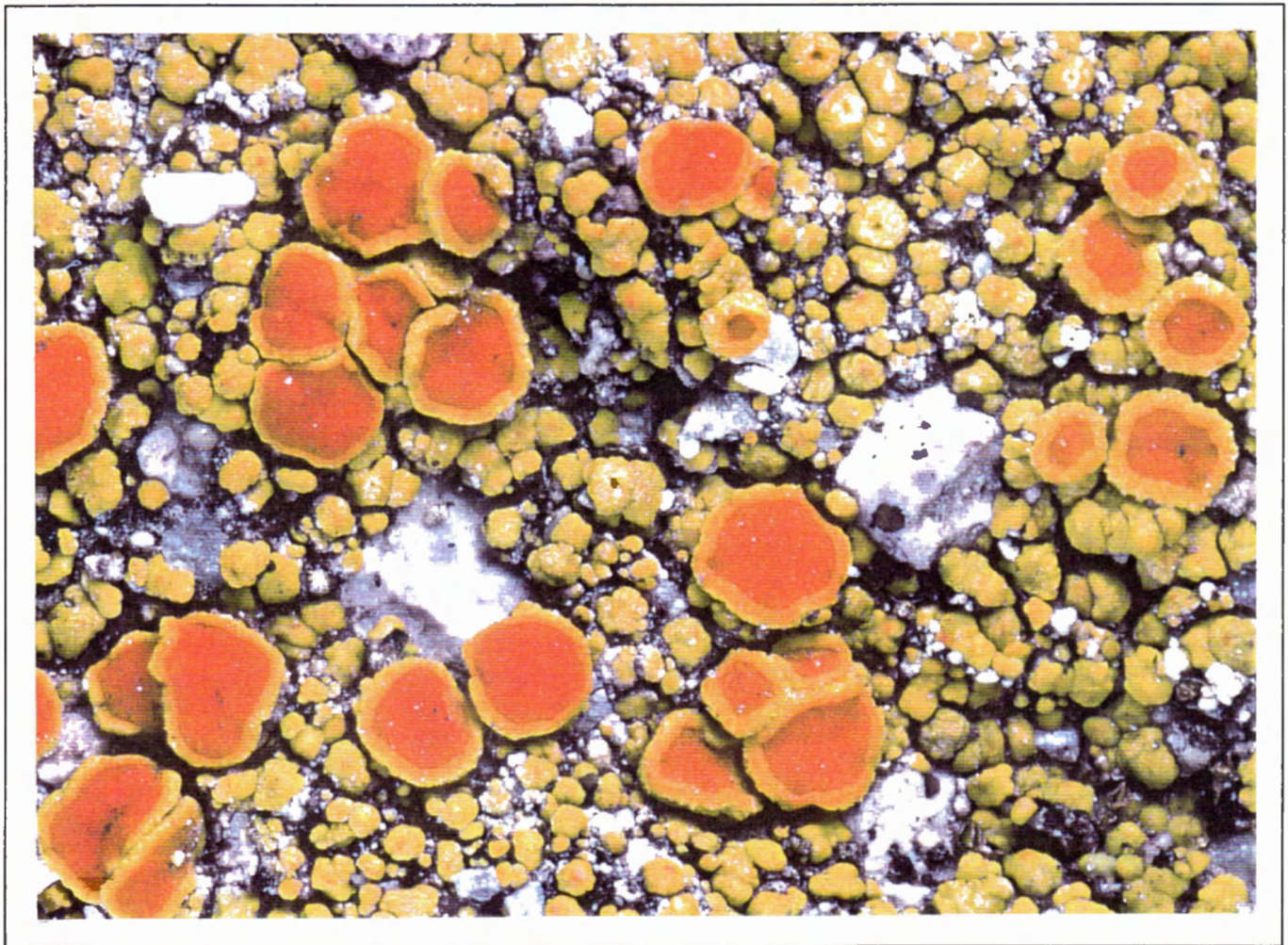


**Bulletin**  
**of the**  
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Volume 4

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The California Lichen Society seeks to promote the appreciation, conservation, and study of the lichens. The focus of the Society is on California, but its interests include the entire western part of the continent. Dues are \$15 per year payable to The California Lichen Society, 1200 Brickyard Way, #302, Point Richmond, CA 94801. Members receive the *Bulletin* and notices of meetings, field trips, and workshops.

The *Bulletin of the California Lichen Society* (ISSN 1093-9148) is edited by Isabelle Tavares, Shirley Tucker, Richard Moe, and Darrell Wright and is produced by Richard Moe. Richard Doell produced the cover of this issue. The *Bulletin* welcomes manuscripts on technical topics in lichenology relating to western North America and on conservation of the lichens, as well as news of lichenologists and their activities. Manuscripts may be submitted to Richard Moe, Bulletin of the California Lichen Society, University Herbarium, 1001 Valley Life Sciences Bldg. #2465, University of California, Berkeley, CA 94720-2465. The best way to submit manuscripts apart from short articles and announcements is by E-mail or on diskette in Word Perfect or Microsoft Word format; ASCII format is a very good alternative. Manuscripts should be double-spaced. Figures are the usual line drawings and sharp black and white glossy photos, unmounted, and must be sent by surface mail. A review process is followed. Nomenclature follows Esslinger and Egan's Sixth Checklist (*The Bryologist* 98: 467-549, 1995). The editors may substitute abbreviations of author's names, as appropriate, from R.K. Brummitt and C.E. Powell, *Authors of Plant Names*, Royal Botanic Gardens, Kew, 1992. Style follows this issue. Reprints will be provided for a nominal charge. The *Bulletin* has a World Wide Web site at the URL <http://ucjeps.herb.berkeley.edu/rlmoe/cals.html>.

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Cover: *Caloplaca bolacina* (Tuck.) Herre, from Santa Rosa Island, California. Photography by Sylvia and Stephen Sharnoff.

# Bulletin of the California Lichen Society

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## Lichens of Cabrillo National Monument, Point Loma, San Diego

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When the lichens of Cabrillo National Monument were surveyed in 1983 (Bratt 1987), 29 species were found. The primary emphasis then was on searching for unusual fruticose species such as *Teloschistes californicus* (then thought to be *T. villosus*) and *Trichoramalina crinita* which had only been reported before 1910. After 1983, as a result of a transplant study and a project to photograph all of the Point Loma lichens, additional species were found. Currently 50 species and infra-specific taxa are known. Ongoing research will undoubtedly raise the count, as several lichen experts have indicated that specimens sent to them are representative of undescribed species.

Cabrillo National Monument covers 144 acres in San Diego County near the tip of Point Loma, which is the northern arm of land bordering San Diego Bay. In the 1850's after the United States acquired California, the need for a lighthouse on Point Loma was evident, and the Old Point Loma Lighthouse was built on top of the ridge at an elevation of 420 feet. Because the old lighthouse was often obscured by dense fog, a new lighthouse was built at the tip of Point Loma near sea level in 1891. The old lighthouse deteriorated and was eventually restored as a national monument to honor Juan Rodriguez Cabrillo, an early California explorer. The land around the lighthouse extends as a strip from the bay side of the point to the top of the ridge and down to the ocean. The original access road to the lighthouse on the bay side is now a trail for foot traffic only extending partway down to the shore. On the ocean side there are trails from a parking lot to tidepools. Vegetation is essentially chaparral with a few oaks and many introduced species, especially near the visitor center.

The following annotated list of lichens reflects current knowledge. Nomenclature follows Esslinger and Egan (1995) for the most part. Indications of abundance refer only to Cabrillo National Monument.

### Acarospora

- geogena* H. Magn.—Medium brown squamules; dark, sunken apothecia; soil consolidator on banks along Bayside Trail; first California record.  
*obpallens* (Nyl.) Zahlbr.—Golden-brown squamules; apothecia darker than thallus; soil consolidator on banks along Bayside Trail.  
*schleicheri* (Ach.) A. Massal.—Dull-yellow squamules; scattered on soil.  
*smaragdula* (Wahlenb.) A. Massal.—Light-brown squamules; dispersed on soil.  
*socialis* H. Magn.—Bright-yellow squamules; reddish-brown, sunken apothecia; on rock; common.

