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The Bulletin of the California Lichen Society (ISSN 1093-9148) is edited by Darrell Wright with a review committee including Larry St. Clair, Shirley Tucker, William Sanders, and Richard Moe, and is produced by Darrell Wright. The *Bulletin* welcomes manuscripts on technical topics in lichenology relating to western North America and on conservation of the lichens, as well as news of lichenologists and their activities. The best way to submit manuscripts is by e-mail or on 1.44 Mb diskette in Word Perfect or Microsoft Word formats; ASCII format is an alternative. Manuscripts should be double-spaced. Figures are the usual line drawings and sharp black and white glossy photos, unmounted, and must be sent by surface mail. A review process is followed. Nomenclature follows Esslinger and Egan's 7th Checklist on-line at http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm. The editors may substitute abbreviations of author's names, as appropriate, from R.K. Brummitt and C.E. Powell, *Authors of Plant Names*, Royal Botanic Gardens, Kew, 1992. Style follows this issue. Reprints may be ordered and will be provided at a charge equal to the Society's cost. The Bulletin has a World Wide Web site at http://ucjeps.herb.edu/rlmoe /cals.html.

With this issue of the Bulletin Darrell Wright resumes as managing editor. Starting with the next issue, send submittals and correspondence to him at 4517 Valley West Boulevard, #C, Arcata, California 95521; voice and fax: 707-825-0779; e-mail: dwright3@jps.net

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Front cover: *Hypogymnia imshaugii* Krog, San Mateo County, California. Photography by Richard Doell. See the article by D. Wright.

Back cover: 1. *Tremolecia atrata* (Ach.) Hertel; 2. *Peltula zahlbruckneri* (Hasse) Wetmore; 3. *Hubbsia parishii* (Hasse) Tehler, Lohtander, Myllys, and Sundin; 4. *Lecanora demissa* (Flotow) Zahlbr. Photography by Ronald Robertson; image processing by Richard Doell. See the article by J. and R. Robertson.

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Catapyrenioid lichens in California

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Abstract: *Twelve species of lichens formerly placed in* Catapyrenium *are so far recorded from California. Short remarks on diagnostic characters of the species and on their distributions are provided. A key to the species occurring in California is presented.* Catapyrenium daedaleum, Clavascidium umbrinum, *and several segregates of the* Placidium lachneum *complex* (Placidium chilense, P. fingens, P. lacinulatum, P. pilosellum, *and* P. squamulosum). Placidium acarosporoides *is a new combination.* Placidium californicum *is described as new.*

Catapyrenium is a member of the Verrucariaceae with simple ascospores and squamulose thalli fastened to the substratum by interwoven rhizohyphae. In some species loosely arranged bundles or tufts of rhizohyphae or rhizines of longitudinally arranged hyphae also occur. *Catapyrenium* was segregated from the genus *Dermatocarpon* in which the thallus is attached to the substratum by a clearly defined central umbilicus. Recent studies showed, however, that *Catapyrenium* was still heterogenous; it was further subdivided into several genera on the basis mainly of anatomical, pycnidial and ascus characters (Breuss 1997). Three of these genera (*Catapyrenium*, *Clavascidium*, and *Placidium*) occur in California.

Catapyrenium s. str. is characterized by a thin (10-30 µm) upper cortex that is uneven in thickness and therefore poorly differentiated from the algal layer (fig. 1a). It is composed of small (5-8 µm in diameter), roundish-angular cells. The algal layer may protrude rather far into the upper cortex, whereas in the other genera mentioned the upper cortex is thicker and well delimited from the algal layer. In the genera with the thicker cortex, the cortical cells are larger (ca. 7-14 µm), angular and more tightly conglutinated. In a vertical section of the thallus the border between the upper cortex and the algal layer forms a sharp, straight line (fig. 1b).

In *Placidium* the walls of the uppermost cortical cells are thick, whereas the walls of the lower cells are thinner, with the change from upper to lower cells being gradual (fig. 1b). *Placidium* comprises about 30 species, 8 of which occur in California. All 8 share a rather uniform thallus morphology and were formerly lumped together as *Catapyrenium lachneum*. They all have brown, medium-sized to rather large squamules, but differ from each other in many finer aspects of thallus anatomy, conidial characters and size and shape of the ascospores. Another important character of *Placidium* is the cylindrical ascus with uniseriately arranged spores. However, this feature is best seen in immature asci and is obscured as the spores mature; the asci become narrowly clavate shortly before dehiscence of the spores. In the recently established genus *Clavascidium* (Breuss 1997) the asci are distinctly clavate from the beginning. Otherwise this genus is very similar to *Placidium* with the same type of upper cortex, although the hyphal wall thickenings described above are less prominent than in *Placidium*.

Twelve species of catapyrenioid lichens are known to occur in California. Most species are important components of soil communities. *Placidium acarosporoides* occurs on rock surfaces. *Catapyrenium psoromoides* and *Placidium fingens* are bark-inhabiting (the latter species is terricolous outside California). The most common species are *Placidium lacinulatum* and *P. squamulosum*. *Catapyrenium daedaleum* and *Placidium lachneum* are confined to alpine sites in the Sierra Nevada. The rarest species is *Catapyrenium squamellum*, known only from California and Jamaica. *Clavascidium umbrinum* is known from one

Californian locality only but is otherwise widely distributed, although scattered, in North America. It is apparent that large areas in California are still undercollected, and the southern part of the state is disproportionately represented in the present investigation.

Key to Californian species of catapyrenioid lichens

For positive identification, sections through the middle of well developed, fertile squamules are necessary. Material without perithecia and/or pycnidia often cannot be determined with certainty. Without detailed knowledge of finer aspects of the thallus anatomy and morphology of the species, it is very difficult to tell sterile *Placidium* species from *Endocarpon* species. Besides the characters mentioned in the introductory section, the hyphal texture of the medullary tissue, the formation of a lower cortex, and pycnidial characters are important to consider for identification. The prosoplectenchymatous medulla consists of filamentous, intricately interwoven hyphae with narrowly cylindrical lumina. This type of medulla is diagnostic for *Placidium chilense* and *P. lachneum*. In other species many cells of the medullary hyphae are strongly swollen to form spherical lumina, giving the medulla a more or less cellular appearance (fig.2). In species with a prosoplectenchymatous medulla, a clearly delimited lower cortex of roundish-angular cells is formed. An important character at species level is the position of the pycnidia, which may appear either as knob-like projections at the margin of the squamules or laminally immersed in the squamules. In the latter case they must be carefully distinguished from perithecia, which also appear as dark dots on the upper surface. Attachment to the substrate is by a more or less dense weft of rhizoidal hyphae with additional rhizines in some species. The rhizines are formed of longitudinally arranged hyphae and vary in size and branching. As they are very brittle in dry condition, fewer will be broken off if the squamule selected for investigation is wetted. Soak the squamule in alcohol for a few seconds to avoid air bubbles and then place it in a small bowl with water and carefully remove the soil from the lower surface with a needle or with tweezers under the dissecting microscope.

1a. Upper cortex of *Catapyrenium*-type (fig. 1a). Squamules tinged with green or gray, or whitish pruinose. Rhizohyphae colorless or brown 2
1b. Upper cortex of *Placidium*-type (fig. 1b). Squamules brown, epruinose. Rhizohyphae colorless 5

2a. On bark. Spores ellipsoidal to fusiform, ca. 13 - 17 x 5.5 - 7 µm. Thallus with spotty pruina especially on distal parts of lobes . . . . . ***C. psoromoides***
2b. On soil or mosses 3

3a. Rhizohyphae colorless to brownish, ca. 2.5 µm in diameter, often in tufts or rhizine-like bundles. Spores narrowly ellipsoidal, 15 - 20 x 5-6 µm. Squamules bare. Not alpine . . . . . ***C. squamellum***
3b. Rhizohyphae dark brown, 3 - 4 µm in diameter, not in tufts or bundles, but forming a dense hyphal weft. Spores +/- clavate, ca. 17 - 22 x 6 - 8 µm. Squamules +/- pruinose. Alpine 4

4a. Squamules small (0.5 - 3 mm), finely notched-incised, usually densely pruinose, dark-rimmed, with a black, paraplectenchymatous lower cortex . . . . . ***C. cinereum***
4b. Squamules larger, irregularly rounded, usually bare or slightly pruinose. Lower cortex lacking, medullary . . . . . hyphae merging into a dark rhizohyphal weft . . . . . ***C. daedaleum***

5a. On bark. Squamules adnate, attached by rhizohyphal weft. Pycnidia not marginal, immersed throughout the squamules. Conidia bacilliform . . . . . ***P. fingens***
5b. On rock, soil or mosses 6

6a. Directly on rock. Squamules convex to almost bullate, with central peduncle. Spores broadly ellipsoidal, ca. 13 - 17 x 8 - 11µm . . . ***P. acarosporoides***
6b. On soil or mosses. Squamules flat or wavy . . . 7

7a. Asci clavate; spores biseriate. Exciple dark. Squamules with a basal layer of dark brown hyphae. Rhizines dark . . . . . ***Cl. umbrinum***
7b. Asci cylindrical and spores uniseriate at least when young. Exciple pale. Dark basal layer lacking. Rhizines pale or lacking 8

8a. Medulla of filamentous hyphae, clearly delimited from the paraplectenchymatous lower cortex . . . 9
8b. Medullary hyphae often divided into globular cells. Lower cortex not sharply delimited from the medulla 10

9a. Lower cortex of angular cells in distinct vertical columns. Rhizohyphae 6 -7.5 µm thick. Pycnidia marginal. Conidia bacilliform, 5-7 µm long. Alpine . . . . . ***P. lachneum***
9b. Lower cortex of irregularly arranged, roundish-angular cells. Rhizohyphae 5 - 6 µm thick. squamules. Conidia oblong, 3-4 µm long. Not alpine . . . . . ***P. chilense***

10a. Spores broadly ellipsoid to subglobose, 10 - 13 x 8 - 9 µm, with rather thick walls (ca. 1 µm). Coastal ... . ***P. californicum***
10b. Spores ellipsoidal, ca. 11 - 17 x 5 - 7.5 µm, thin-walled (ca. 0.5 µm). Coastal or inland 11

11a. Attached by weft of rhizohyphae and additional rhizines ..... ***P. lacinulatum***
11b. Attached by hyphal weft only 12

12a. Pycnidia marginal. ..... ***P. pilosellum***
12b. Pycnidia not marginal, but immersed throughout the squamules 13

13a. Conidia ellipsoid-oblong, 3 - 4 x 1.3 - 2 µm .... ***P. squamulosum***
13b. Conidia bacilliform, 4 - 6 x 1 - 1.5 µm (in California so far found only on bark, known from soil elsewhere) ..... ***P. fingens***

The species:

***Catapyrenium cinereum* (Pers.) Koerber**
This is a close relative of the following species from which it differs by the smaller, finely incised squamules and a paraplectenchymatous lower cortex. It has an arctic-alpine distribution and is not known with certainty from California, but it is included in the key as it is likely to occur in the Sierra Nevada where other alpine species (*Catapyrenium daedaleum* and *Placidium lachneum*) have been found. The Californian dots in Thomson's (1987) distribution map (near San Francisco and in the Coast Ranges) are doubtful.

***Catapyrenium daedaleum* (Kremp.) Stein**
Inyo Co.: 37°26'N, 44°30'W, Eastern Brook Lakes Watershed, Sierra Nevada Mts., along Rock Creek Rd., on soil, elev. 10600 ft (3230 m), E of largest lake, June 1985, *B.D. Ryan 12648* (ASU).

The thallus consists of thickish, irregularly rounded, +/- confluent squamules on soil, humus or mosses. The outer squamules are often somewhat enlarged, giving the thallus an almost rosette-like appearance. The upper surface is brown, often with a greenish-gray tinge, dull, slightly roughened, bare or with a diffuse pruina especially in the central parts of the thallus. A characteristic feature of the species is the non-corticate underside with medullary hyphae merging gradually into the dark rhizohyphal weft. The species has an arctic-alpine distribution and in California is confined to the Sierra Nevada. The sample cited was reported as *Catapyrenium cinereum* by Ryan and Nash (1991).

***Catapyrenium psoromoides* (Borrer) R.Sant.**
Butte Co.: on bark of *Quercus douglasii* at Visitor Center [no precise locality given], 2 April 1976, *D.Toren 2832* (SFSU). Fresno Co.: foothills ca. 55 km SE of Fresno, grassy landscape with few trees, on *Quercus douglasii*, 36°46'N, 119°10'W, elev. 600 m, 29 April 1986, *R. Moberg 6821* (UOS). Lake Co.: on bark of *Quercus douglasii*, on the end of Hell's Peak Road, 26 April 1975, *D.Toren 1801*, with *Placidium fingens* (SFSU); Hell's Peak, on bark of *Quercus douglasii*, April 1975, *L. Sigal*, with *Placidium fingens* (ASU). Napa Co.: Glen Ellen, 25 April 1946, *C.L. Brown 389* (LAM). San Mateo Co.: Santa Cruz Mts., foothills 4 mi from Mayfield, 300 ft, on *Quercus lobata*, 4 June 1904, *A.C. Herre 792* (FH). Santa Clara Co.: on bark of *Quercus douglasii*, road from Frank Raines Park to Livermore just south of the Alameda Co. line, 27 March 1976, *D. Toren 2812*, with *Placidium fingens* (CANL, SFSU). Sonoma Co.: 1 mi N of Santa Rosa, June 1946, *C.L. Brown 444* (LAM).

With respect to habit, *Catapyrenium psoromoides* comes very close to the previous species with which it shares the non-corticate underside and from which it differs mainly in its smaller, narrowly ellipsoidal to subfusiform ascospores, in having pruinose spots especially on the distal parts of the lobes, and in being usually corticolous. The species is widely distributed in the temperate zone (Breuss & McCune 1994) but is rare. The known North American occurrences are restricted to the southwestern states, with most collections from California, where it occurs on bark of *Quercus spp.* Specimens in herbaria may be filed under *Catapyrenium tuckermanii* (=*Placidium tuckermanii*), a species not known with certainty from California.

***Catapyrenium squamellum* (Nyl.) Thomson**
Los Angeles Co.: Near Soldiers Home, on earth among mosses, 1897, *Hasse* (UC). - Santa Monica Mountains, 1898, *Hasse 792* (W).

Catapyrenium squamellum is a rare species known only from California and Jamaica.

***Clavascidium umbrinum* (Breuss) Breuss**
San Diego Co.: Kearny Mesa just S of General Dynamics plant, E of Cabrillo Freeway, field with depressions and scattered *Adenostoma*, 19 April 1966, *W.A. Weber & R. Santesson* (COLO).

Externally, *Clavascidium umbrinum* looks like a *Placidium* species, but differs in having the asci distinctly clavate rather than (sub)cylindrical. The squamules have a +/- thick, dark basal layer, dark rhizines, and dark perithecial

walls. Most North American records are from the periphery of the Great Plains (Breuss & McCune 1994).

***Placidium acarosporoides* (Zahlbr.) Breuss, comb. nov.**
Basionym: *Dermatocarpon acarosporoides* Zahlbr., Beih. Bot. Centralbl. 13: 153 (1903).
Inyo Co.: near Haiwee Reservoir, elev. 4500 ft, 25 April 1910, *H.E. Hasse 1309* (FH). Los Angeles Co.: Catalina Island, May 1911, *H.E. Hasse* (NY). Riverside Co.: Palm Springs, on granitic rock, elev. 550 m, 1900, *Hasse 826* (W); ibid., 1901, *Hasse 1314* (FH), ibid., November 1903, *Hasse* (FH). - Near Elsinore, *H.E. Hasse 647* (FH). - Joshua Tree National Monument, February 1957, *F.P. Sipe 1325* (COLO). - S of Twentynine Palms, near Skull Rock Trail area, between Belle and Jumbo Rocks Campgrounds, 34°01'N, 116°02'W, on granitic rock, elev. ca. 4000 ft, Mojave Desert, 22 January 1995, *S.D. Sharnoff* (CANL).

The species is recognized by its convex to almost bullate squamules with the central part of the underside protruding to form a +/- distinct peduncle attached directly to the rock, and by its broadly ellipsoidal ascospores. The asci tend to be narrowly clavate, and the thallus may be largely cellular (in thin squamules); for these reasons, the species was not assigned to *Placidium* in earlier treatments (Breuss 1997). Meanwhile, additional well-developed material revealed the thallus anatomy to be more complex and immature asci to be clearly cylindrical, so that the species is here transferred to *Placidium*. *Placidium acarosporoides* is distributed in southwestern North America with occurrences in Chile and South Africa. It grows on sandstone and granite in dry, open places.

***Placidium californicum* Breuss, spec. nov.**
Species nova Placidio squamuloso persimilis, sed ab eo differt ascosporis subglobosis parietibus crassioribus et rhizohyphis valde tenuioribus. A new species quite similar to *Placidium squamulosum*, but differing from it by the subglobose ascospores with thicker walls, and by the much thinner rhizohyphae.

Type: California, Ventura Co., San Nicolas Island, near NAVFAC, north shore, 15 February 1993, *C. Bratt 8241* (SBBG - holotype, LI - isotype).

Additional material examined:
Los Angeles Co.: near Santa Monica, 1896, *H.E. Hasse* (US). - Ventura Co.: San Nicolas Island, in front of NAVFAC, north shore, elev. 400 ft, 6 January 1994, *C.C. Bratt 8760* (SBBG). - San Nicolas Island, central mesa, W of Borrow Pit, 14 February 1993, *C. Bratt 8172* (SBBG). - San Nicolas Island, between NAVFAC Rd. N of Conservation Center and beach; low shrub cover of *Coreopsis gigantea*, *Lycium* sp., and *Lupinus* sp.; disintegrating sandstone outcrops, exposed sand, gullies; 5 January 1995, *S. Tucker 33676* (SBBG, LI). Mexico: Baja California: Cerro Kenton, between Bahia Falsa and Bahia San Quintin, elev. 80 m, 4 January 1989, *C. Bratt 7021* (SBBG).

Squamules ca. 2-4 mm wide, fully appressed, roundish or slightly lobed, +/- dispersed or a few adjacent, upper surface brown, dull; anatomy as in *P. squamulosum*, with no distinct lower cortex; rhizohyphae hyaline, rather thin (3.5-4.5 µm). Perithecia broadly pyriform to subglobose, up to 450 µm wide, with colorless wall. Asci cylindrical, 70-80 x 13-17 µm. Ascospores uniseriately arranged, broadly ellipsoidal to almost globose, 10-13(-15) x (7.5-)8-9(-10) µm, comparatively thick-walled.

The species externally and anatomically very much resembles *Placidium squamulosum* except for its broader, almost globular, thick-walled spores and markedly thinner rhizohyphae (3.5 - 4.5 µm versus 4.5 - 6.5 µm in *P. squamulosum*). It is especially close to *P. squamulosum* var. *argentinum* (Räsänen) Breuss, which has broader spores and thinner rhizohyphae than var. *squamulosum*. The spores of *P. squamulosum* var. *argentinum* are slightly larger, more ellipsoidal than subglobose (12 - 16 x 7.5 - 9 µm), and thin-walled. This variety is known from a few scattered montane inland sites in the Americas, whereas *Placidium californicum* is strictly coastal. On account of the different shape of the spores, the thickness of their walls, and the geographical distribution it is regarded as a separate species.

Placidium californicum seems to be endemic to southern California and Baja California, where it occurs on the coast and offshore islands.

***Placidium chilense* (Räsänen) Breuss**
Los Angeles Co.: San Clemente Island, Upper Chukit Canyon, 2 October 1996, *C.C. Bratt 9861* (SBBG). Santa Barbara Co.: Santa Rosa Island, cliffs at top of NE facing slope within Old Ranch Canyon, on soil over boulder, elev. ca. 50 m, 5 January 1994, *T.H. Nash III 33092* (ASU, LI).

This is a characteristic species with rather large squamules, a thick prosoplectenchymatous medullary layer, a paraplectenchymatous lower cortex, laminal pycnidia with short cylindrical conidia, and small spores. A detailed description is given by Breuss (1993). The species was originally described from South America, but is not rare in southwestern North America with the majority of specimens collected in Arizona. It grows mostly on soil over siliceous rocks.

***Placidium fingens* (Breuss) Breuss**
Lake Co.: on bark of *Quercus douglasii*, at the end of Hell's Peak Road, 26 April 1975, *D. Toren 1801*, with *Catapyrenium psoromoides* (SFSU); Hell's Peak, on bark of *Quercus douglasii*, April 1975, *L. Sigal*, with *Catapyrenium psoromoides* (ASU). Santa Clara Co.: on bark of *Quercus douglasii*, road from Frank Raines Park to Livermore just south of Alameda Co. line, 27 March 1976, *D. Toren 2812*, with *Catapyrenium psoromoides* (CANL, SFSU).

Placidium fingens is similar to *P. squamulosum*, from which it differs mainly by its longer, bacilliform conidia, whereas those of the latter species are oblong-ellipsoidal and shorter. The species was originally described from Tenerife (Canary Islands, on soil) and later found on the Spanish mainland (on soil). A recent collection from Arizona (unpubl.) was also on soil, whereas the Californian samples are from bark of oak (*Quercus douglasii*), growing side by side with *Catapyrenium psoromoides*.

***Placidium lachneum* (Ach.) de Lesd.**
Inyo Co.: Sierra Nevada Mts., 30 km SW of Bishop, Hungry Packer Lake, E of King's Canyon National Park boundary, 37°10'N, 118°38'W, subalpine heath, 17 July 1986, *I.M. Brodo & S. & S. Sharnoff 25354* (CANL); ibid., rocky cliffs above the lake, on north side, elev. 11500 ft, 18 July 1986, *I.M. Brodo & S. & S. Sharnoff 25361* (CANL). Tuolumne Co.: Saddlebag Lake, elev. 10.500 ft, 31 August 1957, *S. Shushan* (COLO).

The most distinctive feature of *Placidium lachneum* is the lower cortex of periclinally arranged, conglutinated hyphae whose angular cells appear in distinct vertical columns. The species has an arctic-alpine distribution and in California is confined to the Sierra Nevada. The samples belong to var. *oleosum* (Breuss) Breuss, with numerous oil droplets in the hyphae of the medulla and lower cortex. Most California specimens identified as *Catapyrenium* (or *Dermatocarpon*) *lachneum* in older literature belong to different species.

