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Volume 7 No. 1 Summer 2000

The California Lichen Society seeks to promote the appreciation, conservation, and study of the lichens. The interests of the Society include the entire western part of the continent, although the focus is on California. Dues caregories (in $ U.S. per year) are: Student/fixed income - $10, Regular - $18 ($20 for foreign subscribers), Family - $25, Sponsor/Libraries - $35, Donor - $50, Benefactor - $100, and Life Membership - $500 (one time) payable to the California Lichen Society, 362 Scenic Ave., Santa Rosa, CA 95407. Members receive the *Bulletin* and notices of meetings, field trips, lectures, and workshops.

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 Richard Doell. The *Bulletin* welcomes manuscripts on technical topics in lichenology relating to Western North America and on the conservation of the lichens, as well as news of lichenologists and their activities. Manuscripts may be submitted to Darrell Wright, Bulletin of the California Lichen Society, 4517 Valley West Blvd. #C, Arcata, CA 95521. The best way to submit manuscripts apart from short articles and announcements is by e-mail or on diskette in WordPerfect or Microsoft Word formats: ASCII format is a very good alternative. Manuscripts should be double-spaced. Figures are the usual line drawings and sharp black and white glossy photographs, unmounted, and must be sent by surface mail. A review process is followed. Nomenclature follows Esslinger and Egan's Sixth Checklist (The Bryologist 98: 467-549, 1995), and subsequent on-line updates: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm. The editor 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 the URL: http://ucjeps.herb.berkeley.edu/rlmoe/cals.html.

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Front Cover: *Sticta limbata* (Sm.) Ach. (x5.5) on wood at Sweeney Ridge, San Mateo County, California. Photography by Richard Doell.

Bulletin of the California Lichen Society

Volume 7 No. 1 Summer 2000

A Key for the Lichen Genus *Physconia* in California, with Descriptions for Three New Species Occurring within the State

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During the course of a study of the lichen genus *Physconia* in North America, and as part of the Sonoran Desert Lichen Flora project, I have had the opportunity to study a large number of specimens from California and the surrounding areas. Among these specimens, a number of new distribution records and three previously undescribed species were found. Ten species of *Physconia* were found to occur in the state, and a key is provided below for their identification.

The secondary products mentioned in the key and descriptions have been identified using thin-layer chromatography, following essentially the standardized methods described by Culberson and Kristinsson (1970) and Culberson (1972), or modifications thereof. In the specimen citations, standard herbarium abbreviations from the *Index Herbariorum* (Holmgren et al. 1990) have been used, except for the notation TLE, which indicates the author's private herbarium.

THE SPECIES OF *PHYSCONIA* OCCURRING IN CALIFORNIA

1a. Thallus with either isidia or soredia (or isidioid soredia); apothecia present or absent **4**
1b. Thallus without soredia or isidia, although sometimes becoming lobulate; often with apothecia **2**

2a. Lower surface mostly white to pale tan, scattered areas in older parts darkening slightly to pale brown-tan; becoming regularly lobulate inward from periphery, the lobules up to 0.5 mm broad, prostrate to somewhat ascending; apparently endemic in California and Baja California; primarily corticolous .... ***Physconia californica*** Essl.
2b. Lower surface darkening to dark brown or black, at least in oldest parts, but usually over much of the lower surface; apothecia often common **3**

3a. Thallus usually growing on the ground, over mosses, *Selaginella*, and detritus (rarely on mosses etc. over rock), usually divided into irregular lobes and lobules which tend to be concave and ascending, sometimes strongly so and then turf-forming; common in California ..... ***Physconia muscigena*** (Ach.) Poelt
3b. Thallus usually growing on bark (occasionally on rock), usually more or less regular and rosette-forming, the lobes usually prostrate and flat; irregular prostrate lobules sometimes developing; common in California ..... ***Physconia americana*** Essl.

4a. Soralia mostly terminal on the ends of the main lobes and/or short lateral lobes (not always conspicuously terminal in short-lobed specimens), soralia labriform; soralia and medulla K-, KC-; lower surface usually very pale or white near the lobe ends, and lacking a cortex, the medullary hyphae therefore visible, some of these usually darkening to form very fine brown/black striations a short distance from the lobe ends; a dark but dull lower cortex gradually is organized inward from the periphery; common in California; on bark or rock, sometimes over mosses .... ***Physconia perisidiosa*** (Erichsen) Moberg
4b. Soralia marginal and/or laminal; lower surface dark brown to black centrally, the peripheral lobes often lighter (white to pale brown), but a well-developed cortex occurs on the lower surface essentially right up to the lobe ends **5**

5a. Thalli often large, the lobes 1.5-4 mm broad, concave and ascending on the ends; soralia irregular on both the upper surface and margins, the soredia granular and becoming isidioid; usually on mosses over rock or soil, occasionally on bark; uncommon in

California ..... Physconia isidiomuscigena Essl.

5b. Thalli small to moderately sized, the lobes mostly 2 mm broad or less, flat to weakly concave or convex, not ascending on the ends; soralia primarily marginal on lobes, of various shapes, laminal soralia forming only in oldest parts **6**

6a. Medulla **and** soralia K-, KC-, soralia marginal and linear; medulla white or off-white; upper cortex paraplectenchymatous; common in California; on bark, wood or rock .... ***Physconia isidiigera*** (Zahlbr. *in* Herre) Essl.

6b. Medulla **and/or** soralia K+ pale yellow to dark yellow and KC+ yellow to orange (containing secalonic acid A); medulla white to pale or medium yellow **7**

7a. Medulla white to more commonly pale to medium yellow, K+ yellow and KC+ yellow to orange (both reactions can be very pale in specimens with a white medulla, and are correspondingly darker in more yellow medullas); soralia marginal and linear to weakly reflexed, usually K+ and KC+ (sometimes weak or obscured by dark pigments) like the medulla; upper cortex paraplectenchymatous; common in California; on bark, wood or rock .... ***Physconia enteroxantha*** (Nyl.) Poelt

7b. Medulla white (rarely discolored in infected or necrotic parts or in old, poorly curated specimens), K- and KC- (or very rarely KC+ rose) (take care to not test the medulla too near the lobe edges, where unseen, incipient soralia may have begun to form, causing false positives); soralia K+ yellow and KC+ yellow to orange (to avoid possible masking by dark soredial pigments, test younger or slightly abraded soralia) **8**

8a. Soralia marginal and often terminal, occurring in a pocket formed by the reflexed cortices, the marginal soralia often in or near lobe axils and becoming distinctly hooded by the upper cortex (reminiscent of soralia of *Xanthoria fallax*), the terminal soralia appearing more or less labriform; upper cortex paraplectenchymatous; locally common in California, perhaps not rare but overlooked; on bark or occasionally rock ..... ***Physconia fallax*** Essl.

8b. Soralia marginal, becoming crisped and reflexed to form more or less labriform, apparently separate marginal soralia; upper cortex scleroplectenchymatous **9**

9a. Medulla C-, KC-; apparently rare in California; on bark or rock ... ***Physconia leucoleiptes*** (Tuck.) Essl.

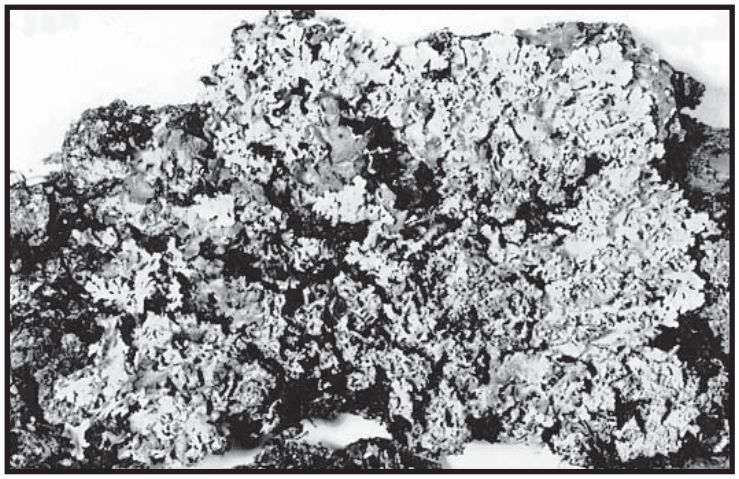
9b. Medulla C+ rose, KC+ rose to reddish (sometimes a faint reaction and/or occurring only in the lower part of the medulla); apparently very rare, perhaps questionable for California (and only a chemotype of the previous species); on bark or rock .... ***Physconia kurokawae*** Kashiw.

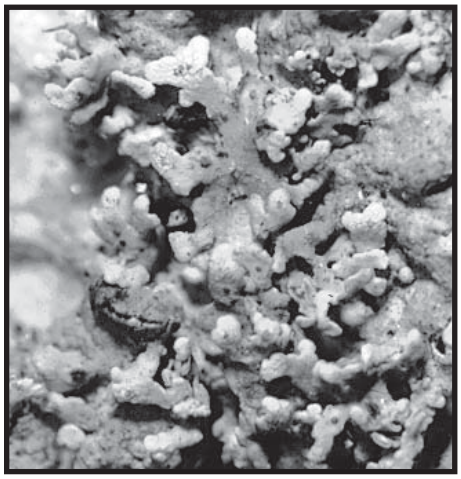
Note: The terms used in the key and the descriptions to describe the organization of the mature cortical tissues (at least 1-2 mm from the lobe end) are essentially as used by Moberg (1977), based on the slightly different terminology of Poelt (1966). *Paraplectenchymatous*: composed of a pseudoparenchyma, the cells more or less isodiametric to somewhat angular; *Prosoplectenchymatous*: composed of elongate, conglutinated hyphae which are mostly parallel to the thallus surface; *Scleroplectenchymatous*: composed of elongate, conglutinated hyphae which are not parallel to each other or the thallus surface.

Physconia californica Essl., sp. nov. Figures 1 & 2. Type: **U.S.A. California. Tulare Co.**: Sequoia Natl. Park; around CCC camp at Yucca Creek on North Fork of Kaweah River; S slope above camp with oaks and some rocks near stream, Sec. 12, T16S, R28E, 580 m, 7 May 1984, *Wetmore 50497* (MIN, holotype).

Thallus foliaceus, usque ad 7 cm diametro, superne griseus vel griseo-fuscus et plus minusve pruinosus, lobulatus; subtus albus vel pallido-fulvus, rhizinatus; rhizinis squarroso-ramosis et nigrescentibus.

Thallus gray to gray-brown, pruinose at least on the lobe ends, up to 7 cm in diameter, more or less regular and orbicular. Lobes rather elongate and discrete to more irregular-flabellate and contiguous, 1-2 mm broad, mostly flat and prostrate. Without soredia or isidia, but becoming regularly lobulate inward from the periphery, the lobules marginal, up to 0.5 mm broad, prostrate to more or less ascending. Medulla white. Lower surface mostly pale, white to very pale tan at periphery and on much of the lower surface, scattered areas in older parts becoming tawny to pale brownish, dull to faintly shiny; rhizines pale or blackening in older parts, simple to furcate in younger parts but with a few to many becoming squarrosely branched. Thallus 130-180 µm thick; upper cortex paraplectenchymatous, 20-30 µm thick; lower cortex irregularly prosoplectenchymatous, ca. 15 µm thick but somewhat indistinctly delimited from the medulla in parts. Apothecia frequent at times but sometimes missing from even large thalli, up to 2.5 mm in diameter, the margin becoming lobulate; ascospores 28-33 x 14-16 µm, *Physconia*-type. Pycnidia occasional; conidia 4-5 x 1 µm, short





Figures 1 & 2: *Physconia californica*, part of holotype specimen, *Wetmore 50497* (MIN). Fig. 1 (left): Habit (x1.4). Fig. 2 (right): Closeup of lobulate central thallus (x11.6).

cylindrical.

Chemistry: no substances detected. Spot tests: all tests negative.

Well developed specimens of *Ph. californica* are very similar in general appearance to two lobulate species which occur in Asia, *Ph. hokkaidensis* Kashiw. and *Ph. lobulifera* Kashiw., both of which have a distinctly black lower surface and a scleroplectenchymatous upper cortex. Many species of *Physconia* at times become irregularly lobulate, even the various sorediate/isidiate species. However, even if the soredia or isidia of such specimens were overlooked, these species are unlikely to be confused with *Ph. californica*, since most of them have a black lower surface. Among other sympatric species, the normally fertile species *Ph. americana* is sometimes rather densely lobulate (including the apothecial rim), although the lobules are less regular, often intergrading in size and form with full-sized thallus lobes, and the lower surface of *Ph. americana* is dark brown or black, at least centrally. Although the typical forms of *Ph. californica* and *Ph. americana* are very distinct, occasional specimens, especially poorly developed or badly treated ones, may be difficult to distinguish. The following tabular comparison will perhaps aid with such difficult specimens:

Physconia americana	*Physconia californica*
-Not or irregularly lobulate, nearly always fertile	-Becoming regularly lobulate, apothecia infrequent or absent
-Lower surface becoming dark brown to black at least in central parts	-Lower surface pale, tan to very pale brownish or tawny in scattered areas
-Rhizines usually moderate in number to abundant in number, mostly black and squarrose, at times forming a velvety blanket under the lobes	-Rhizines often rather sparse, many sparsely branched or furcate although some squarrose ones also present, remaining pale or darkening somewhat.

A rare species in eastern North America, *Physconia subpallida* Essl. (Esslinger 1994), is superficially similar to *Ph. californica* but is mostly fertile with incidental development of secondary lobules, and also differs by having a scleroplectenchymatous upper cortex.

Additional Specimens Examined (Paratypes): **U. S. A. California. Monterey Co.**: Hastings Ecological Preserve, 550 m, *Ryan 27038* (ASU). **San Diego Co.**: Guatay, 1200 m, *Nash 4933* (ASU). **San Luis Obispo Co.**: 16 km E of San Simeon along Rte. 46, 30 m, *Nash 8142b* (ASU). **Riverside Co.**: Cleveland Natl. Forest, Ortega Hwy., N of

Temecula, El Cariso Picnic Area, 850 m, *Ryan 26080b, 26080c* (ASU). **Santa Barbara Co.**: Refugio Pass in the Santa Ynez Mts., 8 km north of Capitan, 700 m, *Ross 26, 34, 39* (ASU). **Tulare Co.**: Sequoia Natl. Park, near Buckeye Flat Campground along Paradise River; 1000 m, *Wetmore 50340* (MIN). **Mexico. Baja California: Isla Cedros**, track from town of Cedros, E side of the ridge below Cerro Redondo; 28°08'N, 115°16'30"W, 1000 m, *Nash 34492* (ASU).

Physconia fallax Essl., sp. nov. Figures 3 & 4
Type: **U. S. A. California. Ventura Co.**: Ozena Campground, Lockwood Valley Road, Los Padres National Forest, *Bratt 11189* (DUKE, holotype; GZU, SBBG, TLE, isotypes).

