

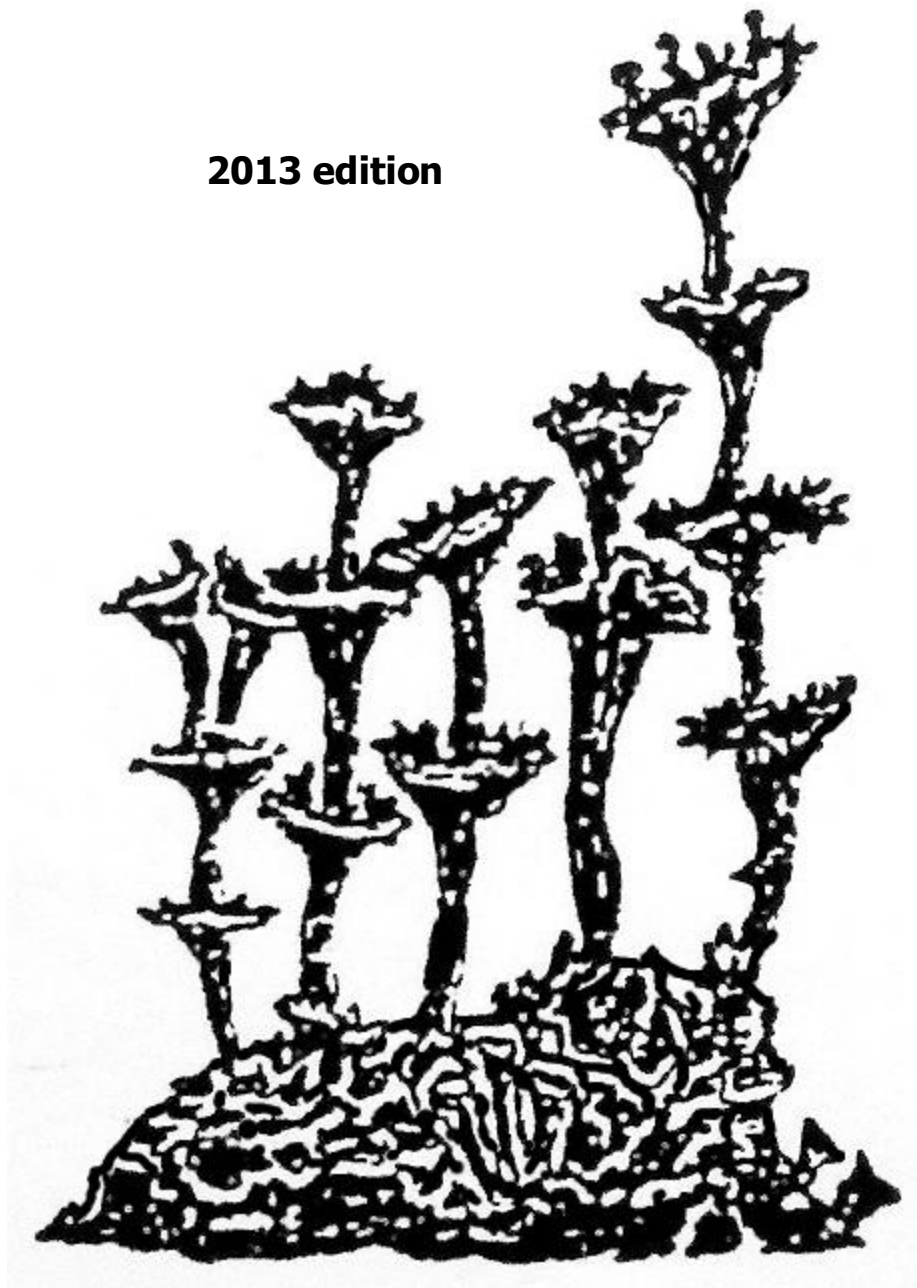
Simplified Field Key

TO Maine Macrolichens

BY

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2013 edition



Simplified Field Key to Maine Macrolichens

Originally Prepared for the 1992 Meeting of the Josselyn Botanical Society; Revised in 2013

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INTRODUCTION

This key has been prepared in the hope of making lichens more accessible. With experience, most of the foliose and fruticose lichens (**macrolichens**) in Maine can be identified quickly and easily in the field with the use of a hand lens. There is now a comprehensive guide available to all the macrolichens known from New England, **The Macrolichens of New England (2007) by James W. and Patricia L. Hinds***, but it covers a large number of species (461), includes many rare species that are unlikely to be encountered, and at 4.5 pounds it is quite heavy to bring into the field. The present key is similar to the simplified key published in 1998, but with the names updated. It covers most of the common species likely to be encountered in Maine (and New England) and is designed to be used either as a paper version or an electronic version on a hand held device. However, this key does not include any photographs or descriptions, so it is recommended that it be **used in conjunction with Hinds and Hinds (2007)**.

The present key aims to make the process of lichen identification easier by using a series of **50 short keys**, each covering a readily defined group of lichens. The keys have been divided on the basis of obvious characters such as *substrate, growth form, color of upper surface when dry, width of lobes, and presence of specialized reproductive structures*. An outline of the major distinguishing characters of the 50 keys is shown in the initial **Quick Key**. Each key is abbreviated with a letter and a number, for easy reference.

In order to make this field key more self-contained, we have included a **glossary** at the end that defines all technical terms used. A combined alphabetical **species index** and **list** at the end of the Key includes references to the particular *keys in this guide*, as well as common names for some species. **Species names generally follow the names in Hinds and Hinds (2007)** unless more recent name changes have gained general acceptance; in those instances the names used in Hinds and Hinds (2007) are shown in parentheses. Information on new name changes can be found in the North American Lichen Checklist by T. L. Esslinger (2012).

The keys have been designed to be useful in the field with only a **hand lens** and therefore *chemical tests have been de-emphasized*, and microscopic characters such as spore size have not been used. In a few instances, the key does not come down to a unique species, but to a pair of species (or very rarely more than a pair) often differing only in chemistry. These have the phrase "*s.lat.*" after them to indicate they form a species group. **The key covers 246 out of the 461 macrolichens reported for Maine in Hinds and Hinds (2007)**. Species not included generally are rare, nearly crustose, poorly understood, or only known from historical records.

The key has been divided into 3 divisions based on substrate: TREE, ROCK, and SOIL. While some lichens are very substrate specific, others are not, and so there is extensive duplication and cross referencing in the keys. The soil category includes lichens growing on soil, on moss over rock, at the base of tree trunks, and on rotting logs. If a lichen does not key out under one substrate, check the same category under a different substrate.

Colors are based on the appearance of the thallus when dry; many lichens become greener or darker when wet. See the Hinds and Hinds book to learn the colors of lichens.

*The book is available directly from the New York Botanical Garden shop, www.nybgshop.org, search "macrolichens" or use the same search on Amazon.

This key is available for free in pdf, ePub or Kindle formats as well as on-line at www.TheDigitalNaturalist.info

DEFINITIONS

BROAD -- lobes usually greater than 4 mm

NARROW -- lobes usually less than 4 mm

NEITHER -- neither sorediate nor isidiate

BROWN -- light to dark brown (or greenish brown)

BLACK TO SLATE -- black, dark olive-green, or slate gray; gelatinous when wet

FLAT -- branches flattened in cross-section

ROUND -- branches round in cross-section

TUFTED -- stalks much branched, like a bush

PODETIA -- stalks unbranched to sparsely branched

INITIAL QUICK KEYS

ON TREES

Foliose

T1 Orange

T2 Yellow Or Yellow-Green

T3 Brown, Broad

T4 Brown, Narrow, Sorediate

T5 Brown, Narrow, Isidiate

T6 Brown, Narrow, Neither

T7 Mineral-Gray, Broad, Sorediate

T8 Mineral-Gray, Broad, Isidiate

T9 Mineral-Gray, Broad, Neither

T10 Mineral-Gray, Narrow, Hollow

T11 Mineral-Gray, Narrow, Sorediate

T12 Mineral-Gray, Narrow, Isidiate

T13 Mineral-Gray, Narrow, Neither

T14 Black To Slate, Isidiate

T15 Black To Slate, Neither

Squamulose

T16 Squamulose

Fruticose

T17 Yellow-Green, Round, Pendent

T18 Yellow-Green, Round, Tufted

T19 Yellow-Green, Flat

T20 Brown

T21 Mineral-Gray

ON ROCKS

Foliose

R1 Orange

R2 Yellow-Green, Sorediate

R3 Yellow-Green, Isidiate

R4 Yellow-Green, Neither

R5 Brown, Broad

R6 Brown, Narrow, Sorediate

R7 Brown, Narrow, Isidiate

R8 Brown, Narrow, Neither

R9 Mineral-Gray, Broad

R10 Mineral-Gray, Narrow, Sorediate

R11 Mineral-Gray, Narrow, Isidiate

R12 Mineral-Gray, Narrow, Neither

R13 Black To Slate, Isidiate

R14 Black To Slate, Neither

R15 Umbilicate

Squamulose

R16 Squamulose

Fruticose

R17 Yellow-Green

R18 Brown

R19 White To Grayish-White

ON SOIL

Foliose

S1 Yellow-Green

S2 Brown To Mineral-Gray

S3 Black To Slate

Squamulose

S4 Squamulose

Fruticose

S5 Tufted, Yellow-Green

S6 Tufted, Brown

S7 Tufted, White To Light Gray

S8 Podetia, Red-Apothecia

S9 Podetia, Brown or No Apothecia, Soredia

S10 Podetia, Brown or No Apothecia, No Soredia

ON TREES

T1 FOLIOSE; ORANGE

1. Soredia present.
 2. Lobes narrow, (0.3)0.4-0.5 mm wide; apical soralia..... **Xanthomendoza weberi**
 2. Lobes wider, (0.8)1.1-1.4 mm wide; marginal soralia.
 3. Soredia linear on lobe margins **Xanthomendoza ulophyllodes**
 3. Soredia in pockets of up-turned margins..... **Xanthomendoza fallax**
1. Without soredia or isidia; apothecia usually common.
 4. Lower surface with noticeable rhizines; thallus cushion-like **Xanthomendoza hasseana**
 4. Lower surface with sparse or abundant holdfasts; without rhizines.
 5. Lobes +/- adherent to the substrate, >0.5 mm wide..... **Xanthoria parietina**
 5. Lobes and apothecia crowded together forming small cushion; lobes <0.5 mm. **Xanthoria polycarpa**

