

Macrolichens of the Pygmy Forest

Mendocino Co. California
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Lichens are symbiotic relationship between fungi & algae that are often overlooked by the casual naturalist and botanist alike. Although usually disregarded, macrolichens are abundant throughout California and especially so in the pygmy forests along the Mendocino coast. When noticed, these plants are conspicuous on trees, shrubs, rock and soil. This is particularly true after a rain, which brings out the bright colors of many lichens which are often dull and brownish when dry.

The pygmy forests of Mendocino County surveyed comprise a unique ecosystem and are sharply differentiated from the neighboring forests. Pygmy forests occur on three extended terraces, cut by the rising sea during the Pleistocene epoch, which ran parallel to the coast at elevations of 300, 425, and 650 feet (Jenny, 1969). The pygmy forests are dominated by stunted Cypress, *Cypressus pygmaea* (Lemmon) Sarg.: Bolander pine, *Pinus contorta* ssp. *bolanderi* (Parl.) Vasey; and dwarfed Bishop pine, *Pinus muricata* D. Don. Also present are ericaceous dwarfed shrubs, Labrador-gea, *Ledium glandulosum* ssp. *columbianum* (Piper) C. L. Hitchc.; California rosebay, *Rhododendron macrophyllum* D. Don; Salal, *Gaultheria shallon* Pursh.; two species of Manzanita, *Arctostaphylos nummularia* Gray and *A. Columbiana* Piper; and Huckelberry, *Vaccinium ovatum* Pursh.



Mature Pygmy Forest Cypress with Cones

In general this area is species poor and space-unsaturated with regard to vascular plants. Up to 25 percent of the soil surface is bare or covered by lichens (Jenny, 1969). Most of these lichens belong to the genus *Cladonia*, with *Cladonia crispata* (Ach.) Flot. making up 90 percent of the lichen ground cover.

The pygmy forests are surrounded by woods or tall Bishop pine and Shore pine, *Pinus contorta* Dougl. Ex Loud.; and by forests dominated by giant Redwoods, *Sequoia sempervirens* (D. Don) Endel, and Douglas fir, *Pseudotsuga menziesii* (Mirb.) Franco.

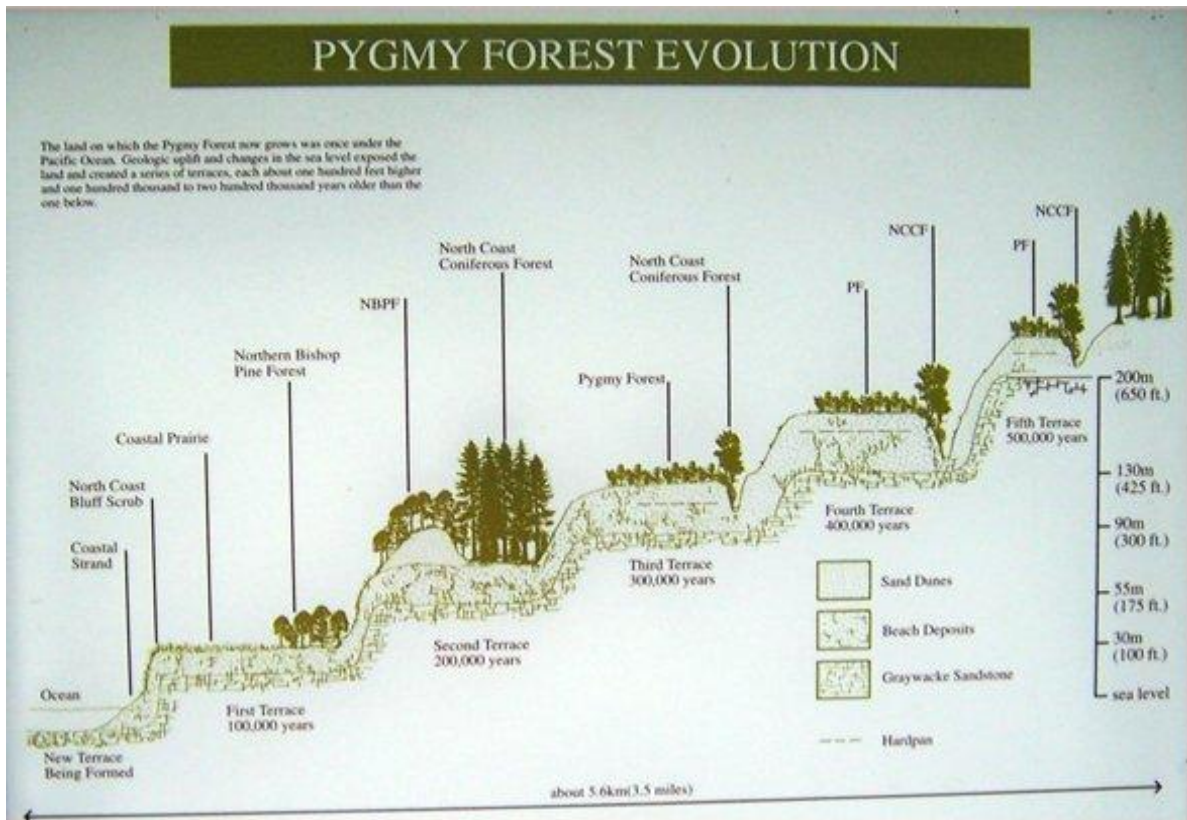
The stunting of vascular vegetation, which gives this area its definitive name, can be attributed largely to two environmental factors, the Blacklock podsol and moisture availability.

The Blacklock podsol system is composed of a four inch thick surface layer, a fourteen inch thick bleached, white A2 horizon, and a cemented hardpan B-horizon which varies from 18-30 inches in thickness. The surface of the soil is extremely acid, having a pH of 2.8-3.9. It is also low in available nitrogen, phosphorous, potassium, and

micronutrients. This supply of important exchange ions, calcium, magnesium, and potassium, is also very low, being less than 1 mg/100g (Jenny, 1969).

After 5-8 inches of rain in the winter the entire surface soil becomes flooded due to the underlying hardpan which produces an artificial water table higher than the normal one in surrounding areas. By late spring this surface water disappears and the soil dried down to the hardpan, hardens and exerts xeric conditions on the vascular plants. A few depressions remain moist throughout the year and give rise to *Sphagnum* bogs.

Although these factors are detrimental to the growth and maintenance of a vascular plant community, they are ideal for the foundation and continuance of a lichen



community. The terricolous lichens in the pygmy forests are able to flourish on soils of pH 3 or lower. The main cause of the displacement of a lichen community are shading by tree or shrub canopies, and accumulation of humus or leaf litter, or an unstable substrate. Due to the poor growing conditions in the pygmy forest, trees & shrubs

rarely achieve a large enough biomass to cause extreme shading or large amounts of leaf litter. The substrates on which the lichens grow are also very stable. The Blacklock soil system is very static; there is little or no erosion, minerals are leached out readily so there is no build-up of nutrients and its characteristics do not allow colonization by new species of vascular plants which might extinguish part of the lichen community. Since the pygmy forests are closed-cone conifer forest, the dominate trees are able to reproduce only after a fire, and therefore under normal conditions cannot reproduce in the open areas and replace the lichen community that flourishes there. Only coniferous trees occur in the area; this gives the corticolous members of the lichen community a stable substrate system. Many lichens found in the area are specific to conifers; they are able to grow on or colonize any of the three types of conifers there. Unfortunately, the reason I was able to easily collect lichens from the crowns of the larger tree in the Pygmy Forest is because bull dozers had just knocked down the trees to make room for building houses. However, the collection locations were revisited in 2010, 36 years after the original study and all the accessible areas remained mostly undeveloped and little changed.

These ideal growing conditions are reflected in the presence of 53 taxa of macrolichens collected and identified in the pygmy forests. This number does not include saxicolous species because there are no rock surfaces in the pygmy forests, or crustose species because they were not investigated.

Four species of lichens previously unreported from California were collected in the pygmy forests. *Cladonia subsquamosa* (Nyl.) Vain. which has been reported as far south as Oregon in North America, *Usnea occidentalis* Mot. which has only been reported from Washington and Oregon, *Usnea condensate* Mot. Which has been reported only from Chile in the western hemisphere, and *Usnea dasypoga* ssp. *bicolor* Mot., reported only from the mountains of Europe (This may be *Usnea filipendula* Stirton).

What is probably a new form or variety of *Usnea californica* Herre was also found and designated *Usnea californica* A. Also found were 6 taxa in the *Usnea*

fragilescens group which is now undergoing revision by Dr. Isabelle Tavares at the University of California, Berkeley, Herbarium; Each of these taxa was assigned a letter suffix (A, B, C, ,,,) in order to separate them; work by Herrera-Campos et al (2001) may shed some light on this group.

Although it may seem counterintuitive, taxonomy is a dynamic science; in twenty five plus years nomenclature may change. Species nomenclature changes with continued research; species listed in the Species Descriptions have been updated (2010-2011). Their probable new nomenclature is presented in parentheses below the original species name.

Voucher specimens of all the taxa listed below have been deposited in the University of California, Berkeley, Herbarium; a partial collection of voucher specimens has been deposited in the California State University, Chico, Herbarium.