***Placidium lacinulatum* (Ach.) Breuss**
Inyo Co.: Death Valley National Monument, entrance to Grotto Canyon, 1 mi s of State Hwy 190, elev. 400 ft, Stovepipe Wells Quadrangle, on clay in rock crevices, west wall of canyon, with desert holly, 11 January 1975, *T.E. Weier 827* (COLO). - Death Valley National Monument, entrance to Mosaic Canyon, elev. 1000 ft, Stovepipe Wells Quadrangle, 13 January 1978, *T.E. Weier 1596* (COLO). Los Angeles Co.: Santa Monica Range, 1897 & 1905, *H.E. Hasse* (B, M). - Claremont, on earth, 24 November 1903, *C.F. Baker 3943* (NY, S). - San Clemente Island, plateau between Thirst and Chukit Canyon (REWS site), elev. ca. 1650 ft, 1 October 1996, *C.Bratt 9822, 9824, 9825* (SBBG). - San Clemente Island, Upper Chukit Canyon, 2 October 1996, *C.C. Bratt 9850, 9859, 9860* (SBBG). - San Clemente Island, Upper Cave Canyon, 2 October 1996, *C.C. Bratt 9851* (SBBG). Madera Co.: Sierra National Forest, road to Bass Lake SE of Rte 41 near Wishon, elev. 1850 ft, 18 September 1985, *C. Bratt* (SBBG). Monterey Co.: Monterey, 1881, *E. Palmer* (US). Riverside Co: Joshua Tree National Monument, March 1958, *F.P. Sipe* (COLO). - On soil in Box Canyon between Mecca Hills and Orocopia Mts., elev. 300 ft., 17 January 1978, *M.A. Hewlett 792a* (SFSU). - Santa Rosa Plateau Reserve (Nature Conservancy), S end of Santa Ana Mts. W of Murrieta, elev. ca. 600 m, 1 November 1986, *W.A. Weber, C. Bratt & J. Larson 82071* (COLO). - S of Twentynine Palms between Interstate Hwy 10 and Black Eagle Mine Rd., on gravelly desert soil, elev. 3200 ft, Upper Colorado Desert, 33°47'N, 115°48'W, 22 January 1995, *S. & S. Sharnoff* (CANL). - Hillside with desert scrub above tennis complex at Ritz-Carlton Hotel, Palm Desert, 19 April 1995, *C. Bratt 8821* (SBBG). San Bernardino Co.: Vicinity of San Bernardino, elev. 1000 - 1500 ft, 22 May 1895, *S.B. Parish 3524* (NY). - Northern slope of San Bernardino Mt., elev. 4000 - 6000 ft, 15 June 1895, *S.B. Parish 3912* (NY). - Mojave Desert, on soil 3 mi N of Rasor, 30 October 1932, *E. Jaeger* (CAS) - 2 mi SW of Parker Dam on the Colorado River, elev. 600 ft, 16 February 1974, *T.H. Nash 6455* (ASU). - Halloran Springs, S of Interstate Hwy 15, elev. 3000 ft, 13 February 1982, *T.E. Weier 2167* (UC). - 35°N, 116°W, East Mohave Scenic Area, off of Kelso-Baker Road, elev. ca. 1200 m, January 1986, *B. Ryan 15378a* (ASU). - 35°25'N, 116°05' W, Hwy 127, ca. 10 mi N of Baker, elev. 300 m (1000 ft), January 1986, *B. Ryan 17172* (ASU). - Kelbaker Rd just N of Kelso, *Ambrosia-Larrea* scrub, elev. 2600 ft, 31 March 1988, *M. Bourell 3516* (CAS). San Diego Co.: On earth on the Mesa (no precise locality given), 30 March 1896, *C.E. Cummings* (Decades of North American Lichens no. 320 *sub Endocarpon hepaticum*) (DUKE, US). - Soledad, near La Jolla, March 1917, *M.C. Ferguson* (NY). - Trail to Elephant Tree (*Bursera microphylla*), Anza Borrego Desert, March 1980, *C. Bratt 1263* (SBBG). - Torote Bowl Trail, Anza Borrego Desert, 6 March 1982, *C. Bratt 2272 & T. Smith* (SBBG). - Split Mt. Rd, ca. 8 mi SE of Ocotillo Wells, Anza Borrego Desert, 19 March 1983, *K. Rindlaub 141* (SBBG). San Luis Obispo Co.: Big Rocks, narrow wooded canyon with conglomerate boulders, cliffs, and sloping rock slabs; scattered oaks and chaparral; Los Padres National Forest, 28 October 1995, *S. Tucker 34161 & C. Bratt* (SBBG). - Big Rocks, off State Hwy 166, 26 mi E of 101, Los Padres National Forest, 20 November 1996, *C. Bratt 10047 & B.Owe-Larson* (SBBG). - Big Rocks, Los Padres National Forest, USFS Rd 30S02 ca. 2 mi N of

State Hwy 166, 26 mi E of U.S. Hwy 101, 35°07'40.8"N, 120°06'59. 3" W, 5 July 1997, *O. Breuss 12972, 12979, 13009, 13025* with C.C. Bratt & S. Tucker (LI). Santa Barbara Co.: Santa Cruz Island, ridge top along Islay Canyon Road, soil in grassland, elev. 800 ft, 15 March 1983, *C. Bratt 3077B* (SBBG, COLO). - Santa Cruz Island, along ridge to Ragged Mtn., with scattered pines on eroded bedrock, elev. 310 - 400 m, 7 January 1994, *B. Ryan* (ASU). Stanislaus Co.: Frank Raines County Park, Del Puerto Canyon, 27 March 1976, *R. Halling 1250* (ASU). Ventura Co.: Open area in Pinyon-chaparral area, ca. 4 mi S of Lockwood Valley Road, Mutau Flat Road, 3 June 1986, *C. Bratt 5082* (SBBG).

Placidium lacinulatum is very similar to *P. squamulosum* from which it differs by having rhizines. These are formed of longitudinally arranged hyphae and may originate from the entire underside of the squamules or may be centrally crowded. They are very variable in size, number and branching. In some specimens they are easily seen at low magnification, while in others they are small and inconspicuous. *Placidium lacinulatum* is very variable and may be divisible into several infraspecific taxa. The specimens cited represent the typical form.

***Placidium pilosellum* (Breuss) Breuss**

Kern Co.: 35°40'30"N, 118°14'30"W, S side of State Hwy 178, 1 mi W of Onyx, elev. 3000 ft (915 m), 9 June 1985, *B.D. Ryan 15688* (ASU). Lake Co.: Elk Canyon near Middle Mt., on serpentine, March 1975, *D. Toren 1497* (SFSU). Los Angeles Co.: Santa Monica, *Hasse 373* (NY). San Bernardino Co.: 4.5 mi N of State Rte 58 on Irwin Road (N of Barstow), 34°59'N, 117°00'W, elev. 2995 ft, 4 January 1975, *T.H. Nash 10346* (ASU). San Diego Co.: Town of Ocotillo along Interstate Hwy 8, elev. 2100 ft, 22 February 1973, *T.H. Nash 7053* (ASU). Santa Barbara Co.: Santa Rosa Island, South Point, S-facing slope, chaparral area with frequent boulders, elev. ca. 270 m, 5 January 1994, *T.H. Nash III 33013* (ASU, LI). Ventura Co.: San Nicolas Island, south side, below Twin Towers at edge of bluff, 26 May 1992, *C. Bratt 7879* (SBBG).

Placidium pilosellum is anatomically similar to *P. squamulosum*, from which it differs in having marginal pycnidia whereas those of *P. squamulosum* are not marginal but are immersed throughout the squamules. As pycnidia are normally developed in both species, determination is possible in most cases with certainty. Tiny hyphal outgrowths (from which the name is derived) are often developed along the margins of the squamules, but easily become abraded; these outgrowths occassionally occur in other species. *Placidium pilosellum* is widely distributed over most of Europe, southwestern Asia, and Australia, and was recently reported from Arizona as new to North America (Nash et al. 1998). The species is mainly to be found on calciferous soil in warm, dry places.

Placidium squamulosum (Ach.) Breuss

Alameda Co.: Old Mines Rd., ca. 10 mi S of Livermore, on soil of serpentine rock outcrop, 27 April 1985, *H. Saylor 2744* (SFSU). Butte Co.: Hwy 32, 5 mi E of Chico, 28 April 1967, *J. Ammirati HDT 19032* (SFSU). Contra Costa Co.: rocky south slope along foot trail to North Peak of Mt. Diablo, scattered pines, oaks, myrtles, elev. 3000 ft, 23 March 1953, *W.A. Weber 8150* (COLO). Inyo Co.: Alabama Hills, N of Lone Pine, creosote bush scrub plant community, northern Mojave Desert, elev. 4930 ft, on soil with *Collema tenax*, 10 December 1983, *M.A. Henry 3* (Herb. Rosentreter). - Death Valley National Monument, on soil near Chloride City, elev. 4000 ft, March 1979, *L. Hamel* (SFSU). - Death Valley National Monument, SE side of Hwy 267, 3.5 mi NE of Scotty's Castle, elev. 1220 m, 6 January 1986, *B. Ryan 14876b* (ASU). Los Angeles Co.: Mission Hills, 1864, Bolander 186 (US). - On earth near Santa Monica, 1896, *H.E. Hasse 373* (US). - Santa Monica Range, 1897, *H.E. Hasse* (B). - Santa Monica Mts., Malibu Cañyon, 1898, *H.E. Hasse 373* (NY). - San Gabriel Cañyon, June 1902, *H.E. Hasse* (NY). - Santa Monica Mts., Topanga Canyon, May 1907, *H.E. Hasse* (FH). - Catalina Island, *H.E. Hasse 292* (NY). - Santa Catalina Island, headland between Cottonwood Cany. and Mills Landing, elev. 0 - 300 m, S of Little Harbo., westside of the island, 5 April 1966, *W.A. Weber & R. Santesson* (COLO). - Catalina Island, Empire Landing, Rippers Cove, bottom of Valley of Ollas, elev. 0 - 20 m, scrub and trees near shore, 28 December 1993, *S. & S. Sharnoff 1263.03* (CANL). Los Angeles Co.: Claremont, San Antonio Cañyon wash, on earth, 19 October 1916, *I.M. Johnston* (FH). - Hills S of Pomona, elev. 1000 ft, 6 September 1918, *I.M. Johnston 3195* (FH). Mendocino Co.: Hwy 128, on soil in a serpentine rock outcrop, 9 March 1985, *H. Saylor 2539* (SFSU). Riverside Co.: Palm Springs, 1903, H.E.Hasse (US). San Benito Co.: dry gravelly wash along Chalone Creek, Pinnacles National Monument, San Benito Range, elev. 293 m, 36°29'N, 121°10'W, June 1991, *B. McCune 19112* (herb. McCune, LI). San Bernardino Co.: NE Etiwanda, Deer Canyon wash, on dry open ground with Riccia, 14 November 1918, *I.M. Johnston* (FH). - San Bernardino Mts., San Bernardino National Forest, Pebble Plain NE of Big Bear Lake off of USFS Rd 3N16, 18 June 1991, *C. Bratt 7353* (SBBG). San Luis Obispo Co.: Los Padres National Forest, US Forest Service Rd 30S11 4.85 mi from turnoff to Hi Mountain lookout, 35°16'38.3"N, 120°28 '5 0. 8" W, 7 July 1997, *C.C. Bratt & O. Breuss 13090* (LI). San Mateo Co.: Santa Cruz Mts., hills near Stanford University, elev. 500 ft, 30 May 1904, *A.C. Herre* (NY); ibid.,

elev. 300 ft, earth in rock crevices, 30 November 1906, A.C. Herre 1135 (US). - Searsville Lake, 6 mi from Stanford University campus, 25 August 1957, *S. Shushan* (COLO). - Searsville Lake, on sandstone, 24 August 1957, *J.W. Thomson 4802* (WIS); ibid., on soil in crevices in sandstone rocks, 25 August 1957, *J.W. Thomson 4787* (WIS). - Santa Cruz Mts., foothills 1.5 mi from Mayfield, elev. 150 ft, 24 April 1903, *A.C. Herre* (NY), ibid. 23 April 1904, *A.C. Herre* (W). - Redwood City, on serpentine soil, 26 March 1973, *L. Sigal 191* (SFSU, WIS). - San Francisco Watershed area, W of State Hwy 280 entered from Canada and Edgewood Roads, 3 January 1998, *C. Bratt 10432* (SBBG). Santa Barbara Co.: Santa Cruz Island, Fraser Point, W end of the island, on vertical, often wet surfaces of stable rock outcrops on rim of small barranca below research trailer, not far from the sea, 25 March 1986, *W.A. Weber & C. Bratt* (COLO). - Santa Cruz Island, west end, south slope of trailer barranca, 50 ft, 26 March 1986, *C. Bratt 5002 & W.A. Weber* (SBBG). - Santa Cruz Island, bluffs NE of Fraser Point, elev. 20 m, grassland and shrubs, 8 January 1994, S. & S. Sharnoff 1289.12 (CANL). - Santa Cruz Island, Cañada del Puerto ca. 1.5 km SW of Prisoner's Harbor along road to Stanton Ranch, N-facing slope with oaks, elev. 15 - 30 m, 9 January 1994, *B. Ryan 31599a* (ASU). - Santa Cruz Island, wave terrace on west end above Forney Cove, elev. 1300 ft, 7 January 1994, *C. Bratt 8572, 8579* (SBBG). - Upper Santa Ynez Valley, along trail between Buckhorn Road and Nineteen Oaks, 4 April 1986, *C. Bratt 5065* (SBBG). - In valley N of Santa Ynez Range, Sage Hill Campground, on Paradise Rd ca. 3 mi NE off State Hwy 154, E of Lake Cachuma, Los Padres National Forest, 19 April 1997, *S. Tucker, C. Bratt & J. Sainz* (SBBG). Sonoma Co.: Santa Rosa, 26 March 1946, C.L. Brown 378 (LAM). Stanislaus Co.: outcrops in pasture, along State Hwy 130 W of Patterson and Interstate Hwy 5, 18 June 1978, *M.E. Hale 53037* (US). Trinity Co.: vicinity of Fawn Campground, Trinity Lake, Trinity-Whiskeytown Recreation Area, 6 July 1975, *H.D. Thiers 33951* (CANL, SFSU). Ventura Co.: Thousand Oaks, 25 March 1975, *H. Thiers 33653* (SFSU). - Open area in Pinyon-chaparral area ca. 4 mi S of Lockwood Valley Road, 3 June 1986, *C. Bratt 5082* (DUKE). - Camarillo, 25 April 1969, *R.O. Schuster* (COLO). - 3.5 mi into Matilija Canyon, Los Padres National Forest, W of Matilija Hot Springs, elev. 1500 ft, 26 December 1952, *W.A. Weber* (COLO). - N side of San Nicolas Island, W of NAVFAC, Tranquility Beach, 13 February 1993, *C. Bratt 8142* (SBBG).

Though very variable externally, *Placidium squamulosum* is recognized by the following combination of characters: rather thin squamules with medullary hyphae often divided into globular cells and lower cortex hardly discernible, lack of rhizines, rather small ascospores, and laminal pycnidia with ellipsoid-oblong conidia. *P. squamulosum* is a cosmopolitan species with a wide ecological amplitude. It is, with *P. lacinulatum*, the commonest species in North America.

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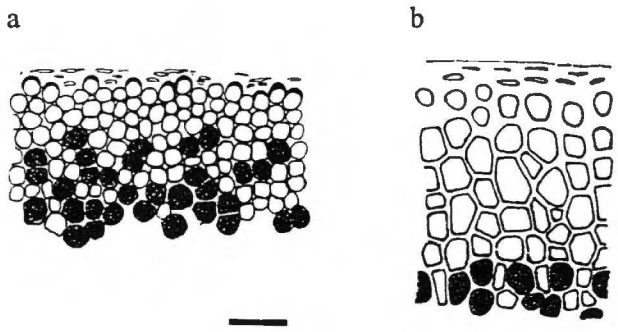

Figure 1. Upper cortices of a. *Placidium* and b. *Catapyrenium*. Bar = 15 µm.

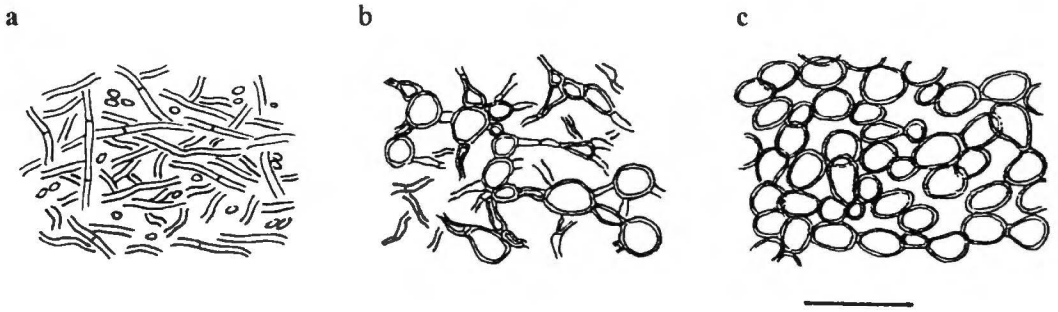

Figure 2. Types of medulla: a. of filamentous hyphae (prosoplectenchymatous), b. with globular cells, c. subparaplectenchymatous. Bar = 30 µm.

Guide to the Macrolichens of California: Part 2, the Gray Foliose Species

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Abstract: *The guide to the macrolichens of California (Bulletin of the California Lichen Society 7(1): 7-16, 2000, orange pigmented species) intended especially for workers in the California Department of Fish and Game and California Department of Forestry and others involved in enforcing environmental protection in California is continued for the gray, gray green, blue gray, and white foliose species. Twenty-two genera and 82 species are treated.* Erioderma sorediatum *D.J. Galloway & P.M. Jørg. is reported as new for California.*

Much new information on the lichens of California has accumulated in the 13 years since the publication of Hale and Cole's *California Lichens*; the present guide brings their account up to date with recently published taxonomies, new records, and improved information on distribution obtained from lichenologists with first hand knowledge of the California lichens. Macrolichens known from Oregon and Arizona but not yet from California are treated so that they may be watched for in California. Practical character data from my own observations over a 20 year period are included. Except for a few cases, the chemical spot testing calls only for 10% potassium hydroxide (K) and 5% sodium hypochlorite (C, Clorox). The paraphenylenediamine reagent (PD) can be obtained in a kit with the other reagents from Charis Bratt at the address in the appendix, which also contains references on the use of the reagents, including a diagram of my method for applying them. All tests are made on the medulla unless otherwise noted.

A color key to the gray macrolichens must deal with the problem that there are brown genera with species which are occasionally gray without even a brown tint, and in addition a few species in the "brown genera" are consistently gray. The genus key gets these generally brownish taxa out of the way at the start. Some of the genera of the brown section, e.g., *Umbilicaria*, *Peltigera*, and *Pseudocyphellaria*, are so distinctive that you may soon be able to tell immediately whether or not your material belongs to them, and you will then be able to skip over the first part of the key. "Brown" lichens which will be treated in the brown and black section of this guide are marked "br" in the key. You can be alerted to these by noticing brown tints in the normal pigmentation or brownish areas of normal, undecayed cortex. Genera which will be treated in the yellow, yellow green, and green section are marked "gr". Nomenclature follows Esslinger (1997).

I envision that there will ultimately be a random access computerized key to accompany this guide. It will display plenty of images during the keying process, including both whole thalli and key characters seen under the dissecting and compound microscopes. It will be distributed on CD ROM and will easily run on a laptop (palmtop?) computer in the field, using the Intkey software or something more friendly, if that is available. In addition, the book is planned to have high quality, printed images of whole thalli and key dissecting microscope characters for all species.