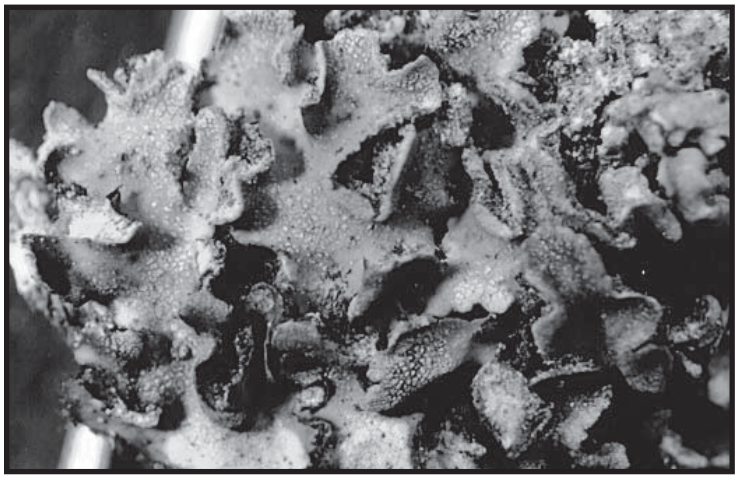
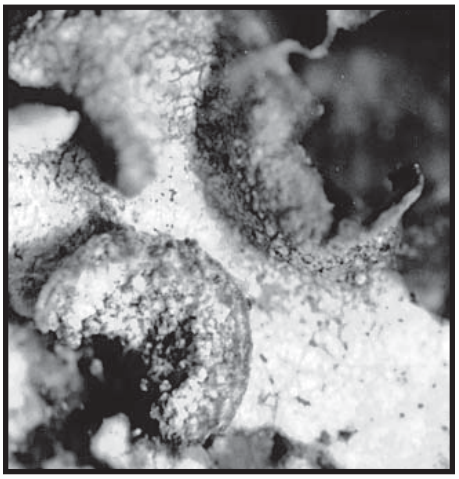
Thallus foliaceus, usque ad 4 cm diametro, superne griseus vel griseo-fuscus et plus minusve pruinosus, sorediatus; soraliis pro parte marginalibus vel axillaribus, elongatis et cucullatis; subtus fuliginosus vel nigrescens, rhizinatus; rhizinis squarroso-ramosis, nigrescentibus.

Thallus gray to gray-brown or darker brown, usually pruinose over much of the upper surface, up to 3 or 4 cm in diameter but often smaller, more or less regular and orbicular. Lobes rather elongate and linear, discrete to contiguous or somewhat overlapping, 0.5-1.5 mm broad, more or less flat to irregularly concave, prostrate. Sorediate, the soralia marginal and terminal on short side branches, the marginal ones often axillary, discrete to occasionally almost continuous, in part forming by separation of the upper and lower cortex and often becoming ear-shaped or hooded (reminiscent of the "nest-shaped" soralia of *Xanthoria fallax*); terminal soralia formed similarly, often appearing reflexed-labriform; soredia granular, greenish to brownish or sometimes noticeably yellowish, mostly 30-50 µm in diameter (dry). Medulla white (areas near the soralia may be pale yellowish). Lower surface black, the ends of peripheral lobes usually whitish to pale tan for some distance (up to 3 to 4 mm in some cases) from the tip; rhizines black and squarrosely branched. Thallus 150-200 µm thick; upper cortex paraplectenchymatous, 26-50 µm thick; lower cortex irregularly prosoplectenchymatous, in part poorly delimited from the medulla, 20-25 µm thick. Apothecia infrequent, up to 2 mm in diameter, sessile, the margin thick and becoming lobulate, the lobules often quite long (often longer than the breadth of the apothecium) and eventually developing reflexed soralia on the ends; spores 33-38 x 15.5-18 µm, Physconia-type. Pycnidia occasional; conidia 4-5 x 1 µm, cylindrical or bacilliform.

Chemistry: secalonic acid A (apparently restricted to the soralia). Spot tests: medulla K-, C-, KC- (positive tests may be obtained if tests are done too close to the soralia or on a lobe edge where unnoticed incipient soralia are present), PD-; soralia K+ faint to dark yellow, KC+ yellow or yellow-orange.

This species is probably closely related to *Physconia enteroxantha*, sharing the paraplectenchymatous upper cortex and the production of secalonic acid A in the soralia (but not in the medulla). The soralia of *Physconia enteroxantha* are usually linear and continuous, and although they may be slightly or occasionally rather strongly reflexed, they are neither hooded nor formed by separating cortices. Another similar species is *Ph. leucoleiptes*, also rare in western North America, which shares the same spot tests (K+ and KC+ in soralia but not in the medulla) but has thick, more pronouncedly labriform soralia which are not at all hooded by separation of the cortices. *Physconia leucoleiptes* can also be distinguished from the present species by the scleroplectenchymatous upper cortex. *Physconia perisidiosa* can look superficially similar from the upper surface, because of the numerous terminal soralia, some of which may be weakly hooded. In that species, the soralia (as well as the medulla) are normally K- and KC-, and the lower surface is very different, basically ecorticate and pale, darkening only centrally and never with a well-formed, shiny cortex.

Additional specimens examined (Paratypes): **U.S.A. California. Los Angeles Co.**: Angeles National Forest, Chilao Campground, 34°20'N, 118°01'W, 1575 m, *Ryan 26510* (ASU). **Monterey Co.** Hastings Natural History Reservation, 36°23'N, 121°32'W, *Tucker 34597* (SBBG). **Orange Co.**: S slope of Santa Ana Mts., Silverado Canyon, 1200 m, *Santesson 17649a* (UPS), 1310 m, *Weber & Santesson*, L-42691 (COLO). **Riverside Co.**: S of Banning at edge of San Bernardino Natl. Forest in San Jacinto Mtns., 33°50'N, 116°48'W, 920 m, *Wetmore 14635* (MIN). **San Diego Co.**: W of Anza-Borrego State Park on Co. Hwy. S2 between CA 79 & CA 78, on S side of road 1.8 km E of CA 79, 920 m, *Wetmore 16955* (MIN); Agua Tibia Wilderness, Magee Palomar Trail, in vicinity of Eagle Crag, 33°23'15"N, 116°57'W, 1375 m, *Ryan 25889* (ASU). **Santa Barbara Co.**: N slope, Orcutt Hill, 34°19'N, 120°25'W, *Bratt 409* (SBBG). **Siskiyou Co.**: road to Etna Summit, 4 km SW of city limits of Etna, 41°25'30" N, 123° 55' 30" W, 1100 m, *Ryan 24882* (TLE). **Ventura Co.**: headwaters of Wilsie Creek, Sisar Canyon, 34°29'N, 119°09.5'W, 1280 m, *Bratt 1052* (SBBG); same locality as type, *Bratt 3339* (SBBG). **Washington. Klickitat**

Figures 3 & 4: *Physconia fallax*, part of holotype specimen, *Bratt 11189* (DUKE). Fig. 3 (left): Habit (x9.4). Fig. 4 (right): Closeup of soralia (x31.5).

Co.: along Hwy 97 at summit of Satus Pass, 45°59.2'N, 120°39.2'W, 950 m, *Esslinger 15975* (TLE). **Mexico. Baja California Norte: Guadalupe Isl.**, near N peak in Cedrus stand, 29° 05' 40"N, 118° 18' 40"W, 1250 m, *Wetmore 75829* (MIN).

Physconia isidiomuscigena Essl., sp. nov. Figures 5 & 6 Type: **U.S.A. Arizona. Coconino Co.**: Grand Canyon Natl. Park, Grandview Trail; 36°00'N, 111°59'W, 1980 m, *Nash 30843* (ASU, holotype; TLE, isotype).

Thallus foliaceus, usque ad 11 cm diametro, superne griseo-fuscus vel brunneus, pruinosus, sorediatus-isidiatus; sorediis irregularibus, granulosis et isidiascentibus, marginalibus vel laminalibus; subtus fuscus vel nigrescens, rhizinatus; rhizinis nigrescentibus, squarroso-ramosis.

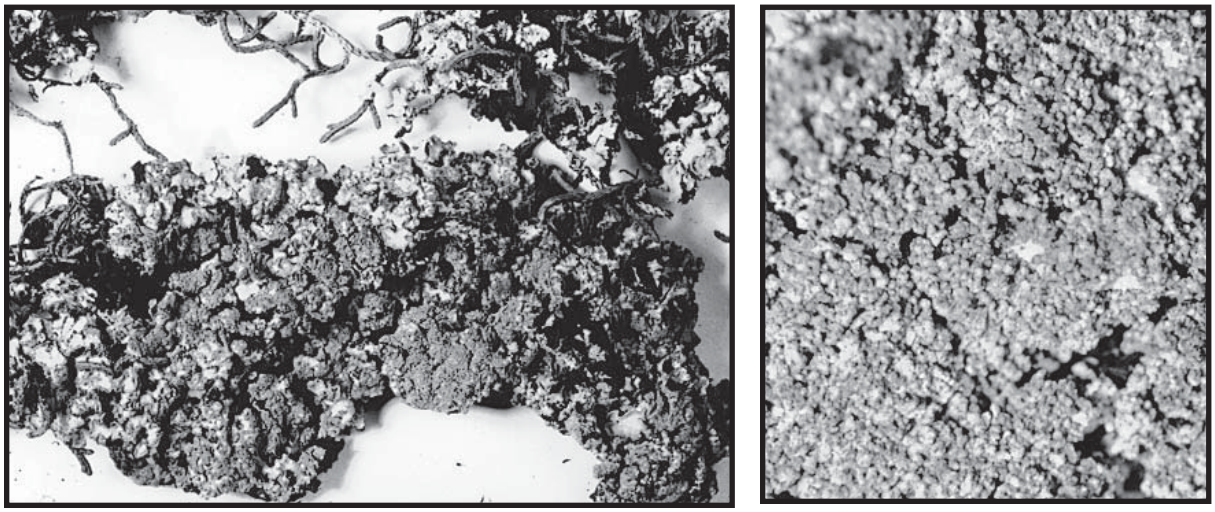
Thallus gray-brown to darker brown, usually whitish pruinose essentially throughout, up to 11 cm in diameter, irregular and often entangled with other thalli. Lobes irregular-flabellate, contiguous or overlapping, mostly 2-4 mm broad, usually ascending on the ends and therefore distinctly concave. Sorediate-isidiate, the propagules arising first on the lobe margins and under upturned lobes, but also later on the upper surface ridges and laminae; propagules granular at first and essentially like coarse soredia (50-75 µm, growing larger), becoming rather irregular and distinctly isidioid, rather like blastidia. Medulla mostly white to off-white or occasionally pale yellowish in patches. Lower surface pale tan to whitish on the lobe ends, soon darkening inward, becoming black, dull to weakly shiny; rhizines black and squarrosely branched. Thallus 150-260 µm thick, upper cortex paraplectenchymatous, 17-38 µm thick, lower cortex irregularly prosoplectenchymatous, 11-15 µm thick. Apothecia and pycnidia not seen.

Chemistry: variolaric acid, often with small amounts of secalonic acid A. Medulla usually K- and KC-, but sometimes K+ pale yellow and KC+ yellow to orange in scattered areas (the propagules sometimes also reacting).

Because of the paraplectenchymatous upper cortex and the presence of granular and isidioid soredia, the smaller specimens of this species were at first confused with *Physconia isidiigera* or *Ph. enteroxantha*, depending on whether or not the K and KC reactions were detected in the medulla. However, this species is distinguished by the much larger thallus and lobe dimensions, distinctive piled and blastidia-like propagules, and the typical substrate, growing on mosses and *Selaginella*, usually over rock (rare on bark). In some ways, it actually seems more closely related to Ph. muscigena, and resembles that species in habit and habitat.

This species is presently known from only two collections in California and is apparently much more common in the southern Rocky Mountains.

Selected additional specimens examined (Paratypes): **U.S.A. Arizona. Apache Co.**: W side of Escudilla Mt., 9.5 km N of Alpine, 2990 m, *Nash 10711* (ASU).



Figures 5 & 6: *Physconia isidiomuscigena*, part of holotype specimen, *Nash 30843* (ASU). Fig. 5 (left): Habit (x1.1). Fig. 6 (right): Closeup of central isidioid soredia (x11.6).

Coconino Co.: Grand Canyon Natl. Park, N rim, junction of paved roads ca. 6.5 km N of Kaibab Lodge, 36° 16' N, 112° 03' W, 2470 m, *Nash 9443* (ASU, MIN, TLE); Grand Canyon Natl. Park, South Kaibab Trail, 36° 03' 45"N, 112° 03' 30"W, 1950 m, *Nash 30819* (ASU, MIN). **California. Los Angeles Co.**: S side of Chatsworth Hills between Chatsworth and Santa Susana, *Weber*, S1876 (COLO). **Riverside Co.**: Santa Rosa Plateau Preserve, S end of Santa Ana Mtns. W of Murrieta, 600 m, *Weber et al.*, 82149 (COLO). **Colorado. Moffat Co.**: Deerlodge Park, on the left bank of the Yampa River at the easternmost end of Dinosaur National Monument, *Flowers*, L71507 (COLO). **Montezuma Co.**: Spruce Canyon near campground area, Mesa Verde Natl. Park, 1830 m, *Weber*, S2337b (COLO). **Montrose Co.**: Paradox Creek, 1.6 km E of Utah state line, 2130 m, *Walker 222* (COLO). **Utah. Daggett Co.**: 27.5 km S of Manila, *Nash 10481* (ASU). **Kane Co.**: Caves Lake, 1585 m, *Flowers 433* (COLO). **Rich Co.**: 3 km SE of Bear Lake and 8 km E of Laketon, 41° 49'N, 111° 16'W, 610 m, *Nash 21330* (ASU). **San Juan Co.**: Elk Ridge 1.6 km NE of Gooseberry R.S., 2630 m, *Flowers 1062a* (COLO). **Washington Co.**: Zion Natl. Park, Coalpits Wash; 37° 11'N, 113° 5'W, 1170 m, *Sigal & Nash 15521* (ASU).

Acknowledgments

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Guide to the Macrolichens of California: Part 1, the Orange Pigmented Species

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Abstract: *The 4 genera and 20 species of orange pigmented macrolichens in California are keyed and descriptions are provided. Some original morphological, ecological, and distributional observations are included. It is intended that the information should be incorporated ultimately into a guide for government agency workers and private sector wildlife biologists who are now having to attend to the conservation of the lower as well as the higher plants.*

There are signs that protection for the bryophytes, lichens, and fungi, long overdue, may be on the way. In California, government agencies and even private timber companies are beginning to pay attention to them in response to pressure from concerned citizens, especially from members of the California Lichen Society (CALS). CALS, not coincidentally, has produced one of the first "red lists" of threatened and endangered lichens in the United States and perhaps the only interactive red list in the world (Magney 1999, 2000), where workers may propose new listings and post updates for species already listed. There is now a need for workers in government agencies to be able to recognize lichens and deal knowledgeably with them in their enforcement of the forest practice laws: for them this guide is especially intended. It will also serve wildlife biologists and registered professional foresters working in the private sector, as well as the lichen-aware public. As a book the guide will provide keys and text accounts for the species known or expected in the state, based on the best available information and will have all taxa illustrated by high quality line drawings. This series of articles will differ from the guide by providing more technical material of interest to lichenologists and will supplement the guide; it will not, however, contain more than a sample of the line drawings. Since the Bulletin articles, at least to some extent, represent the guide in a state of development, feedback concerning them is most welcome and should be directed to the e-mail address above.