### Amandinea

- punctata* (Hoffm.) Coppins & Scheid.—Tiny black apothecia with inconspicuous thallus; on both soil and shrubs.

### Buellia

- halonia* (Ach.) Tuck.—Greenish-yellow thallus with black prothallus; on rocks throughout the Monument.  
*oidalea* (Nyl.) Tuck.—Greenish-yellow thallus with black apothecia; on trees and shrubs throughout the Monument.  
*stellulata* (Taylor) Mudd—Grayish-white thallus with black apothecia; on rocks; common.

### Caloplaca

- bolacina* (Tuck.) Herre—Orange inflated areoles with darker orange apothecia; on both soil and rock.  
*fraudans* (Th. Fr.) H. Olivier—Orange apothecia with a pale orange rim; no apparent thallus; on soil and unconsolidated sandstone; found only on the Bayside Trail.  
*luteominia* (Tuck.) Zahlbr. var. *luteominia*—Tiny scattered areoles on both soil and rock.

### Catapyrenium

- lachneum* (Ach.) R. Sant.—Large brown squamules with dark rim; on soil on ridge below the lighthouse on the bay side.

**Chrysothrix**

*candelaris* (L.) J.R. Laundon—Bright-yellow powdery lichen on the bark of trees and shrubs.

**Cladonia**

*chlorophaea* (Flörke ex Sommerf.) Sprengel—Pale greenish-yellow squamules with sorediate cups on podetia; on soil.

*pocillum* (Ach.) Grognot—Small squamules densely packed, forming large mats over soil; infrequently with podetia ending in squamulose cups; turning bright green when wet; most common *Cladonia* at Monument.

*scabriuscula* (Delise) Nyl.—Large squamules with podetia densely covered with small squamules; easily distinguished from previous species of *Cladonia*.

**Dimelaena**

*radiata* (Tuck.) Hale & Culb.—White crust with lobed margins; black pruinose disks; most common white crust on rocks.

**Diploicia**

*canescens* (Dickson) A. Massal.—White foliose thallus with eroded sorediate central area; closely adnate on trees and shrubs; uncommon.

**Dirina**

*catalinariae* Hasse f. *sorediata* Tehler—Thick, white crustose thallus with abundant soralia; on rocks on ocean side of ridge; taking on a pink tinge when wet.

**Flavoparmelia**

*caperata* (L.) Hale—Large, greenish-yellow, foliose thallus on trees and shrubs; as *Pseudoparmelia caperata* in Bratt (1987).

**Lecania**

*brunonis* (Tuck.) Herre—Inflated brown globules with dark apothecia; on soil or soil over rock; uncommon.  
*fructigena* Zahlbr.—Light-brown inflated globules with dark apothecia; on soil; uncommon.

**Lecanora**

*caesiorubella* Ach. subsp. *merrillii* Imshaug & Brodo—White crust with large, white-rimmed apothecia; on oaks; most common white crust on oaks.

**Lecidea**

*Lecidea* cf. *auriculata* Th. Fr.—Large, black apothecia with sinuous rims; no apparent thallus; on rock.

**Lecidella**

*asema* (Nyl.) Knoph & Hertel—Greenish-yellow, minutely beaded or fissured crust with black apothecia; on rock; common; as *L. elaeochromoides* subsp. *subincongrua* in Bratt (1987).

**Leprocaulon**

*microscopicum* (Vill.) Gams ex D. Hawksw.—Minutely fruticose, greenish-yellow thallus; forming large patches along the Bayside Trail as well as on flatter surfaces on both sides of the ridge.

**Leproloma**

*Leproloma* sp.—Small, white, soil crust with raised lobe margins; not fertile; as *Siphula* in Bratt (1987).

**Mobergia**

*angelica* (Stizenb.) H. Mayrh. & Sheard—Greenish-gray thallus; rimmed, black apothecia; on soil over rock.

**Niebla**

*laminaria* Spjut—(Sida, Bot. Misc. 14:112. 1996) Stiff, greenish-yellow thallus with several branches, broad and twisting; on rock on ocean side; named for the resemblance of the thallus to the blades of the kelp *Laminaria*.

*testudinaria* (Nyl.) Spjut—(Sida, Bot. Misc. 14:140. 1996) Brittle, greenish-yellow thallus with several branches, reticulately ridged; apothecia terminal and subterminal; pycnidia on marginal ridges; on rock on ocean side.

**Ochrolechia**

*Ochrolechia* sp.—Thick white crust; flesh-colored apothecia with broad rims; on trees and shrubs.

**Parmotrema**

*hypoleucinum* (Steiner) Hale—Broad-lobed, gray foliose thallus; suberect lobes with white underside; on oaks and shrubs.

**Peltula**

*euploca* (Ach.) Poelt—Small, brown, peltate squamules with sorediate rims; on rocks; uncommon.

**Pertusaria**

*flavicunda* Tuck.—Thick, greenish-yellow crust with concolorous apothecia; on rock.

*santamonicae* Dibben—Thick white crust; flesh-colored apothecia with centers appearing gelatinized; on oaks and *Euphorbia misera*.

*Pertusaria* sp.—Similar to species above, but thallus more yellowish; asci eight-spored rather than one-spored; on oak; probably an undescribed species.

#### Physcia

*phaea* (Tuck.) J.W. Thomson—White, foliose thallus with white spotting; adnate on rocks; ocean side of ridge.

*tenella* (Scop.) DC. subsp. *tenella*—Narrow-lobed, small, white, foliose lichen; long-ciliate margins with soredia on underside; on shrubs.

#### Polysporina

*simplex* (Davies) Vězda—No apparent thallus; tiny black apothecia; on rock.

#### Pyrrhospora

*quernea* (Dickson) Körber—Dull golden-yellow, powdery crust with reddish-brown apothecia; on trees and shrubs; as *Protoblastenia quernea* in Bratt (1987).

#### Rinodina

*conradii* Körber—Dark, greenish-gray crust growing in small mounds; black apothecia with thalline margins; on soil; fairly common.

#### Roccella

*fimbriata* Darbish.—Greenish-gray, fruticose lichen; nonsorediate; on rock; only known location on mainland California; known from four of the Channel Islands.

#### Sigridea

*californica* (Tuck.) Tehler—White crust with black, pruinose apothecia; often growing in round patches; on trees and shrubs; as *Schismatomma californicum* in Bratt (1987).

#### Tephromela

*atra* (Hudson) Hafellner—Thick, white crust with white-rimmed, black apothecia; on rock; uncommon.

#### Thelomma

*mammosum* (Hepp) A. Massal.—Dark grayish-white areoles with distinct, black, powdery fruiting structures (mazaedia); on rock on ocean side; black spores capable of adhering lightly to a finger placed on a specimen.

#### Vermilacinia

*leopardina* Spjut—(Sida, Bot. Misc. 14:190. 1996) Greenish-yellow, fruticose thallus with abundant branches from holdfast; cortex glossy and dimpled; abundant pycnidia; apothecia subterminal; on shrubs.

#### Verrucaria

*Verrucaria* sp.—Tiny, raised, black areoles containing perithecia; in splash zone at shore among *Chthamalus* spp. (buckshot barnacles).

#### Xanthoparmelia

*coloradoënsis* (Gyelnik) Hale—Greenish-yellow, foliose lichen; loosely attached to rock or soil; uncommon; as *X. taractica* in Bratt (1987).

*mexicana* (Gyelnik) Hale—Greenish-yellow, foliose lichen; plentiful isidia in center of thallus; on rock or soil; common.

#### Acknowledgements

Thanks are due Drs. W.A. Weber, B. McCune, J. Knoph, B. Ryan, and J. Sheard, who identified or confirmed specimens included in this report.