T2 FOLIOSE; YELLOW OR YELLOW-GREEN

1. Thallus yellow, lobes tiny (0.1-0.5 mm wide).
 2. Sorediate; apothecia rare **Candelaria concolor**
 2. Nonsorediate; apothecia common..... **Candelaria fibrosa**
1. Thallus yellow-green; lobes >0.5 mm wide.
 3. Nonsorediate; apothecia and marginal pycnidia common **Ahtiana aurescens**
 3. Sorediate.
 4. Lobes 3-10 mm; soredia forming confluent pustulate masses **Flavoparmelia caperata**
 4. Lobes narrower, 0.5-3.0 mm wide.
 5. Medulla and soredia lemon yellow **Vulpicida pinastri**
 5. Medulla and soredia white.
 6. Soralia on margins, linear **Usnocetraria (Allocetraria) oakesiana**
 6. Soralia on surface or tips, spherical **Parmeliopsis capitata**

T3 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES BROAD

1. Sorediate.
 2. Soredia bright yellow **Pseudocyphellaria crocata** s.lat.
 2. Soredia gray to brown.
 3. Lower surface bare; found on tree bases over moss..... **Nephroma parile**
 3. Lower surface tan-tomentose with gaps showing white.
 4. Lobe tips dichotomously branched; upper surface strongly reticulate-ridged .. **Lobaria pulmonaria**
 4. Lobe tips rounded; upper surface weakly ridged to undulating; often yellowish **Lobaria scrobiculata**
1. Nonsorediate.
 5. Margins of lobes lobulate to dentate-isidiate; at the base of trees **Nephroma helveticum**
 5. Neither sorediate nor isidiate.
 6. Lower surface tan tomentose.
 7. White papillae scattered among tomentum; apothecia on lower surface . **Nephroma resupinatum**
 7. White papillae on lower surface lacking; apothecia on upper surface..... **Lobaria quercizans**
 6. Tomentum not present.
 8. Thallus adnate; margins and lower surface of lobes smooth at base of trees **Nephroma bellum**
 8. Thallus suberect; margins of lobes with pycnidial projections or cilia; rhizines on lower surface; on branches..... **Tuckermannopsis ciliaris** s.lat

T4 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; SOREDIATE

1. Bluish-black hypothallus extending beyond edges of lobes.
 2. Soredia in form of partly decorticated, small or elongate lobules along the lobe margins; thallus bluish **Pannaria conoplea**
 2. Soredia coarsely granular; thallus brownish..... **Fuscopannaria ahneri**
1. Bluish-black hypothallus lacking.
 3. Soredia diffuse over upper surface, mixed with tiny isidia, white showing where abraded **Melanelixia (Melanelia) subaurifera**
 3. Soredia in delimited round or linear soralia.
 4. Upper surface of at least the lobe tips white pruinose (may need lens).
 5. Soralia linear and marginal, KC- **Physconia detersa** s.lat.
 5. Soralia discrete labriform, KC+ orange **Physconia leucoleiptes**
 4. Upper surface lacking pruina.
 6. Tan or white lower surface; soredia marginal and labriform on lobe tips..... **Physciella chloantha**
 6. Black lower surface.
 7. Medulla orange-red..... **Phaeophyscia rubropulchra**
 7. Medulla white.
 8. Soredia coarse, isidioid **Phaeophyscia adiaetola**
 8. Soredia powdery, round and delimited (capitate)..... **Phaeophyscia pusilloides**

T5 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; ISIDIATE

1. Conspicuous blue-black hypothallus surrounding thallus of small squamulose lobes **Parmeliella triptophylla**
1. No hypothallus visible.
 2. Isidia tiny and mixed with diffuse laminal soredia, white when rubbed off **Melanelixia (Melanelia) subaurifera**
 2. Isidia larger, often branched, not mixed with soredia.
 3. Isidia flattened and lobulate **Melanohalea (Melanelia) exasperatula**
 3. Isidia thin and cylindrical.
 4. Thallus uniformly brown **Melanelixia (Melanelia) fuliginosa**
 4. Thallus mineral-gray, brown only on lobe tips, which are reticulately ridged with markings **Parmelia saxatilis**

T6 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; NEITHER

1. Lower surface with bluish-black tomentum **Pannaria rubiginosa**
1. Lower surface without bluish-black tomentum.
 2. Pycnidial projections on lobe margins and apothecia; thallus suberect.
 3. Thallus 2-6 cm wide, lobes usually >0.6 mm wide **Tuckermannopsis ciliaris** s.lat.
 3. Thallus cushion-like, 1-2 cm wide; lobes <0.6 mm.
 4. Lobes finely divided at tips..... **Tuckermanella fendleri**
 4. Lobes entire **Tuckermannopsis sepincola**
 2. No pycnidial projections; thallus clearly foliose.
 5. Thallus brown, not changing in color when wet.
 6. Apothecia mostly flat, with thin margins, present to the edges of the lobes; thallus smooth **Melanohalea (Melanelia) septentrionalis**
 6. Apothecia cup-like with thick and crenate margins, not present to the edge of lobes; thallus rugose **Melanohalea (Melanelia) halei**
 5. Thallus grayish brown, turning green when wet.
 7. Lobe margins and apothecial margins entire, without lobules; lower surface black..... **Phaeophyscia ciliata**
 7. Lobe margins and rims of apothecia lobulate; lower surface tan..... **Anaptychia palmulata**

T7 FOLIOSE; MINERAL-GRAY; LOBES BROAD; SOREDIATE

(for *Peltigera* species which may be found at the base of the trees or on fallen logs, see **Soil Key S2**).

- 1. White spots (pseudocyphellae) visible on upper surface (may need lens).
 - 2. Tan lower surface **Punctelia caseana (perreticulata, subrudecta)**
 - 2. Black or dark brown lower surface **Cetrelia olivetorum s.lat.**
- 1. No white spots on the upper surface.
 - 3. Lower surface tan-tomentose with gaps showing white.
 - 4. Lobe tips dichotomously branched; upper surface strongly reticulately ridged .. **Lobaria pulmonaria**
 - 4. Lobe tips rounded; upper surface weakly ridged to undulating; often yellowish .. **Lobaria scrobiculata**
 - 3. Lower surface bare or with rhizines, not tomentose.
 - 5. Long cilia present on lobe margins; soredia on revolute lobe tips..... **Parmotrema perlatum**
 - 5. Long cilia lacking.
 - 6. Lobes broad and ascending; soredia becoming granular or subsidoid in dissected lobe margins....
..... **Platismatia glauca**
 - 6. Lobes narrower and appressed; soredia laminal and diffuse..... **Myelochroa aurulenta**

T8 FOLIOSE; MINERAL-GRAY; LOBES BROAD; ISIDIATE

(for *Peltigera* species which may be found at the base of the trees or on fallen logs, see **Soil Key S2**).

- 1. Isidia dense, laminal, often branched, and apically ciliate **Parmotrema crinitum**
- 1. Isidia/soredia on lobe margins; without cilia **Platismatia glauca**

T9 FOLIOSE; MINERAL-GRAY; LOBES BROAD; NEITHER

(for *Peltigera* species which may be found at the base of the trees or on fallen logs, see **Soil Key S2**).

- 1. Thallus subfruticose, with sharp reticulate ridges on upper surface of lobes **Platismatia tuckermanii**
- 1. Thallus flattened, with smooth upper surface..... **Lobaria quercizans**

T10 FOLIOSE; MINERAL-GRAY; LOBES NARROW; HOLLOW AND INFLATED

- 1. Sorediate; apothecia rare.
 - 2. Upper surface more or less uniformly perforated with holes; soredia capitate on short cylindrical stalks ..
..... **Menegazzia terebrata s.lat.**
 - 2. Upper surface entire.
 - 3. Soralia labriform on relatively broad lobe tips..... **Hypogymnia physodes**
 - 3. Soralia ring-shaped on ends of narrow suberect lobes..... **Hypogymnia tubulosa**
- 1. Nonsorediate.
 - 4. Lower surface with thick, spongy layer of tomentum; lobes solid but sometimes appearing inflated; rare
..... **Anzia colpodes**
 - 4. Lower surface without spongy tomentum; lobes hollow.
 - 5. Lobes narrow; apothecia common **Hypogymnia krogiae**
 - 5. Lobes generally broader and somewhat fan-shaped; usually sorediate; apothecia rare.....
..... **Hypogymnia physodes**

T11 FOLIOSE; MINERAL-GRAY; LOBES NARROW; SOREDIATE

(if bluish-black hypothallus present, see **Tree Key T4** *Pannaria*, *Fuscopannaria*).

1. Black or dark brown lower surface.
 2. Medulla pale yellow, yellow, orange or red.
 3. Lobes 2-6 mm wide, loosely adnate..... **Myelochroa aurulenta**
 3. Lobes 1-2 mm wide, closely adnate.
 4. Medulla orange-red to red **Phaeophyscia rubropulchra**
 4. Medulla pale yellow to salmon orange; lobe margins white and ecorticate; lobe tips usually pruinose **Pyxine sorediata**
 2. Medulla white.
 5. Ciliate.
 6. Lobes suberect; cilia obvious; uncommon and local **Everniastrum catawbiense**
 6. Lobes adnate; cilia very short, often not seen **Myelochroa aurulenta**
 5. Cilia lacking.
 7. Upper surface of lobes with reticulate white markings..... **Parmelia sulcata**
 7. Upper surface without reticulate white markings.
 8. Soralia marginal; upper surface of lobe tips pruinose.
 9. Soralia linear and marginal; K- **Physconia detersa** s.lat.
 9. Soralia discrete labriform; KC+ orange **Physconia leucoleiptes**
 8. Soralia laminal or terminal.
 10. Lobes 2-5 mm wide soralia in broad diffuse patches on surface **Myelochroa aurulenta**
 10. Lobes 0.3-1.5 mm wide.
 11. Soredia coarse and isidioid, in marginal and terminal soralia.. **Phaeophyscia adiaetola**
 11. Soredia powdery and in capitate soralia..... **Phaeophyscia pusilloides**
 1. White or tan lower surface.
 12. Margins of lobes dissected, breaking up into granular soredia **Physcia millegrana**
 12. Lobes without dissected margins.
 13. Cilia or laterally projecting rhizines on lobe margins.
 14. Lobes linear and flat with marginal soredia; at least some of the lower surface white cottony
..... **Heterodermia speciosa**
 14. Lobes suberect with apical soralia.
 15. Lobes with helmet-shaped inflated tips, sorediate on the inside..... **Physcia adscendens**
 15. Lobes with terminal labriform soralia **Physcia tenella**
 13. Cilia or projecting rhizines lacking on lobe margins.
 16. Upper surface with white pores (pseudocyphellae) or mottled with white spots.
 17. With pseudocyphellae; found only on trees.....
..... **Punctelia caseana (perreticulata, subrudecta)**
 17. With mottled white spots; usually on rocks **Physcia caesia**
 16. Upper surface without pseudocyphellae or mottled white spots.
 18. Thallus greenish or brownish gray; soralia marginal labriform and greenish
..... **Physciella chloantha**
 18. Thallus mineral-gray; soredia white-powdery in round soralia..... **Parmeliopsis hyperopta**