Key to the genera of gray foliose macrolichens of California

Genera in which the upper surface is usually gray but may sometimes be brown

1a. Lobes appearing inflated 2
1b. Lobes not appearing inflated 3

2a. Lobes solid, with pale angular markings toward tips . . . . . ***Brodoa***
2b. Lobes hollow, without pale angular markings . . . . . ***Hypogymnia***

3a. Thallus attached by a central or off-center holdfast (umbilicate), on rock. 4
3b. Thallus attached by rhizines or directly by the lower surface. 6

4a. Fruiting bodies (apothecia) with concentric fissures, +/- expanded; C+ red (all 10 species given for California by Hale and Cole [1988]) (br) (from 3a). . . . . ***Umbilicaria***
4b. Fruiting bodies (perithecia) tiny dots (punctate), without concentric fissures; C- (br) 5

5a. Sorediate, thallus thickish (br) . . ***Peltula euploca***
5b. Not sorediate, thallus thin (br) . . ***Dermatocarpon***

6a. Lower surface with brown veins or vein-like markings on a pale background (br) (from 3b) ***Peltigera***
6b. Lower surface without brown veins 7

7a. Cut edge of thallus shows a dark photobiont layer or no photobiont layer 8
7b. Cut edge of thallus shows a grass green photobiont layer 10

8a. With dense dark hairs or a blue black hypothallus below (br) . . . . . ***Pannaria***
8b. Without dark hairs or hypothallus below or with white hairs 9

9a. Photobiont and medulla not in layers; thallus clearly foliose, never squamulose (br) . . . . . ***Leptogium***
9b. Photobiont and medulla in layers; thallus of tiny squamules (br) . . . . . ***Peltula bolanderi***

10a. Lower surface with abundant white pores (pseudocyphellae) (from 7b) . . ***Pseudocyphellaria***
10b. Lower surface without white pores 11

11a. With elongate, isidiate pseudocyphellae; brown tints on glossy cortex near the margins . . . . . ***Parmelia saxatilis***
11b. With round, often sorediate pseudocyphellae or pseudocyphellae lacking 12

12a. Pseudocyphellae round; medulla C+ rose ***Punctelia***
12b. Pseudocyphellae lacking 13

13a. Thallus small, with small lobes, resembling *Physcia* but upper cortex K-; lower surface dark; margins of lobes usually pruinose; apothecia often with lobules on the margin 14
13b. Thallus not as in 13a 15

14a. At least some rhizines with short, right-angle branches (squarrose); margins of lobes usually pruinose; apothecia often with lobules on their margins (br) . . . . . ***Physconia***
14b. Rhizines simple or sparsely dichotomously branched; margins of lobes not pruinose or lightly so (br) . . . . . ***Phaeophyscia***

Genera with the upper surface always gray, green gray, blue gray, or white; if brown is present, it will not be as normal, generalized pigmentation, but as local damage or changes related to the advanced age of the thallus

15a. Lobes appearing inflated 16
15b. Lobes not appearing inflated 20

16a. Lower surface with tiny pores; rhizines lacking . . . . . ***Cavernularia***
16b. Lower surface without pores 17

17a. Rhizines dense, forking . . . . . ***Hypotrachyna***
17b. Rhizines lacking 18

18a. Lobes solid, with pale angular markings towards tips (see also *Hypogymnia pulverata*) . . . . . ***Brodoa***
18b. Lobes hollow, without pale angular markings . . 19

19a. Upper surface with scattered, roundish perforations; soredia on short, erect lobes ***Menegazzia terebrata***
19b. Upper surface without perforations or at most with a single hole at the lobe tip . . . . . ***Hypogymnia***

20a. Lower surface pale (from 15b) 21
20b. Lower surface dark or mottled 33

21a. Upper surface with definite white markings, pseudocyphellae, maculae, or spot-like macular soralia, not pruina (=powder or powdery appearance); hand lens needed 22
21b. Upper surface without definite white markings (pruina may be present) 23

22a. Lower surface whitish at least toward the lobe tips24
22b. Lower surface pale black or pale brown . ***Punctelia***

23a. Lobes to 3 mm wide; upper surface K+ yellowish, without spot-like soralia on the laminae; lower cortex distinctly present . . . . . ***Physcia***
23b. Lobes to 2 mm wide; upper surface K-; with spot-like soralia on the laminae; lower cortex generally difficult to distinguish from medulla . . . ***Hyperphyscia***

24a. Isidiate 25
24b. Not isidiate 27

25a. Lobes to 2 mm wide . . . . . ***Imshaugia aleurites***
25b. Lobes to 10 mm wide 26

26a. Large, white, often raised spots on lower surface; in comparatively wet habitats (rainfall of not less than about 750 mm [30"] / yr) . . . . . ***Lobaria***
26b. No white spots below; deserts; KC+ red . . . . . ***Canomaculina subtinctoria***

27a. Margins of narrow lobes with long, often branched cilia; lobes to 3 mm wide . . . . . ***Heterodermia***
27b. Margins of lobes without cilia 28

28a. Without rhizines, attached by a holdfast; a narrow lobed species resembling a fruticose lichen but lower and upper surfaces different (greenish or yellowish vs. whitish), therefore technically foliose (gr) . . . . . ***Evernia prunastri***
28b. With rhizines or fine hairs, clearly foliose 29

29a. Lower surface with small pores (pseudocyphellae) . . . . . ***Pseudocyphellaria***
29b. Lower surface without pores 30

30a. Large pale spots below; largest lobes wider than 10 mm . . . . . ***Lobaria***
30b. Pale spots lacking below; largest lobes to about 10 mm wide 31

31a. Soralia capitate (convex) . . . . . ***Parmeliopsis***
31b. Soralia lacking or, if present, not capitate 32

32a. Upper surface K+ yellow; lower surface white (except for *Physcia erumpens* with crateriform soralia and black lower surface) . . . . . ***Physcia***
32b. Upper surface K-; lower surface white or pale tan . . . . . ***Physciella***

33a. Pseudocyphellae and/or small white markings (maculae) on upper surface only (from 20b) . . . 34
33b. Pseudocyphellae on both upper and lower surfaces . . . . . ***Cetrelia***

34a. Pseudocyphellae in lines or ridges 35
34b. Pseudocyphellae round or lacking 36

35a. Ridges coarse, somewhat netted, sorediate, not cracking along their length . . . . . ***Parmelia***
35b. Ridges (in part these are merely slightly raised maculae) very fine (lens essential), low, pale, forming a definite network of fine cracks as they split along their length (rimose) . . . . . ***Rimelia***

36a. Soralia crateriform, lower surface black except for the tips of the lobes . . . . . ***Physcia erumpens***
36b. Soralia not crateriform 37

37a. Lower surface with tiny pores opening into cortex-lined chambers . . . . . ***Cavernularia***
37b. Lower surface without pores 38

38a. Isidiate or sorediate 39
38b. Neither isidiate nor sorediate 41

39a. Medulla K-, C-, and KC-; pycnidia on margins . . . . . ***Platismatia***
39b. Medulla either K+, C+, or KC+; pycnidia on laminae 40

40a. Pseudocyphellae present, round or punctate, laminal, converting to soralia; C+ red . . . . . ***Punctelia***
40b. Pseudocyphellae lacking; C- except for *P. austrosinense* with white on the lower side of the lobe tips . . . . . ***Parmotrema***

41a. Axils of lobes with short, black cilia; medulla C+ red; thallus closely attached to substrate . . . . . ***Parmelina quercina***
41b. Cilia lacking; medulla C-; thallus loosely attached 42

42a. Upper surface not reticulate ridged; lower surface deeply wrinkled; rhizines lacking . . ***Esslingeriana***
42b. Upper surface weakly to strongly reticulate ridged; lower surface at most shallowly wrinkled; rhizines present, although rare and limited to a few attachments points . . . . . ***Platismatia***

In the species treatments (Bratt) = C. Bratt, pers. comm., (Tucker) = S. Tucker, pers. comm.

Brodoa

Thalli small to medium, 4-7 cm; **lobes** < 2 mm, filled with medullary hyphae; **upper surface** gray to brown or black, depending on exposure, with pale angular markings toward lobe tips; **lower surface** light brown to black, apparently white pruinose; **rhizines** lacking (data are for *B. oroarctica*). Separated by Goward (1986a) from *Hypogymnia* by the stuffed lobe interiors (vs. hollow in *Hypogymnia*); spore size (8-12 x 6-8 µm vs. 5-9 x 3-5 µm); structure of lower cortex (of +/- vertically oriented hyphae vs. paraplectenchymatous); substrate (rock vs. mainly bark); and ecology (arctic-alpine vs. mostly boreal temperate). Three species worldwide, 1 in California.

***B. oroarctica* (Krog) Goward** Syn.: *Hypogymnia oroarctica* Krog. Oregon (McCune and Geiser 1997), might be expected on rock at high elevations in the Cascade Ranges or the northern Sierra Nevada. The +/- cylindrical lobes may appear fruticose (D. Baltzo, pers. comm.)

Canomaculina

Thalli small to large, 5-20 cm; lobes 1-15 mm with rounded apices; **upper surface** gray, +/- maculate; apices of lobes rounded; **lower surface** +/- uniformly pale brown;

rhizines of 2 types: short, extending to the margins but not reaching the substrate, and long, clustered, and connecting with the substrate; **cilia** markedly tapered, coarse, commonly branched (Elix and Hale 1987). Four species in North America, 1 in the southern U.S. including Arizona; credibly mapped as in California in Hale (1979).

***C. subtinctoria* (Zahlbr.) Elix** Syn.: *Parmelia subtinctoria* Zahlbr., *P. haitiensis* Hale, *Parmotrema subtinctorium* (Zahlbr.) Hale, *Rimeliella subtinctoria* (Zahlbr.) Kurok. **Thalli** 5-15 cm; lobes 7-13 mm; **upper surface** greenish-gray, shiny and faintly white-spotted; **lower surface** +/- uniformly brown; **rhizines** present nearly to the margin; **apothecia** rare. Hale (1965) gives it as on deciduous trees. The only indication that the species is in California seems to be the small map in Hale (1979). Neither C. Bratt nor S. Tucker have seen California records (pers. comms.). It might be expected in that part of the Sonoran Desert that extends into southeastern California (the Colorado and Mojave Deserts in Imperial, Riverside, San Bernardino, and San Diego Counties [Hickman 1993]). It occurs from Arizona south to Sinaloa and southern Baja California, Mexico (B. Ryan, pers. comm.)

Cavernularia

Thalli small, generally < 2 cm in diameter; **lobes** to 1 (2) mm wide; whitish or greenish gray; **lower surface** black to brown at the margins and with fine pores opening into cortex-lined chambers; **rhizines** lacking. Prefers conifers. Two species worldwide, both in California.

1a. Soredia lacking, usually with apothecia ***C. lophyrea***
1b. Soredia present; apothecia rare . . . . . ***C. hultenii***

***C. hultenii* Degel.** - DEL NORTE, HUMBOLDT, MENDOCINO (Hale and Cole 1988; see Tucker and Jordan (1979) for other references for these counties), HUMBOLDT (Monument Ridge w of Rio Dell, 22 January 1998, *Wright 6243*). Small and easily overlooked.

***C. lophyrea* (Ach.) Degel.** - MENDOCINO, HUMBOLDT (Hale and Cole 1988); see Tucker and Jordan (1979) for other references for these counties.

Cetrelia

Thalli medium to large, 5-20 cm; **lobes** broad, 7-20 mm; **upper surface** whitish to greenish gray; **lower surface** black with brown margin; **pseudocyphellae** (small white spots) on both upper *and* lower surface; **soralia** on lobe margins (data is for *C. cetrarioides*). Resembling *Parmotrema*, but easily distinguished by the pseudocyphellae. Five species in North America, 1 in the Pacific Northwest south to Oregon (Goward et al. 1994; McCune and Geiser 1997).

***C. cetrarioides* (Duby) Culb. & Culb.** - Syn.: *Parmelia cetrarioides* (Delise *ex* Duby) Nyl. C. Bratt has seen a record from LAKE (pers. comm.) but is doubtful about its origin. Reports in Tucker and Jordan (1979) were based on misidentifications (Tucker). This should be watched for in coastal northern California. The favored phorophyte is *Alnus rubra* (McCune and Geiser 1997).

Erioderma

Thalli small, to ca. 0.5 cm; **lobes** ca. 0.5 mm wide; **upper surface** grayish brown with short, stiff, erect hairs (matted and soft in *Leioderma*); **lower surface** whitish to cream, cortex lacking. Three species reported for North America, 1 found recently in California.

***E. sorediatum* D.J. Galloway & P.M. Jørg.** - **Rhizines** only near the margins, in small, dense tufts (according to Galloway and Jørgensen [1975] and Galloway [1985]; tufts not mentioned in the North American references; sorediate on the edges of the upturned lower surface of the lobes; **PD+** orange (PD- in *Leioderma*). HUMBOLDT (W. Ellyson, pers. comm. 2000; a voucher is at HSU). Found by W. Ellyson in a study of epiphytes of *Picea sitchensis* at Prairie Creek Redwoods State Park. It is reported from southwest Oregon as a rare coastal species by McCune and Geiser (1997). It should be looked for on the North Coast of California in open habitats (McCune and Geiser 1997) as well as in those parts of the forest where its high light requirement would be satisfied (Maass 1983).

Esslingeriana

Thalli small to medium, to 9 cm; **lobes** 2-4 mm wide, wrinkled and cracked; **upper surface** whitish to greenish gray; **lower surface** jet black centrally to dark brown at some margins, deeply wrinkled; **soredia** and isidia lacking; **apothecia** common; **pycnidia** on margins. Mostly on dead conifer twigs from 300 to 1500 m (1000 to 5000 ft) elevation. This is a genus of one species, separated from *Cetraria* by the clear difference between the upper and lower surfaces.

***E. idahoensis* (Essl.) Hale & M.J. Lai** - Syn.: *Cetraria idahoensis* Essl. LAKE n to SISKIYOU; CALAVERAS n to SHASTA (Hale and Cole 1988); BUTTE, LAKE,

MENDOCINO, SIERRA, SISKIYOU, TEHAMA, YUBA (Bratt).

Hyperphyscia

Thalli small (Californian species), 0.5-2 cm in diameter; **upper surface** pale brownish gray or dark brown, matt; **lower surface** pale toward margins, brownish centrally; cortex often difficult to detect; tightly attached except on rough bark. Three species reported for North America, 1 for California.

***H. adglutinata* (Flörke) H. Mayrh. & Poelt** – Syns.: *Physcia. elaeina* (Sm.) A.L. Sm., *P. adglutinata* (Flörke) Nyl. **Thalli** to 1 cm in diameter; **soralia** laminal and at the tips of short lateral lobes (Thomson 1963). LOS ANGELES or VENTURA (Thomson 1963, as *P. elaeina*); MONTEREY (Doell and Wright 1996); RIVERSIDE? (Riefner et al. 1995); SAN LUIS OBISPO (Bourell 2000); SANTA BARBARA, VENTURA, Channel Islands (Bratt). Hale and Cole (1988) have no range information. A number of quite old reports needing verification are in Tucker and Jordan (1979) as *P. adglutinata*; for example, it is not possible to know from Hasse's (1913) account if he had authentic *H. adglutinata*.

Hypogymnia

Thalli small to medium; **lobes** mostly hollow, usually roundish in cross section ("inflated"), mostly 3-4 mm in diameter, but *Hypogymnia physodes* deceptively flat; **upper surface** white to gray or sometimes brown; **lower surface** black and +/- wrinkled; **rhizines** lacking. In a variety of habitats, perhaps preferring conifers but regularly also on hardwoods, rather rare on rock. Twenty-three species are reported from North America, 10 from California. Key adapted from McCune and Geiser (1997) with additional information from Goward (1986a, b), Goward et al. (1994), Hale and Cole (1988), and Ohlsson (1973).

1a. Sorediate 2
1b. Not sorediate 8

2a. Soredia on underside of lobe tips 3
2b. Soredia laminal or apical 4

3a. Cavity white above, dark below; short side lobes lacking; lower surface not consistently perforate; lobes often +/- flat . . . . . ***H. physodes***
3b. Cavity dark above and below; short side lobes present; lower surface consistently perforate near lobe tips . . . . . ***H. vittata***

4a. Soredia diffuse over the whole upper surface which is pale gray and distinctly brittle . . . . . ***H. mollis***
4b. Soredia in +/- delimited soralia 5

5a. Lobes mostly filled with medulla ("stuffed"); soredia coarse . . . . . ***H. pulverata***
5b. Lobes hollow 6

6a. Basally constricted lobules on the margins; lobes distinctly swollen; PD+ bright orange ***H. oceanica***
6b. Basally constricted lobules lacking; lobes not distinctly swollen; PD- or slowly yellow (on soralia) 7

7a. Lobes +/- erect; soralia covering the lobe tip, > 1 mm in diameter . . . . . ***H. tubulosa***
7b. Lobes appressed; soralia < 1 mm in diameter on tips of short lateral lobes, larger and more laminal on the main lobes . . . . . ***H. bitteri***

8a. Cavity white throughout or ceiling white and floor pale gray . . . . . ***H. imshaugii***
8b. Cavity neither white throughout nor white with pale gray floor 9

9a. Medulla PD+ red 10
9b. Medulla PD- or pale yellow 14

10a. Lobes distinctly trailing and pendulous 11
10b. Lobes erect or appressed 12

11a. Lobes about 1mm in diameter, cascading in arcs from substrate; ceiling of cavity usually white . . . . . ***H. duplicata***
11b. Lobes 2-5 mm, rarely in arcs; ceiling of cavity dark . . . . . ***H. enteromorpha***

12a. Lobes 2-5 mm in diameter . . . . ***H. enteromorpha***
12b. Lobes mostly < 2mm 13

13a. Lobes usually raised from the substrate, long, narrow, roundish ("stringy" appearance); on the immediate coast . . . . . ***H. heterophylla***
13b. Lobes appressed, short, broad, flattish; widespread (esorediate thalli) . . . . . ***H. physodes***

14a. Ceiling of cavity white to gray, floor dark; lobes short, narrow . . . . . ***H. metaphysodes***
14b. Ceiling *and* floor dark; lobes not short and narrow 15

15a. Branches erect or drooping, dividing in a conspicuously isotomic manner ..... ***H. inactiva***
15b. Branches appressed to trailing 16

16a. Medulla KC+ pink; generally with short, bud-like side lobes ..... ***H. occidentalis***
16b. Medulla KC-; bud-like side lobes usually lacking ..... ***H. apinnata***

H. apinnata **Goward & McCune** - **Lobes** 2-5 mm wide, puffy, the tips often swollen and with a terminal hole; **interiors** dark; **short, bud-like side** lobes lacking or sparse; **KC-**; **soredia** lacking; **apothecia** common. CONTRA COSTA, HUMBOLDT (collections of E. Peterson *fide* S. Tucker, pers. comm.). Like *H. enteromorpha* except for the sparse bud-like side lobes and the KC test.

H. bitteri **(Lynge) Ahti** - **Lobes** narrow, appressed, flattened, the tips blunt; color of the **interior** not clear from the available literature, but at least the floor is dark (Goward and McCune 1994); **soredia** in hemispherical soralia at lobe apices, developing on the laminae with age, densely packed with fine, powdery soredia; **K-**; **KC-**; **PD -** (Ohlsson 1973). The only evidence for the presence of this in California is the map in Hale (1979) which shows it as extensive in the northwestern part of the state. On bark, wood, or rock. Not treated by McCune and Geiser (1997). Neither C. Bratt nor S. Tucker have seen California records (pers. comms.). Ohlsson (1973) maps specimens seen by him from Mexico to Canada and Alaska as in the Rocky Mountains without an approach to the Pacific Coast until northern Washington is reached.

H. duplicata **(Ach.) Rass.** - **Lobes** ca. 1 mm wide, mainly linear elongate, pendulous, arcing, nodulose, the **interiors** with white ceilings; **upper surface** generally whitish; **lower surface** often expanded and visible from above; **soredia** lacking; **KC-**; **PD+** yellow becoming bright orange. Hale (1979) gives this as in Oregon, but I have seen no report from California other than that of Lindsay (1973); his collection at HSU, labeled as this species, is *H. heterophylla*, a common species in his study area (Samoa Peninsula, HUMBOLDT).

H. enteromorpha **(Ach.) Nyl.** - **Lobes** 2-5 mm wide, puffy; **interiors** dark; **short, bud-like side lobes** usually present; **soredia** lacking; **apothecia** common; **KC+** red, **PD+** yellow. CONTRA COSTA (Baltzo 1970); CALAVERAS (Pinelli and Jordan 1978, cited in Tucker and Jordan 1979); DEL NORTE, HUMBOLDT, MENDOCINO, MONTEREY, SANTA CRUZ, SISKIYOU, SAN MATEO, SONOMA (Hale and Cole 1988, fig. 74b); AMADOR, EL DORADO, GLENN, LAKE, MARIN, NAPA, SANTA BARBARA, SANTA CLARA, SAN LUIS OBISPO, SHASTA, STANISLAUS, TEHAMA, TRINITY, YOLO (Bratt).

H. heterophylla **L. Pike** - **Lobes** 1-3 mm wide; **interiors** dark; **short, narrow side branches** present; **soredia** lacking; **apothecia** common; medulla **PD+** yellow to red. MENDOCINO (Pike and Hale 1982, Riefner et al. 1995); HUMBOLDT, SANTA BARBARA, SISKIYOU, SAN LUIS OBISPO (Riefner et al. 1995); SAN MATEO (Doell and Wright 1996); DEL NORTE, MENDOCINO, MARIN, MONTEREY, SANTA CRUZ, SONOMA (Bratt). Mostly close to the ocean. Common on *Pinus contorta* on the Samoa Peninsula (HUMBOLDT).

H. imshaugii **Krog** - **Lobes** 1-2 (3) mm wide, not appressed; **interiors** white throughout or the floor pale gray; **soredia** lacking; **apothecia** common; **PD+** yellow to red or PD-. Widespread (Hale and Cole 1988, fig. 74c, and other records).

H. inactiva **(Krog) Ohlsson** - **Lobes** 1-3 (4) mm wide; **interiors** dark; **upper surface** gray to greenish gray but may be brownish if exposed to the sun; **soredia** and **isidia** lacking; **apothecia** common; **branching** strictly isotomic dichotomous (equally forking), a conspicuous feature; medulla **PD-**. SANTA CRUZ n in the Coast Ranges (Hale and Cole 1988); DEL NORTE, HUMBOLDT, MENDOCINO, MARIN, NEVADA, SHASTA, SONOMA (Bratt); CALAVERAS (Pinelli and Jordan 1978, cited in Tucker and Jordan 1979); MENDOCINO (Malachowski 1975).

H. metaphysodes **(Asah.) Rass.** - **Lobes** < 2mm wide, contiguous and appressed in the manner of *H. physodes*; **interiors** with white ceilings and dark floors; **upper surface** whitish to greenish gray; **soredia** lacking; **apothecia** common; medulla **PD-** or pale yellow (cf. *H. physodes*, PD+ red). MERCED, SAN LUIS OBISPO (Riefner et. al 1995); SAN MATEO? (McGee 1998); SAN LUIS OBISPO (Von Reis 1991, according to S. Tucker); SISKIYOU, TRINITY (Hale and Cole 1988); MADERA, MERCED, MONTEREY, SISKIYOU, SAN LUIS OBISPO, SONOMA, YUBA (Bratt).

H. mollis **L. Pike & Hale** - **Upper surface** pale gray, dull, brittle; **interiors** dark; **soredia** distinctly laminal, not confined to the lobe tips; **apothecia** not seen by Pike and Hale, **PD-**. ORANGE, RIVERSIDE, SANTA BARBARA (including the Channel Islands), SAN DIEGO (Riefner et al. 1995); SAN LUIS OBISPO (Pike and Hale 1982,

Riefner et al. 1995); MONTEREY, SISKIYOU?, SAN LUIS OBISPO, RIVERSIDE, SAN DIEGO (Bratt). Evidently not known outside of California (Goward 1988).