Below are::

1. Key to the lichen species of the pygmy forest.
2. Species Descriptions
2. Literature Cited
3. [Collection Locations](#)
4. [Glosser of terms](#)

KEY TO THE MACROLICHENS OF THE PYGMY FORESTS

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1. Thallus fruticose.....	24
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2. Thallus sorediate or isidiate.....	4
3. Lower surface of thallus black.....	5
3. Lower surface of thallus white, tan, or brown.....	7
4. Thallus sorediate.....	10
4. Thallus isidiate.....	18
5. Lobe margins ciliate; lobes not appearing inflated..... <i>Parmelia arnoldii</i>	26
5. Lobe margins lacking cilia; lobes inflated or appearing inflated.....	6
6. Lobes not hollow, appearing inflated due to pitting of the lower surface..... <i>Cavernularia lophrea</i>	5
6. Lobes hollow; lower surface not pitted..... <i>Hypogymnia inactiva</i>	20
7. Apothecia borne on the underside of the lobe tips; medulla pale yellow to orange..... <i>Nephroma laevigatum</i>	25
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9. Lower surface of thallus with raised pinkish white veins, apothecia borne on the tips of narrow, digitately clustered lobes..... <i>Peltigera canina</i>	29
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10. Lower surface of thallus white, tan, or brown.....	14
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18. Lower surface of thallus with a short nap of rhizoids forming a tomentum.....	19
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20. Lower surface of thallus black; veins absent.....	21
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21. Lower surface of thallus bare, or with scattered small, black rhizoids.....	23
22. Upper surface of lobes whitish to pale green, lacking white angular markings; cilia up to 1 mm long, arising from laminal and marginal isidia... <i>Parmelia crinite</i>	27
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25. Thallus short, 2-5 cm long, prostrate, branches cylindrical <i>Alectoria nidulifera</i>	2
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27. Medullary tissue a solid central cord composed of closely interwoven Longitudinally extending hyphae surrounded by a cylinder of loosely, Interwoven hyphae which connects it with the cortex.....	45

28.	Thallus solid, or with scattered hollow spaces, branches flattened or cylindrical, squamules absent.....	29
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29.	Thallus silver-gray, pink, orange, to brownish; lobes cylindrical, the tips swollen; apothecia terminal... <i>Sphaerophorus globosus</i>	39
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30.	Thallus tufted, with a single distinct point of attachment to the substrate.....	31
30.	Thallus pendulous, hanging draped over branches or twigs.....	33
31.	Orbicular or oblong soralia borne on the margins of the lobes; thallus small, 2-3 cm tall..... <i>Ramalina farinacea</i>	36
31.	Soredia present or absent; when present not in orbicular or oblong soralia; thallus small to medium-sized.....	32
32.	Thallus small, 3-5 cm tall, shiny, the branches hollow and perforate, especially near the base; ramuli absent... <i>Ramalina roseleri</i>	38
32.	Thallus small to medium-sized, 4-12 cm long, dull; branches not perforate, densely covered by curved, occasionally coralloid ramuli..... <i>Alectoria imshaugii</i>	1
33.	Thallus 10-20 cm long; branches flattened and perforate, forming minute nets..... <i>Ramalina menziesii</i>	37
33.	Thallus 10-35 cm long; branches cylindrical, not perforate, white striate on the main branches..... <i>Alectoria sarmentosa</i>	3
34.	Podetia forming cups, the cups open into the interior of the podetium.....	35
34.	Podetia forming cups that are closed or cups lacking.....	37
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37.	Podetia forming broad definite cups.....	38
37.	Podetia not forming cups, or forming tiny, narrow cups.....	39
38.	Cups shallow, with pointed or cup bearing proliferations Arising from the center; podetia with or without squamules <i>Cladonia cervicornis subsp. verticillata</i> (Hoffm.) Ahti Lichenologist 12: 126 (1980) <i>Cladonia verticillata</i>	18
38.	Cups deep, goblet-shaped, covered on the inner and outer Surfaces with small peltate squamules, not proliferating from The center..... <i>Cladonia pyxidata</i>	15
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39.	Apothecia light to dark brown.....	41

40.	Podetia covered by squamules, esorediate; cortex KOH-, not Turning yellow.....	<i>Cladonia bellidiflora</i>	7
40.	Podetia without squamules, sorediate; cortex KOH+, turning yellow.....	<i>Cladonia macilenta</i>	13
41.	Podetia esorediate; branches terminating in points; primary thallus crustose, soon disappearing.....	<i>Cladonia impexa</i>	12
41.	Podetia sorediate, unbranched, or the branches blunt at the tips or bearing cups; primary thallus of squamules.....		42
42.	Podetia covered by large squamules up to 3 mm in length, podetia coated with a powder if white to yellow-green soredia.....	<i>Cladonia coniocraea f. phyllostrata</i>	10
42.	Podetia lacking squamules, or having scattered squamules near the base, soredia present or absent.....		43
43.	Soredia granular; the base of the podetia corticated	<i>Cladonia nemoxyna</i>	14
43.	Soredia farinose, the base of the podetia decorticate or occasionally corticated.....		44
44.	Podetia coated by white to yellow-green soredia, 40-50 um In diam.; podetia subulate or forming tiny, narrow cups	<i>Cladonia subulate</i>	9
44.	Podetia with scattered, very fine farinose soredia present, 15-20 um in diam.; podetia subulate or forming irregular Cups with circle of proliferations.....	<i>Cladonia subulate</i>	17
45.	Thallus pink or red in color.....	<i>Usnea rubiginea</i>	53
45.	Thallus whitish, greenish, or yellow-green in color.....		46
46.	Thallus with no definite single point of attachment to the substrate.....		47
46.	Thallus with at least one definite point of attachment to the substrate.....		48
47.	Primary branches blackening, clothed by ramuli; cortex with small sub cylindrical papillae.....	<i>Usnea dasypoga ssp. Bicolor</i>	45
47.	Primary branches concolorous with the rest of the thallus, ramuli rare; cortex cratered and having hemispherical papillae	<i>Usnea fragilesceus</i> F	51
48.	Primary branches obviously inflated.....		49
48.	Primary branches not obviously inflated.....		50
49.	Branch tips sorediate, the soredia orbicular; thallus whitish yellow-green.....	<i>Usnea fragilesceus</i> A	46
49.	Branch tips sorediate, appearing powdery; thallus pale green to yellow-green.....	<i>Usnea occidentalis</i>	52
50.	Medulla pink or red.....		51
50.	Medulla white.....		52
51.	Medulla composed of a thin white layer of loosely interwoven hyphae surrounding a pink, dense, central cord; thallus long-pendulous, moderately branched.....	<i>Usnea californica</i>	42
51.	Medulla composed of a thin white layer of loosely interwoven hyphae surrounding a dark red, central cord; thallus short-pendulous, very sparsely branched.....	<i>Usnea californica</i> A	43

52.	Thallus tufted; branches with ramuli, the ramuli papillate and sorediate.....	<i>Usnea condensata</i>	44
52.	Thallus tufted or pendulous; branches with or without ramuli; If present ramuli may be sorediate but not papillate.....		53
53.	Thallus pendulous; soredia becoming isidiate.....		54
53.	Thallus tufted; soredia not becoming isidiate.....		55
54.	Cortex papillate, the papillae small, lacking a depression in the tip; ramuli sorediate.....	<i>Usnea fragilesceus</i> B	47
54.	Cortex minutely papillate, the papillae with a depression in the tip; ramuli absent.....	<i>Usnea fragilesceus</i> C	48
55.	Ciliary ramuli present on the primary branches; cortex smooth or with widely scattered small papillae; secondary branching sparse...	<i>Usnea fragilesceus</i> E	50
55.	Ciliary ramuli absent; cortex papillae, the papillae small and becoming sub cylindrical; secondary branching profuse. .	<i>Usnea fragilesceus</i> D	49

SPECIES DESCRIPTIONS

1. [*Alectoria imshaugii*](#) Brodo, I.M. and Hawksworth, D.L. (1977) *Alectoria* and allied genera in North America. – *Opera Bot.* 42: 1-164



Thallus fruticose, small to medium-sized, 4-12 cm long, attached to the substrate at a single point, tufted or pendulous, very stiff, light greenish yellow, abundantly and irregularly branched; main branches 0.-2 mm thick, strongly flattened near the base, the larger branches and the base occasionally perforate and hollow, the tips of the branches becoming cylindrical; soralia always present, becoming isidiate, orbicular to linear; surface tuberculate; pseudocyphellae occurring of the tubercles; branches densely covered by curved, sometimes coralloid ramuli; no true lateral branches present; apothecia absent.

The algal host is *Protococcus*.

This lichen is found throughout the pygmy forests. Superficially it resembles an *Usnea*, but its extreme stiffness and numerous isidiate soralia and ramuli make it easily distinguishable upon closer examination.

2. [*Alectoria nidulifera*](#) Norri. apud Nyl., in *Flora* 58:8. 1875.
(*Bryoria furcellata* (Fr.) Brodo and D. Hawksw.)



Thallus fruticose, short, 2-5 cm long, spreading to prostrate and rarely pendulous, soft, sometimes flatly tufted, light to dark brown, cylindrical to slightly flattened, irregular, the main branches 0.1-0.3 m in diam., usually irregularly curved, rarely straight, rarely pitted, blackening in the older parts, white soralia usually present, narrowly ovoid, 0.3-0.4 x 0.1-0.2 mm in diam., thinner branches cylindrical, no true lateral branches present; ramuli scattered, more numerous on the thinner branches, sometimes arising from the margins of the soralia, concolorous with the thallus or turning black; apothecia absent. The algal host is *Protococcus*.

This inconspicuous lichen can be found throughout the pygmy forests on conifer twigs or bark. The light brown thallus blends in with the substrate and is therefore easily overlooked. One might confuse this species with *Cornicularia californica* (Tuck) DR., at first, but a closer examination will show that *C. californica* has strongly tufted flattened branches, no soredia, many fibrils, and abundant apothecia on the branch tips.

3. [*Alectoria sarmentosa*](#) (Ach.) Ach., Lich. Univ. 595. 1810
Lichen sarmentosus Ach., Kongl. Vet. Ach. Nya Handl.
16:212. 1795



Thallus large, 1-35 cm long, straw colored to greenish, pendulous, abundantly dichotomously or monopodially branched, the base indistinct; main branches 0.5-2 mm in diam., cylindrical or slightly flattened, tuberculate, with pseudocyphellae occurring normally as scars on the tubercles which appear as white striations on the branches; lateral branches sometimes numerous, short or elongate, perpendicular or pendent, often crispate; apothecia borne laterally, the exciple smooth or wrinkled, often pseudocyphellate, the margins thin, the disks concave to convex, often wrinkled, brown or blackening, dull, naked; hymenium up to 90 um thick, asci 80 x 30 um in diam., spores 2-4 per ascus, colorless when young, almost black at maturity, oval. The algal host is *Protococcus*.

All material examined of this species was sterile. The only other long pendulous lichen that *Alectoria sarmentosa* may be confused with in the pygmy forests is *Ramalina menziesii* Tuck., although upon close examination, *R. menziesii* will reveal minute perforations of the thallus. *Alectoria sarmentosa* is found throughout the pygmy forests. Robust, mature colonies, when draped over branches, are up to 50 cm wide and 35 cm long. Also found in the area are immature specimens that have a distinct point of attachment, are less than 10 cm long, and do not occur in colonies. They may be identified as *A Sarmentosa* by the white striations on their branches.