T12 FOLIOSE; MINERAL-GRAY; LOBES NARROW; ISIDIATE

- 1. Thallus loosely attached and subfruticose; lobes suberect **Pseudevernia consocians**
- 1. Thallus clearly foliose; lobes adnate.
 - 2. White spots (pseudocyphellae) on upper surface..... **Punctelia rudecta**
 - 2. Without white spots.
 - 3. Isidia flattened and squamiform; lower surface white and fibrous, lacking a cortex **Heterodermia squamulosa**
 - 3. Isidia not squamiform; lower surface cortical.
 - 4. White or tan lower surface..... **Imshaugia aleurites**
 - 4. Black or dark brown lower surface.
 - 5. Surface of lobe tips with reticulate pattern of white lines (pseudocyphellae).
 - 6. Squarrosely branched rhizines present **Parmelia squarrosa**
 - 6. Rhizines unbranched or branched simple dichotomously; not squarrose .. **Parmelia saxatilis**
 - 5. White reticulate markings absent; medulla orange-red **Phaeophyscia rubropulchra**

T13 FOLIOSE; MINERAL-GRAY; LOBES NARROW; NEITHER

- 1. Thallus subfruticose to fruticose; lobes adnate to erect **Pseudevernia cladonia**
- 1. Thallus clearly foliose; lobes adnate.
 - 2. Lower surface with thick, black, spongy tomentum; rare..... **Anzia colpodes**
 - 2. Lower surface without thick black tomentum.
 - 3. Margins and sometimes upper surface of lobes with numerous squamulate lobules; lower surface white and fibrous, lacking a cortex; apothecia rare **Heterodermia squamulosa**
 - 3. Squamulate lobules absent or, if present, lower surface cortical; apothecia common.
 - 4. Lower surface black or dark brown.
 - 5. Thallus grayish brown; rhizines often radially projecting around apothecia; upper surface smooth..... **Phaeophyscia ciliata**
 - 5. Thallus mineral-gray, rhizines not radially projecting; upper surface often wrinkled **Myelochroa galbina**
 - 4. Lower surface white to tan.
 - 6. Lobes or rims of apothecia lobulate, lobe tips often pruinose..... **Anaptychia palmulata**
 - 6. Margins of lobes entire; upper surface not pruinose.
 - 7. Upper surface with mottled white spots; medulla K+ yellow..... **Physcia aipolia**
 - 7. Upper surface without white spots; medulla K+ or K-.
 - 8. Apothecia uncommon; marginal soralia usually present **Heterodermia speciosa**
 - 8. Apothecia common.
 - 9. Apothecia blackish to white pruinose; medulla K-..... **Physcia stellaris**
 - 9. Apothecia pale or orange brown..... **Imshaugia placorodia**

T14 FOLIOSE; (GREENISH) BLACK TO SLATE-GRAY; GELATINOUS; ISIDIATE

- 1. White tomentum on lower surface.
 - 2. Tomentum very short, hard to see with hand lens; lobes apically dissected to isidiate **Leptogium laceroides**
 - 2. Tomentum long, hairs up to 1 mm or longer, obvious with a hand lens.
 - 3. Thallus slate-gray; isidia cylindrical..... **Leptogium burnetiae**
 - 3. Thallus black; isidia granular **Leptogium saturninum**
- 1. Without tomentum on lower surface.
 - 4. Lobe surface with numerous, narrow, longitudinal wrinkles visible with a hand lens; isidia granular, sparse to abundant **Leptogium milligranum**
 - 4. Lobe surface smooth, pustulate or ridged, without fine longitudinal wrinkles; isidia usually abundant.
 - 5. Thallus bluish slate-colored; lobe surface smooth; isidia cylindrical to clavate to lobulate..... **Leptogium cyanescens**
 - 5. Thallus dull greenish or brownish black.
 - 6. Some of isidia in mature part of thallus squamiform; rare **Collema flaccidum**
 - 6. Isidia cylindrical to nearly spherical.
 - 7. Thallus surface markedly pustulate and ridged; isidia mostly cylindrical... **Collema furfuraceum**
 - 7. Thallus surface not markedly pustulate; isidia mostly nearly spherical... **Collema subflaccidum**

T15 FOLIOSE; (GREENISH) BLACK TO SLATE-GRAY; (GELATINOUS); NEITHER

- 1. Bluish slate-colored; surface of lobes finely and irregularly wrinkled **Leptogium corticola**
- 1. Brown, brownish-black, or greenish black; lobes without fine wrinkles.
 - 2. Lobes much divided, up to 0.2 mm broad, flattened to almost round, often short and crowded and appearing as clustered coralloid outgrowths..... **Leptogium tenuissimum**
 - 2. Lobes larger.
 - 3. Thallus 2-6 cm broad with lobes expanded and separate..... **Collema nigrescens**
 - 3. Thallus 2-3 cm with lobes small, crowded and fused, forming a cushion with interstices; covered with small apothecia **Collema leptaleum**

T16 SQUAMULOSE

(For *Cladonia* species formed at base of trees or on rotting logs without podetia so only mineral-gray squamules are present, see **Soil Key S5**).

- 1. Conspicuous blue-black hypothallus surrounding squamules with isidia on margins **Parmeliella triptophylla**
- 1. Without blue-black hypothallus.
 - 2. Lobes much divided, crowded, and appearing as clustered, coralloid outgrowths..... **Leptogium tenuissimum**
 - 2. Squamules not divided, imbricate, around 1.0 mm long, and sorediate on margins of lower surface..... **Hypocenomyce scalaris**

T17 FRUTICOSE; YELLOW-GREEN; ROUND IN CROSS-SECTION; PENDENT

- 1. Branches loosely filled with medullary hyphae, a central dense cord lacking.
 - 2. Apices of branches thin and tipped with soredia or granules, often hooked (use lens); black pycnidia not present..... **Ramalina thrausta**
 - 2. Apices of branches not hooked or tipped with soredia; black pycnidia usually present; pseudocyphellae common, white and raised, ovoid to elongate **Alectoria sarmentosa**
- 1. Branches with distinct, dense central cord (genus *Usnea*; if collecting in downeast Maine, see Hinds and Hinds (2007) for additional species).
 - 3. Sorediate.
 - 4. Branches, including main branches, with coarse, white tubercles, becoming sorediate..... **Usnea ceratina**
 - 4. Branches with abundant, isidia-like fibrils; soralia sometimes isidioid **Usnea filipendula**
 - 3. Non-sorediate.
 - 5. Cortex eroding away on the main branches, numerous long lateral fibrils present **Usnea longissima**
 - 5. Cortex present and continuous; lateral fibrils less numerous or absent.
 - 6. Surface of main branchlets smooth except for annular rings **Usnea trichodea**
 - 6. Surface of main branchlets not smooth.
 - 7. Branches coarse, with coarse tubercles..... **Usnea ceratina**
 - 7. Branches fine, rugose and pitted and without papillae..... **Usnea cavernosa**

T18 FRUTICOSE; YELLOW-GREEN; ROUND IN CROSS-SECTION; TUFTED

- 1. Soredia and isidia lacking; apothecia common, with fibrils radiating from disk edge **Usnea strigosa**
- 1. Sorediate, isidiate, or isidiate-sorediate.
 - 2. Sorediate only.
 - 3. Branches with papillae tubercles sorediate..... **Usnea ceratina**
 - 3. Smaller branches with numerous flat or convex soralia containing granular soredia..... **Usnea fulvoreagens**
 - 2. Isidiate or isidiate-sorediate.
 - 4. Surface of branches with orange or reddish color; rare..... **Usnea rubicunda**
 - 4. Surface of branches yellow-green or greenish-yellow.
 - 5. Isidiate only; branches covered with isidia; papillae absent..... **Usnea hirta**
 - 5. Soredia raised.
 - 6. Raised isidiate-sorediate patches present..... **Usnea subfloridana**
 - 6. Isidiate-sorediate patches absent; branches mostly with isidia or sorediate isidia; usually pendent..... **Usnea filipendula**

T19 FRUTICOSE; YELLOW-GREEN; FLATTENED IN CROSS-SECTION

- 1. Sorediate.
 - 2. Soredia diffuse, granular to subsidoid; surface of branches irregularly wrinkled ... **Evernia mesomorpha**
 - 2. Soredia in distinct marginal or apical soralia.
 - 3. Branches hollow and sometimes perforated; tips attenuated with isidioid soredia at tips **Ramalina roesleri**
 - 3. Branches not hollow.
 - 4. Soredia forming broad white patches over the exposed medulla..... **Ramalina pollinaria**
 - 4. Soredia not forming broad white patches.
 - 5. Soredia farinose and restricted to delimited lateral soralia; lobe tips not finely divided..... **Ramalina farinacea**
 - 5. Soredia granular, irregularly spreading over adjacent areas; lobe tips finely divided **Ramalina intermedia**
- 1. Nonsorediate; apothecia common.
 - 6. Branches somewhat rounded, to 1.5 mm wide, hollow and perforated **Ramalina dilacerata**
 - 6. Branches strap-shaped, 2-10 mm wide, solid, surface smooth to striate **Ramalina americana**

T20 FRUTICOSE; BROWN

1. Soralia present; tufted to subpendent.
 2. Soralia with projecting tufts of isidioid spinules..... **Bryoria furcellata**
 2. Soralia without projecting isidioid spinules.
 3. Thallus grayish green to pale brown with basal branches darker; K+ **Bryoria nadvornikiana**
 3. Thallus brown; K- **Bryoria fuscescens**
1. Soralia absent; subpendent to pendent.
 4. Thallus greenish gray to gray; K+ **Bryoria capillaris**
 4. Thallus pale to dark brown; K- **Bryoria trichodes** s.lat.

