange** (but PD reaction may be slow, allow up to 30 sec)– otherwise morphologically very similar to *mitis* *Cladonia arbuscula* subsp. *beringiana*
 - 4b. PD- *Cladonia arbuscula* subsp. *mitis*

The Other *CLADONIA* P. Browne: **Cups, wands, clubs, and squamules**

174 species, subspecies and varieties in North America, ~62 species recorded in Alberta and another 38 with potential to be recorded in Alberta (closest location; online herbarium databases checked [double-tabbed spp. not on ACIMS list]):

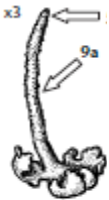
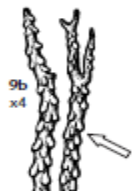
- acuminata* (Ach.) Norrlin (Circumcontinental; NA; ACIMS)
- albonigra* Brodo & Ahti (Brodo & Ahti 1996) (Pacific NW; NA)
- amaurocraea* (Flörke) Schaerer (ACIMS)
- bacilliformis* (Nyl.) Glück (ACIMS)
- bellidiflora* (Ach.) Schaerer (ACIMS but requires revision of material)
- borealis* S. Stenroos (ACIMS)
- botrytes* (K. G. Hagen) Willd (ACIMS)
- cariosa* (Ach.) Sprengel (ACIMS)
- carneola* (Fr.) Fr (ACIMS)
- cenotea* (Ach.) Schaerer (ACIMS)
- chlorophaea* (Flörke ex Sommerf.) Sprengel (ACIMS)
- coccifera* (L.) Willd. (NA, Aus, SA, Africa, Asia, Europe; NA; ACIMS)
- conista* (Nyl.) Robbins
- coniocraea* (Flörke) Sprengel (ACIMS)

cornuta (L.) Hoffm. subsp. *cornuta* (ACIMS)
crispata (Ach.) Flotow var. *crispata* (See OSYC07 for comparison table; ACIMS)
cristatella Tuck. (ACIMS)
cryptochlorophaea Asahina (ACIMS)
cyanipes (Sommerf.) Nyl. (ACIMS)
decorticata (Flörke) Sprengel (ACIMS)
deformis (L.) Hoffm. (ACIMS)
digitata (L.) Hoffm. (ACIMS)
ecmocyna Leighton subsp. *ecmocyna* (ACIMS)
ecmocyna subsp. *intermedia* (Robbins) Ahti (ACIMS)
ecmocyna subsp. *occidentalis* Ahti (Brodo & Ahti 1996) (ACIMS)
fimbriata (L.) Fr. (ACIMS)
furcata (Hudson) Schrader (NA; In AB, mountains & up north; NA; ACIMS)
glauca Flörke (PIER03; ACIMS)
gracilis (L.) Willd. subsp. *gracilis* (ACIMS)
gracilis subsp. *turbinata* (Ach.) Ahti (ACIMS)
grayi G. Merr. ex Sandst. (ACIMS)
humilis (With.) J. R. Laundon (ACIMS)
imbricarica Kristinsson (N USA; NA) (ACIMS)
macilenta Hoffm. (ACIMS)
macilenta var. *bacillaris* (Genth) Schaerer (ACIMS)
macroceras (Delise) Hav. (BC, NT, YT, Europe; ALL; T. Ahti)
macrophylla (Schaerer) Stenh. (ACIMS)
macrophyllodes Nyl. (ACIMS)
magyarica Vainio (Central USA [rare]; ALL)
merochlorophaea Asahina (ACIMS)
metacorallifera Asahina
multiformis G. Merr. (ACIMS)
norvegica Tønsberg & Holien (ACIMS)
novochlorophaea (Sipman) Brodo & Ahti (Brodo & Ahti 1996)
ochrochlora Flörke (ACIMS)
phyllophora Hoffm. (ACIMS)
pleurota (Flörke) Schaerer (ACIMS)
pocillum (Ach.) Grognot (ACIMS)
pyxidata (L.) Hoffm. (ACIMS)
rei Schaerer (Syrek & Kukwa 2008, [Dolnik et al. 2010](#)) (ACIMS)
robbinsii A. Evans (ACIMS)
scabriuscula (Delise) Nyl. (ACIMS)
squamosa Hoffm.
stricta (Nyl.) Nyl. Syn C. *gracilescens* (NA; ALL)
subfurcata (Nyl.) Arnold (ACIMS)
subulata (L.) F. H. Wigg. (ACIMS)
sulphurina (Michaux) Fr. (ACIMS)
symphycarpa (Flörke) Fr. (Ahti 2000) (BROD01; ACIMS)
transcendens (Vainio) Vainio (ACIMS)
trassii Ahti (Ahti 1998) (BROD01)
turgida Hoffm. (mainly E NA; BROD01, NA; ACIMS)
umbricola Tønsberg & Ahti (ACIMS)
uncialis (L.) F. H. Wigg. (see EVAN32 for some keys to similar spp; ACIMS)
verticillata (Hoffm.) Ahti (Ahti, in litt.)

Key to *Cladonia* Groups (modified from GOWA99)

- 1a. Podetia absent; thallus consisting entirely of primary squamules **Group A**
 1b. Podetia present 2
 2a. Podetia much branched to richly branched (>2 times) **Group B**
 2b. Podetia unbranched to 1-2x branched 3
 3a. Some podetia tips opening by a gaping hole **Group C**
 3b. Podetia tips closed (Note: all specimens key here in which openings are restricted to other portions of the podetia, and the upper portion of the podetia is dull-tomentose) 4
 4a. Podetia longitudinally ribbed or fibrous AND esorediate and cupless **Group D**
 4b. Podetia not longitudinally ribbed or fibrous, may have soredia and/or cups 5
 5a. Distinctly cupped 6
 6a. Cortex with a distinct yellowish cast (usnic acid present) and/or red apothecia **Group E**
 6b. Cortex not distinctly yellowish (usnic acid absent or in low concentration) 7
 7a. Podetia bearing at least some soredia (check upper portions) 8
 8a. Cups broad, the largest ones to more than 2.5 times wider than the width of the supporting stalk **Group F**
 8b. Cups narrow, the largest ones to less than 2.5 times wider than the width of the supporting stalk **Group G (Use Group I Key)**
 7b. Podetia lacking soredia **Group H**
 5b. Not at all cupped 9
 9a. Podetia bearing soredia or corticate granules, or both (check upper portions) **Group I**
 9b. Podetia lacking soredia and corticate granules (Note: dorsiventral squamules and/or microsquamules may, however, be present) **Group J**

Pictorial summary of the above:

Odd-balls	A 	B 	C 	D 
Cupped, not as above	E (or Red apothecia) 	F 	G (Use Group I) 	H 
Not cupped	I 	J 		

Cladonia A: Squamulose Cladonia in Alberta

This key is most useful in arid, open sites with abundant squamulose *Cladonia* colonies lacking podetia. Many *Cladonia* that typically form podetia start off as squamulose colonies, and cannot be keyed to species. Be very careful to select squamules you are certain belong to single colony of interest. TLC is required for certain metabolites.