4. [*Anaptychia leucomela*](#) (L.) Mass., Mem. Lich., 35. F.28. 1853.
Lichen laeucomelas L., Sp. Pl. ed. 3. 1613. 1764.
(*Heterodermia leucomelos* (L.) Poelt)

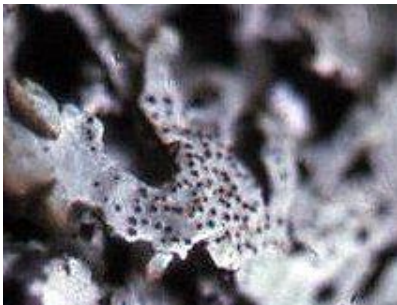
Thallus small, about 4 cm in diam., light greenish gray, fruticose and ascending, long and branched, the branches linear, the ends crenate, recurved and white-sorediate, the margins bearing branched, black cilia, about 3 mm in length; lower surface white and decorticate; apothecia middle-sized, 4-6 mm in diam., pedicellate, the disks flat, white pruinose, the exciple lobate; spores ellipsoidal, 35-55 X 16-25 um in diam.



The algal host is *Protococcus*.

Only one specimen of *Anaptychia leucomela* was found, high on the trunk of a conifer near Summers Lane. This specimen, although sterile, was easily distinguishable from any other whitish lichen found in the area by the long cilia on its lobe margins.

5. [*Cavernularia lophyrea*](#) (Ach.) Degel., Medd. Fran. Goteborgs Bot.Tradg 12:128. 1938.



Parmelia lophyrea Ach., Meth. Lich. 198.

1803.

Thallus small, rarely more than 25 mm long, and 10 mm wide, greenish gray to whitish, appearing inflated, loosely adnate, subfruticose; lobes narrow, less than 1 mm across, branched, flat, often densely covered with dark brown pycnidia, turning brown at the tips, wrinkled and minutely pitted, the margins cut-crenate to sinulate; [lower surface](#) black, turning brown at the lobe tips, shiny, reticulately pitted to perforate; rhizines lacking; apothecia small, 4-8 mm in diam., sub sessile, the disc concave to flat, chestnut-brown, the exciple entire to sub crenate; spores spherical, 3.5-4.5 um in diam. Pycnidia minute, less than 0.1 mm in diam., dark brown, filled with a hyaline jelly.

The algal host is *Protococcus*.

This little lichen is rare on conifer bark and twigs in the pygmy forests. It is also considered rare throughout its range, probably due to its extremely small size. If *Cavernularia lophyrea* can be found, its inflated-appearing lobe tips and pitted underside make it readily identifiable.

6. [*Cetraria orbata*](#) (Nyl.) Fink, mycol. 21:298. 1918

Platysma orbatum Nyl., Flora 52:442. 1869.



Thallus foliose, small to medium-sized, 208 cm in diam., dark olive-green to brown, firmly attached to the substrate; lobes small, 103 mm in diam., sinuate to laciniate, crowded, ascending, the margins crenate, occasionally bearing scattered small cilia and pycnidia; lower surface concolorous, paler or whitish, pitted-lacunose, bearing scattered rhizines; apothecia small to large, 1.5-6 mm in diam., borne on the margins, sessile; the disk concave to irregular, pale to dark chestnut-brown, shiny; the exciple crenulated; spores spherical to sub spherical, 5-7 X 4-5 um in diam.; pycnidia borne on the lobe margins, minute, 0.1-0.2 mm in diam., black; cortex not turning yellow with KOH.

The algal host is *Protococcus*.

This lichen is common on conifers and *Rhododendron* throughout the pygmy forests. It is closely related to, and resembles *Cetraria ciliaris* Ach., and the only way the two can be separated is by a KOH test. *C. ciliaris* gives a positive response, turning yellow, when KOH is applied to the cortex.

7. *Cladonia bellidiflora* (Ach.) Schaer., Lich. Helv. Spic. 21. 1823

Lichen bellidiflorus Ach., Lich. Suec. Prod. 194. 1798.



Primary squamules commonly disappearing, small or middle-sized, 1.5-3.0 mm long; podetia 20-[50 mm tall, the base commonly dying; squamulose, the squamules small to middle-sized, 2-5 mm long, crenate or laciniate, ascending to erect, flat or involute, sparse to abundant, the upper surface yellowish, the lower surface white, becoming brown toward the base, not forming cups; cortex continuous to chinky or areolate, discontinuous, smooth or verruculate, squamulose, the squamules splitting off the cortex, the cortex yellowish glaucescent, the decorticate part white, opaque; apothecia scarlet, on proliferations; spores 8 per ascus, hyaline, spherical, 4-7 um in diam. Pycnidia on the apices of the proliferations, black; cortex KOM-, not turning yellow.

The algal host is *Pleurococcus*.

Cladonia bellidiflora is rare on soil or humus in the pygmy forests. The only other *Cladonia* in the area with scarlet apothecia is *Cladonia maclienta*, which is found on dead or decaying wood.

8. *Cladonia carassensis* Vain., Acta Soc. F. Fenn. 4:313. 1887.

Cladonia japonica Vain. In Hue, Nouv. Arch. Mus. Hist. Nat. 3(10):265.

1898

Primary squamules persistent, small, 1-2 mm long and broad, the margins crenate or incised crenate, ascending, tufted, the upper surface glaucescent, the lower surface white, esorediate; podetia arising from the upper side of the primary squamules, whitish to ashy brown, variegated, opaque, decorticate, parts semi pellucid, esorediate, smooth; squamules present or lacking, 1-2 mm long, 20-30 mm tall and up to 2 mm in diam. Forming cups, the cups abruptly flaring, 3-5 mm broad, uneven, oblique, one side almost open to the interior of the podetium, the margins entire or dentate to radiate-proliferate, the apices of the proliferations usually irregularly subcorymbose or cymosa lacerate, or rarely forming cups, usually in tufted clusters; apothecia small, up to 0.3 mm in diam., borne at the apices of the proliferations, brown or reddish brown; spores 8 per ascus, hyaline, spherical, 4-7 μm in diam.; pycnidia dark brown, borne at the apices of the podetium or on the margins of the cups; cortex KOH+, turning yellow.

The algal host is *Pleurococcus*.

This lichen is found on soil, intermixed with *Cladonia crispata* (Ach.) Flot., which it closely resembles, in all the pygmy forests. *Cladonia carassensis* is usually shorter than *C. crispata* and it is KOH+, turning yellow.

9. *Cladonia coniocraea* (Florke) Spreng., in Linn., Syst. Veg. Ed. 16. 4:272. 1827

Canomyces coniocraea Florke, Deutsch, Lich. 7:11. 1821.

Primary squamules persistent, medium-sized to fairly long, up to 5 mm long and up to 4 mm wide, 0.1 mm thick, the margins crenate or entire, convex or concave; upper surface olive-green or glaucescent; lower surface white, becoming granulose soresiate; podetia arising from the upper surface of the primary squamules, up to 32 mm tall, 1-2 mm thick, tapering, subulate or with tiny cups at the tips, the interior of the cups soresiate; podetia dichotomously branched or unbranched, a small part of the base or the area immediately below the apothecia occasionally corticated with a sub continuous or areolate to verruculose cortex, the major part decorticate and bearing farinose soresidia, the soresidia forming a whitish to yellowish green powder; podetial squamules usually backing, occasionally bearing a few near the base; apothecia brown, borne on the margins of the cups or on the tips of the podetia; spores 8 per ascus, hyaline, spherical, 4-7 μm in diam.; pycnidia small, 0.05-2 mm across, light to dark brown, borne on the tips of the podetia.

The algal host is *Pleurococcus*.

Cladonia coniocraea is fairly common on bark at the base of trees in the pygmy forests. All specimens examined lacked apothecia. This lichen can be identified in the field by the powder of soresidia covering the podetia.

10. *Cladonia coniocraea* f. *phyllostrota* (Florke) Cain., Acta Soc. F. Fl. Fenn. 53:113. 1922

Caldonia ochrochlora var. *phyllostrota* Florke. Clad. Comm. 79. 1828.

As in *Cladonia coniocraea* f. *coniocraea* except podetia densely covered by squamules up to 3 mm in length.

11. *Cladonia crispata* (Ach.) Flot. In Wendt. Therm. Wermbr. 96. 1839

Baeomyces turbinatus var. *crispatus* Ach., Meth. Lich. 341. 1803.

Baeomyces crispatus Wahienb., Flora Lapp. 456. 1812



Primary squamules persistent or disappearing, middle-sized, 1-4 mm long, 0.5 mm wide, digitate-laciniate, crenate, ascending, flat or involute, scattered or in tufts, rarely forming cushions, the upper surface glaucescent to olive-brown, rarely whitish glaucescent, the lower surface white or the base becoming brown, esorediate; podetia arising from the upper surface of the primary squamules, the base persistent or dying and the growth continuing from the apices, 10-100 mm tall, up to 5 mm in diam., forming cups, the cups perforate and open into the interior of the podetium, flaring abruptly, the margins becoming repeatedly proliferate, the apices of the proliferation subcorymbose, the axils of the branches commonly perforate, the tips of the proliferations bearing cups, blunt, or bearing apothecia, esorediate; the cortex of the podetium continuous or sub continuous, smooth or with slightly developed areoles, shiny or dull, impelilucid, whitish, blaucescent, or pale brown, the dying parts becoming black; apothecia small, 0.5-1.3 mm in diam., at the apices of the branches or of short subcorymbose branchlets, light brown to reddish brown; spores 8 per ascus, hyaline, spherical, 4-7 μ m in diam., pycnidia on the margins of the cups, or on the apices of branchlets or on the upper surface of the primary squamules, black, 0.1-.03 mm across; KOH-, not turning yellow.

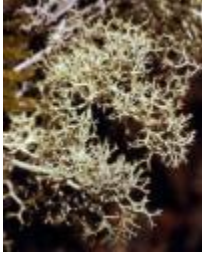
The algal host is *Pleurococcus*.

Cladonia crispata forms extensive mats on the soil in many areas of the pygmy forests. This growth habit, and its subcorymbose branchlets, bearing apothecia, make it easily distinguishable from any other lichen found in the pygmy forests except *Cladonia carassensis* Vain., which is shorter and is KOH+, turning yellow.