T21 FRUTICOSE; MINERAL-GRAY

1. Isidiate **Pseudevernia consocians**
1. Isidia (and soredia) lacking **Pseudevernia cladonia**

ON ROCK

R1 FOLIOSE; ORANGE

1. Soredia or isidia present; apothecia usually absent.
 2. Thallus closely adherent to rock; central part with laminal, coarse, bulbous isidia, some of which break up into coarse soredia **Xanthoria sorediata**
 2. Thallus lobes narrow, dissected, and ascending, 0.1-0.4 mm wide; laminal coarse isidia absent but granular soredia present at lobe margins **Xanthomendoza weberi**
1. Soredia and isidia absent; apothecia usually present.
 3. Lobes flat, thin, and adherent to substrate, often with thickened edges giving lobe tips a concave appearance..... **Xanthoria parietina**
 3. Lobes appearing thicker, with tips convex and proximal parts arched **Xanthoria elegans**

R2 FOLIOSE; YELLOW-GREEN; SOREDIATE

1. Lobes relatively broad, 3-10 mm wide.
 2. Soredia on surface of lobes..... **Flavoparmelia caperata**
 2. Isidia on surface of lobes pustulate, sometimes breaking open to appear sorediate **Flavoparmelia baltimorensis**
1. Lobes narrower, 1-3 mm wide.
 3. With large capitate soralia; alpine **Arctoparmelia incurva**
 3. With marginal soralia..... **Usnocetraria (Allocetraria) oakesiana**

R3 FOLIOSE; YELLOW-GREEN; ISIDIATE

1. Lobes 3-10 mm wide; isidia pustulate, sometimes breaking open to appear sorediate **Flavoparmelia baltimorensis**
1. Lobes 1-3 mm wide; isidia not breaking open.
 2. Lower surface black with brown only at the margins..... **Xanthoparmelia conspersa**
 2. Lower surface uniformly tan to dark brown **Xanthoparmelia plittii**

R4 FOLIOSE; YELLOW-GREEN; NEITHER

1. Lower surface white..... **Arctoparmelia centrifuga**
1. Lower surface not white.
 2. Lower surface uniformly tan to dark brown.
 3. K+ yellow changing to orange-red (stictic and norstictic acid) **Xanthoparmelia cumberlandia**
 3. K+ yellow changing to blood red (salazinic acid) **Xanthoparmelia viriduloumbrina**
 2. Lower surface black, except brownish at margin.
 4. K+ yellow changing to orange red (stictic and norstictic acid)..... **Xanthoparmelia angustiphylla**
 4. K+ yellow changing to blood red (salazinic acid) **Xanthoparmelia hypofusca (tasmanica)**

R5 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES BROAD

(for *Peltigera* species found on soil over rock, see **Soil Key S2**).

1. Attached to substrate by single holdfast (umbilicate).
 2. Indistinctly umbilicate; small lobes 1.0 cm or less crowded together on wet rocks; upper surface with black dots (perithecia); turns green when wet.....**Dermatocarpon luridum**
 2. Distinctly umbilicate; lobes usually >1.0 cm wide.
 3. Upper surface with black dots (perithecia); apothecia never found .. **Dermatocarpon miniatum** s.lat.
 3. Upper surface without black dots (perithecia); apothecia common see **Rock Key R15**; *Lasallia* and *Umbilicaria*.
1. Attached to substrate by rhizines or tomentum.
 4. Coarse granular soredia present..... **Nephroma parile**
 4. Nonsorediate.
 5. Lower surface tomentose.
 6. Apothecia located on lower surface of lobe tips **Nephroma resupinatum**
 6. Apothecia located on upper surface..... **Lobaria quercizans**
 5. Lower surface not tomentose.
 7. Margins of lobes lobulate to dentate-isidiate..... **Nephroma helveticum**
 7. Margins of lobes entire **Nephroma bellum**

R6 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; SOREDIATE

1. Medulla orange-red; soredia coarse, sometimes isidioid **Phaeophyscia rubropulchra**
1. Medulla not orange-red.
 2. Soralia marginal and isidioid.
 3. Thallus brownish or greenish mineral-gray; lobes usually 0.5-1.5 mm wide ..**Phaeophyscia adiaetola**
 3. Thallus blackish mineral-gray; lobes usually <0.5 mm wide **Phaeophyscia sciastra**
 2. Soralia not isidioid-like.
 4. Bluish-black hypothallus extending beyond lobe edges.
 5. Soredia as decorticated, small or elongate squamules along the lobe margins; thallus ashen blue, sometimes with yellowish-tan tinge..... **Pannaria conoplea**
 5. Soredia coarsely granular; thallus brownish.....**Fuscopannaria ahlneri**
 4. Bluish-black hypothallus lacking.
 6. Lobes scabrose or pruinose; soredia marginal **Physconia detersa** s.lat.
 6. Lobes not pruinose.
 7. Thallus light or dark brownish mineral-gray, turning green when wet; soralia capitate.....
..... **Phaeophyscia pusilloides**
 7. Thallus brown, not turning green when wet; soredia are whitish when rubbed off.
 8. Soredia diffuse over upper surface, mixed with tiny isidia.....
..... **Melanelixia (Melanelia) subaurifera**
 8. Soredia delimited.
 9. Thallus dull; soralia mainly terminal on short ascending lobe tips... **Melanelia sorediata**
 9. Outer thallus lobes shiny; soralia laminal and submarginal, appearing as blackened mounds if not abraded..... **Melanelia disjuncta**

R7 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; ISIDIATE

- 1. Medulla orange-red; soredia coarse, sometimes isidioid **Phaeophyscia rubropulchra**
- 1. Medulla white.
 - 2. Thallus light to dark brownish mineral-gray, turning green when wet.
 - 3. Thallus brownish or greenish mineral-gray; lobes usually 0.5-1.5 mm wide .. **Phaeophyscia adiaetola**
 - 3. Thallus blackish mineral-gray; lobes usually <0.5 mm wide..... **Phaeophyscia sciastra**
 - 2. Thallus brown, not turning green when wet.
 - 4. Isidia tiny and mixed with diffuse laminal soredia that are whitish when rubbed off **Melanelixia (Melanelia) subaurifera**
 - 4. Isidia larger and not mixed with soredia.
 - 5. Isidia granular to elongated and inflated, spatulate; lower surface tan to dark brown **Melanohalea (Melanelia) exasperatula**
 - 5. "Isidia" really branching lobules; lower surface black **Melanelia panniformis**

R8 FOLIOSE; GRAYISH BROWN TO BROWN; LOBES NARROW; NEITHER

- 1. Lower surface with a blue-black tomentum; red-brown apothecia common..... **Pannaria rubiginosa**
- 1. Blue-black tomentum lacking.
 - 2. Thallus dark brown.
 - 3. Margins of lobes with pycnidial projections and white pseudocyphellae..... **Melanelia hepatizon**
 - 3. Marginal pycnidial projections and white pseudocyphellae lacking.
 - 4. Upper surface of main lobes covered with numerous, fine branching lobules **Melanelia panniformis**
 - 4. Upper surface smooth and shiny with black, immersed pycnidia..... **Melanelia stygia**
 - 2. Thallus light brown to mineral-gray.
 - 5. Lobes without reticulate white markings; rims of apothecia lobulate; lobe tips usually pruinose..... **Anaptychia palmulata**
 - 5. Lobes with linear white markings.
 - 6. White markings laminal and marginal; medulla K+ red **Parmelia omphalodes**
 - 6. White markings marginal only; medulla K-..... **Parmelia neodiscordans**

R9 FOLIOSE; MINERAL-GRAY; LOBES BROAD

(For *Peltigera* species found on soil on rocks, see **Soil Key S2**).

- 1. Sorediate.
 - 2. No white spots (pseudocyphellae) on upper surface **Myelochroa aurulenta**
 - 2. Pseudocyphellae on upper surface **Cetrelia olivetorum** s.lat.
- 1. Nonsorediate.
 - 3. Isidiate, often apically ciliate..... **Parmotrema crinitum**
 - 3. Nonisidiate..... **Lobaria quercizans**

R10 FOLIOSE; MINERAL-GRAY; LOBES NARROW; SOREDIATE

- 1. Lobes hollow and inflated; soredia labriform **Hypogymnia physodes**
- 1. Lobes solid.
 - 2. Black lower surface.
 - 3. Upper surface of lobe tips weakly reticulately ridged and white spotted; soredia laminal **Parmelia sulcata**
 - 3. Upper surface lacking white markings and spots.
 - 4. With linear, suberect lobes bearing cilia on margins; soredia laminal **Everniastrum catawbiense**
 - 4. Lobes appressed; cilia short or lacking.
 - 5. Upper surface scabrose or pruinose, at least at lobe tips; soredia marginal **Physconia detersa** s.lat.
 - 5. Upper surface plain, not pruinose.
 - 6. Medulla orange-red to red **Phaeophyscia rubropulchra**
 - 6. Medulla white or pale yellow.
 - 7. Lobes relatively wide, 2-5 mm; soredia in broad diffuse patches on surface **Myelochroa aurulenta**
 - 7. Lobes narrower, 0.5-1.5 mm.
 - 8. Soredia coarse and isidioid..... **Phaeophyscia adiastrum**
 - 8. Soredia powdery, round and delimited (capitate)..... **Phaeophyscia pusilloides**
 - 2. White or tan lower surface.
 - 9. Cilia present on lobe margins (not to be confused with projecting rhizines, see 13a below).
 - 10. Lobes with helmet-shaped inflated tips, sorediate on the inside **Physcia adscendens**
 - 10. Lobes with terminal, labriform soralia; near seashore **Physcia tenella**
 - 9. Cilia lacking.
 - 11. Margins of lobes breaking up into granular soredia.
 - 12. Lobes narrow (0.1-0.4 mm) and linear, surface even, without mottled white spots; medulla K+ yellow..... **Physcia subtilis**
 - 12. Lobes broader (0.3-1.0 mm) with mottled white spots on surface; medulla K- **Physcia millegrana**
 - 11. Margins of lobes not breaking up into granular soredia.
 - 13. Laterally projecting rhizines at lobe margins; lobes linear and flat with apical or marginal soredia; at least some of lower surface fibrous **Heterodermia speciosa**
 - 13. Laterally projecting rhizines absent; lower surface cortical.
 - 14. Upper surface with mottled white spots; soralia capitate, at least in part; medulla K+ yellow..... **Physcia caesia**
 - 14. Upper surface uniform, soralia mostly marginal and lip-shaped, sometimes laminal and crateriform; medulla K-..... **Physcia dubia**