- 1a. Lower surface of squamules **UV+blue white** (look for even a pale reaction) 2
1b. Lower surface of squamules UV- 3
- 2a. Primary squamules rounded, grey to green, margins entire and reflexed, thin, typically developing small, cone-shaped cupped podetia; sphaerophorin (TLC) ***C. imbricarica***- TLC to confirm
2b. Primary squamules irregular, grassy-green, margins divided, typically developing wand-like podetia that may form narrow cups or proliferate into jester hats; homosekikaic acid (TLC) ± sekikaic acid, rarely fumarprotocetraric acid ***C. rei*** – TLC to confirm
- 3a. Squamules **PD+ red to orange**, reaction may be patchy (fumarprotocetraric) 4
3b. Squamules PD- or **PD+ yellow** 8
- 4a. Squamules ≤ 1 mm in diameter, convex, shell-like mostly on sandy soil; in process of being described with McCune and Morse, may produce tiny ***C. peziziformis*** like podetia, color of squamules varies from pale or medium green to *Hypocenomyce*-like; known from multiple natural regions, but most common in the grasslands ***C. toninoides ined.***
4b. Squamules >1 mm in diameter, shape various, distribution various 5
- 5a. Squamules K- or dingy brown, typically forming at least some small cupped podetia even when immature consider ***C. pocillum*, *C. chlorophaea*, *C. fimbriata*** (Key F or H) Cannot be keyed from squamules alone
5b. Squamules **K+ yellow** 6
- 6a. Squamules 1-3 mm long 1-2 mm wide ***C. cariosa***
6b. Squamules > 3mm long and 2 mm wide 7
- 7a. Squamules typically forming at least some small cupped podetia, pycnidia rare ***C. magyarica***
7b. Squamules lacking cupped podetia, pycnidia common ***C. symphycarpa s.s.***
Rare fumarprotocetraric chemotype
- 8a. Squamules yellow-green to creamy-green above, pale yellow to rarely cream or white below, KC+ yellow, oily (usnic acid), restricted to the grasslands and southern parkland regions ***C. robbinsii***
Squamules of other usnic yellow species that typically form cups or wands may also key out here – they often have orange pigments near the attachment point, and the lower surface of the squamules is typically white
8b. Squamules green to grey to brown, KC-, distribution various 9
- 9a. Squamules 1-3 mm long 1-2 mm wide; atranorin ± rangiformic acid (TLC) ***C. cariosa***
9b. Squamules > 3mm long and 2 mm wide; metabolites vary 10
- 10a. Squamules uniformly **K+ red** (allow 1-2 minutes for reaction to form); atranorin, norstictic acid (TLC) ***C. symphycarpa s.l. I***
10b. Squamules patchy **K+red**, **K+yellow** or K-; atranorin ± norstictic acid or psoromic acid or rangiformic acid (TLC) 11
- 11a. Largest squamules <5 mm long and <90 µm thick, typically forming at least some tiny, wand-like podetia ***C. acuminata***

- 11b. Largest squamules > 5mm long and >120 µm thick, incipient podetia lacking or with tiny, brown, cauliflower-like apothecia forming early in development 12
- 12a. Squamules loosely appressed, >12 mm long, tubular when moist; 1 collection from BC ***C. affin. cariosa***
- 12b. Squamules ascending, largest 5-12 mm long, flat when moist..... 13
- 13a. Squamules slightly convex, deeply incised, dividing into isotomic bi- or trifurcations; pycnidia 0.2-0.3 mm in diameter; when present, podetia club-like, typically hollow throughout or just flattened at the base, and branching near the tip..... ***C. symphycharpa s.s.***
- 13b. Squamules flattened like they have been pressed, incised and dividing irregularly; pycnidia 0.3-0.4 mm in diameter; when present, podetia club-like, typically flattened at the base, branches dividing basally and then anastomosing ***C. symphycharpa s.l. l***

Cladonia Group B: branched > 2 times - Modified from Goward 1999. This is a simplified version that excludes species not encountered by ABMI to date or on the ACIMS list.

- 1a. Podetia lacking a cortex: podetial surface appressed-cottony, matte; lacking vegetative propagules (see key to ***Cladonia*** formerly in genus ***Cladina***)
- 1b. Podetia distinctly corticate (at least in part); podetial surface compact, dull or shiny; may be sorediate, granular or squamulose 2
- 2a. Podetial surface with a distinctly yellowish cast (usnic acid present), **KC+ yellow** or apparently KC- 2
- 3a. Podetia proportionately rather stout especially when fertile; branch axils at least in part open; podetia tips lacking cups ***Cladonia uncialis***
- 3b. Podetia proportionately slender; branch axils open or closed; podetia tips cupped or not; medulla UV- ***Cladonia amaurocraea***
- 2b. Podetial surface not at all distinctly yellowish (usnic acid absent), KC- 4
- 4a. Podetia tips regularly expanding as completely open cups; **UV+blue-white**, PD-; widespread 5
- 5a. Esorediate, cortex continuous ***Cladonia crispata* var. *crispata***
- 5b. Sorediate at least terminally, edges of cups inrolled ***Cladonia cenotea***
- 4b. Podetia tips various; UV-, **PD+ orange**; range various 6
- 6a. Podetia tips and/or branch axils bearing flaring cups, these closed, but often somewhat sieve-like or lacerate; basal portion of podetia brownish or blackish; terminal portion of podetia distinctly hard-corticate ***Cladonia multiformis*** (narrow variant)
- 6b. Podetia uncupped or bearing gaping, cuplike openings, these restricted to branch axils, not at all sieve-like; distribution various 7
- 7a. Terminal portions of podetia generally in part lacking a cortex, often furnished with soredia, corticate granules and/or detachable microsquamules, these sometimes extending downward into the middle or basal portions of the podetia; podetial squamules more or less asymmetrically arranged, the largest ones restricted to the “upper” side of the podetia; terminal portions of branches occasionally lacerate, but rarely flattened ***Cladonia scabriuscula***
- 7b. Terminal portions of podetia corticate more or less throughout, lacking soredia, corticate granules, and detachable microsquamules; podetial squamules absent to occasionally abundant, more or less symmetrically arranged around the podetia..... 8
- 8a. Basal portions of main podetia more or less distinctly flattened in cross-section; terminal portions of the supporting branches somewhat flattened or longitudinally lacerate or both ***Cladonia multiformis*** (fertile form)
- 8b. Basal portion of main podetia round in cross-section; podetial tips spiky; podetia slender, 20-120mm tall ***Cladonia furcata***

Cladonia Group C: podetia tips with open axils or open cups – Modified from Goward 1999. This is a simplified version that excludes species not encountered by ABMI to date or on the ACIMS list.