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#### Bleach Residues in Herbarium Paper May Damage Lichen Collections

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Five collections of *Bryoria capillaris* (Ach.) Brodo & D. Hawksw., vouchers for a macrolichen flora of Marin County, California, which had been in their packets from three to five years, were found to have stained the packets pink, in some cases bright pink, with an image

of the lichen. All the branches in contact with the paper were bleached to a very pale yellowish brown. The papers were 100% cotton fiber bond (one of the two brands was labelled "archival quality") which I chose for its supposed chemical inertness. Reddish staining such

Wright: Bleach Damage

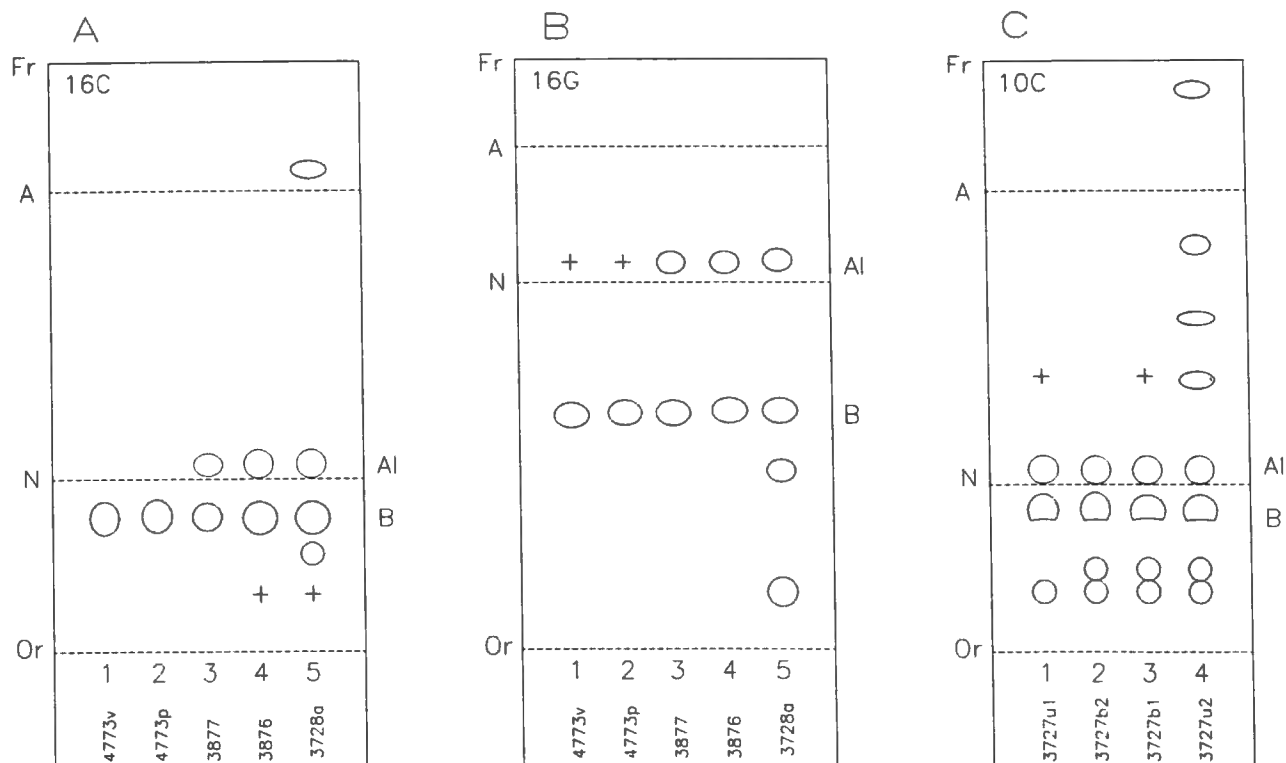


Fig. 1. A. Undamaged *Bryoria capillaris* compared with with damaged material in standard solvent C. B. The same in solvent G. C. Four different areas of a single damaged *B. capillaris* thallus. A, atranorin; Al, alectorialic acid; B, barbatolic acid; Fr, solvent front; N, norstictic acid; Or, origin.

as this by *B. capillaris* and *Alectoria nigricans* (Ach.) Nyl., both of which have the closely related benzyl esters, barbatolic and alectorialic acids (Culberson 1969; Culberson et al. 1977), is mentioned by Brodo and Hawksworth (1977), while Purvis et al. (1992) describe the same for *Hypocenomyce xanthococca* (Sommerf.) P. James & Gotth. Schneider and *Tephromela armeniaca* (DC.) Hertel & Rambold, both with alectorialic acid. These C+ red or pink substances are in the cortex in *Bryoria* and *Alectoria*, and will therefore be in direct contact with the packaging material.

To help determine if chlorine in the paper might be giving a "C" reaction with the lichen, I cut two 8½ x 11 in. sheets of packet paper into 8 cm discs and soaked them in 30 cc distilled water in a clean Petri dish for four hours. I then removed the paper and squeezed the water it contained into the dish. This solution, evaporated in a watch glass over low heat, yielded a small residue which gave a positive Beilstein test<sup>(1)</sup> for organic halogen; I repeated the test twice, carefully cleaning the copper wire between tests, and obtained the same result. My packet paper evidently contains halogen, most likely chlorine from the manufacturer's bleaching process

TLC in standard solvent systems C and G (Culberson 1972; Culberson et al. 1981) showed extra spots in the chromatogram of the bleached material compared with that of freshly collected *Bryoria capillaris* which was

never in contact with paper, consistent with Santesson's (1973) report of calcium hypochlorite producing tetrachloro-substituted orcinol when reacted with unmodified orcinol. Not all discolored thalli showed extra spots, however. I spotted damaged material (*B. capillaris*: Wright 3877, 3876 and 3728a) from Marin County at origins 3, 4 and 5, plates 16C and 16G (fig. 1). At origins 1 and 2, I spotted material from two areas of the thallus of *B. capillaris* (Wright 4773) from Lake County, which was never in contact with a chlorine-containing surface (the Marin County population from which Wright 3877, 3876, and 3828a had been obtained, could not be relocated to provide fresh material for this comparison). Origins 1 through 3 show only barbatolic and alectorialic acid, as expected for *B. capillaris* (alectorialic acid appears only as traces in the G chromatograms of Wright 4773). Origin 4 has an additional low-running trace spot which might be interpreted as fumarprotocetraric acid. Although Brodo and Hawksworth (1977) do not report this substance from North American *B. capillaris*, they do mention its occurrence in some European collections. Because this spot is consistently well-developed in chromatograms of the more damaged thalli (cf. plate 10C), I suspect that it is a damage artefact; however, there is always a possibility that a trace of fumarprotocetraric acid is present. Origin 5 has, besides this spot, two more new spots and appears to represent the most damaged of the thalli chromatographed on this plate.

Plate 10C has extracts of four different areas of a single damaged thallus of *Bryoria capillaris* (Wright 3727). Origins 1 and 4 were from mostly unbleached areas; 2 and 3 were from strongly bleached areas. One of the less bleached parts (origin 4) shows at least six extra spots; the clipping of the bases of the barbatolic spots may represent a seventh spot which was not visible using the ordinary techniques. Apparently areas of the thallus which are not discolored may still be altered chemically.

Next, I checked a series of 39 C+ pink or red collections including *Flavopunctelia flaventior* (Stirton) Hale (nomenclature follows Esslinger & Egan 1995), *F. soledica* (Nyl.) Hale, *Melanelia subaurifera* (Nyl.) Essl., *M. tominii* (Oksner) Essl. (syn. *M. substygia* (Räsänen) Essl.), *Punctelia* cf. *borreri* (Sm.) Krog, *P. stictica* (Duby) Krog, and *P. subrudecta* (Nyl.) Krog, all with lecanoric acid except *P. stictica*, which has gyrophoric. 14 (36%) of these had produced at least some discoloration of the packet, usually in the form of small spots where soralia were in contact with the paper, as would be expected in the case of these lichens, in which the C+ substance is in the medulla and soredia, not in the cortex. To be certain that these packet artefacts are the same substances as produced in the KC and C tests, it would be necessary to identify the substances or at least characterize them reasonably well, and there has been almost no work on this since the tests were discovered 130 years ago (Hale 1974:120-121).

Probably all lichen collections which would otherwise be in contact with bleached paper should be placed in a protective, non-reactive inner wrap to preserve their chemical integrity and help ensure valid chromatographic results. I am repackaging my own collections with an inner wrap consisting of a wax paper bag such as is sold in supermarkets; bleach in the paper ought to be prevented by the wax overlay from contacting the lichen. The cushioning plastic foam or the unbleached excelsior wraps used in some herbaria should also be tested for reactivity towards lichen benzyl esters. Hawksworth (1974:27) reported that specimens to be placed in packets at the Commonwealth Mycological Institute were first inserted into transparent paper envelopes.