I separate the macrolichens initially by color, a useful and traditional starting point (cf. Hale 1979). The major groups are planned to be 1. orange; 2. gray, gray-green, and white; 3. yellow and greenish yellow; and 4. brown, gray-brown and blackish. I have tried to design the keys to make identification practical without collecting the lichen or with collecting very little of it, since lichen populations are often overly impacted (a fragment may be needed for examination with the microscope or chemical testing). The glossary of essential terms will be as much a teaching device as a reference.

Part 1. The orange macrolichens (in *Teloschistes californicus* only the disks are orange). All of these genera except *Edrudia* are placed in the family Teloschistaceae and are related by the distinctive polarilocular spores and the presence of orange anthraquinone pigments in the cortex giving a K+ purple reaction. Despite the characteristic Teloschistacean pigmentation, *Edrudia* is now placed in the Lecanoraceae.

I began work on the orange group with the view that distinguishing between *Teloschistes* and *Xanthoria* could be problematic. I then discovered that all of our *Teloschistes* species have branches with fine longitudinal striation of the cortex, easily seen under the dissecting 'scope at 15x, perhaps reflecting the lengthwise orientation of the cortical hyphae (see table 1, p.14). It remains to be seen if this character is constant for the genus; I do not find any definite reference to it in the literature I have examined. *Xanthoria* entirely lacks this striation, and, of course, does not show the *Teloschistes* pattern of cortical hyphae in a thin longitudinal section of cortex at 400x (observed in *T. chrysophthalmus*, *Wright 2246*; *T. exilis, Wright 3618*; and *T. flavicans, Wright 3917*), where one sees instead many tiny circular figures, presumably representing transversely sectioned vertical hyphae, along with some short curling figures. In addition, *Xanthoria* is mostly dorsiventral with hapters or rhizines on the lower surface, although a few species are attached more or less basally. Note in particular the apparently undescribed, sorediate, occasionally also apotheciate *Xanthoria*, *X. sp.* of this treatment, so far reported only from the central

coast, which has a basal holdfast and narrow, flattened lobes without fine striation. *Teloschistes californicus* is dorsiventral but lacks hapters and rhizines and is otherwise ummistakable, having strongly tomentose, gray, striate, flattened lobes bearing small apothecia with orange disks.

For those who might want to confirm an identification with microscopic characters or to compare species, a table of characters, including some macroscopic ones, is given at the end (pg. 15).

Key to the orange macrolichens of California (Teloschistaceae and *Edrudia*)

Note that anthraquinone pigmented lichens may be quite gray when growing in the shade, although even then the disk will be orange. J. Hinds (pers. comm.) has found *Teloschistes chrysophthalmus* in New England and in Texas with gray lobes and only the disks orange.

1a. Foliose, with rhizines or hapters on the lower side, or, if attached by the lower part of a flat, glabrous, orange branch, then apothecia never terminal, ciliate, nor appearing to "flex" the branch (the branch appears to continue from a second insertion on the underside of the apothecium) ..... ***Xanthoria***
1b. Fruticose, without rhizines or hapters, the branches roundish or dorsiventrally compressed, then gray (disks orange), or the apothecia ciliate, or appearing to "flex" the branch **2**

2a. Thallus of tangled, orange, filamentous branches on coastal rocks and soil banks..... .....***Caloplaca coralloides***
2b. Thallus normally fruticose, branches not fine and tangled **3**

3a. Branches strongly pubescent, gray, only the discs orange ..... ***Teloschistes californicus***
3b. Branches at most weakly puberulent, usually orange at least in part **4**

4a. Sorediate, without apothecia ... ***Teloschistes flavicans***
4b. Not sorediate, usually with apothecia **5**

5a. Apothecia ciliate on margins .... ***Teloschistes chrysophthalmus***
5b. Apothecia not ciliate **6**

6a. Apothecia terminal, commonly attached eccentrically ..... ***Edrudia constipans***
6b. At least some apothecia appearing to "flex" the branch (see couplet 1), never attached eccentrically .... ***Teloschistes exilis***

***Caloplaca coralloides* (Tuck.) Hult.:** Thallus to 2 cm in diameter and 8 mm high. Branches to 0.4 mm in diameter, round, bumpy. I can find nothing in the references cited nor in Herre (1910) or Hasse (1913) on an attachment. Examination of my own material, *Wright 4213* from near Stinson Beach, Marin County, suggests that it may be attached by the cortex along part of the length of a few branches. Soredia lacking. Apothecia fairly common, terminal or lateral. One of the most easily recognized species on seashore rocks, according to Arup. It is distributed along the coast over the whole length of the state and as far north as northern Oregon (Wetmore and Kaernefelt 1998), although in my experience in central California, it is rare. It is mainly on exposed vertical surfaces of hard, acid rocks not subject to bird manuring (Arup 1995b, Wetmore and Kaernefelt 1998). A related species, *C. thamnodes* Poelt, with branches 0.4 mm or more in diameter rather than 0.2 to 0.4 mm, is in Baja California, Mexico and might be expected in the extreme southern part of the state. However, reports place it about 100 km south of the international boundary (Arup 1995a).

Caloplaca is a genus of crustose lichens, so it is somewhat surprising to find this dwarf fruticose species placed there. However, a prothallus, a typical crustose feature, is sometimes present. Arup (1995a) states that its position in the genus is very uncertain. Historically it has been assigned to other genera.

***Edrudia constipans* (Nyl.) Jordan.** (*constipans*, crowding closely together): Thallus 15 to 25 mm broad, resembling a tiny *Teloschistes*. Apical parts orange, lower parts tan to white, occasionally blackening. Branches to 1.1 mm, dorsiventrally compressed, attached to substrate by the base. Cartilaginous strands in central part of medulla. Soredia lacking. Apothecia terminal, commonly eccentrically attached. Pycnidia on dorsal surface of branch, immersed. This is a genus of a single species endemic to the rocky, isolated Farallon Islands 42 km off the coast of San Francisco (Farallons National Wildlife Refuge), where no visitors are allowed at this time because of the sensitive habitat.

Nineteenth century lichenologists had assigned this lichen to several different genera at different times. W.P. Jordan of the University of San Francisco re-studied it (Jordan 1980), and, still accepting it as Teloschistaceae, erected the new genus *Edrudia* to accommodate it, based on the simple rather than polarilocular ascospores and the long filiform, rather than short subcylindric or ellipsoidal conidia. About the same time, Poelt and Hafellner (1980) investigated the ascus apex and found it to be *Lecanora*-rather than *Teloschistes*-type. Along with this and in light of the simple spores, they moved the new genus to the Lecanoraceae, considering it an "anthraquinone-pigmented side branch" of that family; on this account it would have arrived at its resemblance to Teloschistaceae by convergent evolution. Although the spores are single-celled and lack a septum, it might be noted that they have an "incomplete transverse cytoplasmic band" (Jordan 1980), suggesting the vestige of a septum. In any case, both the geography and morphology imply an unusual evolutionary history.

That *Edrudia* has never turned up on the mainland, despite the fact that the Farallons are heavily populated with birds which could disperse it, is also interesting. I am reminded of the Marin County "endemic" vascular plant, Leschke's Indian Paintbrush (*Castilleja leschkeana,* Scrophulariaceae), long known only from the type collection from Pt. Reyes, which ultimately turned out to be an Alaskan species, *C. chrymactis* (Hickman 1993). These migratory birds do visit *somewhere*, if not the California mainland: perhaps *Edrudia* should be sought on the coast of Alaska (cf. the occurrence of the arctic alpine lichen *Thamnolia* on the immediate coast 70 km north of the Farallons [Wright 1992]).

I hope to obtain a status report on *Edrudia* from the Farallons biologists, with whom, it seems, I will be able to communicate by e-mail.

Teloschistes

There are four easily recognized species in California. On the basis of the few available literature reports (Hale and Cole 1987; Riefner et al. 1995) and my own observations in the San Francisco Bay Area counties, they are uncommon to rare. All four species should probably be listed as rare, and in some cases they will be endangered. *Teloschistes contortuplicatus* (Ach.) Vězda, a species of dry habitats, is given by Goward (1999) from vertical limestone rock faces in the Rocky Mountains south to Nevada and Arizona. In California it might be sought where limestone occurs east of the Sierran crest. It forms erect tufts with branches to 8 mm long, but usually about 5 mm, with cilia and globose, isidia-like outgrowths. All *Teloschistes* species are attached basally, and rhizines are absent (Purvis et al., eds. 1995).

1. *Teloschistes californicus* Sipman: Thallus to 30 mm in maximum extent, mostly about 20 mm, invariably gray (C. Bratt pers. comm.). Lobes to 2 mm wide, according to Sipman (1993), but reaching 3 mm in *Bratt 8216* from San Nicolas Is., dorsiventral, mostly linear, rather stiff, prominently pubescent, with strong longitudinal and reticulate striation, perforations, and coralloid branching from the margins. Apothecia infrequent, laminal on upper surface, to 2.5 mm in diameter in the Bratt collection (Sipman: 1 mm); exciple strongly pubescent. Pycnidia in orange warts, not seen in the Bratt specimen. Granular sorediate toward the tips of the lobes. A rare species now known only from the Channel Islands (C. Bratt, pers. comm.). There are historical records from Pt. Loma, San Diego County and Newport, Orange County (Hasse 1913), but the species seems to be no longer present on the mainland. Published reports up to 1993 were as *T. villosus* (Ach.) Norman, a South American species which Sipman (1993) separates from *T. californicus* as sorediate on the more strongly ridged lower surface and by having a larger, more densely tomentose, imperforate thallus with hairs 0.2 mm instead of 0.1 mm long. Sipman gives the hairs of *T. californicus* as 1 mm long, but this is a typo (H. Sipman, pers. comm., 2000). He says that all specimens identified as *T. villosus* from California seen by him are *T. californicus*.

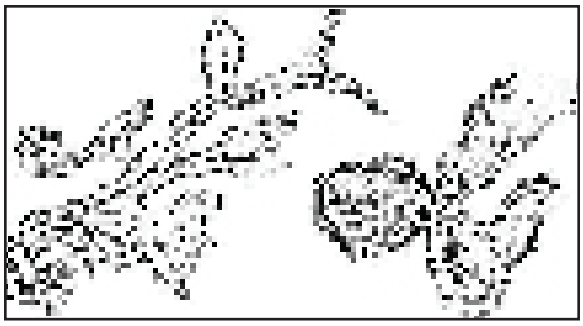

Fig 1. *Teloschistes californicus* Sipman, San Nicolas Island, Ventura County, California, C. Bratt 8216. Sketch by R. W. Becking. (left) A branch (x1.5). (right) An Apothecium (x14).

2. *Teloschistes chrysophthalmus* (L.) Th. Fr.: Thallus to 20 mm in diameter, in compact, roundish tufts. Lobes to 2.5 mm wide, dorsiventral with fibrillose branches. Soredia lacking. Apothecia on the margins of the lobes or terminal, to 6 mm in diameter with fibrils on their margins. Pycnidia frequent, in low reddish warts. Toward the coast, mostly from the San Francisco Bay Area south, rare. There is no other California lichen which has apothecia that are both orange and ciliate. I have seen it in Marin County on California Buckeye (*Aesculus californicus*), Toyon (*Heteromeles arbutifolia*), and an unidentified fruit tree. It appears to be more common in Sonoma County, where Judy Robertson reports that it is widespread (pers. comm., 2000). There is an excellent photograph in Wirth (1995, v.1, p. 14), where the author gives it as extinct in his area; a cautionary observation: this lichen needs protection in California (cf. Hale and Cole 1988, p. 170). It is already extinct in New England, according to J. Hinds (pers. comm.).

3. *Teloschistes exilis* (Michaux) Vainio: Thallus to 30 mm in diameter. Branches to 0.6 mm in diameter, rounded or somewhat flattened to angled as in *T. flavicans* (based on *Wright 3616* and *3618*). Branches which appear to continue from the base of the exciple seem quite characteristic for this species. Toward the coast and rare from the Channel Islands to Sonoma County (Pepperwood Preserve, Franz Valley Road: a range extension 60 km northeast from the Marin County localities reported by Riefner et al. (1995). It may be plentiful locally, as at the Pepperwood Preserve, where it occurs on shrubs in an area which, although 45 km from the Pacific Ocean, still receives considerable fog (J. Robertson, pers. comm.). Hale (1979) comments on the similarity of *T. exilis* to *T. flavicans*, and it looks as though they would qualify as a fertile-sorediate "species pair" in the sense of Poelt. At least some Marin County material has a very fine, whitish pubescence.

4. *Teloschistes flavicans* (Sw.) Norm.: Thallus to 100 mm in diameter, generally about 30 mm. Branches to 1 mm in diameter, rounded or somewhat flattened or angled. Branching dichotomous. Soralia often appear as yellow bumps, and not all of them will have developed definite soredia. Apothecia not seen in California material. Pycnidia frequent, in orange tubercles. This is the most commonly encountered *Teloschistes* sp. in my experience, but rare nonetheless. In coastal areas from Santa Barbara County north to Sonoma County (collected at Bodega Bay by J. Robertson; Hale and Cole [1988] mention an historical record). It grows on bark and occasionally among mosses on rocks (Three Peaks, Tomales Bay, Marin County; Devil's Slide, San Mateo County). A thallus 12 cm long was observed on California Bay (*Umbellularia californica*) on Inverness Ridge in Marin County.

Xanthoria

The genus is common and widespread in California, although some species are quite rare. Thirteen species are reported from the state by Lindblom (1997). *Xanthoria* seems to be a difficult group, although some species such as *X. parietina* and *X. polycarpa* are easy to recognize. All the species prefer open, nutrient enriched sites, as, for example, on roofs about the bases of television antennas on which birds perch, where one sees quite a lot of *Xanthoria*, presumably *X. candelaria*. It is common to find pycnidia in all species except as indicated.

Characters which call for the compound microscope are in brackets. Key adapted from L. Lindblom (1997).