- 1a. Podetia sorediate & **UV+ blue-white** 2
 - 2a. Podetia cupped, cups open with inrolled margins, cups proliferating 1-3 times **Cladonia cenotea**
 - 2b. Podetia blunt to subulate, typically branching 1-2 times and longitudinally fissured; usually squamulose at base, squamules sometimes extending towards tip; axils may be open but cups absent..... **Cladonia glauca**
- 1b. Podetia lacking soredia (or at most weakly and inconspicuously sorediate in *Cladonia scabriuscula*; UV+ or -... 3
 - 3a. **UV+ blue-white**, PD- 4
 - 4a. Largest apical cups distinctly flaring, to more than 1.5 mm wide; branch axils also in part distinctly flaring; podetia slender to more often stout, typically lacking secondary squamules; widespread **Cladonia crispata var. crispata**
 - 4a. Apices open but not flaring; secondary squamules common, deeply incised, the largest ones often distinctly branching; over acidic soil, wood, or bark; cups present; widespread in humid regions **Cladonia squamosa**
 - 3b. UV-, **PD+ orange**..... 5
 - 5a. No cups present, holes restricted to branch axils; podetial squamules thin, in part distinctly asymmetrically arranged around podetia, the largest ones restricted to the 'upper' surface, strongly reflexed; podetia whitish, greenish, or brownish; at lower elevations **Cladonia scabriuscula**
 - 5b. Cups typically present, with sieve-like perforations through at least the upper surface and often through the lower surface **Cladonia multiformis**

Cladonia Group D: Podetia longitudinally ribbed or fibrous

- 1a. Podetia more or less densely squamulose (check basal portions), otherwise essentially lacking a cortex, to more than 20 mm tall; apothecia generally absent 2
 - 2a. Podetial squamules peltate (attached by the central portions of the lower surface), oriented more or less parallel to surface of podetia (check lower portions of podetia); medulla **PD+ strongY** (psoromic acid present); alpine **Cladonia macrophylla**
 - 2b. Podetial squamules not at all peltate (except occasionally minutely peltate in *Cladonia verruculosa*, restricted to lower elevations), attached by basal portions, shingle-like or oriented more or less perpendicular to surface of podetia; PD tests various 3
 - 3a. Medulla PD-; perlatolic acid present **Cladonia decorticata**
 - 3b. Medulla **PD+ pale to bright yellow, orange, or red**; perlatolic acid absent; upper portion of podetia unbranched to much branched; podetial medulla compact, cartilaginous, often somewhat glassy, darkening only in extreme basal portions, or not at all darkening; podetia tips often **PD+ strong yellow** (atranorin plus norstictic or psoromic acid present) **Cladonia acuminata**
- 1b. Podetial squamules, if present, confined to basal portions; podetia often strongly corticate, to less than 20 mm tall; apothecia present 4
 - 4a. Podetia with a distinctly yellowish cast; **KC+ yellow**, K- (usnic acid present; atranorin absent); apothecia pale brown; multiple apothecia clustered at the top of podetia; over decaying wood..... **Cladonia botrytes**
 - 4b. Podetia not at all yellowish, KC- (usnic acid absent); over soil or mossy rock; apothecia dark brown, multiple apothecia per podetium; **K+ yellow** or **red** (atranorin present) 5
 - 5a. Primary squamules to less than 2.5 mm long, ascending. thick, tongue-like; podetia common, basal portions of podetia invariably roughened and more or less patchy corticate; semi-arid habitats **Cladonia cariosa**

5b. Primary squamules to more than 2.5 mm long, almost foliose, ascending at the tips only when wet, but curled up when dry; podetia sparse, basal portions of podetia often rather smooth and continuously corticate *Cladonia symphyarpa*

Cladonia Group E: Yellow cupped or grey-green cupped with red apothecia - Modified from GOWA99

- 1a. Podetia bearing soredia or corticate granules, or both 2
- 2a. Medulla **K+ strong yellow or orange, PD+ yellow or orange** (check podetia tips); **apothecia red** 3
 - 3a. Basal squamules to 5–10 (–15) mm long, at least in part densely sorediate; largest cups to more than 2.5 times wider than the width of the supporting stalk (check well-developed cups); PDO *Cladonia digitata*
 - 3b. Basal squamules to 2–5 (–7) mm long, sorediate or not; largest cups generally less than 2.5 times wider than the width of the supporting stalk 4
 - 4a. Upper portions of podetia bearing fine/farinose soredia, these grading downward into granular soredia; podetial squamules absent or at most confined to basal portions; widespread in humid coastal regions but unlikely in Alberta *Cladonia umbricola* (chemotype 4)
 - 4b. Upper portions of podetia bearing more or less corticate granules, these grading downward into squamules; podetial squamules not confined to basal portions; KCY, PDY *Cladonia transcendens*
- 2b. Podetial medulla K- or KdingyBr, PD-; apothecia various (red to brown) 5
 - 5a. Apothecia, if present, **pale brown; pycnidia dark brown** 6
 - 6a. Cups clearly broader than stem of podetium, rim of sterile cups distinctly and regularly dentate, resembling a crown; may or may not UV+ *Cladonia carneola*
 - 6b. Podetia not as above, either tall and slender or less than 8 mm tall and stout with finger-like projections from cup margins more like a jester's cap than a crown; UV- 7
 - 7a. Podetia tall and distinctly slender (20-80mm tall), generally less than 1.5 mm wide at maturity (check basal portions), usually distinctly tapering upward to the narrow cup which may proliferate into a crown-like cup; basal portions often "bruised"-bluish; cobwebby, semi-translucent medulla visible where soredia abraded; barbatic acid present; zeorin absent; mossy boulder beds *Cladonia cyanipes*
 - 7b. Podetia less than 8 mm tall on average; primary squamules relatively thick, persistent & pancake-like, often sorediate along the upturned margins; narrow cups producing finger-like projections that splay out like a jester's cap; primarily on decayed wood (see 2010 site 942); UV-, K Peach (stereome only), KCY *Cladonia "brevicyanipes"*
 - 5b. Apothecia, if present, **red; pycnidia dark brown or red**; rim of cups more or less even, or at least not pointed-crownlike; (Note: specimens with basal squamules > 5 mm long key here) 8
 - 8a. Medulla UV- or **UV+ dull white** (squamic acid absent: check freshly scraped podetial surface); zeorin present (copious needle-like crystals radiating from old specimens) 9
 - 9a. Podetia bearing fine/farinose soredia; soredia confined to the upper third of podetia or covering most of podetia; 25-85mm tall, cups regular and narrow in proportion to stem; podetia rarely fissured or torn *Cladonia deformis*
 - 9b. Podetia bearing corticate granules or distinctly granular soredia, or both; soredia, if present, confined at maturity to the cupped, upper portions of podetia; 6-25mm tall, cups broad in proportion to stem *Cladonia pleurota*
 - 8b. Medulla **UV+ strikingly blue-white** (squamic acid present); zeorin absent (except present in *C. coccifera*) 10
 - 10a. Upper portions of podetia bearing fine/farinose soredia 11
 - 11a. Cups to more than 3 mm wide; podetia bearing only fine/farinose soredia; cups often irregular at maturity; podetia often distinctly torn lengthwise [but beware of juvenile specimens that may be more regular and intact] *Cladonia sulphurina*
 - 11b. Cups to 1–2.5 mm wide (see 4a); podetia bearing farinose soredia in upper portions and granular soredia in lower portions; cups more or less regular at maturity; podetia not torn; widespread in humid regions *Cladonia umbricola* (chemotype 2)