It is noteworthy that the packet discoloration is permanent, whereas red color as observed in the C test is thought of as fleeting. In my experience, color in the C test is often not fleeting if only enough hypochlorite to wet the end of a plastic toothpick is used. With hypochlorite in excess, the colored reaction products themselves may be quickly bleached. In the case of discolored packets, lichen product, not bleach, is in excess.

I thank Isabelle Tavares for confirming the identification of *Bryoria capillaris*.

(1) The Beilstein test consists of placing a clean copper wire carrying a little of the substance to be tested into the flame of a Bunsen burner or equivalent. Green coloration of the flame indicates the presence of organic halogen. See Ahmann and Mathey (1967) for another lichenological application of this test. I found that the test works best with wire (20 gauge, about 1 mm in diameter) which is hammered out flat at its tip to produce a microspatula (flat surface holds more substance, thin metal heats more quickly). The wire should be flamed before flattening to remove any polyvinyl chloride coating, which will itself give a positive Beilstein test, and then scraped clean and bright with a razor blade to remove oxide developed in the flame. Rescrape between uses. I evaporated the test solution to dryness and then took up the residue on the microspatula wetted with 1 to 3 drops of water. Wipe as much material as possible onto the microspatula from the area on the watch glass where the substance is deposited. With a slurry of residue on the microspatula, carefully introduce the tip into the hottest part of the flame. Green coloration of the flame is observed up to 1 cm back from the tip. I practiced this procedure with NaOCl evaporated from household bleach before testing the evaporated material under study. The test with the copper dipped in an aqueous NaOCl solution succeeded with a 0.5% solution but failed with 0.1%.

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***Ramalina thrausta* (Ach.) Nyl. in California**

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Several well-developed thalli of the mainly circum-boreal lichen *Ramalina thrausta* were found intermixed with other pendulous macrolichens collected on fallen branches between Cazadero and Fort Ross, Sonoma County, California. In coastal North America this species is generally known from higher latitudes; its occurrence in California does not seem to have been reported in published accounts.

The long threadlike branches of *Ramalina thrausta* make this taxon extremely difficult to distinguish with the unaided eye from the morphologically similar thalli of *Usnea cavernosa* Tuck., *Alectoria sarmentosa* (Ach.) Ach., and *Alectoria* sp. with which it was collected. Unlike thalli of *Usnea* species, however, those of *R. thrausta* lack a central cord in the medulla. With a dissecting microscope, *R. thrausta* can be readily distinguished by the morphology of the branch tips, which are recurved to inrolled as in many other species of *Ramalina*, rather than terete and straight as in species of *Usnea* and *Alectoria* (see illustration in Thomson 1984). Care must be taken to examine intact branches, as the fine tips frequently break off. *Ramalina thrausta* might also be confused with coastal forms of *R. menziesii* Tayl., in which the fine, dissected reticulations come to resemble filamentous branches, but the latter species will always show at least some degree of thallus reticulation upon careful examination.

The thalli were found wound among branches and other lichen thalli, without any distinct attachment. The fallen branches bearing the lichens were collected on a shady hill by the Cazadero elementary school and closer

to the coast in an open grassland with *Umbellularia californica* Nutt. and *Arbutus menziesii* Pursh at Bohan Dillon Rd. and Ft. Ross Rd. (coll. I. Tavares 4251, 4261). Co-occurring lichens included *Usnea cavernosa*, *U. filipendula* Stirton, *U. longissima* Ach., *U. californica* Herre, *U. wirthii* Clerc, *Alectoria sarmentosa*, and *Alectoria* sp. The town of Cazadero is located at 127 feet above sea level and about 6 miles from the coast.

Details of the characteristics and distribution of *R. thrausta* in North America are found in Bowler (1977). While inland this species is said to follow the boreal forest at least as far south as New Mexico, on the west coast its approximate latitudinal range in North America is given as 62°N to 48°N. However, more southerly localities for *R. thrausta* now appear to be known; its sporadic occurrence in coastal Oregon has been reported (McCune and Geiser 1997). The Cazadero locality extends the known coastal range for the species to about 38°N latitude. *Ramalina thrausta* is likely to be present elsewhere in California, particularly along the north coast, where it may pass unnoticed due to its resemblance to other macrolichens occurring in greater abundance at the same sites. Lichen enthusiasts are encouraged to watch out for this species!

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***Usnea longissima* Ach. in San Mateo County**

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Eighty seven years ago, in his "Lichen Flora of the Santa Cruz Peninsula, California", A.W.C.T. Herre (1910:226) had this to say about *Usnea longissima*: "About the head of Purissima Creek, altitude 1900 feet, the long swaying silver-gray fronds of this lichen form a conspicuous feature of the landscape".

Today, if you venture to the head of Purissima Creek, you will not find any of these "soft but bright silvery or gray-green" lichens, to quote Herre once more. Between the beginning of this century and what is rapidly becoming the end of it, *U. longissima* is clearly disappearing from San Mateo and adjoining counties, if indeed there is any left at all.



In 1994 Richard Doell and I discovered a *Quercus agrifolia* festooned with *U. longissima* growing in the forest near our cabin in the Santa Cruz Mountains at the southern tip of San Mateo County.

For about a year we enjoyed keeping an eye on what we regarded as our private treasure, but then to our dismay the tree was blown over during a winter storm. It now hangs horizontally over a canyon, unable to reach light, sun, or its usual complement of fog and rain, and the *U. longissima* is about all gone.

I have found no other record of this lichen in San Mateo County in the local herbaria or in the distribution lists being compiled by Cherie Bratt. These lists report *U. longissima* in Del Norte, Humboldt, Siskiyou, Mendocino,

Lake and Sonoma Counties, but nothing further south. Hale and Cole (1988) report it as "rare from the San Francisco Bay area northward".

The death of the *U. longissima* we found in the forests of San Mateo County may be representative of what has been happening to this silver-gray lichen since the turn of the century. The southern limit of its distribution has inexorably been moving north since Herre's time.

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### *Verrucaria tavaresiae* sp. nov., a Marine Lichen with a Brown Algal Photobiont

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#### Introduction

One of the most unusual lichens in the world, and one about which very little is known, grows in the intertidal zone along the coast of central California. The lichen was first collected at Moss Beach, San Mateo County by M. Wynne and was mentioned in a footnote to a monograph about life histories of brown algae (Wynne 1969). Wynne sent a specimen to T.D.V. Swinscow, a specialist in pyrenocarp lichens, who identified it as a species of the genus *Verrucaria*. The present report is based on specimens of what is presumably the same species collected from two localities in San Francisco Bay and from McClure's Beach, Marin County. These specimens have immersed perithecia and bitunicate asci each with 8 hyaline, nonseptate spores characteristic of *Verrucaria*. This species of *Verrucaria* is unique in that it is the only lichen known to harbor a brown algal photobiont; nearly all other lichens have green algae or cyanobacteria as photobionts. Brown algae (Phaeophyceae) are characterized by chlorophylls *a* and *c* and fucoxanthin as photosynthetic pigments, reproductive cells with unequal, laterally inserted flagella, mannitol or laminarin as a photosynthetic product, and alginate in their cell walls. They range in form from microscopic filaments (e.g., some Ectocarpales) to complex thalli many meters long (e.g., some members of Laminariales and Fucales). There are no unicellular brown algae. In several orders there are species that have crustose thalli. In this lichen

the photobiont, which was isolated into culture from the Moss Beach collection (Wynne 1969), is such a crust-*Petroderma maculiforme* (Wollny) Kuckuck (type locality: Helgoland, North Sea, Germany). Although Wynne's report has been referenced in handbooks and textbooks (Tschermak-Woess 1988; Friedl and Büdel 1995; Henssen and Jahns 1974), the lichen itself has never been named or described. Indeed, up to the present time it has not been determined whether this brown algal-fungal symbiosis fits the definition of a lichen (e.g., Hawksworth 1988). Several other types of symbioses involving fungi and brown algae are known, but in each a fungus occupies the tissue of an alga without altering the overall algal morphology appreciably. These symbioses are regarded as cases of parasitism if they are facultative or as mycophycobioses if they are obligate (Kohlmeyer and Kohlmeyer 1979). In California, the large fucalean brown algae *Halidrys dioica* Gardner and *Cystoseira osmundacea* (Turner) C. Agardh are occasionally parasitized by the ascomycete *Haloguignardia irritans* (Setchell & Estee) Cribb & Cribb, the ascocata of which induce galls in the algal tissue. In the North Atlantic a well-studied symbiosis is that of the fucalean *Ascophyllum nodosum* (L.) Le Jolis and the ascomycete *Mycosphaerella ascophylli* Cotton. *Ascophyllum* is apparently never found uninfected, but comparisons with related species imply that the fungal tissue, which is a small proportion of the total biomass, does not alter the form of the alga. In the brown algal-fungal symbiosis

under consideration, the majority of the biomass is contributed by the mycobiont. The fungus is clearly the exhabitant and the alga the inhabitant as stipulated by Hawksworth's (1988) definition of a lichen. The structure, texture, and habitat of the symbiosis differ from that of the free-living alga. It is appropriate, therefore, to refer to the symbiosis as a lichen. I am proposing the name *Verrucaria tavaresiae* in honor of Dr. Isabelle Tavares, mycologist and lichenologist of the Herbarium of the University of California at Berkeley, who introduced me to the study of lichens.