R11 FOLIOSE; MINERAL-GRAY; LOBES NARROW; ISIDIATE

- 1. White markings or spots on upper surface.
 - 2. Tips of lobes with white spots (pseudocyphellae) **Punctelia rudecta**
 - 2. Tips of lobes with reticulately ridged, white markings.
 - 3. Squarrosely branched rhizines present..... **Parmelia squarrosa**
 - 3. Rhizines unbranched or branched simple dichotomously, not squarrosely branched..... **Parmelia saxatilis**
- 1. Upper surface plain.
 - 4. With isidia only, medulla white..... **Imshaugia aleurites**
 - 4. Soredia coarse granules, sometimes isidioid; medulla red-orange..... **Phaeophyscia rubropulchra**

R12 FOLIOSE; MINERAL-GRAY; LOBES NARROW; NEITHER

- 1. Margins of lobes and apothecia lobulate **Anaptychia palmulata**
- 1. Margins of lobes and apothecia not lobulate.
 - 2. White to tan lower surface; upper surface with mottled white spots **Physcia phaea**
 - 2. Black to dark brown lower surface (sometimes tan at margin).
 - 3. Lobes hollow, appearing inflated **Hypogymnia physodes**
 - 3. Lobes solid, not appearing inflated, with white linear markings.
 - 4. White markings laminal and marginal; medulla K+ red **Parmelia omphalodes**
 - 4. White marking marginal; medulla K- **Parmelia neodiscordans**

R13 FOLIOSE; (GREENISH) BLACK TO SLATE-GRAY (GELATINOUS); ISIDIATE

(For *Phaeophyscia sciastra*, a nongelatinous, dark gray to black, foliose lichen, see **Rock Key R6 and R7**).

- 1. White tomentum on lower surface.
 - 2. Thallus slate-gray; isidia cylindrical **Leptogium burnetiae**
 - 2. Thallus dark gray to black; isidia granular **Leptogium saturninum**
- 1. Tomentum lacking.
 - 3. Thallus bluish to brownish slate-colored.
 - 4. Lobes broad and rotund; bluish slate **Leptogium cyanescens**
 - 4. Lobes narrow, apically dissected and isidiate; brownish (may appear blackish to naked eye) **Leptogium lichenoides**
 - 3. Thallus dark gray to black.
 - 5. Thallus distinctly ridged and pustulate; isidia cylindrical in part **Collema furfuraceum**
 - 5. Thallus surface generally even; isidia not cylindrical.
 - 6. Isidia squamiform, at least in part; rare **Collema flaccidum**
 - 6. Isidia large and spherical **Collema fuscovirens**

R14 FOLIOSE; (GREENISH) BLACK TO SLATE-GRAY (GELATINOUS); NEITHER

- 1. Collected submerged on rocks in streams **Peltigera hydrothyria**
- 1. Not found submerged in streams.
 - 2. Thallus greenish black **Collema nigrescens**
 - 2. Thallus bluish to brownish slate-colored.
 - 3. Lobes narrow, apically dissected to isidioid **Leptogium lichenoides**
 - 3. Lobes broader, not apically dissected **Leptogium corticola**

R15 UMBILICATE

1. Thallus yellowish green; apothecia flesh-colored; thalli crowded together, appearing crustose.....
.....**Rhizoplaca subdiscrepans**
1. Thallus not yellowish green; apothecia not flesh-colored.
 2. Upper surface with black dots (perithecia)..... **Dermatocarpon miniatum** s.lat.
 2. Upper surface without black dots.
 3. Upper surface with papillate, cylindrical, or leaf-like isidia.....**Umbilicaria deusta**
 3. Upper surface without isidia.
 4. Upper surface strongly pustulate.
 5. Lower surface brown to tan..... **Lasallia papulosa**
 5. Lower surface black **Lasallia pennsylvanica**
 4. Upper surface not strongly pustulate.
 6. Upper surface reticulately ridged towards center; some long rhizines on lower surface.....
.....**Umbilicaria proboscidea**
 6. Upper surface not reticulately ridged.
 7. Lower surface black, covered with dense mat of short black rhizines; upper surface plain
 8. Upper surface brownish.....**Umbilicaria mammulata**
 8. Upper surface whitish gray.
 9. Found in temperate habitats **Umbilicaria americana**
 9. Found in alpine and subalpine habitats..... **Umbilicaria vellea**
 7. Lower surface not covered with dense mat of black rhizines.
 10. Lower surface with irregular plated and/or flattened rhizines.
 11. Margins finely perforated and lacerated; deeply grooved on upper surface.....
..... **Umbilicaria torrefacta**
 11. Margins entire; no cracks on upper surface**Umbilicaria muehlenbergii**
 10. Lower surface smooth and bare.
 12. Upper surface rugose with an intricate pattern of ridges ...**Umbilicaria hyperborea**
 12. Upper surface smooth; thallus dissected and irregularly ascending.....
.....**Umbilicaria polyphylla**

R16 SQUAMULOSE

1. Conspicuous blue-black hypothallus surrounding squamules with isidia on margins. **Parmeliella triptophylla**
1. Blue-black hypothallus and isidia lacking.....(see **Soil Key S4**) *Cladonia* spp.

R17 FRUTICOSE; YELLOW-GREEN

1. Nonsorediate.....(see **Soil Key S5**) *Cladonia* spp.
1. Sorediate.
 2. Soredia forming broad white patches over the exposed medulla, especially at lobe tips
.....**Ramalina pollinaria**
 2. Soredia not forming broad white patches.
 3. Soredia farinose and restricted to delimited lateral soralia; lobe tips not finely divided.....
.....**Ramalina farinacea**
 3. Soredia granular, irregularly spreading over adjacent area; lobe tips finely divided.....
.....**Ramalina intermedia**

R18 FRUTICOSE; BROWN

1. On rocks in or near the water of lakes and streams; appearing as "furry" mats at waterline.. **Ephebe lanata**
1. Not associated directly with water(see **Tree Key T20**) *Bryoria* spp.

R19 FRUTICOSE; WHITE TO GRAYISH WHITE

1. Stalks lacking phyllocladia.
 2. Stalks simple, topped with a reddish-brown apothecia **Baeomyces rufus**
 2. Stalks intricately branched **Cladonia rangiferina**
1. Branches or stalks covered with lobule-like, whitish phyllocladia.
 3. Soredia in capitate soralia **Stereocaulon pileatum**
 3. Nonsorediate.
 4. Pseudopodetia covered with thick spongy tomentum **Stereocaulon tomentosum**
 4. Tomentum, if present, not thick and spongy.
 5. Phyllocladia cylindrical and branching (coralloid), at least in part.
 6. Prostrate-decumbent, forming dorso-ventral mats; apothecia and cephalodia rare; gray tomentum often present; phyllocladia incised squamiform to coralloid squamiform **Stereocaulon saxatile**
 6. More erect, not prostrate-decumbent.
 7. Phyllocladia partly grain-like and partly coralloid; apothecia usually common **Stereocaulon intermedium**
 7. Phyllocladia not grain-like, usually all coralloid.
 8. Apothecia common **Stereocaulon dactylophyllum**
 8. Apothecia rare **Stereocaulon subcoralloides**
 5. None of phyllocladia coralloid.
 9. Prostrate-decumbent, forming dorso-ventral mats; apothecia and cephalodia rare; gray tomentum often present; phyllocladia incised squamiform **Stereocaulon saxatile**
 9. More erect, not prostrate-decumbent.
 10. Cephalodia conspicuous; dark brown; phyllocladia grain-like, usually on soil **Stereocaulon paschale**
 10. Cephalodia usually not conspicuous; phyllocladia not all grain-like.
 11. Apothecia uncommon; phyllocladia vary from grain-like to lobate squamiform **Stereocaulon glaucescens**
 11. Apothecia usually common; phyllocladia digitate squamiform **Stereocaulon dactylophyllum**

ON SOIL

S1 FOLIOSE; YELLOW-GREEN; LOBES BROAD

1. Lobes very broad, 20-30 mm; lower surface black centrally and tan at margins; rare... **Nephroma arcticum**

S2 FOLIOSE; BROWN TO MINERAL-GRAY; LOBES BROAD

1. Apothecia round, sunken in pits in the upper surface; rare **Solorina saccata**
1. Apothecia not present, or if present not sunken in pits in the upper surface.
 2. Upper surface spotted by numerous gray to brown, peltate, often finely crenate cephalodia; algal layer of thallus bright green, consisting of green algae.
 3. Lower surface with distinct, grayish brown, marginally paler veins **Peltigera leucophlebia**
 3. Lower surface lacking distinct veins, dark centrally with paler margins **Peltigera apthosa**
 2. Upper surface without cephalodia; algal layer of thallus dark, composed of cyanobacteria.
 4. Upper surface distinctly isidiate or margins finely lobulate.
 5. Isidia scattered on upper surface; lobe margins flat and even, without lobules.
 6. Isidia fine, basally constricted, granular, flattened, or weakly coralloid **Peltigera evansiana**
 6. Isidia peltate **Peltigera lepidophora**
 5. No isidia on upper surface; lobe margins or cracks with small lobules or lobule-like isidia.
 7. Lower surface without veins but with dark tomentum demarcating pale tomentose spots **Peltigera elisabethae**
 7. Lower surface with typical dark, raised veins, paler at margins **Peltigera praetextata**
 4. Upper surface and margins lacking isidia, although coarse lobules or regeneration squamules may be present.