- 10b. Upper portions of podetia bearing corticate granules; farinose soredia absent..... 12
 12a. At least lower portions of podetia densely covered in detachable microsquamules; didymic acid present; widespread ***Cladonia metacorallifera***
 12b. Lower portions of podetia variously roughened or squamulose, or both, but never densely covered in detachable microsquamules; didymic acid absent
 ***Cladonia granulans*** (see ***Cladonia metacorallifera***)
- 1b. Podetia lacking soredia and corticate granules (detachable microsquamules may, however, be present) 13
 13a. Largest cups to less than 2.5 times wider than the width of the supporting stalk; podetia 10–40 mm tall; medulla K- or **K+ strong yellow** [BE AWARE OF *C. cristatella*; usually uncupped and not squamulose, but can have squamules and proliferations can resemble cups] ***Cladonia bellidiflora***
 13b. Largest cups to more than 2.5 times wider than the width of the supporting stalk; podetia 7–20 mm tall; medulla K-, 14
 14a. Upper portions of podetia lacking squamules and detachable microsquamules; zeorin and didymic acids absent, barbatic and usnic acid present ***Cladonia borealis***
 14b. Upper portions of podetia bearing numerous dorsiventral squamules or detachable microsquamules, or both; zeorin or didymic acid present 15
 15a. Podetial squamules generally sparse throughout; podetia more or less distinctly corticate; zeorin present; didymic acid absent; copious needle-like crystals radiating from old specimens
 ***Cladonia coccifera***
 15b. Podetial squamules generally dense throughout, especially in lower portions (see 11a); podetia otherwise essentially noncorticate; zeorin absent; didymic acid present; needle-like crystals also absent ***Cladonia metacorallifera***

***Cladonia* Group F: Grey-green broadly cupped, sorediate or granular**

Most of these require chemistry (thin layer chromatography) to distinguish. You will not be asked to key these out in class – simply call them *Cladonia* Group F! Here are some of Albers's common species:

Species	PD	K	KC	C	UV	Other useful traits
<i>carneola</i>	-	-	-	-	BW	dentate, crown like rim to cups, yellowish-green
<i>imbricaria</i>	-	-	-	-	BW	podetia short or lacking, dry sites
<i>carneola</i>	-	-	dingyY	-	- Or BW	dentate, crown like rim to cups, yellowish-green
<i>merochlorophaea</i>	-	-	pink-violet, R	R	pale B	pale podetia with copious microsquamules near base
<i>cryptochlorophaea</i>	- or O-R	R	R	- or Y	pale Y	
<i>novochlorophaea</i>	- or O-R	-	-	Y	W	erect pointy granules on podetia OR esorediate/egranulate, rare
<i>merochlorophaea</i>	O-R	-	pink-violet, R	R	pale B	pale podetia with copious microsquamules near base
<i>chlorophaea</i>	R	-	-	-	-	thin layer of coarse granular soredia
<i>fimbriata</i>	R	-	-	-	-	cup abruptly broadens from stalk, like wine-glass, soredia farinose
<i>grayi</i>	- or R	-	-	-	Purple	lower half of podetia generally bearing few if any detachable microsquamules

*Note that in BROD96 they describe *C. novochlorophaea* as being consistently esorediate and egranular.

Cladonia Group H: Cupped, not yellowish & non-sorediate/granular

Notes: modified from GOWA99, KNUD09, and BROD01

- 1a. Podetia proliferating predominantly from cup centres..... *Cladonia verticillata*
- 1b. Podetia proliferating predominantly from cup margins, or proliferations lacking..... 2
 - 2a. Basal portion of podetia distinctly darkening to dark brownish or blackish; **PD+ yellow, orange, or red**;
..... **Key H1**
 - 2b. Basal portions of podetia yellowish, orangish, brownish, or at least not distinctly blackening..... 3
 - 3a. Medulla **K+ yellow** (atranorin present)..... 4
 - 4a. Podetia goblet-shaped, broad goblet-shaped cups with peltate squamules inside and squamules occasionally on margins of cups; podetia short (to 25mm tall; primary squamules present
..... *Cladonia pocillum group including magyarica*
 - 4b. Podetia 25-120mm tall, slender, cups narrow, lacking peltate squamules; primary squamules absent or small (to 6mm long); pruina slight to absent; rarely branching..... *Cladonia ecmocyna*
 - 3b. Medulla K- or dingyB..... 5
 - 5a. Medulla PD- or dingyBrown 6
 - 6a. Podetia short-stalked, vase-like, to less than 5 mm long at maturity; from large primary squamules; medulla UV- to dull UV+; containing sphaerophorin..... *Cladonia imbricaria*
 - 6b. Podetia long-stalked, to more than 5 mm long at maturity; containing homosekikaic and sekikaic acids; medulla usually PDY *Cladonia novochlorophaea*
 - 5b. Medulla **PD+ orange** (fumarprotocetraric acid present) **Key H2**