#### Material and methods

Material was collected from the intertidal zone of San Francisco Bay at Fort Mason (Black Point) just west of the public fishing pier, from the intertidal zone on the northwest side of Yerba Buena Island, and from the splash zone at McClure's Beach. Air-dried and fresh material were examined. Paradermal (parallel to thallus surface) and vertical sections were cut with a razor blade using a dissecting microscope, mounted in water, lactophenol, or corn syrup, and examined with a standard compound microscope and an epi-fluorescence microscope. A fluorescence probe for algininate was used as described in Vreeland and Laetsch (1989) to stain brown algal cell walls.

*Verrucaria tavaresiae* R. Moe sp. nov.

Thallus epilithicus in saxi littoralibus, in statu vivo aequaliter piceus usque obscuro-atrovirens, impolitus, in statu sicco hepaticus cum maculis atris et margine atro, irregulariter extensus, ad 1 mm crassus, sub-coriaceus. Superficies laevis, nec rimosa nec areolata. Heteromerus, stratum corticale tenue vel carens, stratum algaceum ad 70  $\mu\text{m}$  altum, medulla paraplectenchymata. Algae ad Phaeophyceas pertinentes, in filamentibus ad superficiem perpendicularibus dispositae, uniplastidiales. Perithecia immersa, applanato-ampulliformia, difficulter visibilia in statu vivo, in statu sicco manifesta. Sporae 8, eseptatae, 5–7 X 12–15  $\mu\text{m}$ , paraphyses carentes. Pycnidia simplicia vel multilocularia, pycnoconidia filiformes, ca. 0.5  $\mu\text{m}$  crassae, 8  $\mu\text{m}$  longae.

Holotype: UC1512286; upper intertidal zone at Fort Mason, San Francisco, California; R. Moe & P.C. Silva, 15.xii.1975.

#### Habit and habitat

At Fort Mason *Verrucaria tavaresiae* occupies the middle to upper intertidal zone, adhering tenaciously to both horizontal and vertical rock surfaces. Rock at Fort Mason is Franciscan sandstone (Wahrhaftig 1984: fig. 15). The lichen occupies a zone that is immersed and

exposed at least once each day. The zonation pattern here is skewed upward because of the exposure to waves generated by wind through the Golden Gate. At the Yerba Buena Island site, the lichen is found on vertical surfaces in the upper intertidal zone. At McClure's Beach, it occupies the splash zone on extremely exposed rocks. It is associated in all three locations with the crustose red alga *Hildenbrandia* and the crustose stage of the red alga *Mastocarpus papillatus* (J. Agardh) Kützing (formerly known as *Petrocelis middendorffii*, and colloquially called "tar spot alga"). At Fort Mason it grows among the brown algae *Pelvetiopsis* and *Fucus*. Thalli occupy patches that are variable in outline and extent, the largest seen being about 25 cm in greatest dimension. They are affixed firmly to the surface of the rock. There are no macroscopic features by which *V. tavaresiae* can be unequivocally distinguished from a crustose alga or the crustose base of an upright alga. When wet it is uniformly dark brownish- or greenish-black, and practically indistinguishable from the crust of *Mastocarpus*. When it is exposed to dry air, the lichen becomes first a matte black, then becomes lighter, except for a thin, blackish-brown margin. The perithecia, pycnidia, and punctulae become visible as contrasting dark spots (fig. 1A). Very dry living thalli and some herbarium specimens become grayish-buff and have irregular black cracks. The change of color to dark tan is apparently characteristic of several species of marine *Verrucaria* (Lamb 1948). The thallus is soft enough to depress with a fingernail, but brittle enough to break, and never gummy like the *Mastocarpus* crust. The surface is smooth with no regular cracks or areolae. If the surface is covered with water, perithecia and pycnidia are barely visible with a hand lens as darker spots. In thinnest thalli perithecia are evident as slight swellings.

#### Anatomy

The thallus is 250 to 1000  $\mu\text{m}$  thick and markedly zoned (fig. 1C). Margins are ca. 100  $\mu\text{m}$  thick. At the surface, except near the margins, is an algal layer ca. 75  $\mu\text{m}$  thick covered by a very thin (<5  $\mu\text{m}$ ) layer of fungal tissue. Below the algal layer is a medulla composed of very dense tissue with densely packed, thin-walled,  $\pm$  isodiametric cells. Close to the substrate and near the margins the tissue is more filamentous, but still very dense. The algal layer consists of straight algal filaments oriented perpendicularly to the thallus surface. The filament density is ca. 10 filaments per 100  $\mu\text{m}^2$ . Cells composing the algal filaments are 6–10  $\mu\text{m}$  in diameter and about as long as wide. Each cell has one golden-brown chloroplast. Walls of the filaments test positive for algininate, the wall material of brown algae. Filaments are not joined to each other, but are isolated by dense, hyaline fungal tissue consisting of thin-walled, cytoplasmically dense cells 2–4  $\mu\text{m}$  in diameter. The same small-

celled tissue occurs in a layer of varying thickness below the filaments. Algal filaments are infrequently branched. The polarity of the filaments, as indicated by the divergence angle of the branches, is inconsistent, with the apex of some filaments at the lower surface of the algal layer and that of others at the upper surface. Development of the algal layer appears closely coordinated with growth at the margin. Algal cells are absent at the margin, but are present just proximally to it as branched filaments oriented in a plane parallel to the thallus surface. Further behind the margin, the algal cells branch to produce the vertical filaments evident in mature regions of the lichen. These vertical branches are produced both above and below the plane of initial branching of the horizontal filaments.

The medulla varies greatly in thickness. It is composed of thin-walled, densely packed cells 4–6  $\mu\text{m}$  diam X 4–10  $\mu\text{m}$  long. Cells are  $\pm$  hyaline, but have brownish or reddish-brown walls that become darker towards the base of the thallus. Vertical sections of the medulla resemble sections of crustose red algae. At the base of the thallus the fungal filaments are oriented horizontally but towards the surface they become vertically oriented. Where the thallus overgrows crustose red algae, basal hyphae seem to elongate, separating from each other and penetrating the substrate.

Perithecia (fig. 1B) are sparse or crowded, completely immersed, flask-shaped, with a dark black shield (involucrellum) of irregularly outline, and are 300–500  $\mu\text{m}$  in surface diameter. The internal diameter of the perithecium (excipular diameter) is 200–250  $\mu\text{m}$ . The perithecial wall becomes brownish with maturity. Asci are clavate, and 40  $\mu\text{m}$  long. Spores are 8 per ascus, spherical before release (when living), and become elliptical afterwards, 12–15  $\mu\text{m}$  X 5–7  $\mu\text{m}$ . Paraphyses were not seen. Periphyses, which are crowded, originate from the perithecial wall below and along the ostiolar channel. They are 1.5 to 2  $\mu\text{m}$  thick and up to 30  $\mu\text{m}$  long. They are sometimes branched but do not anastomose.