***H. occidentalis* L. Pike** - **Lobes** to 3 mm wide, tips puffy and often with a hole, **interiors** dark; **short, bud-like side lobes** present; **upper surface** gray, usually rugose in older parts of the thallus; **soredia** lacking; **apothecia** common; medulla **PD-** or pale yellow. HUMBOLDT, MENDOCINO, PLUMAS, SISKIYOU, SONOMA, TEHAMA (Pike and Hale 1982); MENDOCINO (Riefner et al. 1995); MONTEREY (Tucker and Bratt 1996a); SAN MATEO (Doell and Wright 1996); DEL NORTE, MARIN, SANTA BARBARA, SIERRA, SAN LUIS OBISPO (Bratt).

***H. pulverata* (Nyl. *ex* Crombie) Elix** - **Lobes** mostly stuffed with medulla, not hollow; **soredia** laminal, coarse. Goward (1988) gives it as only on rock (Hudson Bay). Reported as very rare in coastal Oregon by McCune and Geiser (1997). Should be watched for on the coast of northern California.

***H. tubulosa* (Schaerer) Hav.** - **Lobes** 1-3 mm wide, **interiors** dark; **soredia** in well-defined soralia on or very near the lobe tip, a very distinctive feature; **apothecia** not seen; medulla **PD-**. SAN BENITO n to HUMBOLDT (Hale and Cole 1988); SHASTA, SONOMA (Riefner et al. 1995); BUTTE, HUMBOLDT, LAKE, MENDOCINO, NAPA, SANTA CRUZ, SAN LUIS OBISPO, SHASTA, SONOMA, YUBA (Bratt); CALAVERAS (Pinelli and Jordan 1978, cited in Tucker and Jordan 1979); CONTRA COSTA (Baltzo 1989); MARIN (Wright unpubl.); SAN MATEO (Jordan 1968).

***H. vittata* (Ach.) Parrique** - **Soredia** on the underside of burst primary lobe tips and on slender side lobes; **upper surface** usually partly brownish; medulla **PD-**. Goward et al. (1994) gives this as in Oregon, but McCune and Geiser (1997) say it is not yet known there. Neither C. Bratt nor S. Tucker have seen records from California (pers. comms.).

Hypotrachyna

Thalli small, 1-4 (10) cm wide; **lobes** 0.5-2 (4) mm wide with ascending tips; **upper surface** gray or pale green, sorediate; **lower surface** black; rhizines dense, dichotomously branched. Twenty-seven species reported for North America, 2 for California, 1 yellow green (Hale and Cole 1988 and miscellaneous reports). Key adapted from McCune and Geiser (1997).

1a. Rhizines sparsely branched; soralia laminal and on the margins, becoming diffuse; C+ red .... ***H. revoluta***
1b. Rhizines richly branched; soralia terminal and subterminal; medulla C- ..... ***H. sp.***

***H. revoluta* (Flörke) Hale** - **Soredia** of coarse granules; **upper surface** K+ yellow. MARIN (Mt. Tamalpais, J. and R. Robertson, pers. comm.); SANTA BARBARA n to the S.F. Bay Area (Hale and Cole 1988); SONOMA (J. Robertson, confirmed by B. McCune, pers. comm.); SANTA BARBARA and Channel Islands (Bratt 1986; Bratt, pers. comm.) The material from MARIN cited as this species by Wright (1998) was misidentified.

H. sp. - **Soredia** of fine powder; **upper surface** K+ yellow. An apparently undescribed species reported by McCune and Geiser (1997) as rare in the Cascade Range in Oregon. It might be expected in the southern continuation of the Cascade Range in Shasta and Siskiyou Counties.

Imshaugia

Thalli small to medium, to 5 cm; **lobes** 0.5-2 mm wide, thin; **upper surface** whitish, shiny; **lower surface** whitish to pale brown; **rhizines** simple, short; **isidia** laminal, cylindrical, thin; **apothecia** generally lacking, with brownish disk when present. **K+** yellow, **PD+** yellow.

***I. aleurites* (Ach.) S.F. Meyer** - Syn.: *Parmeliopsis a.* (Ach.) Nyl. SONOMA (J. and R. Robertson 2000).

Lobaria

Thalli medium to large, 8-15 cm or more; **lobes** to 15 mm; **upper surface** greenish, brownish, or yellowish gray, often with a coarse network of ridges; **lower surface** tomentose (with short, fine, usually dense hairs) and with large, pale, bare spots which may be raised; **soredia and/or isidia** may be present; **photobiont** green or blue green (a cyanobacterium), but, if green, then a cyanobacterium will be present within a delimited region (cephalodium) in the medulla. Twelve species are reported for North America, 4 for California. *Lobaria oregana*, a non-sorediate, non-isidiate species known from Del Norte and Humboldt Counties is green to yellow green and will be treated as part of that color group. Treatment adapted from McCune and Geiser (1997) supplemented by Jordan (1973).

1a. Soredia and isidia lacking; upper surface greenish to brownish gray; medulla K-; Oregon ..... ***L. linita***
1b. Soredia and/or isidia present 2

2a. Upper surface gray to brownish gray with fine hairs - toward tips of young lobes; K- or brownish ***L. hallii***
2b. Upper surface greenish or brownish gray without fine hairs; K+ yellow to orange 3

3a. Upper surface strongly reticulately ridged, without yellowish tinge; primary photobiont green; medulla KC- . . . . . ***L. pulmonaria***
3b. Upper surface weakly ridged or merely undulating, with yellowish tinge (usnic acid); photobiont blue-green; KC+ reddish . . . . . ***L. scrobiculata***

***L. hallii* (Tuck.) Zahlbr.** - **Lobes** mostly 1-5 cm; **upper surface** gray to brownish gray, rough, with fine, sparse hairs toward the lobe tips (strong lens); **lower surface** pale brown or whitish, tomentose; **bare spots** of lower cortex flat; **soredia** in dark, roundish, laminal and marginal soralia; **apothecia** rare; **photobiont** blue-green; **K-**. On bark. BUTTE (Jordan 1973), LAKE (Bratt); HUMBOLDT, MENDOCINO (Wright 1998).

***L. linita* (Ach.) Rabenh.** - **Lobes** generally 1-4 cm; **upper surface** greenish to brownish or brownish gray; **lower surface** light colored, tomentose especially towards the center; **bare spots** of lower cortex raised; **soredia** and **isidia** lacking; **apothecia** fairly common; primary **photobiont** green, cyanobacteria in cephalodia; **K-**. On bark, rock, and soil. Reported from Oregon (on the coast and in the Cascade Ranges) by McCune and Geiser (1997). Might be expected in DEL NORTE and SISKIYOU.

***L. pulmonaria* (L.) Hoffm.** - **Lobes** generally linear, 1-3 cm; **upper surface** greenish to olive or brownish, intensely green when wet, with a network of ridges; **lower surface** tomentose, brownish to blackening toward the center; **bare spots** of lower cortex raised; **soredia** and **isidia** on the ridges and margins; **apothecia** uncommon; primary **photobiont** green, cyanobacteria in cephalodia; **K+** yellow. Uncommon to rare in the southern part of its California range but progressively more frequent northward from the San Francisco Bay Area. DEL NORTE, HUMBOLDT, LAKE, MENDOCINO, MARIN, NAPA, SANTA CLARA, SANTA CRUZ, SHASTA, SISKIYOU, SAN MATEO, TRINITY (Hale and Cole 1988, fig. 75b); SONOMA (Wright 1998).

***L. scrobiculata* (Scop.) DC.** - **Lobes** mostly 1-5 cm; **upper surface** pale green to olive with a yellowish tinge, dark gray when wet, weakly ridged, rough near the lobe tips but without fine hairs; **lower surface** tomentose, light colored to dark in older areas; **bare spots** of lower cortex small, mostly not raised; **soredia** in roundish soralia; **isidia** absent; **apothecia** uncommon; primary **photobiont** blue green; **K+** yellow, **KC+** red, but the medulla does not always react. On bark and mossy rocks. From SANTA CRUZ n in the Coast Ranges, including HUMBOLDT and MARIN (Wright unpubl.) It is evidently rather rare in the southern part of its range, as Hale and Cole observe, but not rare from HUMBOLDT north.

Menegazzia

Thalli small to medium, 2-6 cm; **lobes** mostly 1-2 mm, hollow; **upper surface** pale gray, greenish gray, or cream, with scattered, roundish perforations; **lower surface** black, shiny, wrinkled, brown at the edges; **soredia** on short, erect lobes; **apothecia** not seen in western North American material. One species in North America.

***M. terebrata* (Hoffm.) A. Massal.** - Syn.: *Parmelia pertusa* (Schrank) Schaerer. **K+** yellow or light orange. On bark, especially of *Alnus rubra* (McCune and Geiser [1997], which contains an excellent photograph; see also the line drawing in Hale and Cole [1988]). HUMBOLDT, MENDOCINO (Hale and Cole 1988). Hale and Cole note that erupting lobe tips may also contain soredia (Wirth [1995] and Poelt [1969] also describe something like this), which might lead to confusion with arthropod damaged *Hypogymnia physodes*; that species should be separable by its K+ yellow and KC+ pink reactions.

Parmelia

Thalli small to medium, to about 12 cm; **lobes** 1.5-10 mm; **upper surface** whitish or pale gray with linear or angular markings (**maculae** or **pseudocyphellae** [if cracked and penetrating into the medulla]) which are often sorediate and/or cracked or isidiate, depending on the species; **lower surface** black and shiny to brown at the margins; **rhizines** branched in some species, mostly unbranched in others. Until the work of Mason Hale beginning about 1960, this was a catchall genus for a wide variety of +/- related foliose lichens. Since then numerous genera have been segregated from it, including revivals of 19th century segregates, leaving in North America a residue of 10 species of *Parmelia* in the narrow sense, of which 4 are definitely known from California.

Esslinger (1997) considers some *P. kerguelensis* a chemotype of *P. saxatilis*. See also *P. pseudosulcata*.

1a. Isidiate 2
1b. Sorediate . . . . . ***P. sulcata***

2a. Isidia dull, mostly without cortex . . . ***P. hygrophila***
2b. Isidia shiny, hard-corticate 3

3a. Rhizines with strong right-angle branching . . . . . ***P. squarrosa***
3b. Rhizines unbranched or with apical branching . . . 4

4a. K-; rhizines rather freely forking . ***P. pseudosulcata***
4b. K+ yellow becoming red orange; rhizines mostly unbranched . . . . . ***P. saxatilis***

Key adapted from Ryan (1994-1999) and McCune and Geiser (1997).

P. hygrophila **Goward & Ahti** - **Lobes** mostly 2-5 mm; **upper surface** pale to dark greenish or bluish gray; **isidia** dull, not corticate, generally in clusters along **pseudocyphellae** which form a network toward the margins, decomposing into **soredia** and forming eroding masses in the center of old thalli; **apothecia** occasional; **rhizines** sometimes with few, short, lateral branches, generally simple to sparsely forking (Ryan 1994-1999); **K+** yellow to red orange. On bark and dead wood, rare on rock. EL DORADO, SAN DIEGO, SISKIYOU, TUOLUMNE (B. Ryan, pers. comm.)

P. pseudosulcata **Gyelnik** - *P. kerguelensis* of North American authors (Esslinger 1997). **Lobes** mostly 1-3 mm; **upper surface** whitish to greenish or blue gray; **maculae** pale, angular, toward the lobe tips, not forming a net; **isidia** laminal and marginal, generally in clusters (?); **K-**. On bark and dead wood, rarely rock. Reported by Goward et al. (1994) as in California, given only as far south as Oregon by McCune and Geiser (1997).

P. saxatilis **(L.) Ach.** - **Lobes** mostly 1-4 mm; **upper surface** whitish or greenish gray; **maculae** pale, angular toward the lobe tips; **isidia** corticate, shiny, laminal and marginal; **K+** yellow becoming deep red orange. Usually on acidic rock, occasional on bark (MARIN, Bolinas Ridge); CONTRA COSTA (Baltzo 1970); CALAVERAS (Pinelli and Jordan [1978], cited in Tucker and Jordan [1979]); MENDOCINO (Malachowski 1975); FRESNO, MONTEREY, SANTA BARBARA, TULARE (Bratt); RIVERSIDE, SAN DIEGO, SAN LUIS OBISPO, TULARE (Hale and Cole 1988, fig. 76b). Early reports are in Tucker and Jordan (1979) but should perhaps be verified.

P. squarrosa **Hale** - **Lobes** linear, tending to be narrow, 2-5 mm; **upper surface** whitish, greenish, or greenish gray; **pseudocyphellae** toward apices, in a checkered pattern, cracked, but raised reticulations absent; **isidia** (or isidiosoredia) corticate, shiny, marginal and laminal, dense, irregularly inflated; **apothecia** rare; **rhizines** squarrose in the central part of the thallus, simple toward the margins; **K+** yellow becoming red orange. On bark and dead wood. Rare in north Coastal Forest (Hale and Cole 1988); MENDOCINO, SIERRA?, SISKIYOU, SONOMA (Bratt).

P. sulcata **Taylor** - **Lobes** mostly 1-4 mm; **upper surface** whitish gray to greenish or bluish gray; **isidia** lacking; **maculae** pale, angular, toward the lobe tips; **soredia** on laminal ridges which often form a network; apothecia uncommon (Ryan); however, in 20 years I have seen only about 2 fertile populations; perhaps more often fertile outside of California); **rhizines** +/- richly squarrose; **K+** yellow to red orange. On bark and dead wood, rarely on rock. Widespread (Hale and Cole 1988, fig. 76c). Certainly a candidate for commonest macrolichen in California.

Parmelina

Thallus small to medium, 3-8 cm; **lobes** 2-3 mm, sublinear; **cilia** in the axils, short, black; **upper surface** light gray; **pseudocyphellae** lacking (Hale 1976; Elix 1993). One species reported for North America. Hale (1976) advises that it may be necessary to look carefully for the cilia, as they can be short and sparse.

P. quercina **(Willd.) Hale** - Syn.: *Parmelia quercina* (Willd.) Vainio. **Lower surface** black; **soredia** and **isidia** lacking; **rhizines** dense, mostly unbranched; **apothecia** common, disk brown; **K-** (cortex K+ yellow); **C+** red. Widespread, not reported from the North Coast, the Modoc Plateau, and the east side of the Sierra Nevada (Hale and Cole 1988, fig. 76d), nor from north of the California-Oregon line (Goward et al. 1994; McCune and Geiser 1997). MARIN (Mt. Tamalpais, *Wright 3350*, on shrub oak in xeric chaparral, not mapped for this county by Hale and Cole); SONOMA (Wright, unpubl.) Appears to be a xerophyte, taking the place of *Parmotrema* in the dry eastern parts of this county.

Parmeliopsis

Thalli small, to 6 cm; **lobes** ca. 1 mm, linear, +/- contiguous; **upper surface** whitish gray to gray, K+ yellow; **lower surface** black with a narrow brown zone at the margin; **soredia** in capitate laminal soralia; **apothecia** lacking (Hale and Cole [1988]; occasional: McCune and Geiser [1997]); **K-**; **UV+**. Four species reported for North America, 1 for California. *Parmeliopsis ambigua* (Wulf.) Nyl. is

identical except for the yellowish green upper surface and the chemical contents.

***P. hyperopta* (Ach.) Arnold** - On bark and dead wood. CALAVERAS, HUMBOLDT, TEHAMA, TRINITY, - SISKIYOU (Hale and Cole 1988); CALAVERAS (Pinelli and Jordan [1978], cited in Tucker and Jordan [1979]).

Parmotrema

Thalli medium to large, to 12 (20) cm; **lobes** 4-12 mm wide; **upper surface** gray, whitish gray, or greenish gray; **lower surface** black with a brown, mostly bare zone at the margin; **cilia** often present on margins; **soredia** various, 1 species isidiate; **apothecia** +/- stalked, with dark brown disk. Thirty-two species reported for North America, 6 for California. The K+ yellow reaction, as opposed to the more common light orange one in the same species, apparently occurs when the secondary products are in low concentration. Treatment based on McCune and Geiser (1997), Hale (1965), and Hale and Cole (1988).

1a. Isidiate; cilia arising from the isidia ... ***P. crinitum***
1b. Sorediate, not isidiate, or thallus lacking both soredia and isidia 2

2a. C+, cilia lacking ..... ***P. austrosinense***
2b. C- 3

3a. K-, KC+ pink, UV+ brightly fluorescent (360 nm, "long wave") ..... ***P. arnoldii***
3b. K+, KC-, UV- or weakly fluorescent 4

4a. K+ yellow becoming red or orange red ***P. stuppeum***
4b. K+ persistent yellow or becoming at most medium orange 5

5a. White on underside of lobe tips 6
5b. Without white on underside of lobe tips ***P. chinense***

6a. Sterile apothecia with sloping, non-pedicellate exciples present ..... ***P.* sp. 1**
6b. Apothecia lacking (fertile apothecia may very rarely be present in *P. hypoleucinum*) 7

7a. White lower cortex well developed and continuous or nearly so on underside of lobe tips ..... ***P. hypoleucinum***
7b. White lower cortex in spots or at most poorly demarcated patches ..... Apparent intermediates between ***P. chinense*** and ***P.* sp. 1**

***P. arnoldii* (Du Rietz) Hale** - Syn.: *Parmelia a.* Du Rietz. **Lobes** 4-12 mm; **upper surface** whitish or greenish gray; **lower surface** black with a broad, brown margin; **cilia**, if present, to 5 mm; **soralia** on revolute lobe tips; **apothecia** rare; **K-**; **UV++**. Widespread (Hale 1979, fig. 104, and other records: see Tucker and Jordan [1979]). Goward et al. (1994) separate this species from *P. chinense* by the length and distribution of the cilia and by the brownish color of the soralia. However, brownish color was not constant in my sample (present in 20% of 14 thalli). I tested mean cilium length as a character separating this from *P. chinense* (Goward and McCune 1994) and found a statistically significant difference[1], but, in at least some California populations, the character is problematic to evaluate accurately: measurement is difficult, and 8% of *P. arnoldii* individuals lacked cilia altogether.

***P. austrosinense* (Zahlbr.) Hale** - Syn. *Parmelia a.* Zahlbr. **Lobes** 5-10 mm; **upper surface** light gray, +/- clearly maculate (Hale 1965); **lower surface** black, white in a broad zone along the margin; **cilia** lacking (Hale and Cole 1988); **soralia**, on the margins, linear to irregular; **apothecia** very rare; **K-**, **C+** red. There may be a characteristic conspicuousness of the photobiont in the area of white lower cortex (Wright, unpubl.) SAN LUIS OBISPO, SAN DIEGO n to SANTA BARBARA (Hale and Cole 1988, Riefner et al. 1995).

***P. chinense* (Osbeck) Hale & Ahti** - Syn. *Parmotrema perlatum* (Hudson) M. Choisy, *Parmelia perlata* (Hudson) Ach. **Lobes** mostly 2-6 mm; **upper surface** whitish, gray, or greenish gray; **lower surface** black, brown in a broad zone along the margin; **cilia** plentiful to sparse, some forking; **soralia** terminal, frequently revolute; **apothecia** rare; **K+** yellow to light orange. Widespread in the coastal counties (Hale and Cole 1988, fig. 77a, and other records). Common on Coyote Bush (*Baccharis pilularis*) in Coastal Scrub in MARIN. Many thalli will have spots of glossy white on the underside of the lobe tips and are considered intermediate with *P.* sp. 1, q.v. See *P. arnoldii* for a discussion of cilium length and distribution and soralium color as characters separating the *P. chinense* from it.

***P. crinitum* (Ach.) M. Choisy** - **Lobes** mostly 2-6 (10) mm; **upper surface** whitish, gray, or greenish gray; **lower surface** black, brown in a broad zone along the margin;

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[1] $p < 0.001$, 2-tailed Mann-Whitney test (data heteroscedastic), using the normal approximation for large samples (Zar 1984): 37 cilia +/- evenly distributed on 11 thalli of *P. chinense* and intermediates with *P.* sp. 1; 49 cilia on 14 thalli of *P. arnoldii*.

cilia short, arising from the isidia and from the margins of the lobes; **soralia** lacking; **isidia** on the laminae; **apothecia** rare; **K+** yellow to light orange. The only isidiate *Parmotrema* known from the Pacific Coast (Ryan 1994-1999). DEL NORTE, HUMBOLDT (Hale and Cole 1988); MENDOCINO (Tucker and Kowalski 1975); MARIN, SANTA BARBARA (Wright 1994).

***P. hypoleucinum* (Steiner) Hale** - **Lobes** mostly 10-15 mm; **upper surface** light gray, shiny, white maculate, rugose with age; **lower surface** black, white in a broad zone along the margin where rugulose and naked, this area sometimes turning pink in age; **cilia** present; **soredia** in linear soralia on the margins; **apothecia** extremely rare; **K+** yellow to light orange (morphology from Hale [1965], *sub Parmelia hypotropa*). Near the coast from SAN DIEGO to SAN LUIS OBISPO (Hale and Cole 1988 and other records); MONTEREY (Bourell 2000). *H. Peters 459* from NAPA (Yountville) at SFSU, determined by Mason Hale, may represent material introduced on nursery stock; the collection has an apothecium, said by Hale (1965, *sub Parmelia hypotropa*) to be "extremely rare" in this species, so that one might wonder if *Peters 459* is not *P.* sp. 1, but the apothecium is unlike the abortive apothecia of that entity.

***P. hypotropum* (Nyl.) Hale** - Morphology as for *P. hypoleucinum*, which was at one time synonymized with *P. hypotropum*. The chemistry, however, is not the same stictic acid complex: **K+** red. At San Quintin, Baja California (coll. P.A. Bowler, herb Wright, chiefly norstictic acid and atranorin by TLC of D. Glavich). Ryan (unpub l. Sonoran key to *Parmotrema*) mentions this from California.