H1 – Proliferating predominantly from margins or proliferations lacking; base of podetia dark brown to black

- 1a. Terminal portion of podetia **soft, dull, distinctly cobwebby/arachnoid or appressed-tomentose** (Note: specimens in which the podetia are in part pale-spotted against a black background key here)..... 2
 - 2a. Pale-spotting rather coarse (check at base of podetia); medulla and (pale portions of) cortex **K+ yellow** (atranorin present); podetial squamules common, evenly spaced, and ear-shaped; alpine..... *Cladonia trassii*
 - 2b. Pale-spotting rather fine; medulla and cortex K- or K dingyBrown (atranorin absent); distribution various 3
 - 3a. Podetia to (1.0-)1.5–2.5 mm wide as measured below cups; cups generally distinctly wider than width of the supporting stalk; tomentum generally extending downward to at least mid-portions of podetia; podetia blackening only below the middle; pale-spotting therefore restricted to basal portions; lowland to subalpine elevations *Cladonia phyllophora*
 - 3b. Podetia to 0.5–1.5 mm wide; cups, if present, generally not much wider than width of the supporting stalk; tomentum often restricted to terminal portion of podetia; podetia often blackening upward into upper portions; pale-spotting therefore often conspicuous more or less throughout; widespread in cool sites, especially at alpine elevations..... *Cladonia stricta*
- 1b. Terminal portion of podetia distinctly **hard-corticate, often more or less shiny**, at most only weakly cobwebby/arachnoid..... 4
 - 4a. Podetia invariably cupped; cups to more than 2–3 mm wide at maturity... *Cladonia gracilis* subsp. *turbinata*
 - 4b. At least some uncupped podetia present; cups to less than 2–3 mm wide at maturity (Note: specimens more than 70 mm tall key here) 5
 - 5a. Podetia to more than 1.5 mm in diameter (check basal portions) (Note: specimens more than 100 mm tall key here) 6

6a. Podetial wall 0.02–0.04 mm (20–40 µm) thick, tough (check basal portion, especially in vicinity of convex areoles); medulla soft, rather loose; podetial cortex generally distinctly glossy; widespread in base-rich sites..... *Cladonia macroceras*

6b. Podetial wall 0.01–0.02 mm (10–20 µm) thick, brittle; medulla rather hard, compact; podetial cortex dull to somewhat shiny, but not distinctly glossy; conspicuous longitudinal slits to base of podetia; podetia browned; podetial squamules absent; in acidic sites at lower elevations

..... *Cladonia gracilis* subsp. *vulnerata*

5b. Podetia to less than 1.5 mm in diameter 6

6a. Podetial wall 0.02–0.04 mm (20–40 µm) thick (check basal portion, especially in vicinity of convex areoles); medulla soft, loose; cortex glossy; podetia generally widest near base

..... *Cladonia macroceras* (see 12a)

6b. Podetial wall 0.01–0.02 mm (10–20 µm) thick; inner portion of medulla hard, compact; cortex dull or somewhat glossy; podetia generally no wider near base than in mid-portions.....

..... *Cladonia gracilis* subspecies

H2 – Proliferating predominantly from margins or proliferations lacking; base of podetia not distinctly darkening; medulla K- to dingy brown, PD+ yellow, orange, or red

1a. Cortex in terminal portions of podetia dull, soft, minutely cobwebby/arachnoid or appressed-tomentose; podetial squamules present; tomentum extending downward to at least mid-portions of podetia

..... *Cladonia phyllophora* (young form)

1b. Cortex in terminal portions of podetia dull or shiny, apparently hard or at least not minutely tomentose; podetial squamules present or absent 2

2a. Podetia greenish or brownish; cups generally bearing few or no marginal proliferations **Return to H1**

2b. Cup interiors containing strongly convex granules or areoles, or both, occasionally also microsquamulose. 3

3a. Primary squamules horizontally spreading, distinctly overlapping, forming compact rosettes, often nearly foliose; over base-rich substrates..... *Cladonia pocillum*

3b Primary squamules ascending or erect, tufted or scattered, not forming compact rosettes, not at all foliose; over acidic or base-rich substrates 4

4a Podetial cortex continuous, warty or shinglelike/imbricate; primary squamules 1–2.5 mm long; medulla UVpaleB; homosekikaic acid present; rare *Cladonia novochlorophaea*

4b Podetial cortex discontinuous, plated/areolate; primary squamules 1–7 mm long; medulla UV-; homosekikaic acid absent 5

5a. Growing on calcareous substrates (effervesce when dilute vinegar added to soil or rock); podetia often slightly pruinose; cups often with squamules around margins; cortex subcontinuous

..... *Cladonia magyarica*

5b. Growing on acidic soil, over downed wood or tree bases or granite; no pruina or marginal squamules, cortex truly discontinuous; common; widespread *Cladonia pyxidata*

Cladonia Group I: Uncupped or narrowly cupped, sorediate &/or corticate granular - modified from GOWA99, THOM68, BROD01, PINO10

- 1a. Corticate granules conspicuous over at least upper portions of podetia; podetial soredia absent or at most inconspicuous, restricted to extreme upper portions; 2
- 2a. Medulla K- or **K+ dingy brown** **Key I1**
- 2b. Medulla **K+ strong yellow** **Key I2**
- 1b. Soredia present over podetia, conspicuous over at least upper half; corticate granules absent or, if present, confined to lower portions of podetia 3
- 3a. Medulla **K+ strong yellow**, OR **PD+ strong yellow** OR both **Key I3**
- 3b. Medulla not as above 4
- 4a. Medulla PD-; apothecia, if present, red or brown **Key I4**
- 4b. Medulla **PD+ orange or red**; apothecia, if present, brown **Key I5**
- I1 –Corticate granules over minimum upper ½ of podetia; medulla K- or KdingyBr**
- 1a. Medulla PD-, usually **UV+** 2
- 2a. At least some podetia tips opening by a gaping hole (check carefully); podetial squamules deeply incised, the largest ones often distinctly branching; squamatic acid present; widespread in humid regions **Cladonia squamosa** var. **squamosa**
- 2b. Podetia tips not at all opening (but branch axils may be perforate); podetia 10-50mm tall; simple or sparingly branched 3
- 3a. Most podetia with longitudinal slit-like fissures; sorediate intermixed with corticate granules; squamulose towards podetia bas **Cladonia glauca**
- 3b. No slits or gaping openings in podetia; podetia cylindrical, cupless, squamulose; podetial squamules at most shallowly incised, scarcely branching; perlatolic acid present **Cladonia decorticata**
- 1b. Medulla **PD+ orange or red** 4
- 4a. Podetial squamules peltate (attached by their central portions), oriented more or less parallel to surface of podetia; no soredia or granules present; middle to alpine elevations **Cladonia macrophylla**
- 4b. Podetial squamules attached by the basal portions, oriented more or less perpendicular to surface of podetia; soredia and/or corticate granules sparse over podetia, often restricted to apical portions, but occasionally extending downward; never cupped, tips always tapered; at lower elevations **Cladonia scabriuscula**
- I2 – Corticate granules over upper ½ of podetia; medulla KY**
- 1a. Lower surface of larger squamules distinctly yellowish or orangish at point of attachment; apothecia, if present, red; specimens with a yellowish cast key here (**KC+ yellow** or KC- if [usnic acid] low); over bark or wood **Cladonia transcendens**
- 1b. Lower surface of larger squamules white or brownish at point of attachment; apothecia brown 2
- 2a. Podetial squamules deeply incised, the largest ones often distinctly branching; thamnolic acid present; over acidic substrates, especially bark **Cladonia squamosa**
- 2b. Podetial squamules at most shallowly incised, not at all branching; norstictic and/or psoromic acids present; over base-rich substrates **Cladonia acuminata**