12. [*Cladonia impexa*](#) Harm., Lich. Fr. 3:32. 1907

Cladonia pacifica Ahti. Annual. Soc. Zool. Bot. "Vanamo" 32(1):25. 1961
(*Cladina portentosa* ssp. *pacifica* (Ahti) Ahti)

Primary thallus crustose, soon disappearing and seldom seen, composed of small granules, 0.1-0.2 mm in diam., scattered or glomerate, yellowish green; podetia highly variable, 1-2 mm in diam., and up to 13 mm tall, very light green, semi pellucid, in extensive mats of small cushions, branching mainly by anisotropic trichotomies, rarely by dichotomies and polychotomies of 4-5, branches sub equal, or forming more or less distinct synpodia, the ultimate branches typically slender, sharp-pointed, spreading widely, either straight or curved in various directions, the axils mostly perforate, the surface dull with distinct areoles containing the algal cells, in the older parts the areoles becoming scattered and the cartilaginous inner layer becoming exposed giving the plants a semi pellucid appearance; apothecia small, solitary or grouped at the tips of the branchlets, brown or brownish black; spores 8 per ascus, hyaline, spherical, 4-7 um in diam.; pycnidia at the tips of the branchlets, light reddish brown, containing a colorless jelly. Ahti considered this lichen to be 3 species: 1) *C. impexa* in Europe, 2) *C. terrae-novae* in eastern North America, and 3) *C. pacifica* in western North America. Thomson (1967) did not find consistent difference between *C. impexa* and *C. pacifica* hence he reduced *C. pacifica* to synonymy.



The algal host is *Pleurococcus*.

All specimens collected lacked apothecia. This lichen is found on soil throughout the pygmy forests. It is easily recognized in the field because the white, cushion like mats of *Cladonia impexa* contrast sharply with the forest floor, and it is the only reindeer moss found in this area.

13. *Cladonia macilenta* Hoffm., Deutschl. Fl. 2:126. 1796.

Primary squamules persistent, small to middle-sized, up to 4 mm long and 3 mm wide, lobate or crenate-lobate, flat or involute, upper side glaucescent to whitish, lower surface white or turning darker at the base, rarely yellowish brown, lower surface and margins granulate sorediate or esorediate; podetia growing from the primary squamules, short or elongate, 5-42 mm tall, up to 3 mm thick, cupless, simple or sparingly branched, tips blunt or pointed; apothecia often lacking, entirely sorediate or with the area near the apothecia and the base corticated; soredia either granular or farinose, whitish or pale green; cortex of the podetia grayish green, areolate or verrucullate; apothecia scarlet, middle-sized, up to 2 mm across; spores 8 per ascus, hyaline, spherical, 4-7 um in diam., pycnidia red on primary squamules, minute, 0.1-0.2 mm in diam.; cortex KOH+, turning yellow.



The algal host is *Pleurococcus*.

This lichen is very common on dead or rotting wood in the pygmy forests. Its bright scarlet apothecia against the green or brown background of the area easily catches the eye.

The only other lichen with scarlet apothecia in the area is *Cladonia bellidiflora*, (Ach.) Schaer, which is much less common. The cortex of *Cladonia macilenta* gives a KOH+ yellow reaction while *C. bellidiflora* does not change color when KOH is applied.

14. *Cladonia nemoxya* (Ach.) Nyl., Lich. N. Zealand. 18. 1988.

Baeomyces radiates var. *nemoxyus* Ach., Meth. Lich. 324. 1803

Cladonia fimbriata var. *nemoxya* (Ach.) Vaino, Act. Soc. Faun. Flor. Fenn. 10:295. 1894

(*Cladonia rei* Schaerer)

Primary squamules persistent or disappearing, small to middle-sized, up to 3 mm long and 2 mm wide, irregularly lobed, crenate to sinuate or incised; upper surface glaucescent to pale olive-green, somewhat slate-colored when dry; lower surface white, ascending, esorediate, or sparingly granulose; podetia arising from the upper surface of the primary squamules, ashy-glaucous, 25-90 mm tall, slender, 1-2 mm thick, with tiny cups at the tips or subulate, the margins of the cups entire to denticate or with subulate proliferations, corticated at the base and occasionally up to the middle, the cortex continuous to verrulate or commonly lacking and becoming entirely granulose soresiate, rarely bearing squamules; apothecia dark brown often perforate, small 0.5-1.3 cm in diam., formed at the tips of subulate podetia or on stalks from the margins of the cups; spores 8 per ascus, hyaline, spherical, 4-7 um in diam. Pycnidia on the margins of the cups or at the tips of subulate podetia, dark brown, minute, less than 0.2 mm in diam.

The algal host is *Pleurococcus*.

Cladonia nemoxya is found on soil and rarely on rotting wood in the pygmy forests. In the field it can be distinguished from other terricolous *Cladonias* by its long, unbranched, grayish podetia.

15. *Cladonia pyxidata* (L.) Hoffm., Deutschl. Fl. 2:121. 1796

Lichen pyxidatus L., Sp. Pl. 2:1151. 1753.



Primary squamules persistent, rarely disappearing, small to medium-sized, 2-7 mm long and up to 4 mm broad, irregularly lobed or incised, the tips rounded, the sides crenate or sinuate, ascending or appressed, the upper surface glaucescent to pale olive-green the lower surface white, darkening at the base, esorediate; podetia growing from the upper surface of the squamules, 4-40 mm tall, simple or with short marginal proliferations bearing apothecia, forming cups, the cups flaring gradually and goblet-shaped, deep, the interior of the cups closed and decorticate in part with small peltate squamules covering the interior and outer surface; podetia slate-gray to olive-green or with brownish shades; apothecia uncommon, 0.5-1 mm in diam., borne on the margins of the cups or on short stipes on the margins, reddish brown; spores 8 per ascus, hyaline, spherical, 4-7 μm in diam.; pycnidia on the margins of the cups or on primary squamules.

The algal host is *Pleurococcus*.

Cladonia pyxidata is found over moss over bark in the pygmy forests. All specimens examined lacked apothecia. In the pygmy forests this lichen is easily spotted because of its deep goblet-shaped cups. The only other taxon on the west coast that resembles it is *Cladonia chlorophaea* (Flk.) Spreng. Which can be identified by a positive KOH test and the presence of soredia.

16. *Cladonia subsquamosa* (Nyl.) Vain., Acta Soc. F. Fl. Fenn, 4:L445. 1887

Cladonia delicate var. *subsquamosa* Nyl., Flora 49:421. 1886.

(*Cladonia squamosa* var. *subsquamosa* (Nyl. exLeighton) Vainio

Primary squamules persistent or disappearing, middle-sized, 1-2 mm long, 3-5 cm in width, the upper surface glaucescent, the lower surface white, the margins entire to crenate; podetia arising from the upper surface of the primary squamules, the base dying and growth continuing from the apices, impelilucid, whitish, fray, or glaucescent, 12-40 mm tall, up to 2.5 in diam., sub cylindrical, usually forming cups, the cups open to the interior of the podetia, usually unbranched, but occasionally proliferating at the margins, the cortex of the podetia vericulose-areolate to becoming entirely dispersed, esorediate, covered with small squamules, up to 1 mm in length; apothecia small, borne subradiately or irregularly at the apices of the podetia, brown or yellow-brown; spores 8 per ascus, hyaline, spherical, 4-7 μm in diam., pycnidia dark brown to black, 0.1 mm across, borne on the margins of the cups or at the apices of the podetia.

The algal host is *Pleurococcus*.

This lichen is found on rotting wood or the bases of trees in the pygmy forests. It is easily identified by the covering of small squamules of the decorticate podetia.

17. *Cladonia subulata* (L.) Wigg., Prim. Fl. Nolsat. 90. 1780.

Lichen subulatus L., Sp. Pl. 1153. 1753.

Primary squamules persistent, or disappearing, small, 2-3 mm long, upper surface whitish glaucescent to blackening, lower surface white; podetia arising from the upper surface of the primary squamules, white to ashy-glaucous, tall and slender, 30-70 mm tall and up to 3.5 mm thick, cylindrical, cupless or with irregular cups formed by circles of proliferations, the base with some cortex, usually totally decorticate and covered with very fine farinose soredia about 18 µm in diam.; apothecia rare, borne on the margins of the cups or on the tips of the podetia, sessile or stipitate, dark brown, brown or reddish brown; spores 8 per ascus, hyaline, spherical, 4-7 µm in diam.; pycnidia light brown, 0.2-0.4 mm in diam., borne on the margins of the cups or on the tips of the podetia.

The algal host is *Pleurococcus*.

This lichen is rare on soil in the pygmy forests. All specimens examined lacked apothecia. *Cladonia subulata* can be distinguished from other terricolous *Cladonias* by the very fine farinose soredia occurring at the base of the podetia.

18. *Cladonia cervicornis* subsp. *verticillata* (Hoffm.) Ahti
Lichenologist 12: 126 (1980)

Cladonia verticillata (Hoffm.) Schaer., Lich. Helvet. Spic. 31. 1823.

Cladonia pyxidata var. *ferticilliate* Hoffm., Deutschl. Fl. 2:122. 1796.

(*Cladonia cervicornis* ssp. *verticillata* (Hoffm.) Ahti)



Primary squamules persistent or disappearing, middle-sized, 3-5 mm long and 1-3 mm wide, irregularly wedge-shaped or lobed, the lobes crenate or slightly incised, flat or convolute, often ascending, the upper side olive-green to reddish or brownish glaucescent, the lower surface white or sometimes turning black toward the base, esorediate; podetia arising from the upper surface of the margins of the primary squamules, up to 50 mm tall and 3 mm in diam., flaring at the tip into short, broad cups, up to 9 mm in diam., shallow and with small pointed or cup-bearing proliferations growing from the centers of the closed cups, often with several tiers of cups, each arising from the center of the previous tier, the cup margins entire or with apothecia or pycnidia; cortex of the podetia continuous or chinky-areolate, the areoles smooth, sub contiguous, the narrow interspaces white, the color dull, whitish green to

brown; esorediate, with or without squamules; apothecia sessile or on short stipes, small to middle-sized, less than 3 mm broad, brown or reddish brown, rounded, broader than the stipes which support them; spores 8 per ascus, hyaline, spherical, 4-78 um in diam.' Pycnidia in the centers of the cups or on the margins, reddish brown.