***P.* sp. 1** - **Lobes** to ca. 5 mm; **upper surface** whitish gray, not maculate; **lower surface** black centrally, ivory white in a broad, rugulose zone at the margin; **cilia** few and short; **soredia** in terminal, frequently revolute soralia; **apothecia** common, to 7 mm, disk light brown, with pyramidal (sloping or "mounding") sorediate exciple; 1 larger apothecium contained only 3 well developed asci with spores 22 (29) x 10 µm; **pycnidia** common; **K+** yellow to light orange. HUMBOLDT (Arcata Bottoms, on an old fence; without apothecia but with apotheciform pycnidia); MARIN (Arroyo Hondo, Pt. Reyes Seashore, on an old fence, *4520*; Inverness Ridge, on bark of "Japanese White Plum", *3730, 6927*; Pine Gulch Creek, on *Acer negundo*, *3999*; San Geronimo Ridge, on *Heteromeles*, *4931*, *5184*; Shafter Bridge, on bark of *Aesculus* (?), *5048*); SONOMA (Knight's Valley, on *Umbellularia*, *4971*.) The chemistry is based on *Wright 3730*, Inverness Ridge, Marin Co., 21 January 1989, K+ yellow, PD+ orange; TLC in standard solvents C and G of an intermediate between *P.* sp. 1 and *P. chinense* showed a stictic acid complex like that of *P. chinense* with additional well-developed, high running spots in class 5 not found in those species. The apothecia, which look as though they grade into pycnidia, are mostly sterile, either with an hymenium only and no asci or with a few asci containing abortive spores. The abortive apothecia are strongly correlated with glossy white cortex dominating on the underside of the lobe tip.[2] Rare in mesic woodland. Very distinctive when fully developed and seen in a number of different localities. This lichen apparently has the K+ light orange stictic acid complex of *P. chinense*, *P. crinitum* and *P. hypoleucinum* (without norstictic acid), which together with the quasi-fertile morphology suggests that it is in some way ancestral to generally sterile, sorediate *P. chinense*.

***P. stuppeum* (Taylor) Hale** - Syn.: *Parmelia stuppea* Taylor. **Lobes** 4-8 mm; **upper surface** gray, sometimes reddish in age; **lower surface** black, brown in a broad zone at the margin; **cilia** usually present; **soralia** on the margins and continuing over them, but the lobe tip itself not revolute; **apothecia** occasional (contrary to Hale and Cole [1988]); **K+** yellow becoming deep red orange. LOS ANGELES (Bratt 1999); MENDOCINO s to SAN LUIS OBISPO, preferring broadleaf trees (Hale and Cole 1988 and various records). Although the soralia continue over the edges of the lobes, the margins themselves do not generally curve under as in *P. arnoldii* and *P. chinense* (fig. 1); however, Hale (1965) says they may do so in age, and I found one such specimen in Marin Co. with the K test as for *P. stuppeum*.

a.) *P. chinense*

b.) *P. stuppeum*

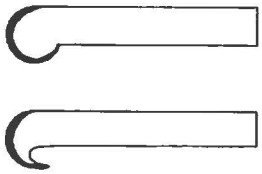

Fig. 1. Sorediate lobe tips of a.) *Parmotrema chinense* and b) *P. stuppeum*, redrawn from Hale (1965, *sub Parmelia perlata* and *P. stuppea*).

[2] p=0.006, 2-tailed Fisher Exact Test (Zar 1984) : 12 thalli of *P.* sp. 1, 51 of *P. chinense*, and 57 intermediate thalli were included.

Physcia

Thalli small, mostly < 5 but sometimes to 10 cm, sometimes cartilaginous (="firm, elastic, flexible"); **lobes** to 3 mm, usually < 2 mm (measurements are widths); **upper surface** white to pale or dark gray; **lower surface** white in most Californian species, sometimes pale brown, black in 1 species. **Disk of apothecium** white pruinose to black. On bark, rock, and soil. Thirty-six species are reported for North America, 23 for California. Where cilia are not mentioned for a species, they are lacking. The white spots, which are very small, are best seen when wet. The K reaction, which is yellow unless otherwise specified, is checked in the medulla, taking care to keep the solution off of the cortex, which, if wetted with it, may bleed yellow onto the medulla.

1a. Without marginal cilia 2
1b. With marginal cilia 3

2a. Soredia and isidia lacking 7
2b. Soredia and/or isidia present 18

3a. Without soredia; apothecia abundant on mature thalli ..... ***P. leptalea***
3b. With soredia on lobe tips; apothecia mostly rare ... 4

4a. Soredia inside helmet- or hood-shaped lobe tips ..... ***P. adscendens***
4b. Soredia on underside of flat or reflexed lobe tips .. 5

5a. Hairs on upper surface ..... ***P. tenellula***
5b. Without hairs on upper surface 6

6a. Cilia +/- pale; thalli forming rosettes on bark and inland rocks ..... ***P. tenella* ssp. *tenella***
6b. Cilia almost black (upper surface also may be blackish); thalli "scattered or forming small, furry cushions" (Ryan) on maritime rocks .... ***P. tenella* ssp. *marina***

7a. Upper surface +/- uniformly densely pruinose; lower surface often yellowish in places 8
7b. Upper surface at most slightly pruinose; lower surface not yellowish 10

8a. K- (take care to keep reagent off the cortex, which is K+ yellow) ..... ***P. biziana***
8b. K+ yellow 9

9a. On rock; upper surface grayish, brownish, or yellowish; medulla K+ dingy rose or orange in discolored areas ..... ***P. magnussonii***
9b. On bark; upper surface very white; medulla without K+ rose or orange areas ..... ***P. mexicana***

10a. K+ yellow 11
10b. K- 16

11a. Upper surface with white spots (best seen when wet) on lobe tips as well as toward the center of the thallus 12
11b. White spots, if present, only toward the center ... 14

12a. Upper surface gray to dark gray or brownish gray (Moberg [1997]; Ryan [1994-1999] gives bluish, violet-gray, or ashy gray), +/- rugose ..... ***P. phaea***
12b. Upper surface white to gray white, not rugose ... 13

13a. Lobes to 1 mm; on rock ..... ***P. convexa***
13b. Lobes to 2 mm; usually on bark ..... ***P. aipolia***

14a. Lobes 0.2-0.5 (-1) mm; on rock 15
14b. Lobes (0.7-) 1 mm or more; thallus cartilaginous; lobes irregularly branched, short ..... ***P. cascadensis***

15a. Medulla hard; lobes to 0.5 mm ..... ***P. halei***
15b. Medulla lax; lobes to 1 mm ..... ***P. convexa***

16a. Medulla hard; lobes to 0.5 mm ..... ***P. halei***
16b. Medulla lax; lobes to 1 mm or more 17

17a. Upper surface shiny; thallus cartilaginous, thick; on rock ..... ***P. albinea***
17b. Upper surface matt; thallus not cartilaginous; on bark, rarely on rock ..... ***P. stellaris***

18a. With isidia bursting at the tips into granular soredia; discrete soralia lacking (from 2b) ..... ***P. clementei***
18b. With soredia but without isidia except soredia developing into non-corticate pseudoisidia in *P. tribacia* . 19

19a. Lower surface black or dark brown except for the lobe tips; soralia laminal, crateriform ..... ***P. erumpens***
19b. Lower surface white or pale 20

20a. Soralia laminal and capitate, crateriform, or punctate; K+ yellow 21
20b. Soralia mostly marginal (lip-shaped or margins merely granular with soredia) 22

21a. Thallus cartilaginous; upper surface usually finely white-spotted; soralia variable, often capitate, sometimes lip-shaped; on rock, rarely on bark ... ***P. caesia***
21b. Thallus soft; usually without white spots; soralia erupting through the upper cortex in circular patches, never near the lobe tips; on bark, occasionally on rock ..... ***P. americana***

22a. Lobes to 0.3 mm; soralia lip-shaped on margins, wart-like on laminae; on rock 23
22b. Lobes to 2 mm; soredia spreading over the margins or on underside of lobe tips ..... ***P. dubia***

23a. K+ yellow ..... ***P. phaea* (see also *P. tribacia*)**
23b. K- 24

24a. Usually densely pruinose throughout; soralia marginal, linear, not on lobe tips, rarely slightly lip-shaped ..... ***P. dimidiata***
24b. Weakly pruinose; soralia usually at least partly lip-shaped when abundant 25

25a. Soredia isidioid, often corticate; soralia often weakly lip-shaped 26
25b. Soredia becoming conglomerate but not isidioid, without cortex; soralia at tips of side lobes, distinctly lip-shaped, sometimes laminal and crateriform; usually on rock ..... ***P. dubia***

26a. Disks of apothecia densely pruinose; on bark of roadside trees, only occasional on rock ..... ***P. millegrana***
26b. Disks of apothecia without pruina; mainly on exposed rocks ..... ***P. tribacia***

Key adapted from Ryan (1994-1997) supplemented by Hale and Cole (1988), Moberg (1997), and Thomson (1963).

***P. adscendens* (Fr.) H. Olivier** - **Lobes** to 1 (2) mm; **cilia** on margins to 4 (7) mm; **upper surface** white to gray; **pruina** sometimes present, **soredia** beneath helmet-shaped lobe tips; **apothecia** uncommon; **K-**. Widespread but absent from the Modoc Plateau and the e slope of the Sierra Nevada (Hale and Cole 1988, fig. 77d, and various records). Easily recognized by the helmet-shaped lobe tips containing soredia.

***P. aipolia* (Ehrh. *ex* Humb.) Fürnr.** - **Lobes** usually > 1 mm to 2 mm, branching nearly dichotomous; **upper surface** whitish to pale gray, often bluish, sometimes brownish; **lower surface** whitish to pale tan or pale gray; **pruina** weakly developed at most; **white spots** dense; **soredia** and **isidia** lacking; **apothecia** usually abundant, disk red brown to black, usually covered with a heavy white pruina; **K-**. Widespread, California distribution similar to that of *P. adscendens* (Hale and Cole 1988, fig. 78a).

***P. albinea* (Ach.) Nyl.** - **Lobes** 0.5-1 mm, cartilaginous, the tips crenulate; **cilia** lacking; **upper surface** white or gray white, shiny; **lower surface** pale; **pruina** lacking; **white spots** generally lacking; **soredia** and **isidia** lacking; **apothecia** with black disk, which may be pruinose; **K-**. CONTRA COSTA (Baltzo 1989); MARIPOSA (Thomson 1963); EL DORADO, KERN, LASSEN, MARIN, MONO, SANTA BARBARA, SAN LUIS OBISPO, VENTURA (Bratt); possibly also MONTEREY (Bourell 2000).

***P. americana* G. Merr.** - Syn. *P. tribacoides* of authors, not Nyl. **Lobes** to 2.5 mm, fan-shaped, broadened at tips, soft; **upper surface** grayish or greenish white to light gray; **lower surface** white to pale creamy buff; **pruina** usually lacking; **white spots** usually lacking; **soredia** in round laminal soralia, coarsely granular, white to bluish gray; **apothecia** rare; **K+**. On bark, sometimes rock. SAN BERNARDINO (Thomson 1963); SAN LUIS OBISPO (Riefner et al. 1995).

***P. biziana* (A. Massal.) Zahlbr.** - **Lobes** 1 to 2 (3) mm; **cilia** lacking; **upper surface** gray to brownish gray or cream; **lower surface** whitish to brownish; **pruina** usually dense; **white spots** lacking?; **soredia** and isidia lacking; **apothecia** common, the disk black beneath the white pruina; **K-**. MONTEREY (Tucker and Bratt 1996a); SAN LUIS OBISPO (Tucker 1999). The account in Hale and Cole (1988) suggests that the range may be similar to that of *P. stellaris*, q.v.

***P. caesia* (Hoffm.) Fürnr.** - **Lobes** mostly 0.5-1 (3) mm, deeply incised toward periphery of thallus; **upper surface** gray to dark gray; **lower surface** white to dark gray; **pruina** at most slight; **white spots** usually present, fine; **soredia** in soralia which are either laminal and convex or apical on short branches and then capitate or lip-shaped, this latter form sometimes on the margins; **apothecia** rare; **K+**. On bark, occasional on rock. LOS ANGELES to RIVERSIDE; SISKIYOU to INYO and TULARE, SANTA CRUZ (Hale and Cole 1988).

***P. cascadensis* H. Magn.** - **Lobes** about 1-3 mm, cartilaginous, irregularly branched, short; **upper surface** dull gray to bluish gray or gray violet (white to bluish gray [Thomson 1963]); **lower surface** pale; **pruina** lacking (Thomson); **white spots** at most inconspicuous; **soredia** and **isidia** lacking; **apothecia** with black, +/- pruinose disk; **K+**. CONTRA COSTA (Baltzo 1989), LOS ANGELES (Thomson 1963). Ryan (1994-1997) believes this may be just a variant of *P. phaea* with a paler upper surface and inconspicuous white spotting.

***P. clementei* (Turner) Maas Geest.** - **Lobes** 0.3-0.6 mm, thin, soft, richly pinnatifid, not overlapping, sometimes slightly rugose, the tips crenate; **upper surface** white, white gray to bluish gray; **lower surface** pale to brownish; **pruina** lacking; **white spots** not mentioned for this species; **isidia** present, bursting at the tips into coarse **soredia**, discrete soralia

lacking (Ryan [1994-1999]; finally forming crateriform soralia [Thomson 1963]); **apothecia** with dark disk, apparently uncommon; **K+**. On bark. KERN to LOS ANGELES (Hale and Cole 1988).

***P. convexa* Müll. Arg.** – **Lobes** to 1 mm, +/- truncate; **cilia** lacking; **upper surface** whitish gray to gray, shiny; **lower surface** white to brownish or pinkish yellow; **pruina** lacking; **white spots** present, presumably only toward the center of the thallus (Ryan 1994-1999), absent according to Thomson (1963); **soredia** and **isidia** lacking; **apothecia** +/- abundant, disk black with thick margin; **K+**. On rock. In Arizona (Ryan 1994-1999,Thomson 1963). Thomson writes that *P. convexa* has high convex lobes, lacks white spots, and has spores 7-10 µm wide, while Ryan (1994-1999) places his material, which had spores 9-11 µm wide, with the white spotted species; it does seem as though they may be referring to different species.

***P. dimidiata* (Arnold) Nyl.** – **Lobes** to 3 (4) mm, the tips crenate; **cilia** lacking; **upper surface** gray to gray blue or slightly brownish (or cream colored: Moberg [1997]); **lower surface** whitish to gray or brownish; **pruina** usually dense throughout; **white spots** absent or inconspicuous (Goward and McCune 1994); **soredia** mainly in marginal soralia, spilling onto upper surface at maturity; **apothecia** rare; **K-** or + slowly dingy orange. On bark or moss over rock. KERN, LOS ANGELES, MADERA, MERCED, MONTEREY, SANTA BARBARA, SAN DIEGO, SISKIYOU, SAN LUIS OBISPO, TUOLUMNE (Bratt).

***P. dubia* (Hoffm.) Lettau** – Syns.: *P. intermedia* Vainio, *P. teretiuscula* (Ach.) Lynge. **Lobes** 0.2-1 (2) mm, usually radiating; **upper surface** gray white to darkish gray; **lower surface** gray to brownish gray; **pruina** occasionally present, weak; **white spots** faint or absent; **soredia** usually in lip-shaped soralia at apices of side lobes, sometimes concave on the laminae; **apothecia** rare; **K-**. Usually on rock, occasionally on bark. KERN s to LOS ANGELES; SISKIYOU, TRINITY (Hale and Cole 1988); SAN LUIS OBISPO (Bourell 2000, Tucker 1999); Yosemite, MONO, SAN BERNARDINO (Thomson 1963).

***P. erumpens* Moberg** – **Lobes** to 1 mm, sometimes overlapping; **upper surface** whitish gray to weakly brownish gray; **lower surface** black except for the lobe tips; **pruina** occasional; **white spots** not mentioned for this species; **soredia** in laminal crateriform or sometimes capitate soralia originating as cracks in the cortex; **apothecia** not seen from western North America; **K+**. MARIN (J. and R. Robertson 2000), determined by T. Esslinger. See Moberg (1997).

***P. halei* J.W. Thomson** – **Lobes** 0.2-0.5 (1) mm, repeatedly forking or subpinnate at acute angles; **upper surface** gray; **lower surface** white or pale brown; **pruina** lacking; **white spots**, **soredia** and **isidia** lacking; **apothecia** with dark brown to black disk and no pruina; **K+** (K- according to Moberg, cited in Ryan 1994-1997). The medulla is hard, i.e., agglutinated like the cortices. On rock. TULARE (Riefner et al. 1995).

***P. leptalea* (Ach.) DC.** – Syn.: *P. semipinnata* (J. F. Gmelin) Moberg. **Lobes** generally long and narrow, < 1 mm; **cilia** pale with dark tips; **upper surface** whitish to dark gray; **lower surface** white to dark gray or brownish; **pruina** lacking; **white spots** sometimes present; **soredia** in lip-shaped apical soralia; **apothecia** rare; **K-** . CONTRA COSTA (Baltzo [1989], as *P. semipinnata*), SAN BERNARDINO (Thomson 1963); EL DORADO, MONTEREY, SANTA CLARA (Bratt, as *P. semi-pinnata*).

***P. magnussonii* Frey** – **Lobes** to 2 (3) mm, usually short and broad; **upper surface** grayish or brownish, usually with yellowish tinge; **lower surface** white to brownish with a pinkish tinge; **pruina** generally present; **white spots** lacking; **soredia** and **isidia** lacking; **apothecia** common, disk pruinose; **K+** yellow, but discolored areas may be K+ rose or orange. LAKE, determined by S. Tucker (Wright 1997).

***P. mexicana* de Lesd.** – **Lobes** to 1 mm, +/- convex, subdichotomous or pinnate; **upper surface** very white, lobe tips fawn (light yellowish brown); **lower surface** white or pale brown; **pruina**, **white spots**, **soredia**, and **isidia** lacking; **apothecia** with strongly pruinose disk; **K+**. CONTRA COSTA (Baltzo 1998); MADERA (Ryan *fide* Bratt).

***P. millegrana* Degel.** – **Lobes** to about 2 mm, often plentiful, deeply cut, and branched; **upper surface** greenish gray to gray white; **lower surface** white; **pruina** and **white spots** not mentioned for this species; **soredia** on margins and lower surface at the margin, partly lip-shaped; **apothecia** common (Thomson 1963; rare according to Ryan [1994-1999]), disk black but with white pruina; **K-**. ALAMEDA, possibly introduced on nursery stock from the eastern U.S. (Thomson 1963), CONTRA COSTA (Baltzo 1989); EL DORADO, MARIPOSA, SHASTA, TEHAMA (Bratt).

***P. phaea* (Tuck.) J.W. Thomson** – Syn.: *P. callosa* Nyl. (Moberg 1997). **Lobes** usually < 1 but may reach 2 mm, radiating, closely appressed; **cilia** lacking or very sparse (Goward and McCune 1994); **upper surface** gray to dark or brownish gray, +/- rugose (Moberg 1997); **lower surface** whitish to dark gray or brownish; **pruina** lacking; **white spots** conspicuous on lobe tips as well as in the center of the thallus; **soredia** and **isidia** lacking; **apothecia** numerous, with brown to black disk which is sometimes covered with pruina; **K+**. KERN to MODOC in Sierras, SAN DIEGO n to SONOMA

in the Coast Ranges, MARIPOSA to BUTTE (Hale and Cole 1988, partly as *P. callosa*); LAKE, MARIN, SANTA BARBARA, SAN BENITO, SAN DIEGO, SISKIYOU, SAN LUIS OBISPO, TEHAMA (Bratt).

***P. stellaris* (L.) Nyl.** - **Lobes** 0.2-1.5 mm with rounded tips; rhizines sometimes projecting from the underside and visible from above; **upper surface** white gray to darkish, matt; **lower surface** whitish to pale brownish white or pale gray; **pruina** lacking; **white spots** at most indistinct; **soredia** and **isidia** lacking; **apothecia** usually present and abundant; **K-**. Mostly on bark. Widespread but mostly absent from the northern one-fifth of the state and the arid SE (Hale and Cole 1988 and other records).

***P. subtilis* Degel.** - **Lobes** 0.1-0.2 mm (!), discrete, linear elongate, multifid, the tips breaking up into soredia; **upper surface** white to gray green; **lower surface** pale; **pruina** and **white spots** lacking; **soredia** on margins; **apothecia** sparse (Thomson 1963); **K+**. Ryan (1994-1999) observes that, except for the soredia, which may be sparse, this is nearly identical to *P. halei*, q.v. SANTA BARBARA (Tucker, *fide* Bratt); TULARE (Riefner et al. 1995).

***P. tenella* subsp. *marina* (A.E. Nyl.) D. Hawksw.** - **Lobes** to 0.8 mm; **cilia** blackish; **upper surface** pale to dark gray or blackish; **lower surface** white; **pruina** lacking; **white spots** present?; **soredia** as in *P. tenella*; **apothecia** with bluish pruinose disk; **K-**. "Scattered or forming small, furry cushions on maritime rocks" (Ryan 1994-1999). SANTA BARBARA (Thomson 1963); SAN LUIS OBISPO (Riefner et al. 1995).

P. tenella* (Scop.) DC. subsp. *tenella - **Lobes** to 1 mm; **cilia** +/- pale; **upper surface** whitish to bluish gray; **lower surface** white to dark gray or brownish; **pruina** lacking; **white spots** present (Hale and Cole 1988); **soredia** on underside of lobe tips (in apical, lip-shaped soralia [Ryan 1994-1999]); **apothecia** generally rare; K- . MENDOCINO to RIVERSIDE in the Coast Ranges, SHASTA to KERN on the w slope of the Sierra Nevada (Hale and Cole 1988 and various records). Several authors remark on intergrades with *P. adscendens*.

***P. tenellula* Moberg** - **Lobes** ca. 0.5 (1) mm; **cilia** rare; **upper surface** gray to dark gray or brownish, with white to black hairs; **lower surface** white to brown; **pruina** and **white spots** lacking; **soredia** in terminal to marginal soralia, often making the tip widen, occasionally on the underside of the lobe tip; **apothecia** rare; **K-**. Like *P. tenella*, but with hairs on the upper surface. On bark and rock. A Sonoran Desert species so far known in California only from the Channel Islands. LOS ANGELES, SANTA BARBARA (Moberg 1997). I would pronounce te-NELL-yu-la.