8. Upper surface, at least at lobe tips, distinctly tomentose.
9. Thallus small; (lobes usually <4 cm) with small lobes (up to 10 mm broad) that in young specimens are regularly rounded and cupped and bear coarsely granular soredia in round laminal soredia; older specimens are nonsorediate with apothecia borne on ascending, revolute lobes..... **Peltigera didactyla** s.lat.
9. Thallus larger, with broader lobes that are always nonsorediate.
10. Lower surface veinless..... **Peltigera malacea**
10. Lower surface with distinct veins.
11. Lobes <15 mm broad; thallus thick and brittle with margins often strongly undulating, rarely downward curving..... **Peltigera rufescens**
11. Lobes broad, (13)20-50 mm; thallus thin and pliable with margins mostly down curving.
12. Tomentum extending several cm from margins with thallus center often rough or subpruinose, not shiny and smooth; rhizines finely frayed and becoming confluent; lobes (15)20-30 mm broad..... **Peltigera canina**
12. Tomentum usually present only close to lobe margin; thallus center smooth and often shiny; rhizines slender and unbranched to slightly frayed towards tips, not confluent; lobes on average either larger or smaller than 20-30 mm.
13. Lobes (15)25-50 mm broad, thin and papery; rhizines very long (to 15 mm), often tomentose..... **Peltigera membranacea**
13. Lobes (13)15-25 mm broad, moderate in thickness; rhizines to about 5 mm long **Peltigera praetextata**
8. Upper surface of lobes not tomentose.
14. Thallus small (<4 cm) with small lobes (up to 10 mm broad) that in young specimens are regularly rounded and cupped and bear coarsely granular soredia in round laminal soralia; older specimens are nonsorediate with apothecia borne on ascending, revolute, nonsorediate lobes **Peltigera didactyla** s.lat.
14. Thallus larger, with broader lobes that are always nonsorediate.
15. Lower surface with well-defined, acutely branching narrow, raised veins **Peltigera degenii**
15. Lower surface with white areas between relatively flat and broad, rounded branching veins, or veins completely lacking.
16. Upper surface distinctly roughened and scabrose appearing dull.... **Peltigera scabrosa**
16. Upper surface smooth, not scabrose, often shiny.
17. Lower surface without veins but with dark tomentum demarcating pale tomentose spots: often with lobules on margins of lobes **Peltigera elisabethae**
17. Low veins discernible on lower surface; marginal lobules absent.
18. Apothecia marginal, sessile, or on very short very short lobes, disks flat **Peltigera horizontalis**
18. Apothecia absent or raised on narrow lobes; disks saddle-shaped.
19. Apothecia grayish brown to black; lobes rather narrow, 5-15 mm..... **Peltigera neckeri**
19. Apothecia reddish brown; lobes 10-30(40) mm broad.
20. Lobes 20-40 mm broad; rhizines long, slender and unbranched **Peltigera neopolydactyla**
20. Lobes 10-20 mm broad; rhizines short (<5mm).
21. Rhizines in concentric arcs near margins; pale areas between veins generally elongate and neatly radiating **Peltigera horizontalis**
21. Rhizines randomly arranged near thallus margin; pale areas between veins generally rounded or irregular, not distinctly radiating **Peltigera polydactylon**

S3 FOLIOSE; (GREENISH) BLACK TO SLATE-GRAY; LOBES NARROW

- 1. Thallus lobes with swollen and plicate margins **Collema tenax**
- 1. Thallus with margins apically dissected to isidiate.
 - 2. Lobes tiny, to 0.2 mm broad, flattened to nearly round in cross section, appearing as clustered coralloid growths; rare..... **Leptogium tenuissimum**
 - 2. Lobes 1-4 mm broad, with margins finely lobulate..... **Leptogium lichenoides**

S4 SQUAMULOSE

- 1. Squamules gray or blackish; apothecia reddish brown..... **Protopannaria pezizoides**
- 1. Squamules yellowish, greenish gray, or brown; included below are those species commonly forming large squamulose mats without any podetia; many other *Cladonia* species will form small patches without podetia and cannot be easily identified.
 - 2. Squamules finely divided and incised; apothecia, if present, sessile or on very short podetia (<1.0 mm). **Cladonia caespiticia**
 - 2. Squamules not finely divided.
 - 3. Squamules brownish to greenish above, whitish below, often forming compact heads; C+ green **Cladonia strepsilis**
 - 3. Squamules greenish above, whitish below; C-.
 - 4. Squamules large and irregular, up to 7 mm x 25 mm, upper surface often rugose; K+ weakly yellow **Cladonia turgida**
 - 4. Squamules more uniformly strap-shaped, branching dichotomously, up to 4 mm wide, upper surface smooth; K+ yellow changing to red **Cladonia polycarpoides**

S5 FRUTICOSE; TUFTED; YELLOW-GREEN

- 1. Thallus lobes flattened and strap-shaped; alpine.
 - 2. Lobes smooth to faintly rugose, curled into channels **Flavocetraria cucullata**
 - 2. Lobes deeply rugose and more flattened **Flavocetraria nivalis**
- 1. Thallus branches round in cross-section; widespread.
 - 3. Surface of branches dull and fibrous, lacking a cortex.
 - 4. Main branches 2-5 mm in diameter, inflated and irregularly perforated..... **Cladonia boryi**
 - 4. Main branches <2 mm in diameter, not inflated or perforated.
 - 5. Thallus forming compact, rounded heads **Cladonia stellaris**
 - 5. Thallus forming extensive entangled colonies.
 - 6. Apical branches mostly in pairs.
 - 7. Axils of branches all closed; K-..... **Cladonia subtenuis**
 - 7. Axils of branches both open and closed; K+ **Cladonia terra-novae**
 - 6. Apical branches mostly in 3's and 4's with some 2's.
 - 8. Apical branches curved in one direction, mostly in 3's, with 2's not uncommon; widespread.. **Cladonia arbuscula** s.lat.
 - 8. Apical branches not curved in one direction but showing wide angulation, mostly in 4's with 2's rare; sprawling on sandy soil; southern Maine **Cladonia submitis**
 - 3. Surface of branches shiny and corticate.
 - 9. Tips of podetia often flaring into shallow cups..... **Cladonia amaurocraea**
 - 9. Tips of podetia pointed, not cup-forming **Cladonia uncialis**

S6 FRUTICOSE; TUFTED; BROWN

1. Branches flattened in cross-section.
 2. Forming dense tufts with many narrow, finely branched (<1 mm) apical branches ... **Cetrariella delisei**
 2. Apical branches wider (>1 mm) and more coarsely branched.
 3. White, marginal pseudocyphellae poorly formed **Cetraria islandica ssp. crispiformis**
 3. Scattered or continuous, white, linear, marginal pseudocyphellae present and conspicuous.
 4. Marginal projections blunt-tipped, uniform width, frequently branched; alpine **Cetraria laevigata**
 4. Marginal projections tapering to a point; infrequently branched; boreal and temperate **Cetraria arenaria**
1. Branches round in cross-section.
 5. Thallus uniformly dark brown; numerous apical spiny projections present.
 6. Lobes c. 0.5 mm wide, nearly round in cross section; pseudocephellae indistinct.... **Cetraria muricata**
 6. Lobes c 1.0 mm wide, flattened at axils; pseudocephellae obvious, in depressions.. **Cetraria aculeata**
 5. Thallus not uniformly dark brown, lacking apical spiny projections.
 7. Thallus hollow.
 8. Blunt channeled tips actually multi-branched proliferations of older cups... **Cladonia multiformis**
 8. No evidence of proliferated cups near center of tufted thallus; tips not channeled **Cladonia furcata**
 7. Thallus solid.
 9. Dichotomously branched, with no distinct main stems; alpine **Sphaerophorus fragilis**
 9. Main branches distinct, with numerous side branches; rare..... **Sphaerophorus globosus**

S7 FRUTICOSE; TUFTED; WHITE TO GRAYISH OR GREENISH WHITE

1. Branches covered with lobule-like phyllocladia (See also **Rock Key R19**).
 2. Primary crustose thallus persistent, of warty or elongated and incised phyllocladia, usually with abundant dark cephalodia interspersed among them; pseudopodetia 1-2 cm tall..... **Stereocaulon condensatum**
 2. Primary thallus lacking; pseudopodetia 2-6 cm tall.
 3. Tomentum on branches thick and conspicuous; phyllocladia crenate squamiform..... **Stereocaulon tomentosum**
 3. Tomentum less conspicuous or lacking; phyllocladia various.
 4. Cephalodia abundant, dark brown and scabrose; phyllocladia small and grain-like **Stereocaulon paschale**
 4. Cephalodia inconspicuous; phyllocladia verrucose to crenate-squamiform; alpine..... **Stereocaulon alpinum**
1. Branches of stalks smooth.
 5. Surface dull and fibrous, without a cortex.
 6. Basal cartilaginous layer of podetia coal black demarcating scattered overlying whitish patches..... **Cladonia stygia**
 6. Basal cartilaginous layer of podetia gray to brownish **Cladonia rangiferina**
 5. Surface corticate, usually shiny.
 7. Thallus hollow.
 8. Blunt channeled tips actually multi-branched proliferations of older cups... **Cladonia multiformis**
 8. No evidence of proliferated cups near center of tufted thallus; tips not channeled **Cladonia furcata**
 7. Thallus solid.
 9. Dichotomously branched, with no distinct main stems; alpine **Sphaerophorus fragilis**
 9. Main branches distinct, with numerous side branches; rare..... **Sphaerophorus globosus**