Pycnidia are abundant, smaller than perithecia, completely immersed, unilocular or  $\pm$  multilocular, of varying shape and size. Cells around the ostiole are pigmented black similarly to the cells of the involucrellum. The pigmented ostiolar region is ca. 100  $\mu\text{m}$  in surface diameter. Pycnoconidia are filiform, 0.5  $\mu\text{m}$  X 8  $\mu\text{m}$ .

#### Identity of the photobiont

The color of the chloroplasts and presence of alginic acid in the walls are characteristic of brown algae. The sparingly branched filaments and monoplastidial cells are characteristic of *Petroderma maculiforme*. Isolated algae

grown in culture grow first as free filaments, and then as coalescent filaments.

#### Chemical reactions

KOH: -; I: medulla, ascoplasm, spores yellow brown; hymenial gel light blue.

#### Distribution

The lichen is so far known from Moss Beach, San Francisco Bay, and McClure's Beach, but it probably will be found elsewhere when California littoral lichens are surveyed. Macroalgae that occur on the open coast and in San Francisco Bay usually do not have restricted distributions. The photobiont is broadly distributed in the Arctic and Cool Temperate of the Northern Hemisphere and also found in cool regions of the Southern Hemisphere (Wilce et al. 1970).

#### Discussion

*Verrucaria tavaresiae* is unique among known lichens in its association with a brown algal photobiont. The color of the photobiont and its location in a distinct palisade should make identification straightforward. Nevertheless, it is possible that it has in the past been misidentified as a different species of *Verrucaria*, or even as an alga such as *Ralfsia* or *Petrocelis*. Of the species of *Verrucaria* that are regularly immersed in seawater, only *V. maura* Wahlenb. and *V. mucosa* Wahlenb. have been recorded from central California (Herre 1910; Riefner et al. 1995). *Verrucaria maura* is common in temperate and colder regions of the northern and southern hemisphere, where it often forms a black band in the highest intertidal and supralittoral zones. Unlike *V. tavaresiae*, it is areolate and has protruding perithecia. Its photobiont has been reported as a member of Chaetophorales in material from England (Tschermaek-Woess 1988) and as *Heterococcus* in material from Chile (Parra and Redon 1977).

*Verrucaria mucosa* is probably the species most likely to be confused with *V. tavaresiae*. Like *V. tavaresiae*, it has immersed perithecia and is dark when living and becomes lighter upon drying. The perithecia are smaller, however (.15 mm; Purvis et al. 1992), the thallus surface is shiny, and the texture subgelatinous.

Several additional species of marine *Verrucaria* are known from Washington (Ryan 1988a, 1988b): *V. ceuthocarpa* Wahlenb. ex Ach., *V. degelii* R. Sant., *V. erichsenii* Zschacke, *V. halizoa* Leighton, *V. sandstedii* de Lesd., and *V. striatula* Wahlenb. ex Ach. These species apparently occur at higher littoral levels than *V. tavaresiae*.

Of interest in the context of brown algal photobionts is the report of *Heterococcus caespitosus* Vischer as the photobiont of a lichen in Chile identified as *Verrucaria maura* (Parra and Redon 1978). *Heterococcus caespitosus*, usually thought to be a freshwater alga, belongs to the Xanthophyceae, and is more closely related to brown algae than to green algae or cyanobacteria. The figure published of the isolated photobiont makes it clear that *Petroderma maculiforme* is not involved. The lichen was collected from the upper intertidal zone.

*Verrucaria tavaresiae*, in addition to possessing an unusual photobiont, has other noteworthy features. Although periphyses (the filaments extending upwards towards the ostiole from the perithecial wall) are usually defined as unbranched (Eriksson 1981), in *V. tavaresiae* they are sometimes subdichotomously branched. Lamb (1948: pp. 16, 20) records sparingly branched periphyses for *V. elaeoplaca* Vainio, a terrestrial Antarctic species, and *V. serpuloides* Lamb, a subtidal Antarctic species.

*Verrucaria tavaresiae* is unusual in the genus in that the photobiont is for the most part restricted to a distinct layer. In most species of *Verrucaria* algae are distributed throughout the thallus, though they may be more concentrated towards the surface.

Although there have been many species of *Verrucaria* described from the seashore, only a few occur as low in the intertidal as *V. tavaresiae*. It will be interesting to learn if there are any populations of the species that are subtidal or alternatively if some degree of exposure is necessary. So far, only one lichen—*V. serpuloides*—seems to be capable of complete subtidal growth. This species, which apparently occurs only in West Antarctica, grows to depths of 22 m and is intolerant of exposure (Lamb 1948 and pers. obs.).

The catholicity of *Verrucaria* with respect to photobionts is widely reported (though doubted by Gärtner 1992:327), with the green algal genera *Coccolobos*, *Desmococcus*, *Dilabifilum*, *Myrmecia*, the xanthophyte *Heterococcus*, and the brown alga *Petroderma* all being recorded (Tschermaek-Woess 1988). What has not been emphasized is how different these algae are. Xanthophyceae and Phaeophyceae have been found by several molecular analyses to be sister classes, but they are unrelated to green algae (Leipe et al. 1994). Cyanobacteria, the other main taxonomic group of photobionts, are not reported from *Verrucaria*. If there is a positive lichenization signal or trigger in the *Verrucaria* symbiosis, it is something that these unrelated algae have in common, and something that is absent in cyanobacteria.

The description of *Verrucaria tavaresiae* brings to three the number of species of marine *Verrucaria* reported from California. A fourth species, *V. melas*, which is apparently known only from one collection at Point Lobos, San Francisco (Herre 1910), is possibly not a marine species. Although in the original description Herre wrote that *V. melas* grew "on rocks a few feet above the sea", this may be an error. Herre's label accompanying an isotype in CAS states "on rocks above sea—25 to 50 ft elevation". Herre made the following annotation in 1935: "type locality has been destroyed—face of cliff removed". The CAS specimen is a very thin black crust.

The total of three California species seems low by comparison with the 7 to 9 species reported from Fidalgo I. in Washington (Ryan 1988a, 1988b), the 7 species reported from New England (Taylor 1982), the 8 species from Great Britain (Purvis et al. 1992), the 6 to 8 species from the Antarctic Peninsula (Lamb 1948), or the 10 reported from Scandinavia (Santesson 1993). Although marine and maritime lichens appear to be more diverse along cold coasts than warm coasts, the low number reported from California may indicate under-collection.

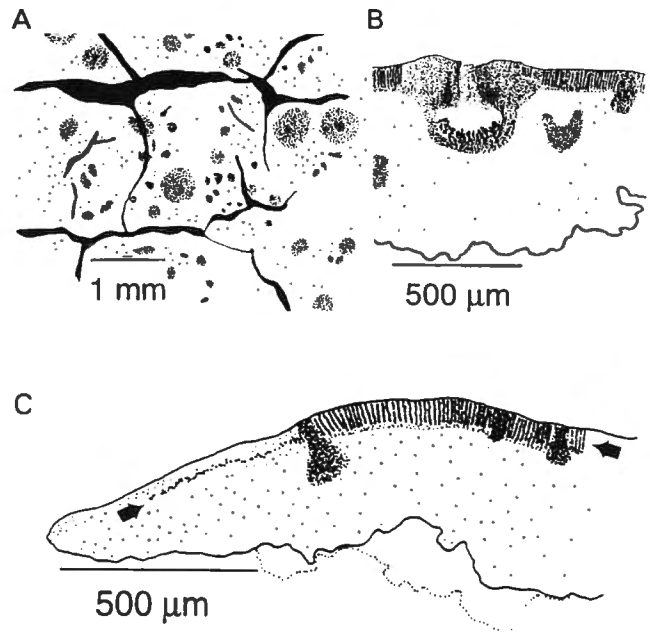


Fig. 1. *Verrucaria tavaresiae*. A. Surface view of part of holotype showing cracks that develop in drying (black lines) and relative size of perithecia (large spots), pycnidia (medium-size spots), and punctulae (small spots). B. Perithecium showing complete immersion in thallus. C. Section of margin showing development of algal layer from horizontally oriented filaments (right pointing arrow) to vertically oriented filaments (left pointing arrow) and thickness of thallus.