I3 – Soredia over upper ½ of podetia; K+ strong yellow, OR PD+ strong yellow OR both

- 1a.** Over base-rich soil or mossy boulders; apothecia, if present, brown; psoromic acid present *Cladonia acuminata* (chemotype 2) 2
- 1b.** Over bark or wood; apothecia, if present, red; thamnolic acid present 2
- 2a.** Podetial squamules present more or less throughout; soredia granular *Cladonia transcendens*
- 2b.** Podetial squamules absent or confined to basal portions; soredia fine/farinose or granular 3
- 3a.** Basal squamules 1–2 (–3) mm long, more or less shallowly lobed, usually rather thick; usnic acid absent *Cladonia macilenta* var *macilenta*
- 3b.** Basal squamules 1.5–7 mm long, deeply lobed, thin; usnic acid present (Note: specimens with a yellowish cast key here) *Cladonia umbricola* (chemotypes 3 and 4)

I4 – Soredia over upper ½ of podetia; PD-, K-

- 1a.** Cortex with a yellowish green cast, **KC+ yellow** or KC- (usnic acid present); apothecia, if present, red or pale brown 2
- 2a.** Podetia to 20–80 mm tall, basal portions often somewhat dark bluish (“bruised”); over mossy rock, humus soils and more rarely, rotting wood; apothecia pale brown or yellow *Cladonia cyanipes*
- 2b.** Podetia to 5–25 mm tall, basal portions pale orangish or darkening, but never bluish; over bark or wood (rare over moss); distribution various 3
- 3a.** Basal squamules 1–3 mm long; apothecia, if present, pale brown; medulla UV- or **UV+ dull yellowish**; barbatic acid present; east of coast ranges *Cladonia bacilliformis*
- 3b.** Basal squamules 1.5–7 mm long; apothecia, if present, red; medulla **UV+ strikingly ice-blue**; squamatic acid present; widespread in humid regions *Cladonia umbricola* (chemotypes 1 and 2)
- 1b.** Cortex not yellowish, KC- (usnic acid absent or in low concentration); apothecia, if present, red, pale brown, or dark brown 4
- 4a.** Podetial squamules abundant more or less throughout, absent only in uppermost portions; perlatolic acid present; over both sandy and humus soil; apothecia dark brown or red brown . *Cladonia decorticata* (see **12b**)
- 4b.** Podetial squamules absent or confined to basal portions; perlatolic acid absent; distribution various; over soil, moss, or wood 5
- 5a.** Basal squamules 1–2 (–3) mm long, 6
- 6a.** Podetia 10–30mm tall; basal squamules shallowly lobed, thin or rather thick; over soil, rock, wood, or bark in well-illuminated sites; podetia rarely branched, and if branched, only near tips; apothecia & pycnidia red *Cladonia macilenta* var *bacillaris*
- 6b.** Podetia 10–90mm tall; basal squamules persistent or disappearing 7
- 7a.** Growing over soils in disturbed habitats (pioneer species); apothecia dark brown; podetia subulate or branching to form a wand-like tip, with apothecia and/or pycnidia at tips *Cladonia rei*
- 7b.** Growing over rotting tree stumps and peat in forests; apothecia brown, less common than brown pycnidia; podetia subulate or irregularly branched; sorediate throughout, often with corticate granules throughout upper portion of podetia and squamules near base *Cladonia glauca*
- 5b.** Basal squamules 1–7 mm long, deeply lobed, thin; over bark or wood, often in shaded sites 8
- 8a.** Podetia terminating in pointed tips; basal squamules 1–3 mm long, the undersides whitish or dark brownish at point of attachment; apothecia, if present, pale brown; barbatic acid present; humid regions at all forested elevations *Cladonia norvegica*
- 8b.** Podetia terminating in pointed tips or blunt tips, or both; basal squamules 1.5–7 mm long, the undersides often orangish at point of attachment (check largest squamules, KP); apothecia, if present, red; barbatic acid absent; humid regions at lower elevations *Cladonia umbricola* (chemotypes 1 and 2)