S8 FRUTICOSE; PODETIA; RED (PINK) APOTHECIA OR PYCNIDIA

- 1. Podetia hollow; primary thallus squamulose.
 - 2. Podetia sorediate.
 - 3. Forming cups.
 - 4. Primary squamules large, 5-15 mm in diameter; K+ or K-.
 - 5. Podetia tall (2.5-8.5 cm) and slender, with longitudinal cracks and fissures; squamules only sometimes sorediate; K- **Cladonia sulphurina**
 - 5. Podetia often short and poorly formed, sometimes absent, but can be up to 4 cm tall, lacking longitudinal cracks and furrows; squamules always sorediate on undersides and margins; K+ yellow **Cladonia digitata**
 - 4. Primary squamules smaller, <5 mm; K-.
 - 6. Podetia tall (2.5-8.5cm) and slender, with longitudinal cracks and fissures; squamules nearly 5 mm in diameter **Cladonia sulphurina**
 - 6. Podetia without longitudinal cracks and fissures; or such cracks and fissures rare.
 - 7. Cups tall and slender, 2-4(8) cm; soredia farinose; red pycnidia common but apothecia rare; squamules small (2-4 mm) or absent..... **Cladonia deformis**
 - 7. Cups short, 1-2(4) cm; soredia granular (do not confuse with finely verrucose areolae of *Cladonia coccifera*); red pycnidia and apothecia common..... **Cladonia pleurota**
 - 3. Not forming cups.
 - 8. Primary squamules large, >5 mm **Cladonia digitata**
 - 8. Primary squamules small, <5 mm.
 - 9. Apothecia sessile on the primary squamules or on the tip of small podetia (up to 0.7 cm tall); primary squamules persistent, crenate or incised, usually sorediate, up to 4 mm wide **Cladonia incrassata**
 - 9. Podetia larger; squamules small and poorly developed, up to 4 mm but usually less, generally sorediate.
 - 10. Podetia sometimes branched, with large corticate area remaining; soredia granular **Cladonia floerkeana**
 - 10. Podetia usually simple and pointed, largely ecorticate and with farinose soredia **Cladonia macilenta**
 - 2. Podetia without soredia, (although areolae in *Cladonia coccifera* may be confused with granular soredia); apothecia common.
 - 11. Forming cups that are usually finely verrucose areolate in upper part; usually alpine..... **Cladonia coccifera**
 - 11. Not forming cups; apothecia large and usually red but may be pale yellowish orange; widespread... **Cladonia cristatella**
- 1. Podetia (pseudopodetia) solid; primary thallus crustose.
 - 12. Apothecia pink, large, and spherical..... **Dibaeis baeomyces**
 - 12. Apothecia reddish brown, small, and flattened **Baeomyces rufus**

S9 FRUTICOSE; PODETIA; BROWN OR NO APOTHECIA; SOREDIATE

- 1. Podetia forming distinct cups.
 - 2. Cups deep, stout to elongate, proliferating on edges or not.
 - 3. Soredia granular **Cladonia chlorophaea** s.lat.
 - 3. Soredia farinose, cups not proliferating.
 - 4. Podetia slender; cups <5 mm wide; sorediate throughout..... **Cladonia fimbriata**
 - 4. Podetia with wider cups, often 5 or more mm wide; soredia largely restricted to upper third of podetia **Cladonia innominata (humilis)**
 - 2. Cups shallow, usually small, or cups open, funnel-like.
 - 5. Cups open, funnel-like with inrolled margins soredia farinose **Cladonia cenotea**
 - 5. Cups not funnel-like, without inrolled margins.
 - 6. Soredia granular; cups with dentate or proliferating margins..... **Cladonia rei**
 - 6. Soredia farinose; cups, where present, tiny and poorly formed.
 - 7. Primary squamules conspicuous, 2-5 mm, with podetia arising from centers; podetia <3 cm long, sorediate throughout..... **Cladonia coniocraea** s.lat.
 - 7. Primary squamules usually disappearing; podetia much longer, 2-12 cm, sorediate only near the tip, often in definite patches..... **Cladonia cornuta**
- 1. Podetia not forming cups or only forming them rarely.
 - 8. Podetia unbranched, <5 cm tall.
 - 9. Primary squamules margins granular sorediate podetia <1 cm tall..... **Cladonia parasitica**
 - 9. Primary squamules not granular sorediate; podetia >1 cm tall.
 - 10. Primary squamules conspicuous, 2-7 mm long.
 - 11. Podetia decorticate, with farinose soredia, arising from center of primary squamules **Cladonia coniocraea** s.lat.
 - 11. Podetia sparsely granular sorediate, densely or loosely covered with squamules similar to the primary squamules **Cladonia acuminata**
 - 10. Primary squamules small, <2 mm long.
 - 12. Podetia blunt, with farinose soredia merging at base with coarse, isidioid granules and minute squamules **Cladonia cylindrica**
 - 12. Soredia granular throughout podetial extent **Cladonia ramulosa**
 - 8. Podetia long and slender, often branched several times, 3-12 cm tall.
 - 13. Open axils; much branched.
 - 14. Soredia coarsely granular **Cladonia scabriuscula**
 - 14. Soredia farinose **Cladonia farinacea**
 - 13. Closed axils; little branched.
 - 15. Mostly corticate; farinose soredia only near the tip, often in definite rounded patches **Cladonia cornuta**
 - 15. Mostly decorticate and covered with farinose soredia..... **Cladonia subulata**

S10 FRUTICOSE; PODETIA; BROWN OR NO APOTHECIA; NONSOREDIAE

- 1. Primary thallus crustose and persistent.
 - 2. Podetia (pseudopodetia) solid..... **Baeomyces rufus**
 - 2. Podetia hollow and inflated..... **Pycnothelia papillaria**
- 1. Primary thallus squamulose, sometimes disappearing at maturity.
 - 3. Forming cups.
 - 4. Cups proliferating from the center.
 - 5. Cups gradually expanding from stalks, bowl-like; podetia usually 1-2 mm at narrowest..... **Cladonia verticillata**
 - 5. Cups shallow, like flat saucers; podetia delicate, usually <1 mm wide at narrowest **Cladonia rappii**
 - 4. Cups proliferating from the margins or not at all.
 - 6. Cups coarse and stout, covered with greenish areoles and peltate squamules **Cladonia pyxidata**
 - 6. Cups gradually tapering, areoles not conspicuous.
 - 7. Centers of cups closed.
 - 8. Cups large, >5 mm wide, with margins dentate or proliferating; apothecia common..... **Cladonia gracilis ssp. turbinata**
 - 8. Cups smaller, usually <5 mm wide, sometimes absent; podetia slender and tall.
 - 9. Podetia robust, 1.5-3 mm thick, 6-10 cm tall..... **Cladonia maxima**
 - 9. Podetia thin, 1-1.5 mm thick, 3-6 cm tall **Cladonia gracilis ssp. gracilis**
 - 7. Centers of cups open or perforated.
 - 10. Cups perforated.
 - 11. Podetia yellowish green, richly branched..... **Cladonia amaurocraea**
 - 11. Podetia greenish white to brown, variously branched; cup membrane perforated with holes **Cladonia multiformis**
 - 10. Cups open and gaping.
 - 12. Podetia finely and densely squamulose..... **Cladonia squamosa**
 - 12. Podetia with squamules either coarse or sparse.
 - 13. Basal squamules large, 5-25 mm long; podetia lacerate and perforate **Cladonia turgida**
 - 13. Basal squamules small, 1-4 mm, or lacking.
 - 14. Podetia relatively short, <5 cm, usually with numerous coarse squamules **Cladonia atlantica**
 - 14. Podetia usually taller, to 10 cm, with few squamules..... **Cladonia crispata**

3. Not forming cups.
15. Podetia barely developed, very short, or lacking including those species commonly forming large squamulose mats with few if any podetia; many other *Cladonia* species will form small patches without podetia and cannot be easily identified; see **Soil Key S4**, couplets 2-4.
15. Podetia simple to branched, usually well developed.
16. Podetia richly branched; axils open.
17. Yellowish green..... (see **Soil Key S5**)
17. Greenish white to brown.
18. Blunt channeled tips actually multi-branched proliferations of older cups..... **Cladonia multiformis**
18. No evidence of proliferated cups near center of thallus; tips not channeled..... **Cladonia furcata**
16. Podetia simple or moderately branched; axils open or closed.
19. Podetia finely and densely squamulose..... **Cladonia squamosa**
19. Podetia with squamules either coarse or sparse.
20. Primary squamules conspicuous and large, 4-25 mm long.
21. Podetia lacerate and perforate; squamules very large, often free of substrate..... **Cladonia turgida**
21. Podetia entire; squamules 5-15 mm long and strap-shaped; attached to soil
22. Squamules 5-15 mm long; K+ yellow changing to red..... **Cladonia polycarpoides**
22. Squamules mostly near 5 mm long; K-..... **Cladonia sobolescens**
20. Primary squamules smaller, 1-4 mm long, or absent.
23. Podetia bone-white, pointed, and wormlike; no squamules; alpine..... **Thamnotia subuliformis**
23. Podetia not bone-white, pointed and wormlike.
24. Podetia tall, 3-10 cm.
25. Podetia moderately branched, often tipped with apothecia..... **Cladonia crispata**
25. Podetia unbranched or sparsely branched, ending in a point, cup, or larger apothecia.
26. Podetia robust, 1.5-3 mm thick, 6-10 cm tall..... **Cladonia maxima**
26. Podetia thin, 1-1.5 mm thick, 3-6 mm tall..... **Cladonia gracilis ssp. gracilis**
24. Podetia shorter, usually <3 cm.
27. Apothecia tan or flesh-colored; rare..... **Cladonia botrytes**
27. Apothecia brown to black.
28. Apothecia small, <width of podetia, usually covered with coarse squamules..... **Cladonia atlantica**
28. Apothecia larger, as wide as or wider than podetia; podetial squamules small or lacking.
29. Podetia usually unbranched; apothecia smaller than or only slightly exceeding width of podetia..... **Cladonia brevis**
29. Podetia branched apically; sides markedly fissured and torn; apical apothecia clearly wider than subtending podetia..... **Cladonia cariosa**

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common names are listed only for species that can be identified by naked eye