1a. Sorediate. **2**
1b. Not sorediate **9**

2a. Soredia forming from breakup of laminal isidia .... ***X. sorediata***
2b. Soredia marginal on lower surface, without isidia **3**

3a. Attached by sparse, very short hapters, [conidia ellipsoid] ..... ***X. candelaria***
3b. Attached by rhizines or at the base, [conidia subcylindric or variously shaped within a single pycnidium] **4**

4a. Soredia produced marginally to submarginally **5**
4b. Soredia produced from lower surface **6**

5a. Lobes 0.3 to 0.5 mm wide ..... ***X. fulva***
5b. Lobes 0.8 to 1.4 mm wide **7**

6a. Lobes fan-shaped, to 6 mm wide, wavy ***X. mendozae***
6b. Lobes +/- linear, to 0.7 mm wide, flat ..... ***X. sp.***

7a. Soredia in marginal, crescent-shaped slits .. ***X. fallax***
7b. Soredia on margins or lower side of helmet-shaped lobe apices **8**

8a. Lobes horizontal to slightly erect, often helmet-shaped; laminal soralia absent ..... ***X. oregana***

8b. Lobes mostly raised, not helmet-shaped; laminal soralia on well-developed thalli ..... ***X. ulophyllodes***

9a. Attached with sparse hapters or directly to substrate, thallus to 25 mm, lobes to 0.7 mm wide **10**
9b. Attached with abundant hapters or with rhizines, thallus to 100 mm, lobes to 3.2 mm wide **11**

10a. Lower cortex absent except under lobe apices, thallus flat ..... ***X. tenax***
10b. Lower cortex present throughout, thallus cushion-like ..... ***X. polycarpa***

11a. With short hapters, [conidia ellipsoid] **12**
11b. With long rhizines, [conidia subcylindric] **13**

12a. Lobes convex; hapters extremely short; resembling a crustose lichen ..... ***X. elegans***
12b. Lobes concave to plane; hapters short; plainly foliose ..... ***X. parietina***

13a. Lobes to 0.9 mm wide, generally 0.6 mm, [septum of spores 5.6 to 7.4 µm] ..... ***X. hasseana***
13b. Lobes to 0.5 mm wide, generally 0.3 mm, [septum 1.6 to 2.8 µm] ..... ***X. montana***

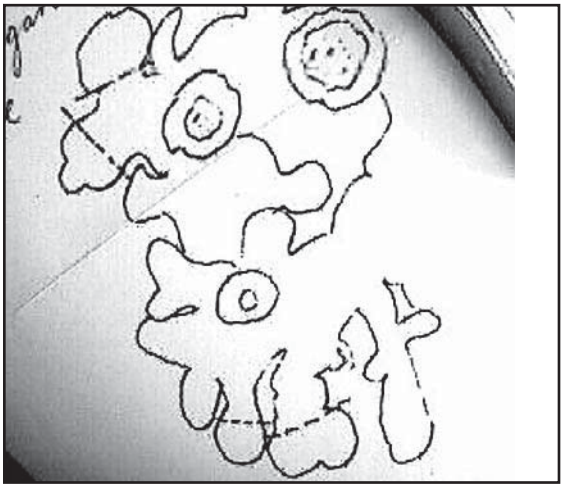

Fig. 2. Measuring the lobes of *Xanthoria* species: my tracing marked by L. Lindblom (pers. comm.).

Lindblom (1997, p. 83) measured lobe width at different points (abbreviations mine) in different cases: the outermost tip, the widest point (WP), and just inside the widest point (IP). She says the published measurements were made at IP except in the cases of *X. borealis* and *X. mendozae*, which were measured at WP. The following descriptions are taken mainly from Lindblom (1997). I faxed a tracing of a *Xanthoria* thallus which she kindly marked (Fig. 2) to indicate where she measures, and from this it looks as though IP would be the first major constriction in the lobe proximal to the tip, or, where no constriction is present, halfway from WP to the proximal end of the lobe.

1. *Xanthoria candelaria* (L.) Th. Fr.: Thallus to 30 mm in diameter. Lobes to 0.5 mm wide (this size seems, however, to be based on very few measurements: see Lindblom 1997, p. 125), more or less erect; forming small cushions or extensive colonies, attached by lower parts of lobes and hapters, which are given as very rare: the attachment then would generally be by the lower part of the lobe. Apothecia in general rare; pycnidia common, the same color as the upper surface or slightly darker. Sorediate on margins of lobe tips and on ridges on the laminae. On bark, rock, and lignum. Common and widespread along the entire California coast except for Humboldt (and presumably Del Norte) Counties, where it appears to be rare.

2. *Xanthoria elegans* (Link) Th. Fr.: Thallus to 55 mm in diameter. Lobes to 1.3 mm wide, usually about 0.8 mm, plane to convex. Apothecia generally plentiful; pycnidia variable in quantity, immersed, somewhat darker than the upper cortex. Soredia marginal, on ridges on the laminae, and from the margins of the apothecia, at least partly corticate (blastidia). This species with its tight attachment to the substrate somewhat resembles a crustose lichen, but, unlike a crustose lichen, it has a lower cortex bearing scattered, white, thick, very short hapters. It is usually on rock but is known also from soil, bone, antlers, and roofs. Lindblom maps it as in most of the Sierra Nevada and on the south coast.

3. *Xanthoria fallax* (Hepp *ex* Arnold) Arnold: Thallus to 30 mm in diameter. Lobes to 1.9 mm wide, usually about 1.2 mm, plane or slightly raised with wide, rounded tips. Rhizines frequent, free or attached with a small foot. Soredia are in horizontal, crescent-shaped slits on the margins which are rimmed with the cortex which remains after the soralium has ruptured through: the appearance suggests a bird's nest. Apothecia rare. Pycnidia immersed to slightly protruding, darker than the upper surface. Mainly on bark, most frequently of oaks, seldom on rock. Reported over much of California, excluding the North Coast (perhaps too wet) and the deserts of the southeast (probably too dry).

4. *Xanthoria fulva* (Hoffm.) Poelt & Petutschnig: Thallus to 9 mm in diameter. Lobes to 0.6 mm wide, usually about 0.4 mm, plane to somewhat convex; horizontal when young, more erect when mature, richly branched. Attached by proximal parts of lobes and by thin, short rhizines. Soredia produced in rounded slits on the margins and apices of the lobes (also on the lower surface of the lobes, according only to Lindblom's key [1997]; the feature is not mentioned in her text). Apothecia generally few. Pycnidia few but almost always present, mostly protruding and dark orange reddish. It is mainly on bark, especially of oak (*Quercus*), elm (*Ulmus*), and sycamore (*Populus*), occasionally on rock and lignum. It has been confused with *X. fallax,* which has distinctly wider lobes and does not produce soredia on the lower surface. The distribution is much like that of *X. elegans*: Sierra Nevada and South Coast, absent from the North Coast and mostly absent from the southeastern corner of the state.

5. *Xanthoria hasseana* (Räsänen) Räsänen: Thallus to 30 mm in diameter. Lobes to 0.9 mm wide, mostly about 0.6 mm, plane, smooth, horizontal, often branched, with rounded apices. Attached by frequent, long, rather thick rhizines with a small foot. Soredia lacking. Apothecia are almost always present and abundant. Pycnidia are immersed to protruding, darker than the upper surface. Apparently difficult to separate from *X. montana* on gross morphology alone: spore size and shape are also needed. On bark, most often of sycamore (*Populus),* usually on the trunk, occasionally on rock or lignum. Widely distributed in California but not on the North Coast or in the southeastern part of the state.

6. *Xanthoria mendozae* Räsänen: Thallus to 25 mm in diameter. Lobes to 6 mm wide, generally smaller, the mature ones fan-shaped and wavy, pruinose, the apices curled downwards, generally attached directly by the proximal part; rhizines short, very rare. Soredia produced from lower surface, large, spherical and with a dull, fuzzy surface ("tennis balls": a microscopic character). Apothecia not seen. Pycnidia immersed, same color as the upper surface. On rock at 400-2900 m. Known from Los Angeles, Shasta, and Tuolumne Counties. Lindbloms's key seems to identify material collected in Tehama County on the west side of the Central Valley, *Wright 6864* (not checked by Lindblom) from bark of oak at about 500 m elevation, as this species, but, besides being epruinose and corticolous, *6864* has rather plentiful apothecia, whereas *X. mendozae* is said to be saxicolous, pruinose, and without apothecia in the 41 specimens examined by Lindblom.

7. *Xanthoria montana* L. Lindblom: Thallus to 30 mm in diameter. Lobes to 0.5 mm wide, plane, smooth, horizontal, often branched, apices rounded, attached by medium thick rhizines. Apothecia almost always present. Pycnidia immersed to protruding, darker than the upper surface. Very similar to *X. hasseana* from which it differs chiefly by the smaller, more cylindric spores (see table 2). On bark and occasionally lignum. Not reported from California, but making a close approach in western Arizona and Nevada.

8. *Xanthoria oregana* Gyeln.: Thallus to 30 mm in diameter. Lobes to 1.0 mm wide, mostly 0.6 mm, plane to somewhat inflated, horizontal when young, erect when mature (may become almost helmet-shaped), richly branched; the narrow tips pointed, attached by the proximal parts and by rhizines. Soredia on the margins of the lobes, at least partly corticate, also powdery on the outer parts of the lower surface. Apothecia very rare. Pycnidia rare to abundant, sometimes in groups, darker orange than the upper surface to reddish. May be difficult to separate from *X. fulva* which has a smaller thallus with narrower, shorter, and less wrinkled lobes and develops distinct, rounded, apical soralia, which are not found in *X. oregana*. Also confusable with *X. ulophyllodes*, which has less wrinkled lobes and more frequent soralia which may occur on the laminae. Mostly on bark, especially of oak (*Quercus* spp.), occasionally on rock, lignum, and soil. Widely distributed in the lower two-thirds of the state, not reported from the southeastern part.

9. *Xanthoria parietina* (L.) Th. Fr.: Thallus to 100 mm in diameter. Lobes to 3.2 mm wide, mostly about 1.6 mm, concave, often somewhat wrinkled, horizontal, sparsely branched and with wide, rounded apices. Attachment is by short, thick hapters. Apothecia almost always present and abundant. Pycnidia immersed to protruding, usually slightly darker than the upper surface. Soredia lacking. On bark and rock, also lignum, shells, roofs, cement, etc. Reported by Lindblom from Contra Costa, Humboldt, and San Diego Counties and from San Clemente Island; collected by me in Marin County (*Wright 5759*, Santa Venetia Hills, 6-15-96) and seen in San Mateo County.

10. *Xanthoria polycarpa* (Hoffm.) Th. Fr. *ex* Rieber: Thallus to 25 mm in diameter. Lobes to 0.7 mm wide, mostly 0.4 mm, plane to convex, mostly horizontal, richly branched, with pointed apices, attached by hapters and by wrinkles of the lower surface. Apothecia generally abundant. Pycnidia immersed, same color as upper surface or slightly darker. Soredia lacking. Mainly on bark of

twigs, but also common on rock and lignum. Distributed along the coast, apparently less common in Humboldt and Del Norte Counties; also in the Sierra Nevada. The commonest species in Marin County where it is often found on California Buckeye (*Aesculus californica)*.

11. *Xanthoria sorediata* (Vain.) Poelt: Thallus to 35 mm in diameter. Lobes to 1.1 mm wide, mostly smaller, plane to convex, apices occasionally concave, horizontal, attached by thick, very short hapters. Soredia laminal, initiated as small isidia which later break up and become crater-like soralia; these may eventually cover the central part of the thallus. Apothecia present less than 10% of the time. Pycnidia usually abundant among the soralia, immersed, somewhat darker than the upper surface. On rock, mostly calcific, a few collections from antlers and bark. This species is chiefly montane, extending over the length of the state. Only 5 populations are mapped by Lindblom.

12. *Xanthoria tenax* L. Lindblom: Thallus to 25 mm in diameter, mostly about 11 mm. Lobes to 0.7 mm wide, mostly about 0.4 mm, plane, horizontal, closely appressed to substrate, sparingly branched, pruinose; with rounded, fan-shaped tips. Lower cortex lacking except near the lobe apices: the principal attachment is apparently by medullary hyphae; hapters are rarely present near the apices. Soredia lacking. Pycnidia immersed, slightly darker than the upper surface. On bark, mostly of twigs, and lignum. On the coast and in coastal and foothill valleys in the lower three-fourths of the state; absent from the deserts and from the North Coast.

13. *Xanthoria ulophyllodes* Räsänen: Thallus to 32 mm in diameter. Lobes to 1.4 mm wide, mostly 0.9 mm, plane, generally slightly raised, branched with wide, rounded tips, attached by rhizines. Soredia on and near the margins, also laminal in well-developed individuals, beginning as small holes in the upper cortex and ultimately covering large areas. Apothecia mostly rare although abundant on some thalli. Pycnidia immersed or slightly protruding, darker than the upper surface. Mainly on bark of tree trunks, occasionally on rock, lignum, and twigs. Reported from only 3 localities in coastal Los Angeles, Santa Barbara, and San Mateo Counties. See *X. fallax* for a comparison with that closely related species.

14. *Xanthoria sp.* Thallus to 30 mm maximum extent, somewhat shrubby. Lobes flat, 0.2 to 0.7 mm wide, attached by a basal holdfast, without fine striation. Soredia in wide ruptures of the lower cortex, sometimes at the branch tips, which may then be expanded, somewhat in the manner of *Ramalina pollinaria*. Apothecia rare (G. Jirak, pers. comm.). On bark, especially of willow (*Salix* spp.) and Coyote Brush (*Baccharis pilularis)*. Discovered by Greg Jirak, CALS treasurer, in Santa Cruz County. Known also from the coast of Marin, Sonoma, Mendocino, and Humboldt counties, not farther from the ocean than about 3.5 km. The spores are polarilocular, and the ascus apex is *Teloschistes*-type (*Jirak and Hubbart 0001*, Sonoma County) with the typical lateral I+ thickenings towards the summit (Purvis et al. 1992). Longitudinal sections of cortex at 400x do not show the *Teloschistes* pattern of cortical hyphae running parallel (periclinal) to the surface of the thallus; they show instead many fine, +/- circular figures suggesting vertically oriented hyphae which have been cut transversely, as would be the case in *Xanthoria*. The fine striation of the branch surfaces, characteristic of at least some *Teloschistes*, is also lacking. Also favoring *Xanthoria* are the subcylindric conidia (bacilliform in Lindblom's terminology); in *Teloschistes* these are cylindric. Awaits publication. See Table 2 and back cover.

For readers with access to a compound microscope, Table 1 (see next page) shows how the orange genera may be separated (definitively) on microcharacters.

Glossary

apothecium (pl. apothecia) an ascus-containing structure (ascoma, ascocarp) with a disk- or cup-like surface which is exposed at maturity, the commonest type of fruiting body in the lichenized ascomycetes.

bacilliform rod-like.

blastidium (pl. blastidia) "a lichen propagule produced by the budding of thalli in a yeast-like manner" (Hawksworth et al., eds., 1995), used by some workers to refer to what appear to be corticate soredia.

conidium "a specialized, non-motile, asexual (?) spore" (Hawksworth et al., eds., 1995); in the case of the lichenized ascomycetes = pycnidiospore or spermatium.

cortex in the lichens, an outer covering of agglutinated (glued together) fungal hyphae.

crustose crust-like; having a thallus without lower cortex and rhizines, fixed to the substrate by the whole of the lower surface.

foliose leaf-like (from *folium*: Latin, *leaf*) said of macrolichens with dorsiventral rather than radial arrangement of the tissues.

fruticose shrub-like (from *frutex*, *fruticis*: Latin, *shrub*) said of macrolichens with radial rather than dorsiventral arrangement of the tissues.

hapter in *Xanthoria* an attachment organ which is short, thick, and has a terminal width extension or "foot" (Lindblom 1997). Cf. rhizine.

hypha (pl. hyphae) a cellular filament, the form of most fungi in the vegetative state.

isidium (pl. isidia) in some lichens a tiny, corticate, often finger-like projection of the surface of the thallus, containing photobiont and capable of functioning as an agent of dispersal (vegetative reproduction).

lamina (pl. laminae: Latin, *layer*, *plate*) in the lichens, the main, flat parts of the thallus.

lignum (Latin, *wood*) dead wood, e.g., stumps, logs, lumber, etc.

lobe a roundish projection or division, as of a leaf.

medulla "the loose layer of fungal hyphae below the cortex and algal layer" (Hawksworth et al., eds., 1995).

pycnidium (pl. pycnidia) flask-shaped structure opening through the upper cortex in which pycnidiospores are produced. See conidium.

rhizine a "short to long, slender attachment organ..., pointed or frayed, with only a faint or small terminal width extension" (Lindblom 1997). Cf. hapter.

septum an internal cell wall or partition (Hawksworth et al., 1995).

soralium (pl. soralia) a structure in which soredia originate and from which they are dispersed.

soredium (pl. soredia) a microscopic, non-corticate bundle of photobiont cells and fungal hyphae capable of functioning as an agent of dispersal (vegetative reproduction), when massed often appearing to the naked eye as powder or granules.

sp. = species (sing.)

spp. = species (pl.)

thallus the vegetative body of a lichen.