I5 – Soredia over upper ½ of podetia; PD+ orange or red, K-; apothecia brown

- 1a.** Podetial soredia continuous, not at all borne in discrete patches 2
- 2a.** Podetia distinctly tapered from bottom to top; mature specimens often with narrow cups topping podetia; usually on wood or bark, including moss over wood; almost never branched; specimens with a distinct greenish cast key here; primary squamules present..... 3
- 3a.** Podetia small, to 1 mm wide and 25mm tall at maturity; rarely branched; soredia often greenish to greyish; basal squamules 1–6 mm wide, never deeply incised; lowlands..... ***Cladonia coniocraea***
- 3b.** Podetia often robust, to 1–2 mm wide and 3–7 cm tall at maturity, often somewhat branched; soredia often whitish; basal squamules 1–11 mm wide, often deeply incised; occurring at all forested elevations ***Cladonia ochrochlora***
- 2b.** Podetia subulate OR crowned with narrow cups with proliferations OR branching at tips; podetia more cylindrical than pointed; often on soil, but occasionally on peat or rotting wood; primary squamules small and crust-like or disappearing; podetial soredia usually grayish or brownish..... 4
- 4b.** Podetia 20-100mm tall; stereome may be distinctly mottled brown-and-white but soredia more uniform in colour, pale green to whitish; cortex generally absent over basal portion of podetia (sorediate from top to bottom) but may be slightly squamulose around base; homosekikaic acid absent (UV-); moderately common in AB, on a variety of substrates on the ground in open boreal forest habitat, including humus-rich soils and rotting wood; **PD+ fast red** (high concentrations of fumarprotocetraric acid) ***Cladonia subulata***
- 4b.** Podetial soredia dirty brownish (occasionally pale greenish), often distinctly mottled brown-and-white; cortex often present over basal portion of podetia; cups if present with narrow pointed proliferations topped with brown pycnidia or apothecia; homosekikaic acid present (medulla **UV+ faint white**, **ferric chloride+ violet**); typically PD- in Alberta, elsewhere **PD+ slow red**, initially **yellow**; growing on soil with low humus content in open habitats ***Cladonia rei***
- 1b.** Podetial soredia discontinuous, at least in part borne in discrete patches..... 5
- 5a.** Podetia predominantly brown or brownish green; podetial medulla generally rather thin; basal squamules absent or at most to 2–3 mm long..... ***Cladonia cornuta* subsp. *cornuta***
- 5b.** Podetia predominantly grey-green; podetial medulla generally rather thick and tough; basal squamules present, to 2–8 mm long ***Cladonia ochrochlora***

Cladonia Group J: Uncupped, podetia smooth or squamulose, not sorediate or corticate granular

Notes: modified from GOWA99, LEND09

- 1a. Cortex with a yellowish green cast (**KC+ yellow** or KC- if usnic acid concentration is low); apothecia red or pale to medium brown..... **J Part 1 - Lead 5**
- 1b. Cortex not at all yellowish (KC-); apothecia of most species dark brown 2
 - 2a. Podetia less than 5 mm tall **J Part 2 – Lead 11**
 - 2b. Podetia more than 5 mm tall 3
 - 3a. Medulla **K+ yellow** (atranorin present) – check growing podetia tips..... **J Part 3 – Lead 17**
 - 3b. Medulla K- or **K+ dingy brown** 4
 - 4a. Medulla, **PD+ yellow or red** (fumarprotocetraric acid present), UV- **J Part 4 – Lead 22**
 - 4b. Medulla PD- or **PD+ dingy brown**), **UV+ blue-white**..... **J Part 5 – Lead 32**

J Part 1 – Cortex yellowish green; apothecia red or pale to medium brown

- 5a. Apothecia and pycnidia red, **K+ purple** (these species almost always have apothecia)..... 6
 - 6a. Medulla or cortex **UV+ blue-white** 7
 - 7a. Primary squamules to 12 mm long and 7 mm wide, esorediate; podetia densely squamulose; cortex discontinuous, patchy; widespread in AB **Cladonia bellidiflora**
 - 7b. Primary squamules to 4 mm long and wide, underside profusely sorediate; podetia verruculose-corticate; common on rotted wood in eastern NA, but also recorded in Alaska **Cladonia incrassata**
 - 6b. Medulla and cortex UV-; podetia esquamulose to moderately squamulose; cortex continuous; usually restricted to eastern NA, rare in the west..... **Cladonia cristatella**
- 5b. Apothecia and pycnidia brown, apothecia K-..... 8
 - 8a. Podetia to less than 15 mm tall; podetial cortex roughened, smooth or areolate 9
 - 9a. Podetia common, 5-10 mm tall; primary squamules tiny and inconspicuous; apothecia pale brown **Cladonia botrytes**
 - 9b. Podetia dwarfed by primary squamules; primary squamules to 15 mm long, erect; lower side of primary squamules distinctly yellow to yellowish white; apothecia brown **Cladonia robbinsii**
 - 8b. Podetia to more than 15 mm tall; podetial cortex smooth; apothecia absent or rarely present, medium brown 10
 - 10a. Medulla K-, P-; podetia 15-100 mm tall **Cladonia amaurocraea**
 - 10b. Medulla **K+ bright yellow**, **PD+ yellow or orange**; podetia 4-35 mm tall **Cladonia poroscypha**

J Part 2 – Cortex not yellowish green; apothecia dark brown; podetia <5mm tall

- 11a.** On calcareous substrates; squamules thick and appressed to the substrate, appearing foliose; podetia cupped when present; northern..... *Cladonia pocillum*
- 11b.** On non-calcareous substrates; squamules not as above, usually ascending; podetia rare or unknown 12
- 12a.** Squamules yellowish-green, **KC+ yellow** (usnic acid and barbatic acid present); underside of squamules distinctly pale yellow or yellowish white *Cladonia robbinsii* (see 9b)
- 12b.** Squamules gray or blue-gray, KC- (usnic acid and barbatic acid absent; atranorin present or absent)..... 13
- 13a.** Medulla **UV+ blue-white** (sphaerophorin present), PR (fumarprotocetraric acid present or absent); typical of rock outcrops in shaded forests..... *Cladonia petrophila*
- 13b.** Medulla UV- (sphaerophorin absent), **PD+ red** (fumarprotocetraric acid always present); typical of other habitats..... 14
- 14a.** Squamules **K+ yellow** (atranorin present); squamules long and erect, upper portions convex-reflexed to show the white underside, without a blackened narrow stipe; thallus not forming distinct cushions; typical of roadside banks and disturbed areas; widespread..... *Cladonia apodocarpa*
- 14b.** Squamules K- (atranorin absent)..... 15
- 15a.** Squamules large and broad, margins not finely divided 16
- 16a.** Podetia rare, when present forming tall irregular cup-like structures; underside of squamules originally white, commonly darkening to grey- or purple-brown
..... *Cladonia mateocyatha*
- 16b.** Podetia common, apothecia common, aberrant form; squamules gray-green, deeply lobed, undersides white *Cladonia ochrochlora*
- 15b.** Squamules smaller, narrow, margins finely divided; podetia absent; apothecia when present borne on a stipe/ecorticate pseudopodetium..... *Cladonia caespiticia*

J Part 3 – Cortex not yellowish green; apothecia dark brown; podetia >5mm tall; medulla **K+ yellow**