***P. tribacia* (Ach.) Nyl.** - Syn.: *P. callosa* of western U.S. authors, not Nyl., at least for some of the material, *fide* C. Bratt. **Lobes** to 1 (1.5) mm, not distinctly radiating, the tips broadened and fan shaped, mostly crenulate when soralia are not present; **upper surface** whitish gray to cream, sometimes bluish, not greenish; **lower surface** whitish to gray brown or with faint pinkish or yellowish tinge; **pruina** lacking (present according to Thomson [1963]); **white spots** not mentioned for this sp.; **soredia** in marginal, usually terminal soralia which are initiated on the lower side of the lobe tip and may become lip-shaped when well developed; **apothecia** rare; **K-**. LOS ANGELES (Bratt 1999); MARIN (Nicasio Reservoir: J. Robertson [pers. comm.], identified by T. Esslinger); SAN LUIS OBISPO (Bourell 2000, Tucker 1999); widespread from TEHAMA south (Bratt).

Physciella

Thalli small to medium, 4-5 (7) cm; **lobes** 1-2 (rarely 7) mm, elongate to rounded; **upper surface** almost white to more often gray or gray brown; **lower surface** white to pale tan; **K-**. On bark, less commonly on rock. Three species in North America, 1 reported for California. Separated from *Physcia* by the K- upper cortex, the structure of the tissue of the lower cortex, and the shape of the conidia (Esslinger 1986); the last 2 characters are microscopic.

***P. melanchra* (Hue) Essl.** - Syn.: *Physcia melanchra* Hue, *Phaeophyscia melanchra* (Hue) Hale. **Soredia** in round to irregular, laminal, occasionally marginal soralia (not lip-shaped); **apothecia** frequent. SAN LUIS OBISPO (Riefner et al. 1995, verified by J.W. Thomson). A reference essential to understanding this taxon as well as *Physciella chloantha* in North America was unfortunately omitted from the references for *Physciella* in the highly useful on-line guide of May and Brodo (2000): Esslinger (1978), when read together with Esslinger (1986), makes it all clear. Before this report by Riefner et al. (1995), its closest known approach to California was in Colorado (Esslinger 1978).

Platismatia

Thalli small to mostly medium or occasionally large, 3-20 cm; **lobes** 3-20 mm wide; **upper surface** white, gray, or greenish gray, may be browned on exposed sites; **lower surface** black, brown, white, or mottled; **rhizines** generally few; **apothecia** rare or lacking in the California species except in *Platismatia lacunosa*; **pycnidia**, when present, on the margins. Six species reported for North America, 5 for California.

1a. Isidiate or sorediate 2
1b. Neither isidiate nor sorediate 4

2a. Lobes narrow, strap-shaped, mostly < 5 mm wide; isidiate only, not sorediate ..... *P. herrei*
2b. Lobes expanded, mostly > 5 mm wide, isidiate and/ or sorediate 3

3a. Upper surface smooth to weakly ridged or wrinkled; occasionally with coralloid fruticose outgrowths .. .. *P. glauca*
3b. Upper surface with a network of ridges; isidiate on the ridges but never with coralloid fruticose outgrowths .... *P. norvegica*

4a. Lobes mostly 5-10 mm wide; upper surface with a network of ridges; medulla PD+ orange *P. lacunosa*
4b. Lobes < 5 mm wide; upper surface not ridged; medulla PD- ..... *P. stenophylla*

Key adapted from McCune and Geiser (1997) supplemented by Culberson and Culberson (1968).

***P. glauca* (L.) Culb. & C. Culb.** – **Lobes** 5-25 mm; **upper surface** smooth to reticulately wrinkled, whitish, grayish, or greenish, may be browned on exposed sites; **lower surface** black, the margins brown, or colored like the upper surface, or white (Culberson and Culberson 1968); **soredia** lacking; **isidia** mainly on lobe margins; **apothecia** rare; **pycnidia** not seen by Culberson and Culberson in their monographic study (1968); **rhizines** few to many; **K-**. Widespread in central and n California (Hale and Cole 1988). Highly variable.

***P. herrei* (Imshaug) Culb. & C. Culb.** – **Lobes** to 3 (5) mm; **upper surface** whitish, grayish, or greenish; **lower surface** mottled black, brown, and white, glossy; **soredia** lacking; **isidia** mainly on lobe margins; **apothecia** rare; **K-**. MONTEREY n to Oregon in the coastal counties (Culberson and Culberson 1968, Hale and Cole 1988).

***P. lacunosa* (Ach.) Culb. & C. Culb.** – **Lobes** mostly 5-10 mm; **upper surface** prominently reticulately ridged, some shade of gray, conspicuously blackening at the margins; **lower surface** somewhat reticulately wrinkled, black centrally, brown at the margins; **soredia** and **isidia** lacking; **apothecia** common (McCune and Geiser 1997), very infrequent (Culberson and Culberson 1968); **pycnidia** on the margins, dark, often protruding (McCune and Geiser), not seen by Culberson and Culberson; **rhizines** few; **K-**, **PD+** red orange. On bark and wood. HUMBOLDT (Hale and Cole 1988); DEL NORTE, EL DORADO, SISKIYOU (Bratt).

***P. norvegica* (Lynge) Culb. & C. Culb.** – **Lobes** mostly 10-20 mm; **upper surface** reticulately ridged, gray, yellowish gray, or yellowish; **lower surface** black centrally, brown to concolorous at the margins with the upper surface; **soredia** lacking; **isidia** usually abundant along the ridges; **apothecia** not seen; **pycnidia** on the margins (Culberson and Culberson); **rhizines** few; **K-**. On bark and wood. McCune and Geiser (1997) report this for California, but I have not seen a reference to any records.

***P. stenophylla* (Tuck.) Culb. & C. Culb.** – **Lobes** mostly 1-2 (4) mm; **upper surface** smooth, whitish, pale brown, or occasionally somewhat darkening; **lower surface** whitish, tan, or brown, minutely reticulate rugose; **soredia** and **isidia** lacking; **apothecia** common, terminal; **pycnidia** few, black, on the margins; **rhizines** rare; **K-**. On bark and wood. HUMBOLDT, SANTA CRUZ, SAN MATEO n to Oregon (Culberson and Culberson 1968, Hale and Cole 1988); SHASTA (Riefner et al. 1995); DEL NORTE, EL DORADO, LAKE, MARIN, MENDOCINO, NEVADA, SHASTA, SISKIYOU, SONOMA (Bratt).

Pseudocyphellaria

Thalli medium to large, 5-20 cm; **lobes** 0.5-3 cm; often reticulate ridged, smooth or merely undulate in *P. rainierensis*; **lower surface** with abundant tiny pores (pseudocyphellae). Primary photobiont a cyanobacterium except in *P. rainierensis*. Six species reported for North America, 3 for California, all brown except for gray *P. rainierensis*, which is not yet reported here but may be present.

***P. rainierensis* Imshaug** – **Upper surface** gray, greenish gray, or bluish gray, the margins lobulate to lacerate or occasionally isidiate; **isidia** elongate or coralloid on laminae of upper cortex especially along cracks and on tiny pedestals formed by the gathering upward of the cortex; **lower surface** whitish to light brown, finely tomentose; **apothecia** rare, disks 1-2 mm; **spot tests** negative, although the medulla may be UV+ white or blue. Internal collections of cyanobacteria ("blue-green" photobiont) called cephalodia are sometimes visible above as small warts, which may erupt. Reported from south central Oregon by Sillett and Goward (1998), who detail the threat to it from clear-cut logging. The conservation measures they suggest must be applicable to other species as well. S. Sillett (pers. comm., 1999) suggests watching for *P. rainierensis* in the Smith River drainage in Del Norte Co.

Punctelia

Thallus to 15 cm; **lobes** to 1.5 cm, rounded; **upper surface** greenish to brownish gray; **pseudocyphellae** giving rise to **soredia** or **isidia**. Resembling *Parmelia*, in which it was formerly included, but distinguished from it by the scattered, round pseudocyphellae (inconspicuous in *P. bolliana*) developing into soralia on the upper cortex and by the shape of the conidia. Thirteen species are reported for North America, 5 for California. They have various ecologies, substrates, and colors of lower surface, but all species currently known from California are C+ rose to red in the medulla and have short, simple rhizines. Treatment adapted from Ryan (1994-1999), supplemented by Wilhelm and Ladd (1992) and McCune and Goward (1995).

1a. C-, upper surface often lobulate with age (SW Arizona) ..... ***P. bolliana***
1b. C+ rose or red; without lobules 2

2a. Isidiate, not sorediate ..... ***P. punctilla***
2b. Sorediate, not isidiate 3

3a. Upper surface ridged; lobes 1-2 mm wide ..... ***P. perreticulata***
3b. Upper surface without ridges; lobes mostly 3-5 mm wide 4

4a. Pale brown below ..... ***P. subrudecta***
4b. Black to dark brown below 5

5a. On rock; upper side shiny, tinged with brown toward the lobe tips as in *Parmelia saxatilis* .... ***P. stictica***
5b. On bark; neither shiny nor tinged with brown; resembles *P. subrudecta* but with black lower surface .... ***P. borreri***

***P. bolliana* (Müll. Arg.) Krog** – Syn.: *Parmelia bolliana* Müll. Arg. **Thallus** to 12 cm; **upper surface** greenish mineral gray, wrinkled, often lobulate with age; **lower surface** pale; **pseudocyphellae** inconspicuous; **soredia** and **isidia** lacking; **apothecia** common; **C-**. Almost always on bark (Wilhelm and Ladd 1992). Given by Ryan (1994-99) as common in SW Arizona on trunks of deciduous trees and on sheltered acidic rocks. Might be expected in SE California.

***P. borreri* (Sm.) Krog** – Syn: *Parmelia borreri, Parmelia pseudoborreri*. **Thallus** to 10 cm; **upper surface** gray to gray green or darker, wrinkled toward the center, shiny; **lower surface** brown-black; **pseudocyphellae** converting to soralia back from the lobe edges; **soredia** in soralia which are laminal and punctiform or marginal and linear, sometimes capitate on the margins; **isidia** lacking; **apothecia** rare; **C+** rose. On bark almost exclusively in the eastern U.S., where it is rare. LOS ANGELES, MARIN, SAN LUIS OBISPO (Riefner et al. 1995, Bowler et al. 1996, Wright unpubl.); SAN MATEO (Doell and Wright 1996); SANTA BARBARA (Hale and Cole 1988); SHASTA (Bratt). Apparently not common in California, but perhaps overlooked; easily mistaken for *P. subrudecta* if the lower surface is not checked.

***P. perreticulata* G. Wilh. & Ladd** **Lobes** only 1-2 mm; **upper surface** foveolate or ridged; **lower surface** pale; **pseudocyphellae** sorediate; **soredia** marginal and diffusely laminal as well as in pseudocyphellae, powdery; **isidia** lacking; **C+** red. MARIPOSA, SONOMA (Adler and Ahti 1996).

***P. punctilla* (Hale) Krog** – **Lobes** to ca. 3 mm (Riefner 1989, fig.1); **lower surface** pale; **pseudocyphellae** small; **soredia** lacking; **isidia** cylindrical to somewhat flattened (papilliform), frequently coralloid branched, matt, with a poorly developed cortex and dark tip; **C+** red. On rock in Coastal Sage Scrub (Ryan 1994-1999). VENTURA (Riefner 1989), determined by Mason Hale. Very rare in North America, a South African species known here from only 2 populations, both in Ventura Co. (Riefner, pers. comm.) It may well have been more common before so much coastal habitat was destroyed by development (cf. Riefner 1989, p. 254).

***P. stictica* (Duby) Krog** – Syn.: *Parmelia stictica* (Duby) Nyl. **Thallus** to 6 cm; **upper surface** light brown to brownish gray, shiny, wrinkled with age; **lower surface** black at the center, dark brown at the margins; **pseudocyphellae** relatively large and conspicuous, not the tiny white dots described by Wilhelm and Ladd (1992), at least in California; **soredia** developing from pseudocyphellae toward the center of the thallus; **isidia** and **apothecia** lacking; C+ rose. Only on rock. Uncommon. FRESNO (Bratt); HUMBOLDT, SANTA CRUZ or SAN MATEO (Hale and Cole 1988); LOS ANGELES (Bowler et al. 1996); MARIN (Wright unpubl.)

***P. subrudecta* (Nyl.) Krog** – Syn. *Parmelia subrudecta* Nyl. **Thallus** to 8 cm; **upper surface** greenish gray, smooth or wrinkled but not foveolate or ridged; **lower surface** pale brown; **pseudocyphellae** relatively large; **soredia** on margins and laminae; **isidia** lacking; **apothecia** very rare; **C+** red. Widespread in the central part of the state toward the coast; recorded also from BUTTE (Hale and Cole 1988 and other records); MERCED, MODOC (Bratt). I know of no other California macrolichen with a

green alga photobiont which has this peculiar pale brown color of the lower surface.

Rimelia

Thalli small to medium, to 7 cm; **lobes** 3-10 mm (Hale and Fletcher 1990); **upper surface** medium to dark gray with a fine network of maculae and cracks; **lower surface** black centrally, brown at margins; **rhizines** sparse, black; **soredia** in coarse, submarginal soralia; **apothecia** lacking. Resembling *Parmotrema* from which it differs by the fine, cracked maculae.

***R. reticulata* (Taylor) Hale & Fletcher** – Syns. *Parmotrema reticulatum* (Taylor) M. Choisy, *Parmelia reticulata* Taylor. **K+** yellow becoming deep red orange. LOS ANGELES to SANTA BARBARA (Hale and Cole 1988 and other records); MARIN (Wright 1994); SAN LUIS OBISPO (Bourell 2000). In material from MARIN (*Wright 3371, 4609*, herb. Wright), the network consists of microscopically low, white ridges (15 x) enclosing slightly lower, darker areas; in age some of the ridges crack along their length. Some *Parmotrema* thalli will have localized networks of cracks but will not have the low ridges characteristic of *Rimelia*.

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Appendix

A carefully prepared kit of basic lichen reagents (K, C, PD, and I) can be obtained from Charis Bratt, Santa Barbara Botanic Garden, 1212 Mission Canyon Rd., Santa Barbara, California 93105, cbratt@sbbg.org. Ms. Bratt prefers you pick the reagents up at the Botanic Garden, but arrangements can be made to ship them. A detailed discussion of how to use the reagents is in Wright (1996), available on request from the author, if a stamped, self-addressed envelope is provided. The diagram below is from that article. See also the article by Tucker and Bratt (1996b). UV tests can be performed with a "rock hound's" UV lamp set for "long wave." DO NOT use the lamp without protective goggles. PD is carcinogenic (besides discoloring whatever it falls on); dispose of waste in a dedicated container to be taken to a toxic waste disposal site.

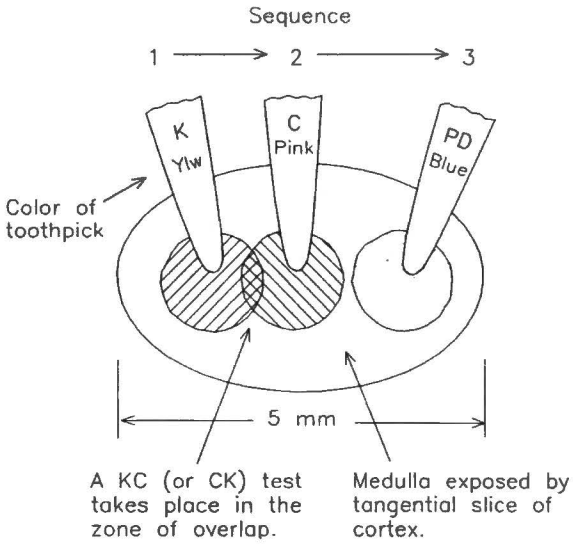

Figure 2. Multiple spot tests with colored plastic toothpicks on a single small exposure of medulla.

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New and Interesting Records of Lichens from California

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Abstract: *Three lichen species are reported as new to the State of California. Ten lichen species are range extensions or taxa infrequently encountered.*

New State Records

***Imshaugia aleurites* (Ach.) S.F. Meyer** Syn.: *Parmeliopsis aleurites* (Ach.) Nyl.- SONOMA CO. 5 mi NW of Cazadero, on oak, *JRR 3955*; on fence rail, *JRR 3959*. This lichen has an isidiate, shiny, upper surface and is closely appressed to the substrate. The similarity to *Physcia* may make it hard to recognize. Confirmed by S. Tucker.

***Physcia erumpens* Moberg** - MARIN CO. Mt. Tamalpais State Park, on oak, *JRR4392*. This species has crateriform, laminal soralia (Moberg 1997). It is so appressed to the substrate that the black underside is difficult to see, allowing it to be mistaken for one of the more common *Physcia* species. It occurs frequently at the base of large rocks, on shaded branches, and on dead wood in coastal chaparral at the rocky headlands south of Stinson Beach within a few hundred yards of the ocean. This collection is a new state record for the California mainland; it has been reported from San Clemente Island by Moberg. Confirmed by T. Esslinger.

***Tremolecia atrata* (Ach.) Hertel** - LAKE CO. Hull Mtn. Rd. 0.8 km (0.5 mi) S of summit, elevation 6800', *JRR 1780*. MARIN CO. Mt. Tamalpais State Park, near West peak, elevation 745 m (2450 ft.), *JRR 4581*. This circumpolar reddish species with black disks is easily overlooked as a rusty smudge on the rock surface. According to Thomson (1997), it has been recorded in the Western US only as far south as Washington State. These discoveries in Lake and Marin Counties represent range extensions of over 1290 km (800) miles. At the Hull Mt. locality, *T. atrata* was found covering several square meters of a single, north facing, hard silica outcrop, associated with *Pseudephebe sp.* and *Sporostatia testudinea* (Ach.) A. Massal. It has not yet been found on similar outcrops in the area. In Marin Co. it was found on only a few square centimeters of vertical, north-facing, siliceous rock. Confirmed by O. Breuss.

Interesting records

***Caloplaca demissa* (Körber) Arup & Grube** Syn.: *Lecanora demissa* (Flotow) Zahlbr. - SOLANO CO. Stebbins Cold Canyon Reserve, on sandstone, *JRR 3316*; SONOMA CO. Pepperwood Ranch, on schist, *JRR 4980*; MARIN CO. Mt. Tamalpais State Park, on serpentine, *JRR 4658*; NAPA CO., Butts Canyon, on serpentine, *JRR 3097*; MENDOCINO CO. UC Hopland Field Station, Panther Rock, on hard siliceous rock, *JRR 4884*. This lobate, sterile, sorediate, brown crust, whose placement in *Lecanora* began to be questioned in 1993, has been assigned to *Caloplaca* on nuclear ITS and SSU base sequences, morphology of conidia and conidiophores, and chemistry by Arup and Grube (1999). It is a usually found on shady rock faces, especially on protected overhangs. Some specimens are fringed with white pruina. Identified by B. Ryan.

***Catapyrenium psoromoides* (Borrer) R. Sant.** - SOLANO CO. Stebbins Cold Canyon Reserve, on oak, *JRR 3307*; LAKE CO. Guenoc Winery, on oak, *JRR 3624*; SONOMA CO. Sonoma Valley Park, on oak, JRR 3338; MENDOCINO CO. UC Hopland Field Station, on oak, *JRR 4835*. One of only two *Catapyrenium* species occurring on bark. Breuss and McCune (1994) list Lake, Butte, and Santa Clara Co. records. We are finding this inconspicuous pyrenolichen quite frequently in crevices of oak trunks in the North Bay Area counties. Confirmed by O. Breuss.

***Dendrisocaulon intricatulum* (Nyl.) Henssen.** - MARIN CO. Mt Tamalpais State Park, on oak , JRR 3811; on *Adenostoma* bark, *JRR 4045*; SONOMA CO. The Cedars, on oak bark, *JRR 3461*; NW of Cazadero, on oak, *JRR 3970*; MENDOCINO CO. UC Hopland Field Station, on oak, *JRR 3812*. This fruticose cyanolichen is easily overlooked among the mosses and gelatinous lichen spp. covering oak trunks. The internal stratification and fine tomentum covering the primary branches distinguish it from similar appearing *Leptogium* species. It may be what Goward (1999) treats as the fruticose photomorph of *Sticta oroborealis* Goward and Tønsberg (syn.: *Dendriscocaulon intricatulum* of authors, not [Nyl.] Henssen). Malachowski (1975) collected this lichen in a pygmy cypress forest in Mendocino Co., at which time it was thought that it might be a free living *Lobaria* cephalodium.

***Dimelaena thysanota* (Tuck.) Hale & Culb.** - MARIN CO. Mt. Tamalpais State Park, just below East Peak summit, on hard siliceous rock with *Dimeleana oreina* (Ach.) Norman, *JRR 4582*. Infrequently collected in

Northern California (Sheard 1974). At the Mt. Tamalpais site these species occurred extensively on a single south-facing outcrop and have not yet been found elsewhere in the area.

***Heppia lutosa* (Ach.) Nyl.** - MARIN CO. Mt. Tamalpais State Park, on soil bank in coastal chaparral, *JRR 4701*; LAKE CO. Guenoc Winery, on soil, *JRR 3646*. This lichen was cited by Sigal and Toren (1975) as occurring in Lake County (a range extension from the dry areas of Southern California). This record from the Marin County coast extends the range into the San Francisco Bay Area.

***Hubbsia parishii* (Hasse) Tehler, Lohtander, Myllys & Sundin** - Syn.: *Reinkella parishii* Hasse.- MARIN CO.: Mt. Tamalpais State Park, coastal headlands, *JRR 3875*. At Mt. Tamalpais State Park this lichen with hollow thallus has been found in only one protected rock crevice with *Lecanographa hypothallina* (Zahlbr.) Egea & Torrente. The second occurrence, at Pt. Reyes, is on a vertical, moist, north-facing, sandstone outcrop in association with *Dendrographa minor* Darbish. This is the first record of *Hubbsia parishii* north of San Luis Obispo County (Tehler 1997). Identified by B. Ryan.

***Koerberia biformis* A. Massal.** - MARIN CO. Mt. Tamalpais State Park, on oak, *JRR 3819*. SONOMA CO. Sonoma Valley Park, on oak, *JRR 3344*; Pepperwood Ranch, on *Quercus agrifolia*, JRR4954; The Cedars, on oak, JRR3457; LAKE CO. Guenoc Winery, on oak, *JRR 3734*. This species, thickly beset with fingerlike isidia with various orientations, was reported by Sigal and Toren (1975) as new to California; earlier Baltzo (1970) had listed it for Contra Costa County in her unpublished thesis. We are reporting it as new for Marin and Sonoma Counties. It is not at all uncommon, usually near the base of oak tree trunks. Confirmed by B. Ryan.