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*Lecania cyathiformis*, a Forgotten California Lichen

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Among the lichens collected by Harold E. and Susan T. Parks at La Jolla, San Diego County in January, 1929 was a new species, issued as no. 3473 of the "Cryptogamae exsiccati editae a Museo Hist. Natur. Vindobonensi"—*Lecania cyathiformis* Szatala, on dead twigs (Borbasia 3:97. 1941; Ann. Naturhist. Mus. Wien 52:2 92. 1942 [1941]). Material of this collection (*H.E. Parks 3371*, on *Rhus*, 3.I.1929) was deposited in UC. Although this species was listed in I. Mackenzie Lamb's "Index Nominum Lichenum, Inter annos 1932 et 1960 divulgatorum" (1963; Ronald Press Co., New York), it

was never included in any issue of the "Checklist of the Lichens of the Continental United States and Canada" (cf. *The Bryologist* 69:141. 1966 and *The Bryologist* 98:467. 1995), nor was it included in "A Catalog of California Lichens" (*Wasmann Journal of Botany* 36:1. 1979 [1978]).

Although Szatala described the spores of *Lecania cyathiformis* as 2-celled, the mature spores are actually 4-celled. The large apothecia are conspicuously elevated on subpedicellate bases.

## Field Trip Reports

### REPORTS OF FIELD TRIPS

Joint Field Trip to Southwest Oregon by CALS and the Northwest Lichen Guild, October 19/20, 1996

The promise of the moist Oregon coast drew lichen enthusiasts from as far away as San Diego, California to Cape Sebastian, Oregon. The Cape juts out into the Pacific about 20 miles north of Brookings, Oregon, and provides undisturbed *Picea sitchensis* and *Pinus contorta* subsp. *contorta* habitat. The wind-gnarled trees and weather-battered sandstones could have held the group there all day, but there was a lot of territory to check out. Saturday afternoon saw the group heading up the Rogue River, ending up about 10 miles (as the crow flies) northeast of Gold Beach, on the Woodruff Trail. This area has a good assortment of habitats, with hardwoods, conifers, small meadows, and serpentines. Some folks continued up the Rogue River to Quosatana Campground, sampling the riparian associations with *Acer macrophylla*, *Alnus* and *Umbellularia californica*.

After the busy day, the participants gathered at Pistol River Friendship Hall to share a delicious meal prepared by Janet Doell and other California Lichen Society members. Several slide presentations and good discussions followed dinner.

Sunday, October 20 saw the group inspecting beach areas: driftwood, beach rocks, and a small riparian area with *Salix* and *Alnus* at Lone Ranch a few miles north of Brookings; then a large beach rock near the mouth of Pistol River. Following that, the dwindling group headed toward Agness, twenty-seven miles up the Rogue River to the Illinois River, then three more miles to Oak Flat. This large meadow on the banks of the Illinois River has an old orchard, and groves of *Quercus garryana* and *Umbellularia californica*, each providing a different community of lichens.

This novice lichenologist is just beginning to realize how many species are here, and just how easily they can be overlooked. There is so much to learn, and many more unusual habitats to explore. We'll be looking forward to the 1998 Bear Camp outing!

People who participated in the field trip include: Nancy Andrich, Rudi Becking, Cheryl Beyer, Charis Bratt, Janet Doell, Ed Gross, Bill Hill, Lisa Hoover, Suzanne Isaacs, Barbara Lachelt, Crystine Masers, Jeanne McFarland, Eric Peterson, Adriane Rhodes, Connie Risley, Bruce Rittenhouse, Veva Stansell, Bob Stewart, Jennifer Stone, and Shirley and Ken Tucker.

Although not all specimens have been identified yet, a fairly complete list of the species found has been compiled. List contributions were made by Charis Bratt, Janet Doell, Shirley Tucker, and Eric Peterson. Nomenclature is as reported in list submissions, with editorial changes made to conform with Esslinger and Egan (The Bryologist 98:467. 1995).

Key to collecting sites:

1. Cape Sebastian; 2. trailhead of Woodruff trail; 3. Quosatana Campground; 4. Lone Ranch beach picnic area, three miles N of Harris Beach Park; 5. Henry Rock, North of Brookings; 6. Oak Flat near Agness; 7. near Friendship Hall, Pistol River

*Acarospora smaragdula* (Wahlenb.) A. Massal. (6) rock  
*Anaptychia setifera* Räsänen (1) conifer branches  
*Arthonia cinnabarina* ? (DC.) Wallr. (3) *Alnus*  
*Aspicilia laevata* ? (Ach.) Arnold (4, 5) rock  
*Biatora vernalis* ? (L.) Fr. (1, 2) *Alnus*  
*Buellia disciformis* (Fr.) Mudd (6)  
*Caloplaca cerina* (Hedwig) Th. Fr. (6) twig  
*Caloplaca flavogranulosa* ? Arup (4) rock  
*Caloplaca holocarpa* (Hoffm. ex Ach.) M. Wade (1) twigs  
*Caloplaca marina* (Wedd.) Zahlbr. subsp. *americana* Arup (5) rock  
*Caloplaca rosei* Hasse (4, 5) rock  
*Caloplaca saxicola* (Hoffm.) Nordin (1)  
*Caloplaca ulmorum* (Fink) Fink (1) twig  
*Candelariella vitellina* (Hoffm.) Müll. Arg. (6)  
*Catillaria globulosa* ? (Flörke) Th. Fr. (1) *Picea sitchensis* bark  
*Cavernularia hultenii* Degel. (1) conifer bark  
*Cetraria*, see *Tuckermannopsis*, *Kaernefeltia*  
*Chaenotheca brunneola* (Ach.) Müll. Arg.  
*Chaenotheca chrysocephala* (Turner ex Ach.) Th. Fr.  
*Chaenotheca trichialis* (Ach.) Th. Fr.  
*Chaenothecopsis pusiola* (Ach.) Vainio  
*Chrysothrix candelaris* (L.) J.R. Laundon (1) *Picea sitchensis* bark  
*Cladonia carneola* (Fr.) Fr. (2)  
*Cladonia cervicornis* (Ach.) Flot. subsp. *verticillata* (Hoffm.) Ahti (1,2)  
*Cladonia chlorophaea* (Flörke ex Sommerf.) Sprengel (1)  
*Cladonia ecmocyna* Leighton  
*Cladonia furcata* (Hudson) Schrader (2, 4)  
*Cladonia macilenta* ? Hoffm. subsp. *macilenta* (2)  
*Cladonia macilenta* Hoffm. var. *bacillaris* (Genth) Schaerer (1)  
*Cladonia ochrochlora* Flörke (2)  
*Cladonia subsquamosa* Kremp. (1, 2, 6)  
*Cladonia subulata* (L.) F.H. Wigg. (1)  
*Cliostomum griffithii* (Sm.) Coppins (3)  
*Coccotrema pocillarium* (Cummings) Brodo  
*Collema conglomeratum* Hoffm. (6)  
*Collema furfuraceum* (Arnold) Du Rietz (6)