The algal host is *Pleurococcus*

Cladonia verticillata is found on soil in all the pygmy forests. It is instantly recognizable by its several tiers of cups arising from the center of the cups below.

19. *Cornicularia californica* (Tuck.) DReitz, Arkiv for Bot. 20: o. 11, 33, and 41. 1926. (*Kaernefeltia californica* (Tuck.) A. Thell& Goward, 1996)

Cetaria californica Tuck., Am. Jour. Sci. 28:203. 1859.



Thallus small, up to 4 cm tall, fruticose, dark olive-green to black, occasionally tan on the side nearest the substrate, ascending, tufted, cartilaginous, lacunose, somewhat channeled, dull, irregularly, dichotomously branched, flat or subterete, the tips much divided, the fertile branches thickened near the tips, the margins crenate or jagged; apothecia 1.5-5 mm across, terminal or subterminal, sessile, appendiculate; disk dark green to black, flat to convex, the surface uneven; thalline margin smooth to distinctly toothed, soon excluded by the disk; spores hyaline, ellipsoidal, nonseptate, 7-8 x 4.5-5 un. In diam.

The algal host is *Protococcus*.

Cornicularia californica is found throughout the pygmy forests. Individual plants are usually found growing scattered over the surface of conifer bark or twigs. This is the only fruticose, tufted, darkly pigmented lichen found in the pygmy forests.

20. *Hypogymnia inactiva* (Krog) Onisson, Bryologist 76:374. 1973.

Hypogymnis imshaugii Var. *Inactiva* Krog, Norsh Polarinst, 144:98. 1968.



Thallus loosely adnate to pendulous, 2-10 cm long, narrowly foliose to subfruticose, fairly stiff, usually smooth, greenish gray to ashy colored, or rarely becoming brown or blackish brown at the margins, and finally throughout; lobes long and narrow, hollow, dichotomously branched and becoming imprecated, somewhat ascending towards the margins; lower surface brownish black to black, wrinkled, rhizines lacking, often perforate near the lobe apices and sometimes in the lobe axis; medulla thin, dark brown to black; apothecia common, middle-sized to large, 3-14

mm in diam., sessile to subpediculate, the disk concave, chestnut-brown or lighter, the exciple entire to irregular; spores sub spherical to short-ellipsoidal, 4-9 x 3.5-6.0 in diam.

The algal host is *Protococcus*.

This is probably the most common taxon seen in the pygmy forest. It grows, very densely at times, on the bark and twigs of all conifers and on Rhododendron. *Hypogymnia inactiva* is morphologically very similar to *Hypogymnia enteromorpha* and *Hypogymnia imshaugii*, which also occur on the west coast. It can be distinguished by its thin black medulla. The other two species have a white medulla.

21. [*Hypogymnia physodes*](#) (L.) Nyl., Lich. Envir. Paris 1896:39. 1896.

Licxhen physodes Linn. Sp. Pl. 1144. 1753.

Parmelia physodes Ach., Meth. Lich. 153. 1803.

Thallus pale olive gray to ivory yellow, sub orbicular, flat and spreading, small to medium sized, 5-12 cm in diam., rather loosely attached to the substratum, slightly inflated, irregularly divided into many narrow lobes, often becoming crowded in the center, the recurved ascendant tips often abundantly sorediate below, the black or brown undersurface showing as a border on the lobes; lower surface brown to black, the tips of the lobes often brown, smooth, sometimes wrinkled, often shiny; rhizines absent; apothecia rare, 3-8 mm in diam. Sessile to subpediculate; disk reddish brown, concave; thalline margins entire to crenate; asci 8-spored; spores hyaline, sub ellipsoidal, nonseptate, 4-9 x 3.5-6 um in diam.



The algal host is *Protococcus*.

Hypogymnia physodes is rare on conifer bark in the pygmy forests. All collections were sterile. This lichen may be confused with *Hypogymnia enteromorpha*, at a distance, but the ascendant, recurved tips, that are often heavily sorediate on the under surface make it easily distinguishable upon closer examination.

22. *Lobaria pulmonaria* (L.) Hoffm. Deutschl. Fl. :146. 1795.

Lichen pulmonarius L., Sp. Pl. 1146. 1753.

Sticta pulmonaria Bir., Fl. Ascon. 2:188. 1808.

Thallus middle-sized to large, 8-20 cm in diam., loosely attached to the substratum, plainly pitted and reticulately ribbed, greenish gray to greenish brown, the margins and ridges often sorediate or isidiate; lobes elongated, deeply and narrowly divided, with somewhat blunt, notched apices; lower surface tan to brown, covered by a spongy nap of rhizines forming a distinct tomentum, with many scattered raised, naked, white spots; apothecia rare, scattered, or sub marginal, 1-6 mm in diam., sessile to subpediculate; thalline margin thin, entire or wrinkled, concolorous with the thallus, finally disappearing; spores byaline, cymbiform, 1-to-3-septate, 18-33 x 5.5-9 um I diam.



The algal hosts are *Protococcus* and *Nostoc*.

This lichen is fairly common and found in all of the pygmy forest areas. It prefers the damper sites and usually was found on the lower trunks of trees.

23. *Lobaria scrobiculata* (Scop.) DC., *Fl. Fr.* 2:402. 1805.

Lichen scrobiculatus Scop. *Flora Carniol.* 2:384. 1772.

Thallus small to middle-sized, 4-9 cm across, firmly attached to the substratum, smooth or slightly pitted and rippled, pale greenish gray to yellowish; lobes up to 3 cm broad, the margins sinuate; soredia laminal or marginal, forming dark gray or bluish warts; lower surface pale buff to dark brown, usually lighter toward the margins, covered by a short nap of ten rhizines forming a tomentum, also bearing many, scattered raised, naked, white spots; apothecia up to 2 mm in diam., reddish brown, spores hyaline, 4-8 septate, 50-75 x 5-7 um in diam.

The algal hosts are *Protococcus* and *Nostoc*.

Lobaria scrobiculata was only found in the pygmy forest bordering Little Lake Road, and was widely scattered on the trunks of trees in that area.

24. *Menegazzia terebrata* (Hoffm.) Mass., *Neag. Lich.* 3. 1854.

Lobaria terebrata Hoffm., *Deutschl. Flora* 151. 1796.



Thallus small to medium-sized, 3-10 cm in diam., usually shiny, grayish olive to ivory/yellow, orbicular, closely adnate, slightly inflated, divided palmately into many sinuate lobes, 3-6 mm wide, perforated with small round holes with conspicuous, raised round masses of soredia, the tips rounded; lower surface black sometimes brown at the edges and at tips of lobes, wrinkled; rhizines absent; apothecia rare, small to middle-sized, 3-8 mm in diam., the disk chestnut-brown at the edges and at tips of lobes, wrinkled; rhizines absent; apothecia rare, small to middle-sized, 3-8 mm in diam., the disk chestnut-brown, the exciple entire; spores 2-4 per ascus, ellipsoidal, 45-60 x 22-28 um in diam.

The algal host is *Protococcus*.

This unique, rare lichen is found on sooth bark trees in the pygmy forests. All collections were sterile. At a distance this taxon can be confused with members of the genus *Hypogymnia*; however the distinct raised masses of soredia and holes in the thallus distinguish it from any other taxon.

25. *Nephroma laevigatum* Ach., Syn. Math. Lich. 242. 1814.



Thallus small to medium-sized, 4-6 cm across, greenish gray to brown; lobes small and round, 1-3 cm across, smooth to wrinkled, minutely pubescent; medulla pale yellow to orange; apothecia 1-5 mm in diam., adnate, borne on the underside of the lobe tips; disk reddish brown flat to concave; proper margin thin, sinuate; spores light brown, fusiform-ellipsoidal, or pyriform, 3-septate, 16.4-23.8 x 6.6-7.0 um I diam.

The algal host is *Parmella*.

This lichen is found scattered throughout the pygmy forests. It is easily identified by its pale yellow or orange medulla with the apothecia occurring on the underside of the lobe tips.

26. *Parmelia arnoldii* Du Reitz, Arkiv for Bot. 20, No. 11:33. 1926.

(*Parmotrema arnoldii* (Du Reitz) Hale, 1974)

Thallus middle-sized to large, 8-16 cm in diam., adnate, white to pale olive-green, lobes large, scarcely elongated, often more or less branched, imbricate, ascending towards the white soresiate, crenate margins, often bearing long black cilia, 2-4 mm in length; black below, sometimes brown toward the lobe tips, usually bearing scattered black rhizines; apothecia absent.



The algal host is *Protococcus*.

Parmelia arnoldii is found throughout the pygmy forests. It is easily recognizable by its white thallus and black cilia. On the west coast it can be distinguished from *P. periata* (Huds.) Ach. By a negative KOH test of the medulla.

27. *Parmelia crinita* Ach., Syn. Math. Lich. 196. 1814.

(*Parmotrema crinitum* (Ach.) Choisy)

Thallus small to middle-sized, 1-4 cm across, loosely adnate, whitish to pale green; soredia and/or isidia present, the isidia marginal or laminal; lobes small, 0.5-2 mm across, rounded to linear, wrinkled-ascending, ciliate, the cilia up to 1 mm long, black, occasionally arising from the isidia; the underside black, turning brownish, then becoming the color of the upper surface near the margins, densely covered by long, simple, black rhizines, up to 2.5 mm long; apothecia rare, subpediculate, small to middle-sized, 4-12 mm in diam., the disk deeply concave, chestnut-brown, the exciple irregular or crenate, soeties bearing cilia or isidia; spores ellipsoidal, 2-30 x 10-18 um in diam.



The algal host is *Protococcus*.

Parmelia crinita in all the pygmy forests were lacking apothecia. In this area the majority of the individuals are small and found growing on *Rhododendron* twigs. Due to this small size, probably because they are immature, they are very hard to identify. The larger specimens are easily identified by the cilia arising from isidia, and the smaller organisms can be identified by comparing them with a larger one.

28. *Parmelia saxatilis* (L.) Ach., Meth. Lich. 204,205. 1803

Lichen saxatilis L., Sp. Pl. 1142. 1753.