Table 1. Comparison of key characters in *Edrudia*, *Teloschistes*, and *Xanthoria*

	Cortical hyphae [1]	Ascospores	Pycnidia	Conidia
Teloschistes (Poelt 1969)	+/- parallel to surface [2]	2-celled, polarilocular	Orange-red to dark brown	Cylindric, short [3]
Xanthoria (Lindblom 1997)	+/- perpendicular to the surface [4]	2-celled, polarilocular	Concolorous with thallus or darker	Subcylindric to ellipsoid, short: 1.5-5 µm [5]
Edrudia (Jordan 1980)	Not given [6]	1-celled	Not given	Filiform, long: 17-22 µm

Notes:

1. The hyphae referred to here are the agglutinated hyphae of which the cortex is formed ("a thick tissue formed by the hyphae becoming twisted and fixed together" [Hawksworth et al. 1995]).
2. Poelt (1974): cortex of lengthwise running hyphae ("längsverlaufenden"). Wirth (1995, v. 2): cortex of periclinal hyphae (+/- parallel to the surface).
3. Wirth (1995, v.2): pycnospores short cylindric. "Pycnospore" and "conidium" are synonymous here, but see Hawksworth et al. (1995).
4. Lindblom (1997): "anticlinal oriented (declining downwards)". Poelt (1974): the hyphae running +/- perpendicular ("senkrecht") with respect to the upper surface.
5. Lindblom (1997, p. 94; fig. 3, p. 95) refers to conidia which are narrowed at one end as "bacilliform", a term generally defined as "rod-shaped", i.e., with parallel sides (see, e.g., Hawksworth et. al. 1995). "Subcylindric", the term adopted here, seems a better description.
6. Jordan (1980) describes the cortex of *Edrudia* as prosoplectenchymatous ("the hyphal elements are seen to be hyphae" [Hawksworth et al. 1995]), but this does not specify their orientation.

(Table 2 will be here, see separate file.

See separate file -- if I can send it OK??)

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Usnea longissima in California

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Readers who have never seen a large tree festooned with long strands of *Usnea longissima* Ach. are encouraged to refer to the accompanying map and go in search of one to visit. *U. longissima*, with its three to four meter long, silvery thalli, is a unique and beautiful lichen.

Like all Usneas, *Usnea longissima* has a tough cord running down the center of the thallus. Unlike in other Usneas, however, the cortex is generally crumbling or even absent on the main branches, giving it the distinctive silvery look mentioned above. Side branches are few but are corticate and are "thickly clothed with simple, nearly straight, horizontal, comparatively short fibrils," as Herre (1910) so aptly described them. The long strands, so distinctive for this species, break up easily, allowing fragments to be blown to another part of the same tree or to a neighboring one. Cracks which develop in the cortex may make it easier for the thallus to break up, and thalli are also weakened and break more readily where they are draped over a branch in direct contact with bark (Gauslaa 1997).

For the most part chemical spot texts are negative in *Usnea longissima*, but the central cord in the main branch reacts blue with iodine, and this may help in identifying questionable specimens, such as fragments or young specimens that have not yet lost their cortex.

Fig. 1. U. loggissima, Seaview Road, Sonoma County, California.

Herre (1910) went on to describe the apothecia as small or very small, lateral as well as terminal, concolorous or pale tan, the spores short ellipsoid. He did not mention soredia. In an earlier report, Schneider (1898) had described the apothecia as rare or wanting, and also made no mention of soredia. Fink (1935) described the apothecia as small, very rare, and terminal. His only reference to soredia was to say that the branches were "scaly, whitish sorediate, especially at the base." Hale (1988), on the other hand, said apothecia were lacking, and Bruce McCune and Linda Geiser (1997) also reported that no apothecia were seen. The latter, however, did report soredia as rare, whereas they are not mentioned at all by Schneider (1898) or Herre (1910). Does the increased rarity of apothecia and the recent report of soredia indicate some overall change in *Usnea longissima* in the United States? In Europe, apothecia are reported as extremely rare, and in Norway fibrils of freshly collected thalli are often richly sorediate (Gauslaa 1997).

We note that the overall distribution in California has changed since 1910, when Herre reported it to be as far south as Purissima Creek in San Mateo County. Now we have no reports of its presence south of Sonoma County (Doell 1997). A casual look at the accompanying map of the distribution of *Usnea longissima* in California (fig. 2) shows that for the most part the old growth forests where we find this lichen growing are in the same ecological area as the redwood, *Sequoia sempervirens*, even though the lichen does not necessarily grow on that tree. As with the redwood, we find *U. longissima* in the coastal mountains north of San Francisco, where the climate is cool and moist, and not more than forty kilometers inland. As we continue north reports are more numerous, and this

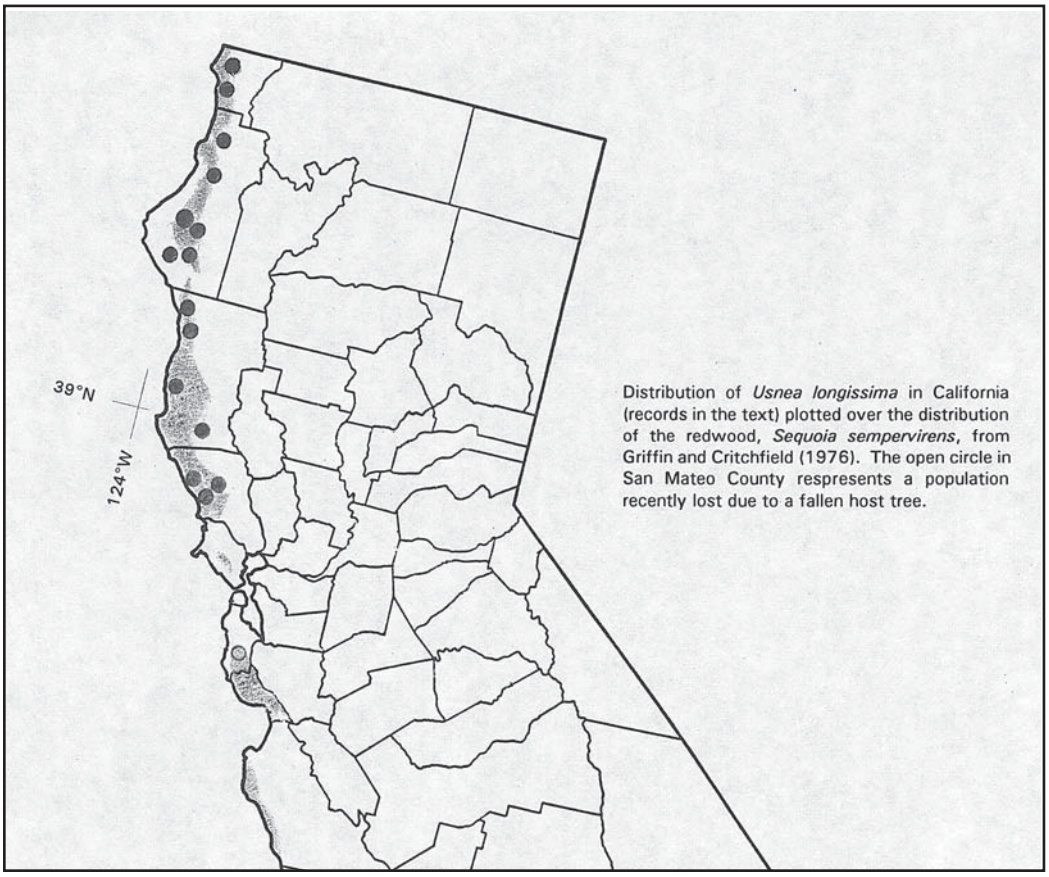

Fig. 2. Distribution of *Usnea longissima in California.*

trend continues into Canada and Southeast Alaska, where it is recorded as abundant (Geiser et al l998). This species might be regarded as a remnant of forests that were once more extensive and a climate that was cooler. What we are finding appear to be relictual populations which may now be extending themselves by wind- and bird-dispersed fragments. The evidence that we are getting that *U. longissima* is becoming rarer in this country is echoed and underlined in Europe, where in many areas it is considered extinct (Poelt 1969; Wirth 1995, v. 2; Gauslaa 1997).

21 populations have been identified statewide: **Del Norte County**: Damnation Creek Trail; Jedediah Smith State Park (2 localities); **Humboldt County**: Bald Mountain east of Maple Creek; Bull Creek near Highway 101; Grizzly Creek State Park; Harper Creek (Mattole Rd.); Honeydew; Mattole Rd. (2 localities); Humboldt Redwoods State Park, Squaw Ridge Rd.; Monument Rd. west of Rio Dell; Prairie Creek Redwoods State Park, Ossagon Trail; Redwood National Park, Dolason Trail; **Mendocino County**: Comptche-Ukiah Rd. near Fort Bragg; Usal Rd.; Yorkville, Galbraith Preserve; **San Mateo County**: Oil Creek Rd. (recently extinct); **Sonoma County**: Austin Creek Recreation Area; Salt Point State Park, Kolmer Gulch; Seaview Rd.; Coleman Valley Rd.; Stewart's Point-Skaggs Spring Rd. (2 localities); Tin Barn road about 5 km from Hauser Bridge Rd. A dot on the map may indicate more than one population. The map of the distribution of *Usnea longissima* in Hale's *How to Know the Lichens*, 2nd edition (1979, p. 213, fig.425), shows the species extending over about three-fourths of the state from west to east, but we have seen no records from outside the redwood zone.

Because the habitat in which *Usnea longissima* thrives is becoming rarer with the steady increase of air pollution, development, and logging in mature forests, it is time to consider a plan to protect it along with our other threatened lichens. There is little precedent for this type of action in the United States, but David Magney, CALS member

and environmental consultant, has compiled a Red List of California lichens, using a ranking system based on that prepared by the California Native Plant Society for vascular plants. Recently *Usnea longissima* was placed on this list, and the best Humboldt County population appears to have been protected from clear-cutting, partly by this listing. With California lichenologists coming to the aid of this effort, perhaps this spectacular lichen can be saved from the decimation which led to its extinction in most of Europe.

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Lichens Collected at San Simeon State Park and Hearst Castle

Field Trip and Foray led by the California Lichen Society, 17 April 1999

Collectors and their codes: Janet Doell (D), Barbara Lachelt (L), Mikki McGee (M), Judy and Ron Robertson (R), Shirley Tucker (T). Collections were determined by the collectors. Collection numbers where given are those of Shirley Tucker. Most of these collections have been deposited at the Herbarium of the Santa Barbara Botanic Garden (SBBG).

Collecting localities:
1. Monterey Pine (*Pinus radiata*) woods on slope near Washburn campground, San Simeon State Park.
2. Coyote Brush (*Baccharis pilularis*) and fenceposts, near Washburn campground.
3. Rock outcrop ca. 0.8 km inland (east) from Washburn campground.
4. Entrance to San Simeon State Park, on Monterey Pine and Monterey Cypress (*Cupressus macrocarpa*).
5. San Simeon State Beach Park, across California Highway 1 from San Simeon State Park.
6. Grounds of Hearst Castle.
7. Small rock outcrops in grassland 0.6 km east of Washburn campground.
8. Oak stand atop rock outcrop 0.8 km inland from Washburn campground.

Alectoria *sarmentosa* (Ach.) Ach. 1 M, L

Amandinea *punctata* (Hoffm.) Coppins & Scheid. 2, 3 T

Arthonia cf. *dispersa* (Schrader) Nyl. 4 T
Arthonia gyalectoides Müll. Arg. 4 T
Arthonia tetramera (Stizenb.) Hasse 1 T

Arthothelium *orbilliferum* (Almq.) Hasse 2 T

Aspicilia *calcarea* (L.) Mudd 3 T

Bactrospora *sp.* 4 T (*36494*) on Monterey Pine (*Pinus radiata*); tiny, black, lecideine apothecia 0.2-0.3 mm in diameter with plane disk; hyaline hypothecium; brown, granular epithecium; unbranched paraphyses; 3-septate hyaline spores, 17-20 x 2-3 µm, 8/ascus. The asci readily pop out of the hymenium, typical of *Bactrospora* but not of *Lecanactis*, which *36494* was at first thought to be.

Buellia *aethalea* (Ach.) Th. Fr. 3, 5 T

Calicium *glaucellum* Ach. 1 R

Caloplaca *arenaria* (Pers.) Müll. Arg. 3 R, T
Caloplaca chrysophthalma Degel. 6 R
Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth. 3 T
Caloplaca fraudans (Th. Fr.) H. Olivier 6 T
Caloplaca holocarpa (Hoffm. *ex* Ach.) M. Wade 2, 6 R, T

Candelariella *coralliza* (Nyl.) H. Magn. 1, 3 D
Candelariella vitellina (Hoffm.) Müll. Arg. 6 T

Chrysothrix *candelaris* (L.) J.R. Laundon 2, 4 R, T

Cladonia *macilenta* Hoffm. 1 L, R
Cladonia ochrochlora Flörke 1 D

Cliostomum *griffithii* (Sm.) Coppins 1, 2 T

Collema *furfuraceum* (Arnold) Du Rietz 6 R, T

Dimelaena *radiata* (Tuck.) Müll. Arg. 3 R, T

Diploschistes *scruposus* (Schreber) Norman 7 R

Diplotomma *alboatrum* (Hoffm.) Flotow 1, 4 T

Evernia *prunastri* (L.) Ach. 1 T 6 D, R

Flavoparmelia *caperata* (L.) Hale 1, 6 T, D, R

Flavopunctelia *flaventior* (Stirton) Hale 1 T, D; 6 D, L, R

Hyperphyscia *adglutinata* (Flörke) H. Mayrh. & Poelt 8 R

Hypocenomyce *sp.* 2 T

Hypogymnia *enteromorpha* (Ach.) Nyl. 1, 4 T
Hypogymnia inactiva (Krog) Ohlsson 1 D

Lecanactis *sp.* 5 T (*36496*) On rock. Dark brown, convex apothecia; disk and exciple same color; hypothecium hyaline; epithecium brown; paraphyses unbranched, septate; spores 1-septate, hyaline, 12.6-17 µm long, 8/ascus.
Lecanactis sp. 2 T (*36495*) Thin, pale green crust, on Monterey Pine (*Pinus radiata*). Tiny, black, plane apothecia; spores 3-septate, hyaline, 14 x 4-5 µm, cylindrical cells.