- 17a.** Basal squamules present, the largest ones to 5–15 (–25) mm long; podetial cortex not at all white-pruinose or cobwebby/ arachnoid; over bark or soil rich in humus; **PD+ yellow**; podetia pale brown to green
..... *Cladonia squamosa* var. *subsquamosa*
- 17b.** Basal squamules absent or at most to 1–6 mm long; podetia white-pruinose or cobwebby/arachnoid or not (check upper portions); distribution various; over soil rich in humus 18
- 18a.** Basal portion of podetia blackening and distinctly pale-spotted; alpine; northern *Cladonia trassii*
- 18b.** Basal portion of podetia orange or greyish orange, not at all pale-spotted; distribution various 19
- 19a.** Podetial squamules absent or, if present, mostly confined to lower half of podetia 20
- 20a.** Podetia to 0.5–1.6 mm wide (excluding cups), often distinctly sinuous; cups rare, but when present – 3.6mm wide; pruina slight to absent; rarely branching; unlikely in AB, but may be present in humid regions at low to middle elevations *Cladonia ecmocyna* subsp. *occidentalis* (see also 21)
- 20b.** Podetia to 3 mm wide (excluding cups), not sinuous; cups usually present, 1-6mm wide; podetial squamules very rare; lacking pruina *Cladonia maxima*
- 19b.** Podetial squamules present (rarely absent), confined to lower half of podetia or scattered throughout; cups to 1.5–10 mm wide; widespread at middle to alpine elevations 21
- 21a.** Pruina usually abundant over at least upper third to upper half of podetia (check sheltered areas); podetial squamules usually numerous (occasionally sparse), scattered from base to top of podetia
..... *Cladonia ecmocyna* subsp. *intermedia*
- 21b.** Pruina absent or sparse; when pruina present, usually restricted to tips of podetia; podetial squamules sparse, mostly confined to base of podetia; cups frequent, often with secondary cups, branching 1-3 times; cups 2-5 mm wide *Cladonia ecmocyna* subsp. *ecmocyna*

J Part 4 – Cortex not yellowish green; apothecia dark brown; podetia >5mm tall; medulla K- or KdingyBrown, PD+ yellow or red, UV-

- 22a.** Terminal portion of podetia soft, dull, distinctly cobwebby/ arachnoid or appressed-tomentose (Note: specimens in which the podetia are in part pale-spotted against a black background key here)..... ***Cladonia stricta***
- 22b.** Terminal portion of podetia distinctly hard-corticate, often more or less shiny, at most only very weakly cobwebby/arachnoid..... 23
- 23a.** Podetia branching; axils of branches at least in part longitudinally lacerate and/or opening by a gaping hole; coastal 24
- 24a.** Ultimate branches corticate more or less throughout, lacking soredia, corticate granules, and microsquamules; podetial squamules absent or sparse, more or less symmetrically arranged around the podetia; apothecia often present, the supporting branches somewhat flattened or longitudinally lacerate, or both 25
- 25a.** Podetia green-grey, branches ascending..... ***Cladonia furcata*** (fertile form)
- 25b.** Podetia dark green-brown, short spiky side-branches at right angles to podetia, white chalky spots near base of podetia ***Cladonia furcata* subsp. *subrangiformis***
- 24b.** Ultimate branches generally in part lacking a cortex, often furnished with soredia, corticate granules, and/or microsquamules, these sometimes extending downward into the middle or basal portions of the podetia; podetial squamules sparse to abundant, more or less asymmetrically arranged, the largest ones restricted to the “upper” side of the podetia; apothecia generally absent; ultimate branches occasionally longitudinally lacerate, but rarely flattened ***Cladonia scabriuscula***
- 23b.** Podetia branching or not; branch axils, if present, not at all lacerate or opening by a gaping hole (perforations, however, may be present elsewhere over podetia); distribution various..... 26
- 26a.** Podetia to more than 1.5 mm in diameter (check basal portions) (Note: specimens more than 100 mm tall key here) 27
- 27a.** Podetial wall 0.02–0.04 mm (20–40 µm) thick, tough (check basal portion); inner portion of medulla soft, loose; podetial squamules generally present; widespread in base-rich sites ***Cladonia macroceras***
- 27b.** Podetial wall 0.01–0.02 mm (10–20 µm) thick, fragile; inner portion of medulla rather hard, compact; podetial squamules generally absent or at most sparse 28
- 28a.** Conspicuous longitudinal slits to base of podetia; podetia browned; podetial squamules absent; in acidic sites at lower elevations ***Cladonia gracilis* subsp. *vulnerata***
- 28b.** Podetia lacking perforations or fissures; podetia squamulose at base; on rocky ground in temperate and boreal forests..... ***Cladonia gracilis* subsp. *gracilis***
- 26b.** Podetia to less than 1.5 mm in diameter 29
- 29a.** Podetial wall 0.02–0.04 mm (20–40 µm) thick (check basal portion); inner portion of medulla soft, loose; cortex glossy ***Cladonia macroceras*** (see 27a)
- 29b.** Podetial wall 0.01–0.02 mm (10–20 µm) thick; inner portion of medulla hard, compact; cortex dull or somewhat glossy 30
- 30a.** Basal portions of podetia not abundantly perforate 17
- 31a.** Podetial squamules present or absent; blackened base and stereome; widespread; alpine to subalpine ***Cladonia gracilis* subsp. *elongata***
- 31b.** Podetia squamulose at base; base of podetia yellow to brown; on rocky ground in temperate and boreal forests ***Cladonia gracilis* subsp. *gracilis***
- 30b.** Basal portions of podetia abundantly perforate; podetial squamules absent; at lower elevations ***Cladonia gracilis* subsp. *vulnerata***

J Part 5 – Cortex not yellowish green; apothecia dark brown; podetia >5mm tall; medulla K- or K+ dingy brown, PD-, UV+ blue-white

Note: *Cladonia simulata* should be in this part of the key, but without observing specimens it is impossible to place it for sure. Revise this key after viewing some specimens. The herbarium with the most specimens is the University of Minnesota Bell Herbarium. This species is listed in ACIMS, but is unlikely in AB; most specimens are from Florida or Georgia.

- 32a.** Podetial squamules absent or at most confined to base; basal portions of podetia distinctly blackening ***Cladonia subfurcata***
- 32b.** Podetial squamules present, scattered more or less throughout; basal portions of podetia blackening or not; distribution various 33
 - 33a.** Upper portion of podetia predominantly brownish, more or less continuously corticate; basal portion of podetia whitish, generally distinctly paler than upper portion; squamatic acid present ***Cladonia singularis***
 - 33b.** Upper portion of podetia predominantly whitish, lacking a continuous cortex; basal portion of podetia pale or darkening; squamatic acid present or absent; distribution various..... 34
 - 34a.** Over bark of standing conifers; squamatic acid present; perlatolic acid absent; humid coastal regions ***Cladonia squamosa* var. *squamosa***
 - 34b.** Over soil, mossy rock, or decaying wood; squamatic acid absent; perlatolic acid present ***Cladonia decorticata***