Thallus small, 3-6 cm in diam., cream-colored, cartilaginous to membranaceous, reticulate-rimose, lacunose; lobes narrow, sinuous, with angular white markings, often pinnately many-cleft, the tips ascending, crenate, rarely brownish, often heavily isidiate; lower surface black, with abundant black rhizines; apothecia rare, 1-6 mm in diam., sessile, disk chestnut-brown, concave; thalline margin entire, sub crenate or irregular; asci 8-spored; spores hyaline, ellipsoidal, nonseptate, 14-20 x 8.0-10.5 um in diam.

The algal host is *Protococcus*.

All material examined lacked apothecia. This species is found in all the pygmy forest. In this area *Parmelia saxatilis* is abnormally small. However, it is easily identified by the angular white markings on the thallus surface.

29. *Peltigera canina* (L.) Willd., Fl. Gerol. Prod. 347 1787.

Lichen caninus L. Sp. Pl. 1149. 1753.



Thallus middle-sized to large, 8-15 cm in diam., light gray, thin smooth and shiny; lobes digitate, often ascending; lower surface whitish to cream, reticulate, with raised, pinkish white veins, closely attached to the substratum with white to brown rhizines; apothecia 2-5 mm in length, oblong, revolute, borne on the tips of narrowly extended lobules, adnate; disk reddish brown; proper margins crenellate; 8 spores per ascus; spores hyaline, acicular, 5-7 septate, 38-72 x 3-5 um in diam.

The algal host is *Dactylococcus*.

Peltigera canina was found only in the pygmy forest on Little Lake Road. This lichen is easily distinguished from any other by its smooth and shiny upper surface and by the distinctive fertile lobe tips.

30. *Peltigera praetextata* (Somm.) Vain., Term. Fuz. 22:306. 1899.

Peltide ulorrhiza var. *praetextata* Somm., Suppl. Fl. Lapp. 123. 1826.

(*Peltigera praetextata* (Flörke ex Sommerf.) Zopf.)



Thallus medium-sized, 6-9 cm in diam., gray, adnate toward the center; lobes narrow, wavy, ascending at the margins, often covered with light or dark, coralloid isidia, especially toward the margins; lower surface whitish, reticulated with cream-colored to brown veins, rhizines brown, not abundant; apothecia 2-5 mm in diam., round or somewhat oblong, revolute, borne on narrow upright lobules, adnate; disk reddish brown; proper margins denticulate; asci 8-spored; spores hyaline, acicular, slightly curved, 3-to-5-septate, 40-50 x 3.3-4.0 um in diam.

The algal host is *Dactylococcus*.

The only specimen of *Peltigera praetextata* collected was sterile. This taxon is easily distinguished from any other gray, foliose lichen by the coralloid isidia on its upper surface.

31. *Platismatia glauca* (L.) Culb. & Culb., Cont. U. S. Natl. Herb. 34(7):360. 1968.

Lichen glaucus L., Sp. Pl. 2:1148. 1753.

Cetraria glauca (L.) Ach., Meth. Lich. 296. 1803.

Thallus foliose, medium-sized, 5-15 cm across, whitish gray; lobes smooth to slightly lacunose, bearing scattered grayish white soredia or isidia; lobes narrow or broad, 5-25 mm across, entire, sinuate or lacerate, the margins strongly ascendant, often extended by coralloid branchlets, thickened, crenate, lagged; lower surface black with white margins shiny, *smooth* or lacunose, rhizines rare, if present small and scattered; apothecia rare, borne on the margins or sub marginally, 2-6 mm in diam., adnate; disk chestnut-brown, flat, sinuate; thalline margin irregular and disappearing, spores hyaline, ellipsoidal, 4.6-6 x 3-4 um in diam.

The algal host is *Pleurococcus*.

Although *Platismatia glauca* is fairly common in the pygmy forests no fertile specimens were collected. This lichen is easily confused with *Platismatia herrei* (Imsh.) Culb. & Culb. Which is more common in the pygmy forests. Both species are highly variable morphologically; the best way to separate them is by the lobe tips. In *P. herrei* they are long and linear (Plate III, Figure 13) while in *P. glauca* they are broad and round. Although *P. glauca* occasionally has soredia, they are not present often enough to be a reliable diagnostic trait.

32. *Platismatia herrei* (Imsh.) Culb. & Culb., Contrib. U.S. Natl. Herb. 34(7): 537. 1968.

Centraria glauca var. *stenophylla* Truck., Synop. Nol Amer. Lich. 1:36. 1882.

Centraria tuckermanii Herre, Proc. Wash. Acad. Sci. 7:340. 1906

Centraria herrei Imsh., Bryologist 57:6. 1954.



Thallus subfruticose, medium-sized, 9-13 cm in diam., whitish; lobes narrow, linear, 0.5-4 mm broad, sometimes up to 8 mm broad near the base; upper surface whitish-smooth to minutely pitted or wrinkled, sometimes covered by coralloid lobules, the margins ascendant, sinuate to lacerate, lacking soredia, isidiate, the isidia simple to branched and coralloid, densely fringing the margins, rarely present on the lower surface, lower surface dark brown to jet black, mottled white and turning white near the margins; rhizines black, rare, occurring only at the points of attachment; apothecia rare, 3-8 mm in diam., terminal, imperforate, hymenium 47-65 μm thick, spores 8 per ascus, ellipsoid to spheroid, 508 x 4-5 μm in diam., nonseptate, pycnidia few, black, minute, less than 0.2 mm in diam., marginal; conidia 1 x 5 μm in diam., rod-shaped.

The algal host is *Protococcus*.

Platismatia herrei is common on the bark and twigs of conifers in all the pygmy forests. All specimens examined were sterile. *Platismatia glauca* (L.) Culb. & Culb. Which closely resembles *P. herrei* is also common in the area. These two species can be separated in the field by the fact that the terminal lobes of *P. herrei* are long and linear, usually 5-10 times longer than broad and the lobes of *P. glauca* are short and rounded with the margins becoming fruticose.

33. *Dendriscoaulon intricatum* Henssen in. ed.

Leptogidium dendriscum Nyl. Flora 56:195. 1873.

(*Dendriscoaulon intricatum* (Nyl.) Henssen)



Thallus small, 3-7 mm tall, forming colonies up to 100 mm long and 40 mm broad, dark olive-brown to brown, minutely fruticose and ascending; lobes less than 0.1 mm across, the branches flattened, irregularly dichotomously branched, subcorymbose at the tips, the tips slightly swollen; upper side light tan, sometimes mottled brown, smooth and shiny; apothecia absent.

The algal host is *Scytonema*.

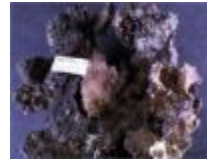
Dendriscoaulon intricatum was only found on conifer bark in the small pygmy forest off Little Lake Road. Its small size and tendency to resemble a moss closely when damp or wet makes it easily overlooked. Close inspection, however, will reveal its fruticose nature which makes it readily identifiable. According to Dr. A. Henssen (personal communication) this taxon may be a free living cephaiodia of *Lobaria* species.

34. *Pseudocyphellaria anomola* Magn. Acta Hortl. Gothob. 13:248. 1940.

(*Pseudocyphellaria anomola* Brodo & Ahti)



Thallus small to medium-sized, 4—12 cm across, loosely attached to the substratum, yellow-brown to brown, usually lighter near the center; lobes broad in comparison to thallus size, reticulate and sometimes lightly pitted; the margins crenate to lacerate, the margins ad ridges often covered by gray-white soredia; lower surface brownish and sometimes becoming lighter near the edges, clothed with spongy nap of short rhizines interspaced with white *sorediate pseudocyphellae*; apothecia absent.



The algal host is *Protococcus*.

This lichen was found in all areas of the pygmy forests. It grows intermixed with *Pseudocyphellaria anthraspis* (Ach.) Magn., but is not as large or robust. Some researchers maintain that this species is merely a sterile sorediate or juvenile form of *P. anthraspis*.

35. *Pseudocyphellaris anthraspis* (Ach.) Magn. Acta Hort. Gothob. 13:248. 1940.

Sticta anthraspis Ach., Meth. Lich. 280. 1803.



Thallus medium-sized to large, 7—15 cm I diam., loosely attached to the substratum, yellow-brown, to dark brown, usually lighter in the center; lobes broad, 5-8 cm, the margins cranate or lacerate, rather deeply reticulate-pitted; lower surface brownish and becoming darker toward the center, clothed with a spongy nap of short rhizines interspersed with white sorediate pseudocyphellae; apothecia middle-sized to large, 1-4 mm in diam., scattered to dense, sessile, the disk flat to convex, reddish brow or darker, the exciple thin, usually disappearing; spores fusiform, 3-septate, 22-31 x 7-10 um in diam.

The algal host is *Protococcus*.

This species is abundant throughout the pygmy forest areas, growing in robust colonies on the trunks of all species of conifers. Its large size and reddish apothecia, especially when wet, make it very noticeable among the small trees of the forest.

36. *Ramalina farinacea* (L.) Ach., Lich. Univ. 606. 1810.

Lichen farinacea L., Sp. Pl. 1146. 1753.



Thallus fruticose, small, 1-4 cm tall, whitish yellow-green, with a single definite point of attachment, rigid, lobes narrow, 0.5-1.5 mm across, sparsely dichotomously or irregularly branched, sub cylindrical to flattened, occasionally channeled, longitudinally wrinkled or pitted, the tips usually tapering, sorediate, the soredia on the upper surface of the lobes or, more commonly, in orbicular or oblong soralia borne on the lobe margins; the disk concave to convex; the exciple finally disappearing; spores oblong-ellipsoidal to ellipsoidal, straight to rarely curved, 13-17 x 5-78 um in diam.

The algal host is *Pleurococcus*.

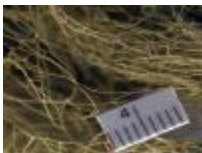
All material examined lacked apothecia. *Ramalina farinacea* is found on conifer twigs and bark in the pygmy forests. This small inconspicuous fruticose lichen is easily identified by its marginal soralia.

37. [*Ramalina menziesii*](#) Tuck., Syn. Lich. N. Eng. 12. 1848.

Lichen reticulatus Noedh. In Schrad., Journ. Bot. 2:237, 238. 1800.

Ramalina raticulata (Noedh.) Kramph., Gesch. Lich. 2:617. 1869.