***Peltula zahlbruckneri* (Hasse) Wetmore** - SONOMA CO. Geysers Rd., on volcanic rock, *JRR 1550*; Mt. Hood State Park, on volcanic rock, *JRR 1473*; Ida Clayton Rd., on serpentine, *JRR 1574*. LAKE CO. Butts Canyon Rd., on serpentine, *JRR 1078*; NAPA CO. Silverado Trail near Rector Reservoir, on volcanic rock, *JRR 3180*. Sigal and Toren extended the range from Kern Co. to Lake Co. (Wetmore 1970, Sigal and Toren 1974). We have found this minutely subfruticose *Peltula* fairly regularly on outcrops in the north Bay Area; usually on steeply sloping, south-facing drainage surfaces with *Peltula euploca*, *Peltula bolanderi*, an unidentified sorediate *Peltula* species, and *Dermatocarpon sp.*

***Phylliscum demangeonii* (Moug. & Mont.) Nyl.** - MARIN CO. Mt. Tamalpais State Park, on shaded vertical serpentine, *JRR 3776*. The range of this infrequently collected lichen is poorly known (Goward 1994).

***Psora pacifica* Timdal** - LAKE CO. Guenoc Winery, on soil, *JRR 3651*. This *Psora* has lightly pruinose, ascending lobes and contains gyrophoric acid (C+ red). At the Winery site it occurs on soil in crevices of serpentine in oak woodland. It has not previously been recorded north of the Bay Area (Timdal 1987). Confirmed by C. Bratt.

Specimens cited are in the herbarium of the collectors.

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Questions and Answers

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When lecturing to the general public about lichens, I field certain questions which are of common interest to those attending. Three such questions are answered below. The column is meant to serve people who are new to lichens and do not have easy access to lichen literature.

1. Question: How many lichens are endemic to California?
Answer: This question was taken up in the last issue of the Bulletin, but since then I received some additional names from Jeanne Larson and found another in Dibben (1980). The list now stands as follows:

Bryoria spiralifera
Edrudia constipans
Lecanora mellea
Niebla tuberculata
Niebla ramosissima (Channel Islands only)
Niebla dactylifera " " "
Pertusaria lecanina
Ramalina puberulenta
Rhizoplaca marginalis
Rhizoplaca glaucophana
Sulcaria isidiifera
Verrucaria tavaresiae

As before, please send comments, corrections, or additions to me at doell@slip.net or to the Bulletin.

2. Question: Why is it that lichens can grow in the higher reaches of the White Mountains although no non-lichenized fungi are present there, perhaps due to the high light intensities, both visible and UV?
Answer: For one thing, it may be too dry for the fungi, and also there may be too little organic matter there for them to live on. Lichens have it all over the non-lichenized fungi because they can photosynthesize thanks to their captive algae and need only rain or fog, the carbon dioxide in the air, and a little sunshine to get their nourishment. They have adapted to extremely inhospitable climates. In deserts they can use the moisture of early morning dew and the light of the sun at sunrise to photosynthesize. Add to that the fact that they can dry out rapidly and live in a desiccated state for months or years, and you can see why they can live where other organisms cannot. Furthermore, the algae in the lichens are protected from UV radiation by the pigments in the lichen cortex. An example of the ability of lichens to adapt to their environment is seen in the maritime Antarctic where during the summer months lichens increase their levels of usnic acid in the cortex. This appears to serve the need for protection from UV radiation.

3.Question: Why are lichens the color they are?
Answer: The color of a lichen is the result of the pigments in the thallus, but that is not the whole story. The substrate also plays a part. There are some interesting examples: white and orange crustose lichens are often found on

calcareous rocks; grey or yellow-green on siliceous rocks or somewhat acid bark. The crustose lichen *Acarospora smaragdula*, normally brown, turns green when growing on copper rich rocks. Yellow or orange pigmentation usually indicates exposure to high light levels. In *Xanthoria parietina*, parts of the thallus in the sun are more orange than parts in the shade, which are grayish green. While the part in the sun has to have protection from UV radiation, which it gets from the orange pigment, the part of the thallus in the shade needs all the light it can get, and the orange pigment is then restricted to the apothecia.

Presence or absence of moisture can also affect lichen color temporarily. *Lobaria pulmonaria* turns from brownish to a bright green when wet. Species of *Pertusaria* can also look very different in a wet winter when they appear green instead of white.

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Notes and News

CALS Lichen Identification Sessions

You are invited to attend CALS Lichen ID sessions at Sonoma State University, Darwin Hall, Room 207, Rohnert Park every second and fourth Thursday evenings of the month starting January 11, 2001, 7 to 9:30 p.m. Bring your lichen specimens to identify. Call Judy at 707-584-8099 for more information

Japanese Lichen Collection

CALS members Bill and Louise Freedman have donated a lovely book of Japanese Lichens to the Society. A friend of the Freedman's bought this book at an auction thinking the specimens were fungi. Bill told her she was half correct. The book is over 2 inches thick, 7-1/2 inches wide and 11 inches long. The weathered pages are filled with pressed lichen specimens collected in Japan over 80 years ago. We are hoping to identify the specimens and provide a safe storage place for the book, which was on display at our Birthday Celebration at SFSU on January 27, 2001. We want to thank Bill and Louise and their friends for this donation. If you are interested in helping identify the lichens contained in the book, please contact Judy at JKSRR@aol.com.

Want-ads

Are there any lichen books you want? Are there any lichen books you would care to donate to our CALS library? Please contact our librarian Greg Jirak if you have any suggestions. Remember, the CALS lending library is always looking for lichen literature and that you can borrow any available book. Greg's e-mail address is gajirak@mcn.org

IAL Advisory Board

As part of the new Constitution of The International Association for Lichenology (IAL), an Advisory Board is to be elected. This Board will consist of lichenologists from all over the world who will transfer and disseminate information about their societies' activities and will present the opinions of their membership on specific matters. The CALS Board has selected Cherie Bratt to be our IAL Advisory Board Representative. Cherie, a founding member of CALS, is a foremost California lichenologist and an expert on the lichens of the Channel Islands. We are proud to have her represent our society.

Lichens and Bryophytes from Steppe to Coast.

A Report on the ABLS Field Trip Aug 10-14, 2000

I had the opportunity to participate in this American Bryological and Lichenological Society field trip last summer. Of the many lichens seen and collected, I will highlight several that I found particularly impressive.

The day was sunny and warm when twenty-five people gathered at the Portland Convention Center to start a four-day journey across the state of Oregon. Most of the participants had just attended the Botany 2000 convention. Lichenologists and bryologists from around the world were going on this field trip planned and led by Bruce McCune and Roger Rosentreter. The Grayline bus drove into view, and we packed our gear and headed east to the Cascade Range. After a three-hour drive we stopped at Wapanitia Pass, an area typical of middle elevations in the Cascade Range. The lichenologists hiked a segment of the Pacific Crest Trail heading southwest while the bryologists kept to wetter habitat. The trail was lined with *Tsuga heterophylla*, *T. mertensiana*, *Pseudotsuga menziesii*, and several species of *Abies*. A native *Rhododendron* (*R. macrophyllum*) was abundant as well. This was my first encounter with *Pilophorus acicularis* (Ach.) Th. Fr. and *P. clavatus* Th. Fr. The greenish thallus and stalked, black-headed apothecia covered many rocks on the side of the trail. Mosses were dotted with the delicate, light-colored apothecia of the crustose lichen, *Dimerella pineti* (Ach.) Vězda. The dominant lichens were *Hypogymnia* (7 species) and *Platismatia* (4 species).

After almost 4 hours of collecting we regrouped on the bus and drove west to the Columbia Plateau. Wet terrain changed to xeric conditions and outside our windows we saw the landscape change to the series of lava flows that make up the Columbia Plateau. We stopped to admire the Deschutes Gorge, using the opportunity to look at the lichens growing on the cement and rock walls, and then continued to the small town of Madras. After an early dinner we drove to the Deschutes Rimrock site and hiked through an area of a recent wildfire to reach the top of the rimrock where the soil lichens were a highlight. I was delighted to find *Cyphelium tigillare* (Ach.) Ach. on a dead juniper branch. On the far side of the rimrock, displays of colorful *Pleopsidium*, *Caloplaca*, and *Psora* species covered the exposed lava flow. Local wildlife was also present: the second group of hikers who stayed by the Deschutes River spotted a rattlesnake. On Friday morning we headed southwest and stopped at Sahalie Falls in the Cascades. The upper part of the McKenzie River crosses forested lava flows and is home to many of the rare and listed cyanolichens in Oregon, including *Nephroma occultum* Wetmore and *Pseudocyphellaria rainierensis* Imshaug. The area is warmer with much lower snowpack than Wapanitia Pass. *Lobaria oregana* (Tuck.) Müll. Arg. was an impressive sight there. Large thalli are frequent and the lichen has a large biomass in the area. We found *Pseudocyphellaria* and *Nephroma* species growing on the small outer twigs of conifer branches, (in California I usually encounter these lichens on the trunks of trees). There were a number of *Cladina* and *Cladonia* species growing in forest openings created by talus rock. We found three species of *Peltigera*, including the bright green *Peltigera venosa* (L.) Hoffm., and I collected *Icmadophila ericetorum* (L.) Zahlbr. for the first time. The pale green thallus and pink apothecia made quite a mosaic on the decayed log. After a three-hour walk along the McKenzie river, complete with beautiful sights of waterfalls and quiet wooded paths, we gathered on the bus to head for the Oregon Institute of Marine Biology in Coos Bay. We were welcomed with a dinner of freshly caught local salmon. The research center is operated by the University of Oregon and has very comfortable dormitory style housing as well as small cabins housing 2 to 4 people. With 2 labs, a central dining area, and a volley ball dugout, this site was a great home base for the next three days.

On Saturday we drove to Cape Arago, a rocky headland jutting into the Pacific Ocean. The Easterners were looking forward to seeing our western lichens, *Ramalina menzeisii* Taylor and *Vermilacinia (Niebla) cephalota* (Taylor) Spjut & Hale, which were quickly spotted. Many walked the four mile trail north to Sunset Bay State Park. The view of the Oregon coastline was spectacular. A special highlight for me was finding a spruce trunk covered with *Dimerella lutea* (Dickson) Trevisan and a lovely display of the delicate chartreuse *Chaenotheca furfuracea* (L.) Tibell on exposed roots along the trail. On Sunday we drove a short distance north along the coast to the Eel Creek Campground. Roger Rosentreter was a great leader, searching out localities for some of the more unusual lichens. The wooly lichens *Erioderma sorediatum* D.J. Galloway & P.M. Jørg. and *Leioderma sorediatum* D.J. Galloway & P.M. Jørg. were quite well hidden on the native Rhododendrons. The illustrations from Bruce's *Macrolichens of the Pacific Northwest* became real as I saw the lichens with the perforations - *Menegazzia terebrata* (Hoffm.) A. Massal (perforations on the upper surface) and *Cavernularia hultenii* Degel. and *C. lophyrea* (Ach.) Degel. (perforations on the lower surface). *Loxosporopsis corallifera* Brodo, Henssen & Imshaug, which I had seen on our CALS field trip to the Lanphere Dunes in Humboldt Co., California, was quite common on conifer trunks. We searched the trees at the edge of the dunes for *Sulcaria badia* Brodo & D. Hawks., and, with all the *Bryoria* thalli draping the branches, it was

a challenge to find an occasional *Sulcaria*. A half-hour hike over the dunes then brought us to one of the conifer 'islands' within the dune structure.

On the north side of the island Roger found *Anaptychia setifera* Räsänen. This foliose species, rarely found in coastal Oregon, has very narrow lobes and is easily overlooked when mixed with *Bryoria* species. The evenings were spent in the lab identifying specimens, playing volleyball or exploring Coos Bay. Lichens covered the tables in one lab and sacks of bryophytes in the other. A few participants moved between both. Everyone seemed to enjoy working with others as we identified our collections.

This field trip was a very memorable experience for me. Traveling, learning, and exchanging ideas with fellow lichenologists and bryologists from near and far made it a great experience. The lichen flora was spectacular, and the opportunity to explore so many different habitats in the state of Oregon was a golden one. Bruce McCune and Roger Rosentreter planned well to meet the needs and interests of the entire group. I recommend this kind of experience for any lichenologist, beginner or advanced. It has brought a new dimension to my appreciation of lichens and lichenologists. It has expanded my own knowledge and understanding of lichens as well as connecting me to the larger community of those interested in the enjoyment, study and conservation of lichens. The next ABLS meeting is scheduled August 12-16, 2001 in Albuquerque, New Mexico. I plan to attend and hope to see you there.

Judy Robertson

News From Sonoma County

Lichen ID Sessions at Sonoma State University

We are happy to announce that Sonoma State University Professor and CALS member Dr. Chris Kjeldsen has given CALS permission to use the SSU Herbarium and a Stevenson Hall classroom for lichen identification sessions. The Herbarium houses over 2000 lichen specimens, some dating back to 1936. Dr. Kjeldsen and his students have collected from many localities in the North Bay and in other parts of northern California. Chad Frick, CALS member, is curating specimens, updating nomenclature, and completing the collections data base. He is also incorporating a number of specimens from Alaska, Honduras, Costa Rica, Wales, and Finland.

Beginning January, 2001, Darwin Hall, Room 207, will be open every 2nd and 4th Thursday evening from 7 to 9:30 p.m. for keying lichen specimens. The dissecting and compound microscopes will be available for use and the SSU Herbarium will be accessible for comparison and confirmation of specimens. This will be a valuable opportunity to work through keys with others, to have access to keys not readily available, and to enjoy the evening working with others interested in lichens.

I would like to see sessions like this start in other localities in California. Ask to use a classroom at the local junior college or university. Bring your specimens, pool your libraries, borrow the CALS Circulating Reference Collection, and start identifying. You will not only add to your own knowledge, but you may find a new record or range extension. The lichens of California are still so little explored. All of our collections make up the data base for the State. Your collections are important to the mapping process, which will be important for conservation efforts in the future. Come join us at SSU.

Judy Robertson

Donors and Sponsors

We would like to recognize the following members of CALS who subscribed after July 2000 at the Donor or Sponsor level. As an expression of our appreciation, these members will receive a free CALS Lichen Poster.

Linnea Hanson
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CALS dues are payable from December 31 to March 31. Dues categories are

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An addressed envelope with a short form to complete are included with this Bulletin. Thank you for your support.

On Pelagic Lichens and Other Interesting Questions

Dr. Richard Moe's "Alga Wade"

When playfully asked if there were pelagic lichens, Dr. Moe grinned and said "Now - let me think -YES!! I don't know for sure, but I will bet that there are lichens on barnacles on whales!"

He was referring to the lichen *Pyrenocollema halodytes* (Nyl.) R.C. Harris which is marine and calciphilic. It is to be found on barnacles in many places and on limpets, etc., in San Francisco Bay and in the ocean. This was one of the many fine tidbits of information obtained by CALS members Bill Hill, Mikki McGee, and Judy Robertson on the Alga Field Trip sponsored by the California Native Plant Society, on June 3, 2000, at the coast guard station, Crissy Field, San Francisco Presidio. The walk - or rather wade - began about 7 A.M. on that Saturday, and most of the time was spent looking at the wide variety of marine algae found on the cement slabs of the old seaplane ramp, with Dr. Moe answering the many questions from the dozen persons who were present. He began with a discussion of the variability of the sand cover around the Bay from year to year. There is also change in salinity of the upper layer (the fresh water/brackish "lens") with rainfall from season to season and from one area of the bay to another due to mixing by currents. He also addressed the changes made by deliberate filling of marshes and the hydraulic mining of the 49'ers; the introduction, deliberate and otherwise, of "foreign" species, few of which are algal; and other environmental factors. He mentioned that 15,000 years ago the bay did not exist: the Golden Gate was then a gorge for the river which came through Raccoon Straits near Angel Island and went down to the ocean near the Farallon Islands.

Algae were discussed which are in the "Green", "Brown", and particularly the "Red" groups. The life histories of perennial and annual stages of microscopic gametophytes alternating with macroscopic sporophyte stages were mentioned. Some of the algae have an annually renewed gametophyte state, others a persistent one. The sporophyte state is annual in most marine algae but may be persistent in larger ones such as the giant kelp *Macrocystis*. Dr. Moe pointed out the strong difference between marine algae (and, in fact, most algae) which are not long lived, and lichens which are. He discussed the many kinds of symbiosis to be found among the algae, from "substrate utilization" through parasitism. He pointed out that algae do not seem to form symbioses with other algae such as they form with fungi in the case of the lichens.

All in all, there are about 900 species of marine algae in California, and something like 100 or more in the Bay. Dr. Moe passed out a checklist of the algae (and lichens) to be found in the Bay, which we annotated with all the other information he provided on the species found.

Definitely I will go again.

Mikki McGee

CALS Fall Workshops at San Francisco State University, 2000

Usnea, September 23, 2000

Doris Baltzo, a founding member of CALS, has been volunteering at the UC Berkeley Herbarium for many years, working with Dr. Isabelle Tavares ("A Preliminary Key to Usnea in California", Bulletin of the California Lichen Society 4[2]). Doris completed her master's thesis at San Francisco State University with a thorough study of the lichens of Mt. Diablo State Park. Her special interest now is the genus *Usnea*. Doris began the workshop by giving a history of her interest in this genus and talked about the first keys she used to identify her specimens. She outlined the anatomy and gross morphology of *Usnea* and explained some of the terms unique to the genus. We worked with our own *Usnea* specimens as she mentored us through the identification process. CALS workshops are a good place to bring your own specimens for identification, since members like Doris with expertise in their field of interest are typically eager to share their knowledge. Participating were Bill Hill, Doris Baltzo, Janet Doell, Bill Ferguson, Tony Alexander, Judy Robertson, and Chad Frick.

Crustose lichens, October 22, 2000

Seven people participated in this crustose workshop led by Judy Robertson.

Judy used a slide presentation to introduce the three morphological groups of lichens, after which our focus shifted to the crustose species. She divided this group into squamulose lichens, marginally lobate crusts, and chinky or areolate crusts. We learned descriptive morphological

terms, thallus characteristics, and external and internal structure of apothecia.

Judy's husband Ron has made a set of teaching specimens, and each participant was able to work with their own set of lichen crusts for the day. We practiced sectioning technique and then observed the final preparations under the compound microscope. Seeing a variety of spore types, and other apothecial characters gave us a good introduction to this challenging group of lichens. Attending were Janet Doell, Janet Gauthrop, Boyd Poulsen, Phil Gordon, Pete Garcia, Bill Hill, and Judy Robertson.

Ascus Staining Workshop, San Francisco State University, November 4, 2000

This was a very productive day. Cherie Bratt joined us from Santa Barbara and brought her microscope and camera set-up so that we could see the final stained slides on the viewer. We found that staining the ascus tip can be a frustrating but rewarding experience. Using the crustose teaching kit made by Ron Robertson, we looked for the picture book examples. Some specimens produced better results than others. The *Candelariella* and especially the *Lecidella* sections were quite clear and recognizable. For some of the other genera it took some imagining to see the characteristic ascus apex. Iodine concentration seems to be critical as well as having sections that are thin. The microscopes at SFSU were a pleasure to work with. By the end of the day we had all learned a great deal. Attending were Bill Hill, Mikki McGee, Cherie Bratt, Cheryl Beyer, Janet Doell, and Judy Robertson.

CALS would like to thank Dr. Dennis Desjardins at San Francisco State for providing the space and equipment for us to hold these workshops. Since Hensill Hall will be undergoing remodeling in 2001, Dr. Chris Kjeldsen of Sonoma State University has offered the use of the SSU Herbarium and a classroom for our fall workshops. We will explore the possibilities of alternating this Sonoma County location with a South Bay location.

California Lichen Society Spring Events, 2001

All lectures will be held at the UC Berkeley Herbarium, 1001 Life Sciences Building and are free and open to the public. Refreshments will be served. Please contact Judy Robertson, (707)584-8099 or JKSRR@aol.com if you have questions.

The Secret Lives of Mushrooms

Wednesday, February 21, 7:00 p.m.
Mike Boom, past president of the San Francisco Mycological Society will teach about mushroom mycelia and their roles in the environment. Discover the basic structures of mushrooms and take a tour of the most common California species.

Mosses and Lichens of Stebbins Cold Canyon Reserve, Solano County

Saturday February 24, 2001, 9 a.m. to 3 p.m.
Sponsored by the Davis Botanical Society and CALS. Join Cheryl Beyer and Judy Robertson to explore the mosses and lichens of this UC Reserve. For those who live near Davis, plan to carpool at 9 a.m. in front of the Arboretum Headquarters on La Rue Rd. Bring lunch, beverage, a hand lens, if you have one, and clothes appropriate to the weather. Sign up for the carpooling by contacting Jean Shephard at the Davis Herbarium, 530-752-1091. Please leave a phone number where you can be reached to arrange the carpools.

Tour the California Academy of Sciences Herbarium including the Lichen Herbarium

Thursday, March 1, 2001, 3-4:30 p.m.
California Academy of Sciences, Golden Gate Park, San Francisco. Mona Bourell, CAS Senior Curatorial Assistant, will lead this tour through the CAS Herbarium. The lichen collection houses much of the material collected and/or accumulated by the early 19th century California collector, A.W.C.T. Herre. These are part of the old Dudley Herbarium collections, formerly at Stanford University, Palo Alto. In addition, there is a good representation of material collected in the Sierra Nevada recently and identified by Bruce Ryan of the Sonoran Desert Project. Volunteer Mikki McGee has worked with Mona to organize and update the collections. The first step has been the upgrading to current nomenclature of the 19th Century and early 20th Century packets. The filing system has been organized to follow the 7th Checklist where possible. The next step will be a review of the identities of these specimens. We will have the opportunity to see these historical Herre collections and enjoy an afternoon with lichenologists and botanists. After the tour there will be refreshments in the conference room. Contact Mikki McGee at mikkimc@juno.com or (415)467-5285 for more information.