Lecanographa *hypothallina* (Zahlbr.) Egea & Torrente 3 R

Lecanora *caesiorubella* Ach. subsp. *merrillii* Imshaug & Brodo 1 R, T
Lecanora expallens Ach. 1 R
Lecanora muralis (Schreber) Rabenh. 7 R
Lecanora cf. *rupicola* (L.) Zahlbr. on rock 5 T
Lecanora sp. 1 T (*36487*) A pale crust on pine. Apothecia pale yellow, to 1 mm in diameter; disk dull, light brown; exciple narrow, pale.
Lecanora sp. 4 T (*36499*). On pine twig. A pale crust with apothecia to 1 mm in diameter; disk dull light brown; exciple narrow, pale.
Lecanora sp. 2 (*36500*), 6 T. On twigs of Monterey Pine (*Pinus radiata*). A matte, pale green crust with apothecia to 0.8 mm in diameter; disk pale yellow-orange; exciple thin, pale yellow, flush with or slightly raised above disk.
Lecanora sp. 6, T (*36538*). On oak. A white crust with apothecia to 1 mm in diameter; disk black with thin, white, raised exciple.
Lecanora sp. 2? T (*36501*). On *Baccharis pilularis*. An inconspicuous gray crust with apothecia to 1 mm in diameter. Disk sunken, yellow-tan; exciple raised, narrow, white, contrasting with the disk.
Lecanora sp. 6 T (*36539*). On live oak. Apothecia to 1 mm in diameter; disk light to medium brown, shiny. Exciple raised, white, smooth, contrasting with the disk.

Melanelia *elegantula* (Zahlbr.) Essl. 6 T

Opegrapha *herbarum* Mont. 1 T

Parmelia *sulcata* Taylor 6 R, T

Parmotrema *chinense* (Osbeck) Hale & Ahti 1, 6 T, L, R
Parmotrema hypoleucinum (Steiner) Hale 1 R

Pertusaria *amara* (Ach.) Nyl. 1 R, L
Pertusaria leioplaca DC. 2 T

Phaeophyscia *cernohorskyi* (Nádv.) Essl. 6 T

Physcia *adscendens* (Fr.) Oliv. 6 T, D
Physcia aipolia (Ehrh. *ex* Humb.) Fürnr. 6 T
Physcia cf. albinea (Ach.) Nyl. 3 T
Physcia callosa Nyl. 3 R
Physcia dubia (Hoffm.) Lettau 3 R
Physcia tribacia (Ach.) Nyl. 3 R

Physconia *isidiigera* (Zahlbr.) Essl. 6 R, T

Pleopsidium *chlorophanum* (Wahlenb.) Zopf 3 T

Pyrrhospora *quernea* (Dickson) Körb. 1, 4 R, T

Ramalina *canariensis* J. Steiner 1 T
Ramalina farinacea (L.) Ach. 1 D, M, R
Ramalina fraxinea (L.) Ach. 1 T
Ramalina leptocarpha Tuck. 1 T, M, L, R
Ramalina menziesii Taylor 1 T, D, L, R
Ramalina pollinaria (Westr.) Ach. 1, 2 D, R
Ramalina subleptocarpha Rundel & Bowler 1, 6 T

Rimelia *reticulata* (Taylor) Hale & Fletcher 1 D

Rinodina *hallii* Tuck. 6 R, T
Rinodina luridata (Körber) H. Mayrh., Scheid. & Sheard 5 T
Rinodina santa-monicae H. Magn. 6 T

Sigridea *californica* (Tuck.) Taylor 1, 4 R, T

Teloschistes *chrysophthalmus* (L.) Th. Fr. 6 D, M
Teloschistes exilis (Michaux) Vainio 1 T
Teloschistes flavicans (Sw.) Norm. 1, 6 M, R

Tephromela *atra* (Hudson) Hafellner 3 R

Thelomma *santessonii* Tibell, a chemical variant of *T. mammosum* (Hepp) A. Massal. 3 R, T

Trapelia *involuta* (Taylor) Hertel? 6 T (*36540*). A crust of pale greenish to white subsquamulose areoles. On pebbles on loose soil bank. Lecanorine apothecia

0.5 mm in diameter; disk reddish-grey; exciple pinkish grey, slightly raised above disk; hypothecium and epithecium pale tan, the latter granular; paraphyses unbranched; spores hyaline, 1-celled, 22.4-24 x 9-10.5 µm, thin walled, 8/ascus.

Unknown sterile crust 2 T (36491) on fencepost. Grey-green squamules to 0.5 mm diam., C-, parasitized with fungus having brown conidia in chains.

Usnea *arizonica* Mot. 6 L, M, R
Usnea cornuta Körber 2 D
Usnea rubicunda Stirt. 1 T, D, L, R
Usnea wirthii Clerc 6 T
Usnea sp. 1 T (*36523*). Smooth, shiny; inflated-constricted; papillate on main branches; soralia containing some isidia; cortex and medulla white.
Usnea sp. 6 T (*36551B*). Tiny, tufted; abundant black-tipped fibrils on main axis; no propagules.

Vermilacinia *cephalota* (Tuck.) Spjut & Hale 1, 4 R, T
Vermilacinia combeoides (Nyl.) Spjut & Hale 3 R

Verrucaria *aethiobola* Wahlenb. 3 T
Verrucaria maura Wahlenb. 5 T

Xanthoparmelia *coloradoënsis* (Gyelnik) Hale 6 D
Xanthoparmelia cumberlandia (Gyelnik) Hale 3 R, T
*Xanthoparmelia mexicana (*Gyelnik) Hale 3 R

Xanthoria *candelaria* (L.) Th. Fr. 2, 3 M, R
Xanthoria mendozae Räsänen 2 T
Xanthoria polycarpa (Hoffm.) Rieber 6 R, T

Nomenclature is according to Esslinger (1997).

This list of collections was compiled by:

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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 fast do lichens grow?
Answer: This is one of the most frequently asked questions. There is no short answer. First, different species grow at different rates, foliose and fruticose species growing faster than crustose ones. Second, climate, altitude, and substrate affect lichen growth. Third, growth rate changes with the age of the lichen, and is greater with young individuals. In crustose species in the far north the period of rapid lichen growth has been estimated to last 300 years for *Rhizocarpon geographicum* (Webber & Andrews 1973). But "rapid" is still only 14 mm in a century, slowing down to 3 mm in a century during the "linear phase."

Here are some further results from investigations of lichen growth rates:

Growth rates of young and old lichen thalli for several species, mm/yr (Gilbert 2000):

	Young thalli	Old thalli
Foliose species		
Peltigera canina	17	
Lobaria pulmonaria	16	
Parmelia sulcata	4.8	
Xanthoria parietina	3.1	0.12
Crustose species		
Verrucaria nigrescens	1	0.27
Lecanora muralis	2.14	

Hale (1974) lists similar rates, although he has *Peltigera canina* growing much slower. The record for *Ramalina menziesii,* a pendent fruticose species, varies from 11 to 90 mm in a seven month period. That is extremely fast for a lichen. The difference between the two measurements reflects the fact that long, pendent lichens are hard to measure because they stretch when wet.

2. Question: How many lichens are endemic to California?
Answer: I could not find an official up-to-date list, but the following lichens are thought to be restricted to California:

From Hale and Cole (1988): *Bryoria spiralifera* and *Edrudia constipans* (Farallon Islands). From Cherie Bratt, Santa Barbara Botanic Garden: *Sulcaria isidiifera, Ramalina puberulenta, Niebla tuberculata* from California as a whole, and *N. ramossisima* and *N. dactylifera* from the Channel Islands. Readers having more information on this subject are encouraged to send comments and additional names to me at doell@slip.net, or to the Bulletin.

3 .Question: What name would you give a lichen fungus before it had found and latched on to its alga and taken on its particular shape?
Answer: It would be given the name of the lichen preceded by "Mycobiont of" (=fungal partner) if that could be identified. It is theoretically possible to identify a fungus by extracting the fungal DNA and matching the sequences obtained against sequences derived from previously identified fungi. Whether a match could be effected would depend on the availability of DNA sequences from the appropriate lichen.

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News and Notes

(Compiled by Judy Robertson)

Donors and Sponsors

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

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CALS Annual Meeting, 1999

The CALS Annual meeting of 1999 was notable for good fellowship, fine food, and a memorable slide lecture by Barbara Lachelt. After a day spent observing lichens in the wild at the San Francisco Watershed, we repaired to the classrooms at San Francisco State, where the more seasoned CALS members dickered over taxonomy, and the newcomers marveled at the intricacies of lichen morphology as revealed by the microscope. Following a delicious potluck dinner, we were treated to "A Lichen Scrapbook," in which Barbara Lachelt showed us what she has learned about lichens during her peregrinations, which have included Alaska, where her family has a cabin.

Barbara was able to appreciate Alaska not only as a dramatic landscape but as a lichen paradise. A snow cover actually protects lichens, while allowing them to photosynthesize. In the tundra, the water-retentive sphagnum mosses create an ideal habitat for many showy lichens. A once lush patch of the lichen, *Peltigera aphthosa*, appeared to have died, but revived spectacularly when water was poured on it. Barbara also takes a great interest in the chemical extremes of the substrates on which lichens can grow from very acid to quite alkaline. Since lichens can absorb but cannot excrete substances, they are very sensitive to toxins such as heavy metals. We saw dramatic photos showing the lethal effects of a bronze survey marker, lead letters in a gravestone, and zinc-galvanized fence wire: on otherwise lichen-rich substrates, the metallic downwash zones were free of lichens. Barbara even showed an abandoned '72 Datsun which sported a dense thatch of lichens, including *Candelaria* and *Flavoparmelia*. Again, the areas around the chrome trim were bare. Some lichens prefer to grow on rocks with bird droppings on them, and *Texosporium sancti-iacobi* was found growing on rabbit fecal pellets.

The show also focused on lichen morphology, with slides showing the similarity of the fruiting body (the ascocarp) of orange peel fungus to the apothecium of a lichen. We also saw a lichenized basidiocarp, *Omphalina*, with a

relatively large fruiting body and tiny thallus. Barbara's slides illustrated many aspects of lichen ecology. There was *Nephroma laevigatum* browsed by slugs, exposing the bright orange medulla while a caterpillar with camouflage coloration matched a *Flavopunctelia*. Many birds incorporate lichens into their nests, and both caribou and feral sheep forage extensively on lichen. Humans have used lichens for medicine and dyes. People have eaten lichens as a survival food, but the lichens may first need to be boiled to remove substances which are unpalatable if not toxic. The last slide brought us back to Alaska, with a dramatic combination of miniature, red-leaved manzanita, loganberry, and the white lichen *Cladina*.

Lori Hubbart

SFBANHOD - the San Francisco Bay Area Natural History Observational Database

There is a move afoot, spearheaded by Jack Laws, manager of field studies at the California Academy of Sciences (CAS), to collect all the observational data available on the natural history of San Francisco into a single on-line database of natural history observations for the city and county of San Francisco made by amateur and professional scientists. It will include results of rigorous field investigations, historical information, collection records, and anecdotal observations, and will be publicly accessible for education, research, and conservation management. The observations will be geo-referenced and incorporated into the ArcView geographic information system (GIS) used by the city, CAS, and the National Park Service. Sensitive data will be flagged and not available to the general public.

The initial boundary for the project is the San Francisco city and county line (including observations on the Bay and ocean). When the system has proven successful, these boundaries will expand to include all the counties bordering San Francisco Bay.

At the second meeting on March 27, 2000, a discussion of which data categories or "fields" would be desirable led to the following list: observer, group affiliation, species name, date, time, number seen, habitat type, sensitivity (whether or not the observation should be made available to the general public), percent certainty of.the observation, comments, and fields specific to individual taxa. Representatives of collaborating organizations were to e-mail a list of appropriate data fields for their taxa of expertise. Participating organizations were also encouraged to discuss and report on funding availability from their organizations to help support the project. An on-line discussion group/listserver was set up. To join, anyone interested may send an e-mail to: sfbanhod-subscribe@egroups.com.

CALS member Marck Menke attended the initial meeting, and Bill Hill the second meeting, and we are tentatively willing to assist the project with data on lichens. Other organizations with representatives attending included the California Academy of Sciences, San Franscisco State University, City College of San Francisco, San Francisco Recreation and Parks Department, Golden Gate Audubon Society, and the San Francisco Mycological Society.

Bill Hill

Spring Lecture Series

David Magney on "Rare and Endangered Lichens"

Protecting our California rare and endangered lichens is a topic of technical and legal definitions, a maze of laws, and education. David Magney navigated it in detail at our monthly Wednesday evening lecture on February 16, 2000. He began with various definitions and then launched into a review of the laws involved, both (California) state and federal, with examples of cases from his personal experience where lichens figured importantly in the decisions. As David put it, "the Ventura Board of Supervisors now knows what a lichen is!" as a result of his testimony as environmental consultant in Ventura County.

At the state level, we in California are fortunate to have some relatively rigorous laws, which many states lack and which are even more protective than the federal laws. Little used for conservation purposes, but one of the most powerful tools to preserve our biological resources, is the General Plan Law. All land use plans in California must comply with the General Plan Law. In connection with "conservation and open space elements" developers must consider lichen-related impact of projects. We have a voice when such clearly written policies are violated. We

have both state (California Environmental Quality Act, CEQA) and federal (National Environmental Policy Act, NEPA) decision making or impact assessment laws, each with its strengths and weaknesses.

With CEQA, two kinds of documents can be prepared: environmental impact reports (EIRs) for projects that will have a significant impact on the environment and "Negative Declarations" for projects where it is thought that no significant impact will result. However, no state agency is empowered to enforce CEQA, so it can only be "publicly enforced" through lawsuits by organizations like the California Native Plant Society (CNPS) or CALS. CEQA EIRs require mitigation for any impact found, while a NEPA environmental impact statement (EIS) does not, and the threshold for "impact significance" requiring investigation is much higher for NEPA than for CEQA. Under NEPA the (federal) Fish and Wildlife Service, Bureau of Reclamation, etc. generally avoid doing a more costly EIS in preference to using Environmental Assessment (EA), which is for federal projects that do not result in a significant impact, but do require impact mitigation.

Finally, there is the California Endangered Species Act (CESA) as well as a federal Endangered Species Act (ESA), by which lichens can be listed as threatened and endangered through petitions to the California Fish and Game Commission or the US Fish and Wildlife Service. Here a candidate is fully protected under the California law but not the federal, and under federal law plants are not protected from "take" on private property.

David stressed the fact that to conserve lichens we must "educate, research, and publish." Lichen articles, symposia, lectures, hikes and field trips all help create an informed public, which agencies and the politicians cannot ignore so easily. To be fully informed about our lichen flora we need scientific research and publication as well as layman articles, videos, etc., on subjects such as lichen ecology, taxonomy, distribution, rarity and endangerment, and population trends. We need to publish a California lichen flora and to train botanists in lichen identification. Even designating a state lichen (*Ramalina menziesii*?) would help -- after all, there is a state tree, rock, even a mollusk! (the banana slug - promoted by the girl scouts): why not a state lichen?