(*Ramalina menziesii* Taylor)



Thallus small to medium-sized, 8-16 cm long, pendulous, or occasionally erect, tufted, the larger specimens draped over branches, straw-colored to pale lemon-green, flattened, perforate, membraneaceous, thin, more or less rigid, rather ribbon-like, flexuous, channeled, becoming lacunose, sparingly branched, puberulent, rarely sorediate, the tips of branches acuminate; apothecia circular, marginal or subterminal, 1-6 mm in diam., subpediculate; disk concolorous with the thallus, concave to convex; thalline margins entire, sometimes disappearing; spores hyaline, oblong-ellipsoidal, straight or often curved, nonseptate, 14-18 x



5.5-8.0 um in diam.

The algal host is *Protococcus*.

Only sterile specimens of *Ramalina menziesii* were found in the pygmy forests. From a distance this lichen resembles *Alectoria sarmentosa*, but the perforate membranaceous lobes of *R. menziesii* are unique.

38. *Ramalina roseleri* (Hochst.) Nyl., Bull. Soc. Linn. Normand. Ser. 2,4:165. 1870.

(*Ramalina roesleri* (Hochst. ex Schaerer) Hue)



Thallus subfruticose, tufted, or prostrate, stiff, small, 3-5 cm in length, attached to the substrate at one point, pale greenish white, shiny, irregularly and profusely branched, branches 2-8 mm wide and 1-3 mm thick, subterete to flattened, usually perforate, especially near the base, the tips fine and delicate, sometimes sorediate; apothecia lacking.

The algal host is *Protococcus*.

Ramalina roesleri is rare on the bark of conifers in the pygmy forests. This taxon is considered rare throughout its range, but perhaps it is merely often overlooked because of its small size and tendency to be hidden by the rough bark on which it grows. When found, this taxon is easily identified by its small shiny thallus that is usually perforate near the base.

39. *Sphaerophorus globosus* (Huds.) Vain., Result. Voy. S. Y. Belgica Bot. 35. 1903.

Lichen globus Huds., Flora Ang. 1:460. 1762.



Thallus fruticose, erect, medium-sized to large, 15-35 mm tall and 20-80 mm broad, loosely branched, silver-gray, pinkish white, light orange, orange-brown or brownish; branches numerous, 0.25-1 mm in diam., terete, smooth and shiny, brittle and breaking easily, with numerous clusters of small lateral coralloid branchlets, less than 0.25 mm in diam. Apothecia terminal, 0.5-2 mm in diam., within thalline receptacles on the tips of the branches, forming a mazaedium; disk concave to almost flat; spores violet-black, spherical, non-septate, 6.6-16 um in diam.

The algal host is *Protococcus*.

This colorful taxon is found throughout the pygmy forests on the bark and twigs of conifers. Its distinctive colors and morphology make it conspicuous and easily distinguishable from any other taxon.

40. *Sticta fuliginosa* (Dicks.) Ach. Meth. Lich. 280. 1803.

Lichen fuliginosa Dicks., Pl. Crypt. Brit. 1:13. 1785.

Parmelia fuliginosa Nyl., Flora 346. 1868.

(*Sticta fuliginosa* (Hoffm.) Ach)



Thallus small to middle-sized, 2-6 cm in diam., loosely attached to the substrate, tan to dark brown, densely covered by dark brown or black isidia; lobes somewhat imbricate, with crenate margins; lobe surface buff or light brown, covered with a nap of soft rhizines forming a tomentum, also bearing scattered, naked soft rhizines forming a tomentum, also bearing scattered, naked, concave, white or pale buff-colored cyphellae; apothecia small to middle-sized, 0.6-1.0 mm in diam., usually marginal, sessile, the disk flat to convex, reddish brown, the exciple thin, soon disappearing; spores fusiform, 1-5o-3-septate, 25-46 x 7-9 um in diam.

The algal host is *Protococcus*.

This lichen is locally abundant in the area along Little Lake Road, but rarely collected in any other area. All specimens examined lacked apothecia. Its dark brown upper surface densely covered by isidia make it easily identifiable in the field.

41. *Sticta limbata* (Sm.) Ach. Meth. Lich, 280. 1803

Lichen limbata Sm. In Sm. and Sowerb. Engl, Bot. 16:tab. 1104. 1803.



Thallus small, 1-3 cm across, loosely attached to the substratum, smooth to slightly pitted, orange-brown to lead-gray colored; lobes broad in comparison to the thallus size with wavy, crenate margins; soredia gray, in orbicular, laminal or marginal soralia; lower surface light buff to brownish, clothed with a soft nap of short rhizines forming a tomentum, also bearing scattered, concave whitish cyphellae; apothecia small to middle-sized, 0.6-2 mm across, scattered, sessile, the disk flat to convex, dull black, the exciple thin, soon disappearing; spores brown, oblong-ovoid, 1-septate, slightly constricted, 15-22 x 5-8 um in diam.

The algal host is *Protococcus*.

This lichen was rarely collected in the area. It may be more common than the few collections indicate, but its small size and tendency to blend in with the conifer bark on which it grown makes it very inconspicuous.

42. [*Usnea californica*](#) Harre, Proc, Wash. Acad. Sci. 7:345. 1906.



Thallus fruticose, pendulous, 10-30 cm long, light gray-green, stiff, with a single point of attachment to the substrate; primary branched irregularly divided and widespread, readily traceable nearly to the extremity of the thallus, very sparsely clothed with ramuli, rarely papillate, the papillae small, hemispherical to club-shaped, occasionally with a pore in the tip; secondary branches long and subdivided, sparsely clothed with ramuli; branchlets and ramuli occasionally sorediate, medulla pink to light red, composed of a very thin layer of loosely interwoven hyphae surrounding a thick dense central cord; apothecia rare, borne on secondary branches, terminal or lateral, small to medium-sized, concolorous or tan; spores nearly globose to broadly ellipsoidal, 4.9-7.3 x 7-11 um in diam.

The algal host is *Pleurococcus*.

Usnea californica is rare on conifer bark in the pygmy forests. All specimens examined lacked apothecia. This lichen can be distinguished from *Usnea dasypoga* ssp. Bicolor Mot., by its red medulla.

43. *Usnea californica* A

Thallus fruticose, tufted to pendulous, 5-20 cm long, very stiff, gray-green to yellow-green, older plants often blackening, with multiple points of attachment to the substrate; primary branches irregularly branched, occasionally reattaching to the substrate some distance from the original base, 1.5-2.5 mm thick; ramuli absent or very rare, rarely sparsely sorediate; secondary branches short, dichotomously or irregularly branched, occasionally reattaching to the substrate; ramuli rare; soredia scattered in orbicular soralia or in cracks in the cortex; medulla composed of a thin white layer of loosely interwoven hyphae surrounding a very thick dark red central cord; apothecia absent.

The algal host is *Pleurococcus*.

This lichen is common throughout the pygmy forests on the trunks of conifers. It can be separated from any other lichen in the area by its thick primary branches, extreme stiffness, its habit of having multiple points of attachment to the substrate, and the dark red central cord.

44. *Usnea condensata* Mot., Lich. *Usnea* Monogr. 2:551. 1938.



Thallus fruticose, tufted to slightly hanging, greenish yellow, small to medium-sized, 408 cm long, attached to the substrate at a single point, with one major axis; primary branches irregular to irregularly dichotomously branched, turning black near the base, sorediate, the soredia in low tubercles, and occasionally becoming isidiate, the branches with many ramuli, 1-2 mm long, the ramuli papillate and sorediate; cortex densely papillate, especially near the base, the papillae

hemispherical; secondary branches sparse, the tips subulate, sorediate, with ramuli, medulla white, composed of a thin layer of loosely interwoven hyphae surrounding a thick, dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This lichen is rare in the pygmy forests, and has not been reported previously from the United States. It can be easily separated from any other *Usnea* by its sorediate and papillate ramuli.

45 *Usnea dasypoga* ssp. *Bicolor* Mot., Lich. Gen. *Usnea* Monogr. 2:189-192, 1938. (*Usnea filipendula* Stirton s.l.?)

Thallus fruticose pendulous, 20-30 cm long, greenish yellow, soft, draped over twigs and branches with no distinct point of attachment; primary branches blackening, the branching simple or densely dichotomous, covered by sub cylindrical papillae up to 0.2 mm in length, rarely sorediate, usually evenly covered by ramuli 1-3 mm long, the ramuli with low inconspicuous hemispherical papillae; secondary and young branches greenish yellow, the papillae scattered, small, hemispherical, with a depression in the tip; ramuli scattered or absent, 0.5-1 mm long, smooth to lightly papillate, the apices of the branches acute, darker green than the rest of the thallus; medulla white, composed of a layer of loosely interwoven hyphae surrounding a dense central cord of the same thickness; apothecia absent.

The algal host is *Pleurococcus*.

This variety is occasionally found in the upper canopy of the larger trees in the pygmy forests. It can be quickly identified by its long soft thallus and blackening or primary branches.

46. *Usnea fragilescens* A

Thallus fruticose, tufted, medium-sized, 4-7 cm tall, whitish to yellow-green, with a single definite point of attachment; primary branches strongly inflated, especially near the base, rarely branched; ramuli sparse; cortex smooth or minutely papillate; secondary branches profuse, irregular, sorediate, the soredia in orbicular soralia, becoming isidiate; ramuli sparse, sorediate; cortex papillate, the papillae small and hemispherical, occasionally with a depression in the tip; medulla white, composed of a thick layer of loosely interwoven hyphae surrounding a thin dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This lichen is uncommon in the pygmy forests. It can be distinguished in the field by its obviously inflated primary branches. Care must be taken, however, in differentiating taxon from *Usnea occidentalis* Mot., which has branch tips covered by soredia instead of orbicular soralia.

47. *Usnea fragileszens* B

Thallus fruticose, pendulous, medium-sized to large, 8-14 cm long, greenish, with a single definite point of attachment; primary branches irregularly dichotomous; ramuli rare, sorediate; cortex minutely papillate; secondary branches profuse, simple, long and the tips acute, densely sorediate, the soredia in orbicular soralia, becoming isidiate; cortex papillate, the papillae larger than those on the primary branches; medulla white, composed of a thick layer of loosely interwoven hyphae surrounding a thin, dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This taxon is found on conifers in all the pygmy forests. It closely resembles *Usnea fragileszens* C, but lacks papillae with a depression in the tip and occasionally has ramuli.