Different Oaks Like Different Folks: a comparison of lichens on deciduous and non-deciduous oaks

Tuesday, March 20, 7:00 p.m.
It is obvious that deciduous oaks have more lichen cover than evergreen oaks, but do they have the same or different lichens? That is the question that spurred this research project by Daniel Lahr, student at Santa Ynez Valley High School, who entered a science fair with it. To find out what happened, join Cherie Bratt as she presents the saga of Daniel and his lichens.

Northwest Scientific Association Annual Meeting

March 21 (Wednesday) through March 24(Saturday)
Humboldt State University, Arcata, CA.

CALS and the Northwest Lichen Guild will be major participants, assuring a strong emphasis on lichens! Highlights will include a workshop on the genus *Usnea* presented by north-coast specialists Rudolf Becking, Doug Glavich, Bruce McCune, and Darrell Wright and a field trip to the Lanphere-Christensen Dunes Preserve, including areas usually off-limits to the public. The University's lab facilities will be turned over to the lichenologists during the meetings. All the necessary chemicals, microscopes, UV box, and TLC equipment will be available for lichen identification.

Every year the Northwest Lichen Guild awards the Goward Prize to the best student or amateur paper delivered orally at the annual meeting. In 2001 this will include members of CALS. An amateur is defined as someone for whom lichen research and/or teaching are not central parts of the way they make their living. The award is primarily prestige and glory, but it comes with a small material item (in the past either a hand lens or an out-of-print lichen book). Talks are judged by a secret panel

appointed by the meeting organizers. If you want to be considered for the prize, let an organizer know.

This is a valuable opportunity to meet with lichen scientists, students and educators, to learn and to exchange information. Arcata is a charming and hospitable town with plenty of lodging and good restaurants. Organizers and persons to contact for more information are:

Steve Sillett, scs6@humboldt.edu
Lori Hubbart, LoriH@mcn.org
Darrell Wright, dwright3@jps.net, 707-825-0779

The informational web site is at http://www.humboldt.ed u/~scs6.

Lichens Close-up: Some How-Tos and Whys of Lichen Photography

Wednesday, April 25, 7:00 p.m.
Richard Doell, photographer for CALS mini-guide and multi-media slide shows, speaks on why some lichen pics "work" and others don't, and what you need and need to do to get more of yours into the first group.

Lichens of the Daley Ranch, San Diego Co.

April 27-29, 2001
The Daley Ranch is a 3,058 acre conservation area in the hills of northeastern Escondido. The area, once frequented by native Californians of the Kurmeyaay and other local tribes, contains a number of natural vegetation communities including lush oak woodlands, coastal sage scrub, chaparral, grasslands, and riparian areas. The area is used for hiking, mountain biking, and horseback riding. CALS member Cherie Bratt has started a lichen inventory for this area, and we will continue the study. This will be a great opportunity to explore the lichen flora in this Southern California area. Lake Dixon is close-by for those who want to camp, but reservations need to be made early. Motel accommodations are available in Escondido.

Speaker

Wednesday, May 16, 7:00 p.m. - To be announced.

Lichens of Calaveras State Park, Calaveras County

June 22-24, 2001
Join with CALS to explore the lichen flora of Calaveras State Park, the home of the Big Trees (*Sequoiadendron giganteum*). The park is north of Yosemite National Park. Habitats range from foothill woodlands to montane forest. We will be camping in mid-elevation, mixed conifer habitat. Patti Raggio, a member of CALS and forest ranger at the Park is working with CALS member Boyd Poulsen to refine a lichen inventory compiled in the 1970's by Joseph Pinelli. We will have the opportunity to learn what they have identified and to add to the list. A highlight will be *Hydrothyria venosa* J.L. Russell, which Patti has found in the park. A group campsite is reserved for us and we can use park facilities for a Saturday evening pot-luck and ID session. The 2 towns of Arnold and Murphy's are close by on Highway 4 for those who prefer motel accommodations.

Botanical Society of America Annual Meeting

August 12-16, 2001
Albuquerque Convention Center, Albuquerque, NM
The Botanical Society of America (BSA) will hold its annual meeting in Albuquerque, New Mexico. The theme for the 2001 meeting is "Plants and People". In addition to the BSA, other societies participating in Botany 2001 will include the: American Bryological and Lichenological Society (ABLS), American Fern Society (AFS), American Society of Plant Taxonomists (ASPT), and the International Organization of Plant Biosystematists (IOPB). A meeting circular with detailed information about registration, housing, social events, field trips, workshops, tours, and all costs will be available online at the Botany 2001 website: http://www.botany2001.org. The deadline for submitting papers, posters, symposium presentations, and special lectures is March 9, 2001. Refer to the website for information and an application.

Lichens of James San Jacinto Mountain Reserve, Riverside County

October 5-7, 2001
We have rescheduled our trip to Mt. San Jacinto Reserve. Mark your calendars for October 5-7. Look for more information in the Summer Bulletin.

If you are interested in participating in any of the above field trips, please contact Judy at JKSRR@aol.com or 707-584-8099.

We would also like to let you know about this event which you might like to attend:

Jepson Bryophyte 2001 Course

March 17-18, 2001
UC Berkeley. The instructor will be Dr. Brent Mishler. Cost is $160-170. Sponsored by Friends of the Jepson Herbarium. Contact Staci Markos (510) 643-7008 or smarkos@socrates.berkeley.edu

In Memoriam

Early members of CALS were saddened to hear of the death of Herb Saylor in May of this year at the age of 54. Although no longer a member of the Society at this time, he had been active in past years and had hosted one of our field trips at his parents' cabin at Kyburz in the Sierras. Herb was a perpetual student and studied under Dr. Harry Thiers at San Francisco State University for many years. Although his main interest was in fleshy fungi, he took Harry's lichen course there as well, and was an enthusiastic participant in the CALS field trips he attended. Herb was a large man both in stature and heart. It was a loss to all of us that his enormous enthusiasm for learning and doing was plagued by health problems and eventually cut short at such an early age.

Janet Doell

Dr. Harry Thiers - a lichenological inspiration

It was with deep sadness that I learned about the death of Dr. Harry Thiers in his sleep after a day of collecting mushrooms. He meant much to me, and to many others. In February I had received a letter from him in response to my question: "How did you get interested in lichens?" Excerpts follow:

"I want to emphasize very strongly at the onset that my interest in these wonderful dual organisms was initiated and tenderly nurtured by Ellen (his wife). It all began while we were students at the Biological Station at the University of Michigan. My time at the station was always pretty well taken up with work on the abundant mushrooms that grew in the area. Ellen, on the other hand didn't have such restrictions and, fortunately for me she enrolled in a lichen class that was taught by Dr. Margaret Fulford, who was not only a wonderful teacher but also a very nice, thoughtful person. Ellen developed a strong interest in lichens, and after our return to Texas, where I taught at Texas A & M, Ellen would frequently take me on lichen outings in the vicinity. What a great experience! She was very thorough in teaching me and it wasn't too long before I was hooked on lichens. We spent several years at Texas A. & M., and my interest in the lichens was very carefully nurtured.

Dr. Harry D. Thiers, distinguished mycologist at San Francisco State University, strong promoter of lichen studies, and founding member of the California Lichen Society, died August 8, 2000. The following are a remembrance and tribute by two of his former graduate students and one of their spouses.

"Upon our move to California we were quite impressed with the abundance and variety of lichens in the area. Even though I continued working on mushrooms, we found time to work on the lichens as well. Unfortunately there weren't many, if any, in the vicinity, so we had to struggle. However, one summer Ellen and I were in Europe attending some meetings and while there made acquaintance with some lichenologists. I was quite impressed with their knowledge and in a weak moment invited some to come visit us in California. I guess I didn't think any of them would, but I was wrong.

"It wasn't too long until we began to have house guests from Europe, some of which were lichenologists. We were visited by two or three lichen people. They were exceedingly helpful, and my knowledge expanded.. One of them was from Norway. He was quite impressed with our lichen flora and showed his enthusiasm by going through the woods shouting "MY BELOVED LICHENS." During this time I began to meet lichenologists from the U.S. They were all very encouraging and gave us help.

"It wasn't too long before I, with Ellen's help, began to establish a lichen collection at SFSU. Ellen donated her collection she made in Michigan, and I began to add California material. It wasn't too long before graduate students wanted to do studies on the lichens. I remember Bill Jordan, Janet Doell, and several others including Doris Baltzo. My students presented the greatest stimulation to my maintenance of an interest. Thank goodness for them. I would never have survived without their stimulation.

"Unfortunately here where we live in Illinois I have seen only two common examples. One of them is a very small foliose lichen that looks like a small Physcia. It grows on the bark of oaks and other hardwoods. The other lichen is a very small, sad looking Cladonia. I am happy to relate, however, that in the southern part of the state there is a pretty good flora."

In 1959 Dr. Harry D. Thiers started teaching at San Francisco State University (then known as a college). Thirty years later, in 1989, he retired, but not before he had inspired, encouraged, and helped a very large number of students. In 1994 he gave a seminar to the newly formed California Lichen Society on the lichen algae. The society had just been formed in January of that year, and Dr. Thiers and his wife, Ellen, were two of the nine charter members.

In the 1960's I was looking for a subject for my master's thesis. Most of Dr. Thiers's teaching involved non-lichenized fungi. But a smaller percentage had to do with lichens - a subject with a small amount of information above the surface (twelve pages at the end of Cryptogamic Botany - Algae and Fungi, 1955, by Gilbert M. Smith) and a huge amount of seemingly unorganized information under the surface. Thus, the brief textbook accounts were the tip of the iceberg. Ah, the wonders of that submerged portion of the iceberg!

Dr. Thiers's graduate course in Lichenology was not given frequently, about once in two or three years, so I considered myself lucky (another tip of the iceberg). In

looking back over my notes I realize how very applicable they are today and how well and clearly organized, due to Dr. Thiers' clear presentation. At the time we were using Hale and Culberson's Third Checklist of U.S. Lichens. There were several interesting field trips to Calaveras Big Trees, Alpine Lake, San Francisco Watershed, Land's End, Sonoma County, Jackson State Park in Mendocino County, and more. One of the field trips to Napa County was memorable. Several of us were loaded into the back of an S.F. State College station wagon with four wheel drive, going up a narrow, rutted dirt road with a sheer drop on one side. I was very quiet, but others were nervously noting the mud, the ruts, the danger of the road. Dr. Thiers commented that "Doris isn't afraid. She hasn't said a word."

My memories of Dr. Thiers are of a bright, smiling, cheerful, enthusiastic person with plenty of energy. I was so busy listening, learning, and studying that there was not time to observe much else. To me Dr. Thiers was a very special teacher and a warm person. The field trips we went on to collect and identify lichens and mushrooms for the courses took us to many collecting sites. Dr. Thiers knew the names of everything we saw - mushrooms and lichens as well as trees and other plants. Yes, he knew and used OUR names also. I felt more important because I was acknowledged by my name. I also had my own desk in the herbarium and felt like part of the family. I had started at S.F. State in 1963, after getting my bachelor's degree in botany at UC, Berkeley. Then I was able to take 6 or 8 units at a time while working part time and raising my family who were in high school and getting ready to go to college themselves.

I have enjoyed his family as well. Ellen, his wife, and his daughter, Barbara, were both closely involved with his classes, students, and work.

A whole issue of Mycotaxon (v. 34[1], 1989) was devoted to a festschrift in honor of Dr. Thiers. In it are twenty- one vignettes telling of him, his classes, and his teaching. All his students regarded him highly. Three of the 23 festschrift articles dealt with the lichens. Of the 13 species named for Dr. Thiers, one was a lichen: *Cladonia thiersii* Hammer. Of the 35 master's degrees of Dr. Thiers's students, 7 had to do with lichens: 1963, Sherry L. Volk, Crustose lichen flora of Marin County, California; 1968, William Paul Jordan, Corticolous and lignicolous lichens of the San Francisco Watershed; 1970, Doris E. Baltzo, A study of the lichens of Mount Diablo State Park, California; 1975, Lorene Livingstone Sigal, Lichens and mosses of California serpentine; 1980, David Walter Smith, A taxonomic survey of the macrolichens of Sequoia and Kings Canyon National Park; 1982, Janet Kemp Hoare, An evaluation of lichenometric methods in dating prehistoric earthquakes in the Tobin Range, Nevada; 1988, Samuel Hammer, A taxonomic survey of the lichen genus *Cladonia* in California. Other students of whom I am aware were Barbara Lachelt and Michelle Seidl.

Suffice it to say that the above lists are also the tip of the iceberg, not only when it comes to lichens, but also when it comes to future inspiration on lichens by past, present and future students, due to Dr. Harry D. Thiers's influence.

Doris E. Baltzo

I attended San Francisco State University as a re-entry student in the late seventies. He introduced me to lichens in a General Botany class and his enthusiasm for cryptogams, even at eight o'clock in the morning, was contagious. It was a privilege to become part of the "Herbarium Gang", and studying under Harry was a unique experience. He demanded your best effort but gave no less himself.

Whether in the herbarium, in class, or on one of his wonderful field trips, Harry was an exciting teacher whose warmth and enthusiasm were limitless, and whose knowledge was phenomenal.

CALS was very fortunate to have Harry as a founding member, giving the society credence among peers, and helping with early decisions where his wisdom and experience were invaluable.

Janet Doell

I would like also to acknowledge Dr. Thiers' generosity, warmth, and gracious tact in accepting me, a completely non-botanical type, into the "Herbarium Circle"—if not "Gang"—and his patiently instilling in me a rudimentary knowledge of lichens. I continue to treasure having been able to attend his last lichen course at SFSU, his acceptance of me, and our resulting friendship.

Richard Doell

President's Message

As this first year of the new millennium comes to a close, I would like to look back in review, and to thank all those who have made this past year so successful.

Thank you to our Board of Directors: To Vice President, Bill Hill, whose faithfulness to every CALS event and persistence in recording each one is making a significant contribution of video tapes to our lending library, and whose computer expertise will eventually put lichen images from our workshops and field trips on the Web; To Secretary, Deb Gillespie, new to CALS, who writes up our minutes, and, as Poster committee co-chairperson, is exploring new customers for our Lichen Poster; To Treasurer, Greg Jirak, who continues to organize our finances and who has spearheaded the new Education/Outreach committee. Greg and his wife, Lori, also an active CALS member, are deeply involved in our conservation efforts. Thank you to Janet and Richard Doell for their very successful production of the first CALS Mini Guide. The Doells are consistently "behind the scenes" on so many CALS projects. Their advice and support has been invaluable.

I want to thank the many people who have led our workshops and field trips this year. Thanks to Ron Robertson for scouting out the Stebbins Cold Canyon Reserve site and creatively sharing his discoveries. Thanks to Barbara Lachelt for her preparation and time leading the Mt. Tamalpais field trip in April. In addition, Barbara has planned many of the CALS Lichen exhibits at the SFMS Fungus Fairs. Her 'Lichen- scrapbook' slide presentation at our January 'CALS Birthday Celebration' started off the year. Thanks to Dick Moe who stood in cold, salt water for what seemed like hours as he showed us many kinds of algae occurring in our San Francisco Bay waters . Mikki McGee has combined her expertise in microscopy with her knowledge of fungi, algae and lichens to lead workshops and field trips. Doris Baltzo has donated her time compiling the Watershed lists. She is our *Usnea* expert and led an excellent *Usnea* workshop. Special thanks to Cherie Bratt for traveling north from Santa Barbara to lead our ascus-staining workshop in November. Thanks to Kerry Heise, Botanist at UC Hopland Station for hosting our Hopland field trip in October, and again to Ron Robertson for his 'Interesting Lichens' slide presentation. Thanks to Stephen Buckhout and Stella Yang for their help with field trip organization this year.

We had a very successful first Spring Speaker Series. Thank you to David Magney who worked with select members of CALS to prepare the Preliminary List of Rare California Lichens. The inclusion of the List in our Bulletin has accomplished exactly what David and the Society intended: it has provided a catalyst for dialogue among commercial interests, Forest and Park Service, the Department of Fish and Wildlife, organizations such as CALS, CNPS, Timberwatch, and others. David, as co- chair with Cherie Bratt of the Conservation Committee, continues to work with a host of conservation issues. Thank you to Mona Bourell who has shared with us her knowledge of bryophytes at the March meeting. Thank you to Dr. Dick Moe for leading us into the realm of Algae In and Out of Lichens in April.

I want to again thank Dick Moe, who has maintained our CALS website. Have you clicked on it yet? There are many
links to other lichen sites. Early issues of the Bulletin are available on-line and our CALS Calendar of events is posted with a variety of other information and announcements. You can even see a photo of the early 20th Century California lichen collector, Albert Herre (1927).

I wish more of you could have heard Dr. Nina Jablonski speak on the *Usnea*-eating Snub-Nosed Monkey. Her talk was fascinating, her preparation impressive, and her enthusiasm inspiring. Please remember, you can see and hear these lectures (and most of our CALS events) by borrowing the video tapes from the lending library.

Thank you to our Bulletin Editor, Darrell Wright, our Production Editor, Richard Doell, and our team of reviewers. The CALS Bulletin is praised by members and non-members near and far. Darrell's keys to the 'Lichens in California series', featured in our Bulletin, will be a valuable resource to layman and professional alike. Thank you to all who contributed articles to our Bulletin. We have

such diversity of lichens in California, and our Bulletin is making this richness known to people around the world.

I want to thank my husband Ron who has taught me to look for something different and to expect something new, at each lichen site. This effort is adding significant information to the inventory of California's lichens. Thank you to my daughters, Lisa and Kelly, for being so patient and understanding as I make my 'excuses' that I have 'lichen work' to do. If I have left out anyone who has been involved in these events or plans, please know you are valued and appreciated.

I want to thank each of you, the faithful members of CALS. If you participated in any of the events of this year, thank you. Remember, just your membership is a force in our efforts to inform and educate so as to conserve the lichens of California.

I am looking forward to a new year, our new Spring Speaker Series, our joint meeting in March with the Northwest Lichen Guild, the upcoming field trips, our lichen ID sessions at Sonoma State University, the production of a new Mini-guide, and new items for our Bulletin. I hope to see our Rare and Endangered Lichen list become finalized and official.

We have a great heritage in the flora of our State. As 2000 ends and 2001 begins, let's renew our commitment to the mission of our Society: to continue to work together to assure that the lichens which have sparked our interest and give us such enjoyment are preserved for our children and for our children's children.

Judy Robertson

(Notes)

The Bulletin of the California Lichen Society

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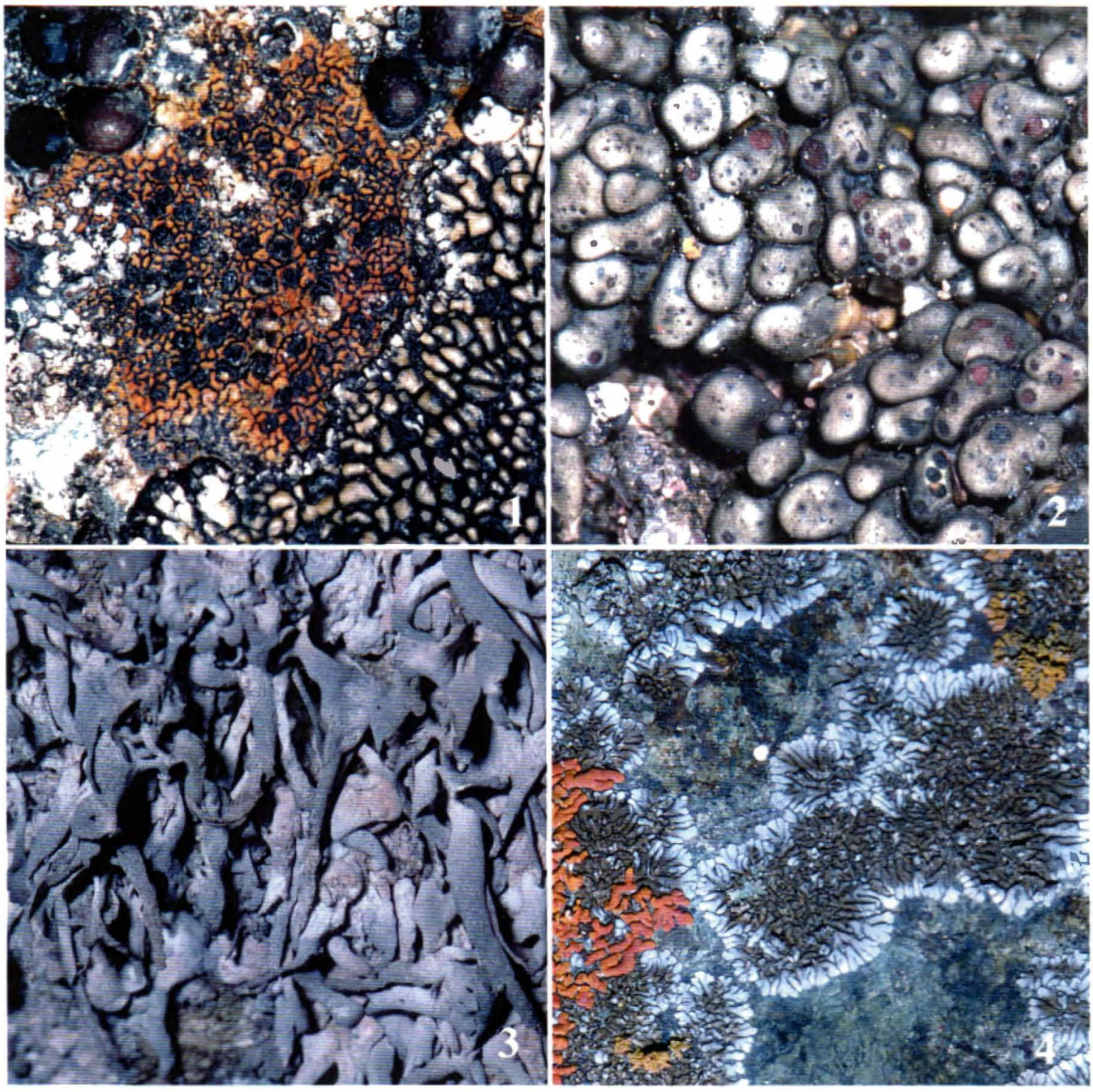
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