To get agencies to consider California lichens in connection with environmental impact, we must educate, pester, and, if necessary, sue them: we must show that we are serious. We must work to include lichens for assessment in state EIRs, and that means lichen surveys must be done. In this connection an official list is extremely important, and a formal organization like CALS carries more weight than individual botanists. Under the federal NEPA, species not actually listed with an agency are ignored. Only *Cladonia perforata* in Florida is on the federal list. That the Forest Service in Oregon under some of the timber plans has had to include impact to lichens, is a big step forward.

Not long ago even vascular plants were not surveyed. Not many of the California forests have permanent botanists, but there were none a few years ago. We hope there will soon be state lichenologists.

We ended with a discussion of how rarity and endangerment is determined for lichens. While rarity and endangerment categories for vascular plants have been developed for some time, these are just beginning to be considered for lichens. We are developing a preliminary list now for California (see it at http://ucjeps.herb.berkeley.edu/rmoe/cals.html). We will need to continue refining it with input from the many professionals worldwide with information on California lichens as well as with information from local workers and observers.

The evening was made even more informative by the experience and concern brought by many of the people present: botanist Cheryl Beyer from Nevada City, Lawrence Janeway from the Chico State herbarium and Department of Environmental Resources in Red Bluff, David Schooley of San Bruno Mountain Watch, Scott LaGreca visiting from the Farlow Herbarium at Harvard, as well as several people from more local herbaria, and members from various chapters of the California Native Plant Society (CNPS). It was an instructive evening regarding how much work we have to do.

Bill Hill

Mona Bourell Talks About Mosses

At the March 15 CALS lecture meeting at the University Herbarium, UC, Berkeley, Mona Bourell gave an excellent introduction to mosses. Mona, a founding member of CALS, is Senior Curatorial Assistant in the Department of Botany at the California Academy of Sciences in San Fran-

cisco, and has been working with mosses for 20 years.

After touching on plants which are not mosses, such as Spanish moss (a bromeliad), and Reindeer moss (a lichen), Mona went on to describe a true moss, which, unlike lichens, is a member of the plant kingdom. In addition, mosses are grass green, whereas lichens are grayish or yellowish green. Both are non vascular and produce spores instead of seeds.

Mona gave a brief overview of the general aspect of mosses, including the difference between acrocarpous mosses which grow upright and form cushions, and pleurocarpous mosses which are more flat and spreading. She also described the moss life cycle and a number of the structures which must be examined microscopically for identification, such as leaf cell shapes and the details of the spore capsules. Excellent slides illustrated these points and helped introduce many of the commoner mosses by name. Moss habitats, which the mosses often share with lichens, and some uses of mosses, were also briefly reviewed.

Following Mona's lecture, refreshments were served in the Herbarium lobby.

Janet Doell

Algae, in and out of Lichens

Dr. Richard Moe, phycologist at the University Herbarium, University of California, Berkeley, and past editor of the Bulletin of the California Lichen Society, addressed an audience of almost 20 people, many of whom were members of the San Francisco Microscopical Society invited by CALS member Mikki McGee, on the nature of the algae that are photobionts of lichens -- and those that are not. It was a grand discussion, with many questions from the group answered by Dr. Moe.

"Algae," now a convenient collective term of no taxonomic significance, was once a name used for simple photosynthetic organisms with neither conducting tissues, nor sterile tissues about the reproductive structures. Now the several former classes are considered to be unrelated. Cyanophyta, in fact, is now considered to be bacterial: the Cyanobacteria group. Dr. Moe briefly discussed changes in taxonomy over the last 30 years and proceeded to show that, of the 100 species of algae known to be photobionts of lichens, 90% are green algae, about 10% are cyanobacteria, and a few are species of yellow green algae (Xanthophyceae). One brown alga (Phaeophyceae) is photobiont in the intertidal marine lichen, *Verrucaria tavaresiae*, known from San Francisco Bay and other places along the California coast.

Photobionts may be very difficult to identify even to genus, partly due to the changes they undergo in the lichenization process and also partly due to the uncertainty that the alga is a photobiont at all and not merely an aerial or soil species with an accidental presence in the lichen thallus. In older herbarium specimens, it is nearly always impossible to identify the photobiont due to deterioration of the characters.

In addition to their role in lichens, algae occur in numerous symbiotic relationships with plants and animals. Free living species are found in very diverse habitats in both tropical and temperate areas, from the green "red-snow" alga and ice-floe species through the aerial species of tree-tops and rocks. Aquatic algae occur in fresh water and to 200 meters deep in the clearest oceans. They are common within rocks and in the soil. In size they range from a few microns to the giant kelp in beds off California's coast. They are truly a diverse and interesting group, even apart from their occurrence in lichens.

Mikki McGee

The Usnea-eating Snub Nosed Monkey

This presentation was made May 17, 2000, by Dr. Nina Jablonski, Chair of the Department of Anthropology and Curator at the California Academy of Sciences, San Francisco. She has published many articles in various journals, written a number of books and special publications, and is associate editor of Perspectives in Human Biology and of the Journal of Human Evolution. In 1998 she was awarded the Fulbright Senior Scholarship for teaching and research in Nepal. It was that research that brought her to CALS, as she has spent many years studying *Rhinopithicus bieta*, the Usnea-Eating Snub Nosed Monkey. In a fascinating talk, Dr. Jablonski explained the place of Snub Nosed Monkeys in the Colobine Monkey Group, made up of fruit-eaters, gum-eaters, insect-eaters, and leaf-eaters. The Snub Nosed is in the leaf-eating group with the adaptations of fore-stomach for fermentation and sharp-edged teeth to cut through vegetation. These leaf-eating monkeys may spend up to 25% of their day with a full gut, digesting their high cellulose meals. The Snub Nosed is one of 4 species

living in the high mountains of Southwest China in relict populations isolated after the last Ice Age. The species lives at altitudes from 3500 to 4500 meters in coniferous forests mixed with some oak habitats.

Dr. Jablonski showed slides of these lovely animals, some in small groups, adding that they will aggregate in groups of up to 3000. Lichens are their primary food throughout the year. In addition to eating the fruticose lichen *Bryoria nepalensis* (80% of their diet) and *Usnea*, probably *U. longissima* (20% of their diet), they also eat foliose lichens from tree branches and foliose and crustose lichens on rocks. They can be seen on steep rock ledges, sunning themselves and scraping lichens off the rocks. Dr. Jablonski's slides showed rock surfaces scraped from the tearing away of lichens. A close relative of *Rhinopithicus bieta*, *R. roxallana*, has a diet consisting of 20% lichens, eaten primarily in winter. In captivity, these monkeys adapt to a leafy diet containing no lichens.

There are less than 1000 *R. bieta* individuals remaining in the wild. Their habitat is threatened because their foraging habits are to strip an area of their lichen food source and then move on to a new area, constantly traveling. Clear cuts from logging are barriers to this constant movement. Dr. Jablonski feels the increased environmental awareness of the Chinese people coupled with the influence of the scientific community there may help to save the Snub Nosed Monkey. Dr. Jablonski, whose enthusiasm was very evident, has many other aspects of *Rhinopithicus* biology which she wants to study, for example, how the monkey manages to successfully chew the rather elastic fruticose lichens. She states that few of the lichen species in their diet have been identified.

Judy Robertson

CONGRATULATIONS!

CALS was granted non-profit status at its inception in 1994, but government regulations stated that we needed to apply for permanent exempt status after a 5 year period. In 1999 we again filed and 5013C status was granted to us. We had to submit a detailed description of our activities and finances for each year. CALS would like to thank Janet Doell who faithfully kept a 'Captain's Log' of all CALS activities and Bill Hill who converted all the finances into detailed Excel spreadsheet files. Their dedication was instrumental in obtaining our exempt status.

Workshops

Identification of Lichens,March 25, 2000

Twelve lichenologists took part in this workshop. After some basic information about lichen classification and morphology by Judy Robertson, a variety of keys were provided for participants to identify their own lichen specimens. Mentor CALS members Janet Doell, Bill Hill, Barbara Lachelt, and Judy Robertson helped the others identify their specimens. We took a tour of the SFSU herbarium where Janet talked about curation and the card file catalog of lichen collections at SFSU (which CALS would very much like to render into an electronic database and put on-line: ed.'s note). The workshop ended at 4 pm. All present left with improved identification skills as well as newly identified lichen specimens. Participants were Tony Alexander, Bill Ferguson, Janet Doell, Debbie Gillespie, Bill Hill, Barbara Lachelt, Melinda Green, Boyd Poulsen, Patty Raggio, Grace Wilson, Dr. Micha Miller, and Judy Robertson.

Field Trips

Stebbins Cold Canyon Reserve

This field trip, originally scheduled for February 26 and canceled due to rain, took place on Sunday, March 26. Stebbins Cold Canyon Reserve is part of the UC Reserve system and is located on Highway 128 west of Vacaville between Blue Ridge on the west and Pleasant Ridge on the east. Members of the Davis Botanical Society met with CALS members at the fire gate leading into the Reserve. The day was warm and sunny, and the lichens had to compete with blooming wildflowers and trees in leaf. We started at a shady spot under oaks with some introductory information about lichen classification and morphology. We then moved to designated stops along the trail, highlighting a different aspect of lichen biology at each one. At our stop by the *Xanthoparmelia* rock, we heard about lichen competition and succession. At the next stop, a large rock covered with a variety of crustose and squamulose lichens, we flagged over 20 species of lichens. Next, we stopped where *Evernia prunastri* was growing on an oak branch and talked about the many uses of lichens. This area is inland from coastal fog influence and experiences dry summers. Crustose lichens and foliose species of *Physcia*, *Physconia*, *Phaeophyscia* and *Melanelia* predominate in the reserve. Fruticose species were uncommon in the areas explored. Also, a fire passing through the area in the 80's must have influenced the species and numbers we encountered. After

a lunch beside the creek, we observed *Diploschistes sp.* parasitizing *Cladonia sp.* Later in the afternoon a few of us hiked the west side of the canyon. Higher and away from the creek, we observed beautiful displays of *Pleopsidium*, *Xanthoria*, and numerous crusts. Several drainage areas on the rocks were covered with Peltulas, including *Peltula euploca*. A list of the lichens collected will appear in a future bulletin.

Participating were Don and Nancy Crosby, Janet and Richard Doell, Bill and Stevie Ferguson, Bill Hill, Glen Hulstein, Barbara Lachelt, Marck Menke, Lynn Narlesky, Boyd Poulsen, Judy and Ron Robertson, Margie Sing, and Irene Tanjeta.

Judy Robertson

Rock Springs

On April 8, 2000, with a stiff wind blowing fog across the landscape, Barbara Lachelt led a field trip to the Rock Springs area on Mount Tamalpais. In attendance were Tony Alexander, Bill and Stevie Ferguson, Bill Hill, Judy and Ron Robertson, and Elizabeth and Leonard Rush. Barbara noted that the last fire here was in 1928 and that the landscape could change drastically with fire. She provided a list of lichens which she found here in the past and commented on the fact that some had not been re-found recently. A nice aspect of her list was a mnemonic 'translation' of lichen names, such as *Candelaria concolor* = (brilliant) (same above and below), *Parmelia sulcata* = (shield) (grooved), *Flavoparmelia caperata* = (yellow + shield) (wrinkled). This was a true 'lichen hike' in that we covered only about 1 mile total distance, all in the vicinity of the parking lot! It is a great place to bring beginners, although perhaps a little overwhelming with its lush diversity of lichens on rocks, trees, and soil. Ron observed that the lichen flora of the south facing open rocky areas we visited (elevation 600 m, about 3 km from the ocean visible below at the base of Bolinas Ridge) was reminiscent of Napa County further inland. On rocks on the grassy slopes to the south of the road junction and parking lot we found the expected saxicolous species *Umbilicaria phaea*, *Lecidea atrobrunnea*, *Punctelia stictica*, *Parmelia saxatilis* (isidiate), *Thelomma mammosum* (spores make a black smudge on your finger), *Neofuscelia*, *Stereocaulon*, and several *Xanthoparmelia* and *Aspicilia* species. But there were surprises, and a number of species expected on trees were also on these rocks, such as *Sphaerophorus globosus* and *Hypogymnia tubulosa*. A formal checklist will follow in a future Bulletin.

Xanthoria species colored the tops of many rocks orange. Barbara commented that naturalist Dr. Robert West claimed he could tell the direction of the prevailing winds by looking at a "bird rock" (perch) - the *Xanthoria* would be on the downwind side of the top of the rock, since the sitting birds face into the wind. And wind there was, blowing a bone chilling fog. Noteworthy on the rocks in an otherwise botanically barren serpentine area were a *Xanthoria* with broad, sorediate lobes, possibly *X. fallax*; *Peltula euploca* (the squamules appeared very foliose on this horizontal surface), *Leptochidium albociliatum* (gelatinous with white cilia, on moss), and *Lecania*. There seemed to be *Hyperphyscia adglutinata* on the concrete of a stone bench under a Gold Cup Oak (*Quercus chrysolepis*). On mossy oak tree trunks were *Sticta limbata*, *Parmelia sulcata*, *Punctelia subrudecta*, and *Fuscopannaria leucostictoides*. A *Nephroma* and several other taxa were photographed.

While the rest of us were still looking at rocks and trees, Ron made interesting finds of soil lichens in areas of exposed ground. Moving into the more wind-sheltered Douglas-fir/oak forest toward the Mountain Theater, we found *Pertusaria amara* among mosses on tree trunks; *Sphaerophorus globosus,* especially on the north, shaded side of the trunks; *Lobaria pulmonaria* in a few good colonies up out of reach; *Sticta fuliginosa*, *Pseudocyphellaria anomala*, *Peltigera*, and *Ochrolechia*. Fallen branches and twigs were covered with *Usnea*, *Hypotrachyna revoluta*, *Parmotrema arnoldii* (UV+ in medulla), *Hypogymnia tubulosa*, and *Parmelia sulcata*. Near the trail past the Mountain Theater there was a somewhat sheltered large rock (bearing a plaque) with an impressive array of lichens. On the small shrubby oaks and chamise on a dry south slope beyond this, we found *Hypotrachyna*, *Tuckermannopsis orbata*, *T. merrilllii*, and *Hypogymnia imshaugii* (white medullary ceiling), as well as Usneas. On the way back to the parking lot through the north facing meadow, we found poison oak (*Toxicodendron diversilobum*) completely festooned with lichens, *Leptogium* on the soil in a low area with a seasonal brook, and *Cladonia*, *Parmotrema*, and *Hypogymnia* on wooden signs. *Platismatia glauca* (isidiate with broad lobes, underside white with black center) was prevalent on Douglas-fir trunks, and the mossy rocks under large shading oaks to the north of the parking area were packed with foliose species which we noticed quickly in passing, before we jumped back into our cars with heaters full blast to warm up again.

Bill Hill

Upcoming Events

CALS Fall Workshop Series

The following three workshops will be held at San Francisco State University, 401 Hensill Hall, from 10am to 4pm. Coffee and snacks are provided. Bring your own lunch. Contact Judy Robertson, JKSRR@aol.com or 707-584-8099 if you have questions.

Usnea: Saturday, Sept. 23, 2000
Doris Baltzo, a CALS founding member and long-time volunteer at the UC Berkeley Herbarium, will guide us through *Usnea* morphology and terminology. We will use various keys to identify our Usneas, and identified specimens will be available.