48. *Usnea fragileszens* C

Thallus fruticose, pendulous, medium-sized to large, 8-14 cm long, greenish, with a single definite point of attachment; primary branches dichotomously branched, the tips appearing forked; cortex papillate, the papillae small and with a depression in the tip; secondary branches common, simple or rarely branched, densely sorediate, the soredia in orbicular soralia, becoming isidiate; cortex papillate, the papillae with a depression in the tip; medulla white, composed of a thick layer of loosely interwoven hyphae surrounding a thin, dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This lichen is found on conifer branches throughout the pygmy forests. It can be identified easily because it is the only pendulous lichen in the area with isidiate soredia and papillae with a depression in the tip.

49. *Usnea fragileszens* D

Thallus fruticose, tufted, medium-sized, 5-8 cm tall, yellow-green, with a single definite point of attachment; primary branches highly branched near the base, then sparsely dichotomously branched; soredia lacking; ramuli sparse; cortex papillate, the papillae small and becoming cylindrical; secondary branches abundant, sparingly and irregularly or dichotomously branched near the tips, sorediate, the soredia in scattered orbicular soralia, densely clothed with ramuli, the ramuli occasionally with orbicular soralia; cortex papillate, the papillae small and becoming sub cylindrical; medulla white, composed of a thick layer of loosely interwoven hyphae surrounding a thin, dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This lichen is common on conifer branches in the pygmy forests. The best field characteristic is its growth form. It is strongly tufted with many primary branches bearing numerous secondary branches densely clothed with ramuli.

50. *Usnea fragilescens* E

Thallus fruticose, tufted, small, 3-4 cm tall, yellow-green, with a single definite point of attachment; primary branches sparingly irregular branched, sorediate, the soredia in orbicular soralia, clothed with ciliary ramuli and ramuli; cortex smooth or with widely scattered small papillae; secondary branches common, irregular, sorediate, the soredia in orbicular soralia, clothed with ramuli or with occasional ciliary ramuli; cortex smooth or with rare small papillae; medulla white, composed of a layer of loosely interwoven hyphae surrounding a thin, dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This small *Usnea* is found throughout the pygmy forests. It is easily recognizable by the ciliary ramuli occurring on the primary branches.

51. *Usnea fragilescens* F

Thallus fruticose, pendulous short, 3-7 cm long, with no definite single point of attachment, greenish yellow, sparingly dichotomously or unevenly branched; branches with rare, solitary ramuli, occasionally constricted at the point of branching; cortex densely papillate, and with scattered craters; medulla white, composed of a thick layer of loosely interwoven hyphae surrounding a thin dense central cord; apothecia absent.

The algal host is *Pleurococcus*.

This species was found only once in the pygmy forest near Summers Lane. This is the only taxon of *Usnea* in the area that has definite craters in its cortex.

52. *Usnea occidentalis* Mot., Lich. Gen. *Usnea* Monogr. 2:570. 1938.

Thallus fruticose, tufted, pale green or light yellow-green, small to medium-sized, 4-9 cm long, attached to the substrate at a single point, with several major axes; main branches much inflated and divided at the base, sorediate and isidiate; secondary branches up to 3 cm long but usually shorter, the tips usually heavily sorediate and appearing powdery; cortex smooth, occasionally decorticate; medulla white, composed of a thick layer of loosely arranged hyphae surrounding a very small dense central cord; apothecia absent.

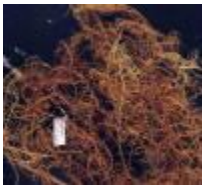
The algal host is *Protococcus*.

This lichen, which has not been reported before from California, is rare on conifer twigs in the pygmy forest. *Usnea occidentalis* resembles *Usnea fragileszens* A, but it has diffuse soredia at the lobe tips rather than orbicular soredia as in the *U. fragileszens* group.

53. *Usnea rubiginea* (Michx.) Mass. In Mem. Of I. R. Listit. Veneto 10:45. 1861.

Usnea florida var. *rubiginea* Michx., Fl. Bor. Am. 2:332. 1803.

Usnea rubicunda Stirton (European taxon only? P. W. James (1979). Notes on *Usnea rubiginea* and *U. rubicunda*. The Lichenologist, 11, pp 322-323 doi:10.1017/S0024282979000384)



Thallus fruticose, medium to large-sized, 5-15 cm long, tufted or pendulous, stiff, light orange red to dark brick-red, with a single definite point of attachment; primary branches cylindrical, repeatedly and irregularly branched, faintly striate, shiny, darker near the base and becoming progressively paler toward the tips, often densely clothed with ramuli, soredia white, scattered or very dense, usually in orbicular soralia; ramuli sparse, cortex smooth and shiny; medulla white, composed of a very thin layer of loosely interwoven hyphae surrounding a thick dense central cord; apothecia rare, borne on the branch tips, 0.8-1.2 cm in diam., the margins entire; exciple sub convex, rough, opaque;

epithecium sooty in color; spores sub ellipsoidal, 9-10 x 6-7 um.

The algal host is Pleurococcus.

Usnea rubiginea is fairly common in the pygmy forests. All specimens examined lacked apothecia. This lichen is extremely easy to identify because it is the only red fruticose lichen found in the pygmy forests.



Pygmy Forest Ground Cover w/ cushions of *Cladonia impexa* on the soil and *Hypogymnia inactiva* on branches

LOCATIONS OF PYGMY FORESTS SURVEYED

California 1975

1. Summers Lane, 1.5 miles east of Fort Bragg, Mendocino Co.
2. 1 mile east of Highway 1 on Mitchell Creek, Mendocino Co.
3. 1.3 miles east of Highway 1 on Simpson Lane, Mendocino Co.
4. 1.5 miles east of Highway 1 on Gibney Lane, Mendocino Co.
5. 2.6 miles east of Highway 1 on Casper Road, Mendocino Co.
6. 2 miles east of Highway 1 on Graveyard Road, Mendocino Co.
7. 1.6 miles east of Highway on Comptche(-Ukiah) Road, Mendocino Co.
8. 1.3 miles east of Highway 1 on Comptche(-Ukiah) Road, Mendocino Co.
9. Mendocino County Airport (Little River Airport), 1.75 miles east of Highway 1 on (Little River) Airport Road, Mendocino Co.
10. 2.75 miles east of Highway 1 on (Little River) Airport Road, Mendocino Co.

Locations 2010

The collection locations were re visited in 2010, 36 years after the original study, and all the accessible areas remained mostly undeveloped and little changed. Some of the road names had changed and a number of collection sites were no longer accessible because the property was now posted or the private roads requested that you did not enter.

A nice feature is the self-guided nature trail, built upon an elevated wooden walkway, which loops through a portion of the Pygmy Forest in Van Damme State Park. This area is a great example of the Pygmy Forests and it allows easy access. The trees in the Pygmy Forest may be small, but they are dense; if there is no game trail, it is almost impossible to force your way through the vegetation.



The trail head is located (on the left) just east of Little River Airport on Little River Airport Road.

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GLOSSARY

Anisotomic branching: Branching with a single major branch, and smaller lateral branches.

Apothecium: The fruiting structure within which the asci are borne and which is usually disk or cup-shaped.

Areole: A small angular division of a surface, separated from others by chinks in the surface.

Areolate: Having flat angular areas separated by white lines or chinks.

Ascus: The sac-like cell which contains ascospores and is located in the hymenium layer of the ascocarp.

Axial: The angle between the main podetium and a branch, or between two branches or lobes.

Caesius: Bluish gray.

Caespitose: Tufted or clumped.

Cartilaginous layer: The inner horny layer of the podetium next to the hollow center.

Ciliary ramuli: Ramuli that resemble cilia, usually prostrate on the cortex and concolorous with it; less than 1 mm long.

Cortex: An outer layer of the thallus or podetium composed of heavily gelatinized hyphae.

Corticolous: Growing on bark.

Corymbose: An arrangement of a cluster or whorl of small branches which come to the same general height.

Crenate: With small rounded projections along the edges.

Cyphellae: Large circular pores on the lower surface of Sticta.

Decorticate: Losing its cortex, or lacking cortex due to disintegration.

Dilated: Broadened.

Esorediate: Lacking soredia.

Exciple: A layer of the apothecium which encircles the hymenium.

Farinose: Very fine, powdery, like flour.

Fibril: Outgrowth from a branch that includes algae, medullary hyphae, and axis, surrounded by cortex;

Foliose: Leaf-like.

Fusiform: Spindle-shaped.

Glabrous: Free from any roughness, hairs or unevenness, smooth.

Glaucouscent: Bluish-green.

Granulose: Composed of coarse granules.

Hymenium: The layer of the ascocarp which is composed of asci and paraphyses.

Impelilucid: Opaque, not translucent.

Incised: Sharply cut.

Isidium: A corticated outgrowth of the cortex.

Isotomic branching: Branching into two or more branches of equal size.

Laciniate: Cut into narrow lobes.

Papillae: Small usually rounded bumps which are hemispherical, conical, or cylindrical and consist solely of cortical tissue

Pellucid: More or less translucent, with the appearance of oiled paper.

Podetium: The hollow erect stalk of the Cladonia.

Primary squamules: The small, leafy, clustered, vegetative parts of the thallus on the substratum which may later give rise to the podetia.

Pseudocyphellae: Simple pores in the upper or lower cortex - protruding medulla hyphae.

Pycnidium: A small flask-shaped organ bearing asexual reproductive bodies, the conidia.

Ramuli: Fibrils extending from the cortex and concolorous with it, 1-3 mm long.

Rhizoid: A hair-like multicellular growth projecting from the underside of the thallus of squamules.

Rimose: Chinky, having a cracked surface.

Rugose: Wrinkled, covered with wrinkles.

Saxicolous: Growing on rock.

Sinuate: With a wavy margin.

Soralium: A structure within which soredia are borne, or a distinct cluster or soredia.

Soredium: A tiny powdery propagule, containing a group of algal cells surrounding a dense layer of fungal hyphae but lacking a cortex.

Sympodium: A type of branching in which one member of a group of branches becomes the main branch, and its growth displaces the other branches so that they appear lateral.

Terete: Cylindrical in shape.

Terricolous: Growing on soil.

Tomentum: A layer of dense matted hairs.

Truncate: Ending abruptly, as if the tip were cut off.

Verrucula: A small warty protrusion. Often low, broad-based protrusions from cortex, not conspicuous in profile-often opening into soralia, especially on upper branches.

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