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Bryoria - Horsehair Lichens [5] - T20
Candelaria - Candleflame Lichens [2] - T2
Cetraria - Iceland Lichens [5] - S6
Cetrariella - Snowbed Iceland Lichens - S6
Cetrelia - Sea-Storm Lichens [2] - T7; R9
Cladonia - Cup Lichens, Reindeer Lichens [52] - S5,6,7,8,9,10; R19
Collema - Jelly Lichens [7] - T14,15; R13,14; S3
Dermatocarpon - Stippleback Lichens [2] - R5,15
Dibaeis - Pink Earth - S8
Ephebe - Rockshag Lichens - R18
Evernia - Oakmoss Lichen - T19
Everniastrum - Powder-Tipped Antler Lichens - T11; R10
Flavocetraria - Snow Lichens [2] - S5
Flavoparmelia - Greenshield Lichens [2] - R2,3; T2
Fuscopannaria - Brown Shingle Lichens - T4; R6
Heterodermia - Fringe Lichens [2] - T11,12,13; R10
Hypocenomyce - Clam Lichens - T16
Hypogymnia - Tube Lichens [3] - T10; R10,12
Imshaugia - Imshaug's Starburst Lichens [2] - T12,13; R11
Lasallia - Toadskin Lichens [2] - R15
Leptogium - Jellyskin Lichens [8] - T14,15,16; R13,14; S3
Lobaria - Lungwort [3] - T3,7,9; R5,9
Melanelia - Brownshield Lichens, Camouflage Lichens [5] - T4,5,6; R6,7,8
Melanelixia - Brownshield Lichens, Camouflage Lichens [2] - R6,7; T4,5
Melanohalea - Brownshield Lichens, Camouflage Lichens [3] - T5,6 R7
Menegazzia - Tree Flute - T10
Myelochroa - Shield Lichens [2] - T7,11,13; R9,10
Nephroma - Kidney Lichens [5] - S1; T3; R5
Pannaria - Shingle Lichens [2] - T4,6; R6,8
Parmelia - Shield Lichens [6] - R4,8,10,11,12; T5,11,12
Parmeliella - Shingle Lichens - T5,16; R16
Parmeliopsis - Starburst Lichens [2] - T2,11
Parmotrema - Ruffle Lichens [2] - R9; T7,8
Peltigera - Pelt Lichens [18] - S2; R14
Phaeophyscia - Shadow Lichens [5] - T4,6,11,12,13; R6,7,10,11
Physcia - Rosette Lichens [9] - T11,13; R10,12
Physciella - Cryptic Rosette Lichens - T4,11
Physconia - Frosted Rosette Lichens [2] - T4,11; R6,10
Platismatia - Rag Lichens [2] - T7,8,9
Protopannaria - Moss-Shingle Lichens - S4
Pseudevernia - Antler Lichens [2] - T12,13,21
Pseudocyphellaria - Specklebelly Lichens - T3
Punctelia - Speckled Shield Lichens [2] - T7,11,12; R11
Pycnothelia - Gnome Fingers - S10

Pyxine - Buttoned Rosette Lichens - T11
Ramalina - Cartilage Lichens [7] - T19; R17
Rhizoplaca - Rock-Posy Lichens - R15
Solorina - Chocolate Chip Lichens - S2
Sphaerophorus - Coral Lichens [2] - S6,7
Stereocaulon - Foam Lichens [10] - R19; S7
Thamnolia - White Worm Lichens - S10
Tuckermanella - Dwarf Wrinkle Lichens - T6
Tuckermannopsis - Wrinkle Lichens [4] - T3,6
Umbilicaria - Rock Tripe [9] - R15
Usnea - Old Man's Beard [10] - T17,18
Usnocetraria - Yellow-Green Ribbon Lichens - T2; R2
Vulpicida - Sunshine Lichens - T2
Xanthomendoza - Sunburst Lichens [5] - T1; R1
Xanthoparmelia - Rock-Shield Lichens [7] - R3,4
Xanthoria - Sunburst Lichens [4] - T1; R1

GLOSSARY OF LICHEN TERMS IN THIS KEY

ADNATE: flat and growing closely attached to the substrate.

ANNULAR: in the shape of a ring.

APICAL: at the top, terminal part, or apex.

APOTHECIA, APOTHECIAL: disk-shaped or cup-shaped fruiting bodies of a lichen (or non-lichenized ascomycetes) containing spore filled sacs.

AREOLE, AREOLAE, AREOLATE: individual segments on the surface of the lichen thallus divided one from another by depressions or cracks.

AXIL OPEN OR CLOSED (*Cladonia*): the upper angle or notch between the branches, either opening into the hollow interior or closed.

C: a solution of calcium hypochlorite used for chemical tests.

CAPITATE: apical and in a semi-globular shape.

CEPHALODIA: localized group of cyanobacteria and associated fungal tissue growing externally (*Peltigera*, *Stereocaulon*); or internally (*Lobaria*) on or in a thallus with green algae.

CILIUM, CILIA, CILIATE: slender, hair-like outgrowths along margins of lobes.

CLAVATE (isidia): club-shaped, with an enlarged tip tapering to base.

CORALLIOD (isidia and phyllocladia): with many cylindrical branches like a coral.

CORTEX, CORTICAL: the outmost layer of the thallus consisting of tightly compressed hyphal (fungal) cells.

CRENATE: with rounded teeth along the edge.

CRUSTOSE: a type of lichen growth form characterized by a strongly adhering crust in intimate contact with the substrate, lacking a lower cortex or rhizines.

DECORTICATE: with a cortex that has fallen away or decomposed.

DICHOTOMOUS: dividing into 2 parts, such as the branching pattern of a fruticose thallus, foliose lobes, or rhizines.

ECORTICATE: without a cortex.

ENTIRE: smooth and unbroken; edge without teeth or lobes.

FARINOSE: of small size, appearing under a lens (10X) as a fine powder (contrast granular).

FIBRIL : short, thin lateral branch, at right angle to main branch (*Usnea*, *Bryoria*).

FOLIOSE: a type of lichen growth form characterized by a dorsal-ventral, leaf-like thallus with the lower surface largely free of the substrate, at least in part; upper surface is different in some way from lower surface (unlike the fruticose growth form).

FRUTICOSE: a type of lichen growth form characterized by a thallus that has erect stalks, is shrubby, or is filamentous and pendulous; attached only at the base; unlike the foliose growth form, little difference between upper and lower surface of branches.

GELATINOUS (*Collema*, *Leptogium*): becoming jelly-like when moistened because of the very high water holding capacity of the thallus.

GRANULAR: of a size large enough so that under a lens (10X) appears as distinct grains (contrast farinose).

HYPHA, HYPHAE, HYPHAL: microscopic filaments of fungal cells which collectively make up the lichen thallus.

HYPOTHALLUS: a layer of hyphae found under the thallus of certain lichens, often tomentum-like; can extend out beyond the thallus edge.

ISIDIUM, ISIDIA: small outgrowths from the upper cortex, functioning as vegetative dispersal units, always covered with a cortex; can be clavate, coralloid, granular, lobate, peltate, spatulate, or squamiform. Tiny projections of the lichen thallus, like miniature fingers or towers growing on the thallus. Individual ones difficult to see without a hand lens (10X). Compared to soredia they have a more organized internal structure.

ISIDIATE: having isidia.

ISIDIOID: appearing like isidia.

K: 10% solution of potassium hydroxide used for chemical tests.

KC: a chemical test using the K reagent followed by the C reagent at the same spot.

LABRIFORM (soralia): lip-shaped with soredia on lower, upturned surface.

LAMINAL: on the upper surface of the thallus away from the margin.

LOBE, LOBATE: a rounded or strap-shaped division of a foliose thallus.

LOBULE, LOBULATE: a small lobe forming along the margin or upper surface of a larger lobe.

MARGINAL : located along the edge (margin).

MEDULLA, MEDULLARY: inner part of thallus, made up of loosely interwoven hyphae.

PAPILLA, PAPILLAE: small, rounded bumps on the surface.

PELTATE : shield shaped and attached by the center of the lower surface.

PENDENT: hanging downward.

PERITHECIA: flask-shaped fruiting bodies of certain lichens, with an apical pore and often immersed in the thallus, containing spore-filled sacs; usually only the pore is visible as a dot on upper lobe surface.

PHYLLOCLADIA (*Stereocaulon*): small, granular, lobed leaf like, or coralloid appendages on branches.

PLICATE: folded or pleated.

PODETIUM, PODETIA: upright, simple or branched, hollow structure formed by tissue of apothecial origin.

PRIMARY SQUAMULES (*Cladonia*): the squamulose thallus from which the podetia arise.

PRUINA, PRUINOSE: a fine, white, powder-like covering on the upper cortex or on the disk of apothecia.

PSEUDOCYPHELLAE: round or elongate openings in the upper or lower cortex where the medullary hyphae come to the surface, usually lighter in color and appearing as spots or lines.

PSEUDOPODETIA: upright structures which resemble the podetia of *Cladonia* but are either not hollow or not of apothecial origin; found in *Baeomyces*, *Sphaerophorus*, *Stereocaulon*, *Thamnolia*.

PUSTULATE: having wart-like or blister-like structures on the upper cortex; usually hollow, sometimes breaking down to soredia.

PYCNIDIA: small, immersed, flask-shaped structures in which special spores (called conidia) are produced which are thought to function either in sexual reproduction or for vegetative dispersal.

RETICULATE: resembling or forming a net or network.

REVOLUTE: with margins rolled backwards or downwards.

RHIZINE: strands of hyphae arising from the lower surface of many foliose lichens, serving for attachment to the substrate.

RUGOSE: having a wrinkled surface.

S. LAT.: *sensu lato*; species name used in a broad sense, usually because it has recently been split into additional species or cannot be identified in the field without chemical tests.

SCABROSE: having a scaly, rough surface.

SORALIA: localized group of soredia; can be annular, apical, capitate, crateriform, labriform, laminal, or marginal.

SOREDIA, SOREDIATE: vegetative dispersal units consisting of a few algal cells surrounded by hyphae and not covered by cortex; appear as small patches of fuzzy eruptions, or abraded sections of the thallus. Soredia (with 10X lens) look like dust (farinose) or small grains (granular) and are located on the surface and/or margin of the thallus.

SQUAMULE, SQUAMIFORM: small scale-like thallus lacking a lower cortex or rhizines.

SQUAMULATE: provided with squamules, i.e. the podetia of *Cladonia*.

SQUAMULOSE: lichen growth form characterized by aggregations of crowded squamules.

SQUARROSE: branching at right angles, as the short side branches of certain rhizines.

THALLUS: the vegetative body of a lichen, consisting of both fungus and algae.

TOMENTUM, TOMENTOSE: a felt-like or web-like mat of hyphae on the upper or lower surface of the thallus surface.

TUBERCLE, TUBERCULATE: a wart-like protuberance on branches of certain *Usnea* and *Ramalina* species, containing medullary tissue.

UMBILICATE: lichen growth form characterized by having a centrally located holdfast (umbilicus).

VEINS: raised, branching, rib-like structures on the lower surface (*Peltigera*).

VERRUCOSE: with small wart-like growths on the surface.

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