Crustose Lichens: Saturday, Oct. 21, 2000
Judy Robertson will provide a teaching set of crustose specimens as we key together up to 15 different species. We will learn apothecium morphology and sectioning techniques and will examine a variety of spores with the excellent compound microscopes in the SFSU Botany Department lab.

Ascus Staining: Saturday, Nov. 4, 2000
Following instructions in a publication by John W. Thomson, we will practice his technique for staining ascus structure: crustose keys often rely on this character to identify species. We will have the teaching set of crustose specimens available, and you are invited to bring your own specimens to try out this technique.

Keying Lichens: Saturday, Oct. 14, 2000 (**in Santa Barbara**)
Cherie Bratt will be teaching this beginner's class on keying lichens. The class is limited to 8 students and will be held at the Santa Barbara Botanic Garden in Santa Barbara. Contact Cherie at cbratt@sbbg.org, 805-682-4726, ext. 152, or send mail to SBBG, 1212 Mission Canyon Road, Santa Barbara, CA 93105.

CALS will not host a workshop in December. We encourage all members to attend the San Francisco Mycological Society Fungus Fair to be held December 2-3. CALS has a lichen exhibit and often a slide presentation. If you are interested in helping prepare or set up the lichen exhibit, please contact Barbara Lachelt at 415-456-2918.

CALS Field Trips

CALS Field Trip to Hopland: Friday, October 6, through Sunday, Oct. 8, 2000
The Hopland Research and Extension Center is the University of California's principal field research facility for agriculture and natural resources in the North Coast region. Located in the foothills of the Macayamas Mountains of Mendocino County, 2.5 hours from both the Bay Area and Sacramento, the Center has a diversity of soils, plant and animal communities and elevations which make it representative of many parts of the Coast Ranges in northwestern California. It is equipped with a laboratory, library, laundry, and bunkhouse with cooking facility. We will start the first field outing on Saturday morning but housing is available beginning Friday evening. The weekend will end at noon on Sunday. Cost will be minimal (approximately $10 to $12 per day) depending on the number of participants. We will have a pot luck dinner Saturday evening and simple breakfast foods Saturday and Sunday. You will need to provide your own lunches. If you are interested in attending, please contact Stephen Buckhout at yscottie@pacbell.com or 408-255-6233.

Mark your calendars for March 21-23, 2001
CALS will join the Northwest Lichen Guild for their annual meeting to be held in Arcata, CA. Look for more information in the Winter Bulletin.

CALS Field trip to the James San Jacinto Mountains Reserve in Riverside County
Originally scheduled for June 16-19, 2000, this trip was cancelled due to conflict with other events. We will try to reschedule this trip in 2001.

Announcements

Mini-Guide

In an effort to stimulate CALS education and outreach, CALS founders Janet and Richard Doell have just published a wonderful new book, *A CALS Mini-Guide to Some Common California Lichens.* Richard's excellent color photographs are accompanied by Janet's explanatory text in this shirt-pocket volume. Forty-one California lichens are illustrated and described. A succinct introduction to lichens is complemented by a short glossary of terms.

This volume is intended to stimulate interest in those who know little or nothing of the lichens. There is no key, and chemistry and microscopic characters are only briefly mentioned. It is priced at $10.00, tax included, to make it easy to sell at field trips, and its compact size fits neatly into one's collecting bag.

The first printing of 100 copies sold out within a month. The Education/Outreach committee invites contributions from CALS members towards the publication costs of the second printing, planned for July, so that we may continue this worthy program to educate the general public about the wonders of lichens.

If you wish to order a copy, you may do so by sending $12.00, including tax, postage and handling, to Janet Doell, 1200 Brickyard Way #302, Point Richmond, CA 94801.

Lending Library

CALS has established a lending library for use by CALS members. The library is intended to make expensive or difficult to obtain volumes available to the membership. The lending library will be stocked primarily through donations, though interested members can submit suggestions for books to be purchased to the CALS Board. The library's initial stock consists of *How to Know the Lichens*, by Mason Hale (donated by Janet and Richard Doell), and *The Lichens*, by Vernon Ahmadjian and Mason Hale (donated by Greg Jirak and Lori Hubbart). We also obtained a reasonably complete set of the *Bryologist* for the years 1970-1998 from a recent liquidation sale.

The CALS Board has adopted the following rules for the library:

1. Volumes will be lent only to CALS members in good standing. If a volume is in the possession of a borrower who ceases to be a member of CALS, the borrower will return the volume promptly to the CALS librarian, at borrower's expense.
2. Each volume will be registered with the CALS Librarian, who will keep track of current possession of all volumes. Whenever a volume is passed on to a new borrower it is the responsibility of the current borrower to notify the Librarian of the new borrower.
3. Each volume may be borrowed for a minimum of three (3) months. After such period the volume can be returned to the CALS Librarian, or can be kept until requested by another borrower.
4. Each borrower will assume responsibility for shipping charges to return the volume or to pass it on to a new borrower.
5. Each borrower assumes complete responsibility for all volumes borrowed. Should any volume be lost or materially damaged while in the possession of, or in transit from, a borrower, the borrower will be responsible for all costs of replacing the volume.
6. Any borrower who violates the rules of the Lending Library may be denied the privileges of the library at the discretion of the Librarian.

If you wish to donate a volume to the CALS lending library, please contact the librarian, Greg Jirak at 707-882-1655, or gajirak@mcn.org. Your extra copies will be greatly appreciated. If you know of a lichen library that is being liquidated, please let the librarian know so that we might attempt to obtain some of the volumes for our library.

Reference Collection

Remember that CALS has a traveling reference collection of lichens that may be borrowed by members. This collection contains many common, and some unusual, lichens. If you haven't borrowed it yet, you should, as you may find in it specimens you have not seen before. When it comes your way, add a specimen or two, particularly those local to your area. Contact the CALS librarian if you wish to be put on the list of borrowers.

E-mail List

CALS has set up an e-mail list (Lichens@eGroups.com) so that members can easily exchange e-mail about topics of mutual interest. This list is restricted to members of CALS, and invitations to join the group will be sent to all members for whom we currently have an e-mail address. If you don't receive an invitation, but would like to join, please send a message to Greg Jirak at gajirak@mcn.org, or visit http://www.eGroups.com and ask to join the Lichens group.

The service we are using, eGroups.com, also provides us with other on-line facilities. For example, we will be maintaining the lending library's "card catalog" on-line so that list members can easily find out what volumes are in the library, and when each volume will next be available.

We will also use eGroups to maintain an on-line calendar for CALS events. List members will automatically receive notification of upcoming CALS events and can consult the on-line calendar for late changes to event schedules. We will be able to share images of lichens, and exchange other files of interest. However, remember that these services will only be available to the members of the CALS e-mail list, which is only open to active CALS members.

Check out these Lichen Web Sites

The CALS web site has links to these sites: just click on the name of one and you will be taken to it.

From a letter by Philip May and Irwin Brodo to the lichen listserver (Honolulu):

Identifying North American Lichens: A guide to the Literature by Philip F. May and Irwin M. Brodo. http://herbaria.harvard.edu/Data/Farlow/lichenguide/index.html.
This guide to the Literature is an annotated bibliography of works useful for identifying lichens in North America. It is 190 pages long and has two parts: general references and specialized references arranged alphabetically by genus. References are cited for every genus in the North American checklist, including lichen parasites. The Guide cites many unpublished works such as theses, working keys, and translations of foreign works into English. There are also keys and other references available only over the Internet, for which addresses are provided where available. The Guide may be stored on your own hard drive. The HTML file can then be quickly read with any browser such as Internet Explorer or Netscape Navigator or may be converted by most word processors into their own format and saved. The Guide is provided with copious hyperlinks to assist in navigation within the documents. The authors welcome feedback, corrections, additions, and suggestions, which should go to the first author at PFMay@aol.com.

Lichen Name Verifier
http://ucjeps.herb.berkeley.edu/rlmoe/cals.html.
This site can be used to check accepted names and authors of lichens as they appear in the on-line 7th checklist. Follow the instructions on the screen.

Lichen Classes, Workshops, Seminars and Forays
There is now a web site of information on lichen courses and field events. First go to the American Bryological and Lichenological Society web site: http://www.unomaha.edu/~abls/. Then click on "Workshops, Classes, Seminars, and Forays." This listing includes both academic and non-academic classes. Most of the classes and events listed are for the West Coast and New England areas with a few in the Rockies and Great Basin area.

Northwest Lichenologists (NWL)
http://www.proaxis.com/~mccune/nwl.html
This is the site of the Northwest Lichenologists, who are now offering a Lichenologist Certification program. The area of concentration is the Pacific Northwest. The exam includes field and laboratory identification and recognition of rare or listed lichen species. The Web site also lists activities of the NW Lichenologists and gives other information about them.

Red List Page
http://ucjeps.herb.berkeley.edu/rlmoe/cals.html.
This web site, built and maintained by Dick Moe, is interactive: you can report new localities for any of the lichen species listed, with a voucher collection to be transmitted to an expert for verification. This information will be used in formulating a published rare and endangered lichen list for California.

Hunt for *Acarospora epilutescens* Zahlbr.

To CALS members:

I have recently begun work on the yellow members of the genus *Acarospora* of the Sonoran Desert at Arizona State University. I was wondering if on any of your field trips to Palm Springs (or vicinity), you have come across any *Acarospora epilutescens*. There have been some problems associated with this species. Hasse collected the original specimen in 1910 and sent it to Zahlbruckner, who published a description of it. Hasse then distributed duplicates as an exsiccat. To make a long story short, Hasse distributed a brown (thickly pruinose) species under the name of this newly described YELLOW (also thickly pruinose) species: *A. epilutescens*. This caused much confusion. Magnusson, having seen only a brown specimen, placed the species in a list of dubious taxa. Weber recognized the problem and confirmed that the holotype is yellow. Hasse's locality information is sparse: the misidentified exsiccat packets read only "Palm Springs." I found some old maps of Palm Springs and tried to somehow retrace Hasse's steps by driving out there and wandering around. I suspect it was collected on the west side of Palm Springs at the foot of the San Jacinto Mountains, although I did not find it during this first trip. The type was collected on granite and this seems to be an area with a high concentration of that substrate. I am wondering if any of you have come across any extremely pruinose yellow *Acarospora* on your journeys (or for that matter any interesting Acarosporas!)

Thank you,

Robin Schramm
Dept. of Plant Biology, Lichen Herbarium, Arizona State University, P.O. Box 871601, Tempe, AZ 85287-1601
robin.schramm@asu.edu

For Sale

CALS has these items For Sale. Cost of mailing should be added to the listed price:

"Lichens of California" available at reduced price.
Mariette Cole, CALS member and co-author of the book, Lichens of California, has offered to supply members of CALS with this book for $11.00 (tax incl.). If you are interested in a copy, please contact Janet Doell at doell@slip.net or at 510-236-0489.

Hand Lens. $5.00 (tax incl.). These are Waltex 4 x 6 x 10 magnifiers (2 fold-out lenses in a single holder; they are superimposed for the highest magnification). Contact Judy Robertson at JKSRR@aol.com or 707-584-8099

CALS Lichen Poster. $5.00 (tax incl.). This colorful poster features 21 lichen species. You can see a picture of the poster at the CALS Web site. Contact Judy Robertson, as above.

Lichen Identification supplies: Please contact Cherie Bratt at cbratt@sbbg.org, or at 805-682-4726, ext. 152 .

A remembrance of Jennifer Stone

When Jennifer Stone lost her long and courageous battle with breast cancer, CALS lost a great and good friend. I first met Jennifer on a trip to San Clemente Island where she proved to be a gracious and most knowledgeable guide. She loved that island and passed that love on to those of us who visited. Subsequently she worked for the Navy on some of their mainland properties - Point Loma, Mira Mesa and such. Even while undergoing chemotherapy, she struggled to work part time. She was the immediate past president of the San Diego Chapter of the California Native Plant Society. She also was a docent at the Torrey Pines State Park, leading tours and sharing her knowledge. Those of you who were on our first trip to Oregon or on the Santa Cruz Island trip will remember Jennifer as a quiet but valuable member of our group.

In my office I have a snapshot of Jenn. She is standing knee deep in a field of flowers with a big smile on her face - happy doing what she loved best. That is how I want to remember her. But I will miss her greatly.

Cherie Bratt

President's Message

Dear CALS Members,

We are half way into this first year of the new millenium, and CALS has successfully completed some new ventures. Our first Spring Speaker Series held monthly, February through May, brought a good range of interesting topics to members and non-members. We have also formed an Education/Outreach Committee. A first project of the Committee was CALS' sponsorship of a Mini-Guide, a "primer" for California lichen identification. We have also experienced some changes in the Society in these first 6 months. Dick Moe, who has produced the Bulletin since summer of 1997, has taken a different job at the Jepson Herbarium and is no longer able to serve as Production Editor. Darrell Wright will now serve as Senior Editor and Richard Doell as Production Editor. A hearty thank you to Dick for the excellent quality of the Bulletin these last three years. Dick will continue as CALS Web Master and as a member of the Editorial Board. Also, Dr. Isabelle Tavares has announced her resignation from the Editorial Board. A sincere thank you to her for the many hours she dedicated as an editor of the Bulletin. We welcome Dr. Larry St.Clair of Brigham Young University to our Editorial Board. Larry has traveled to California often to lead Jepson Herbarium Workshop Programs.

CALS is enlarging its plans and goals and we need your help. We need a public relations representative to contact local radio stations and newspapers to announce CALS events and to be a liaison between CALS and groups like CNPS, the SF Mycological Society, and the Audubon Society. We need a volunteer to enter the lichen collection at SFSU into a computer database. This collection is one of the largest in the state, and the information stored there would be very helpful in formulating the final Rare and Endangered Lichen List as well as becoming part of the database of California lichens currently being compiled by our database committee. We need more people to coordinate and organize field trips, workshops, and speakers. We would like you to get more involved in CALS. We value your needs and your input to the Society. Please feel free to contact any of the board members with your concerns or willingness to help. The time to preserve California lichens is now, the means is to bring more and more people into the awareness of their diversity, their usefulness and uniqueness in nature. In my area of Northern California I see oak woodlands being torn out to plant vineyards and hillside after hillside of rich lichen diversity being lost. Sometimes a rare plant species may move the project a few miles away, but the destruction still goes on. We must work to make the presence of lichens known and to make developers take them into account. We can do this by educating not only ourselves but reaching out and educating the public and private sectors of our communities. CALS can make a difference. You can make a difference. I encourage you to become more involved now. I look forward to hearing from you.

Judy Robertson

(Notes)

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The apparently undescribed *Xanthoria* species pictured here (x4), referred to by some as the "CALS Mystery Lichen", was first collected by CALS treasurer Greg Jirak near the Wilder Ranch in Santa Cruz County. Subsequently, it has been found by Greg and other CALS members in 14 locations from Santa Cruz County north to Humboldt County. Sterile and fertile specimens are being examined by Dr. Louise Lindblom and Dr. Rosmarie Honegger. If you have more information about this lichen or would like more information, please contact CALS editor Darrell Wright. See also p. 13 in Wright: "Guide to the macrolichens of California: Part 1, the orange pigmented species" in this issue of the Bulletin. Photography by Richard Doell.

(Contents overleaf)