- Collema tenax* (Sw.) Ach. group (5) rock, south face  
*Collema auriforme* ? (With.) Coppins & J.R. Laundon (1)  
*Cyphelium inquinans* (Sm.) Trevisan  
*Dimerella lutea* (Dickson) Trevisan (1) *Picea sitchensis*  
*Diploschistes scruposus* (Schreber) Norman (6)  
*Diplotomma alboatrum* (Hoffm.) Flotow (2, 6) *Pseudotsuga menziesii*  
*Diplotomma penichrum* (Tuck.) Szat. (6)  
*Fuscopannaria leucostictoides* (Ohlsson) P.M. Jørg. (2) cedar  
*Fuscopannaria saubinetii* (Mont.) P.M. Jørg. (2, 5, ?) orchard tree / rock, south face / ?  
*Graphis scripta* (L.) Ach. (3) *Alnus*  
*Hafellia fosteri* ? Imshaug & Sheard (4) driftwood  
*Heterodermia leucomelos* (L.) Poelt (1) *Picea sitchensis*  
*Hypogymnia enteromorpha* (Ach.) Nyl. (1, 2, 6)  
*Hypogymnia heterophylla* L. Pike (1) *Pinus contorta* subsp. *contorta*  
*Hypogymnia imshaugii* Krog (1, 6) conifers  
*Hypogymnia physodes* (L.) Nyl. (1, 6)  
*Hypogymnia tubulosa* (Schaerer) Hav. (6)  
*Kaernefeltia californica* (Tuck.) Thell & Goward (*Cetraria californica* Tuck.) (7) *Pinus contorta* subsp. *contorta*  
*Lecanactis salicina* Zahlbr. (1) *Picea sitchensis*  
*Lecania dubitans* ? (Nyl.) A.L. Sm. (1) conifer bark  
*Lecanora hagenii* (Ach.) Ach. (1, 2) conifer twigs  
*Lecanora hybocarpa* (Tuck.) Brodo (6) conifer twigs  
*Lecanora symmicta* (Ach.) Ach. (1, 3) *Alnus*  
*Lecidella elaeochroma* (Ach.) Hazsl. (1) rock  
*Lecidella euphorea* (Flörke) Hertel (3) *Alnus*  
*Leprocaulon microscopicum* (Vill.) Gams ex D. Hawksw. (5) rock, north face  
*Lobaria oregana* (Tuck.) Müll. Arg. (2) *Pseudotsuga menziesii*  
*Lobaria pulmonaria* (L.) Hoffm. (2, 6) *Pseudotsuga menziesii*  
*Lobaria scrobiculata* (Scop.) DC. (6)  
*Melanelia subaurifera* (Nyl.) Essl. (6)  
*Melanelia subolivacea* (Nyl.) Essl. (6) twig  
*Micarea prasina* ? Fr. (1, 4) *Picea sitchensis*, driftwood  
*Mycoblastus sanguinarius* (L.) Norm. (6) conifer bark  
*Mycocalicium subtile* (Pers.) Szat. (1) *Picea sitchensis* snag  
*Neofuscelia verruculifera* (Nyl.) Essl. (5) rock, south face  
*Nephroma laevigatum* Ach. (nom. prop. rej.) (6)  
*Nephroma resupinatum* (L.) Ach. (6)  
*Normandina pulchella* (Borrer) Nyl. (6)  
*Ochrolechia laevigata* ? (Räsänen) Vers. ex Brodo (6)  
*Ochrolechia oregonensis* H. Magn. (1)  
*Ochrolechia pseudopallescens* Brodo (2, 6)  
*Ochrolechia szatalaënsis* Vers.  
*Opegrapha atra* ? Pers. (1) *Picea* twigs  
*Pannaria* (see *Fuscopannaria*)  
*Parmelia saxatilis* (L.) Ach. (1) over moss on soil bank  
*Parmelia sulcata* Taylor (1, 6)  
*Parmotrema chinense* (Osbeck) Hale & Ahti (1) conifers  
*Parmotrema crinitum* (Ach.) Choisy (1) *Picea sitchensis*  
*Peltigera collina* (Ach.) Schrader (1) *Picea sitchensis*  
*Peltigera membranacea* (Ach.) Nyl. (6)  
*Peltigera neckeri* Hepp. ex Müll. Arg. (1, 6)  
*Peltigera praetextata* (Flörke ex Sommerf.) Zopf (6)  
*Peltigera rufescens* (Weiss) Humb. (1)  
*Pertusaria amara* (Ach.) Nyl. (1, 2, 6) conifer bark  
*Pertusaria californica* ? Dibben (1) rock  
*Pertusaria leioplaca* DC. (3, 6)  
*Pertusaria subambigens* Dibben (2, 6)  
*Physcia adscendens* (Fr.) H. Olivier (1) *Picea sitchensis*  
*Physcia aipolia* (Ehrh. ex Humb.) Fűrnr. var. *aipolia* (6)  
*Physcia leptalea* (Ach.) DC. (*Physcia semipinnata* ?) (6)  
*Physcia stellaris* (L.) Nyl. (4) *Alnus rubra*  
*Placopsis gelida* (L.) Lindsay (1) rock; sterile  
*Platismatia glauca* (L.) Culb. & C. Culb (6)  
*Platismatia herrei* (Imshaug) Culb. & C. Culb (6)  
*Pseudocyphellaria anomala* Brodo & Ahti (6)  
*Pseudocyphellaria anthraxis* (Ach.) H. Magn. (6)  
*Pseudocyphellaria crocata* (L.) Vainio (2, 6) *Pseudotsuga menziesii*, *Umbellularia californica*  
*Pyrenula laevigata* (Pers.) Arnold (2) *Pseudotsuga menziesii*  
*Pyrrhospora cinnabarina* (Sommerf.) Choisy (1, 2, 6) conifer twigs  
*Pyrrhospora quernei* (Dickson) Körber (1) twigs  
*Ramalina farinacea* (L.) Ach. (1, 6) conifer twigs, *Umbellularia californica*  
*Ramalina menziesii* Taylor (1, 7) conifer twigs  
*Ramalina pollinaria* (Westr.) Ach. (1, 7) *Picea* twigs, *Pinus contorta* subsp. *contorta*  
*Ramalina roesleri* (Hochst. ex Schaerer) Hue (1) *Picea sitchensis*  
*Rhizocarpon grande* (Flörke ex Flotow) Arnold (5)  
*Sphaerophorus globosus* (Hudson) Vainio (2, 6) conifers  
*Sticta fuliginosa* (Hoffm.) Ach. (6)  
*Sticta limbata* (Sm.) Ach.  
*Toninia ruginosa* (Tuck.) Herre (subspecies not identified)  
*Tuckermannopsis chlorophylla* (Willd.) Hale (1)  
*Tuckermannopsis orbata* (Nyl.) M.-J. Lai  
*Usnea glabrata* (Ach.) Vainio (1, 6, 7) *Pinus contorta* subsp. *contorta*  
*Usnea lapponica* Vainio (6)  
*Usnea longissima* Ach. (1, 2)  
*Usnea wirthii* Clerc (7) *Pinus contorta* subsp. *contorta*  
*Vermilacinia cephalota* (Tuck.) Spjut & Hale (*Niebla cephalota* (Tuck.) Rundel & Bowler) (7) *Pinus contorta* subsp. *contorta*  
*Verrucaria aethiobola* ? Wahlenb. (5) rock  
*Verrucaria maura* Wahlenb. (4) rock  
*Vulpicida canadensis* (Räsänen) J.-E. Mattsson & M.-J. Lai (6)  
*Xanthoparmelia cumberlandia* (Gyelnik) Hale (4) rock

In addition, one or more unidentified species were recorded from each of the following genera:

*Bacidia* (3), *Buellia* (6, on rock), *Caloplaca* (1, 5, 6, on conifers and rock), *Fuscopannaria* ? (6, on oak), *Hypotrachyna*, *Koerberia* ? (6, on oak), *Lecanora* (1, 2, 5, 6), *Lecidea* (1, 3, 5, 6, on rock, *Picea sitchensis*, *Alnus*), *Leproloma* ? (1, jade green, leprose, on *Picea sitchensis* bark, soil?), *Ochrolechia* (1, 2, 3, 6, on *Picea sitchensis* bark, other

## Field Trip Reports

conifers), *Parmeliella* (1, on soil), *Pertusaria* (1,3,6, on rock, *Alnus*), *Rhizocarpon* (4, on rock), *Rinodina* (1, 6 conifer twigs), *Usnea*, and *Verrucaria* (4, 6, on rock). Parasites on *Lecanora* (3) *Alnus*, *Parmelia sulcata* (1, 6), and *Usnea* (1, 6) were also collected, as well as an unidentified pyrenocarp (3), *Alnus*.

Veva Stansell (text) Eric B. Peterson (list compilation)

### San Bruno Mountain

San Bruno Mountain was again host location for a lichen field trip on January 5, 1997. The weather was remarkably cooperative.

Fourteen members of the California Native Plant Society and the Friends of San Bruno Mountain jointly held an introductory field trip to the lichens of San Bruno Mountain, led by CALS members Mikki McGee and Bill Hill. The trip emphasized lichen form types, diversity, and habitat diversity between exhaust-swept roadside along the bay shore and seawind-swept summit areas. A grand time was had by all.

Mikki McGee

### CALS Wantrup Preserve Field Trip

On Saturday and Sunday, January 18–19, 1997 CALS took a field trip to the Wantrup Wildlife Sanctuary in Napa County near Pope Valley, California. This was a joint venture with the Napa chapter of the California Native Plant Society, with members Barbara Stafford, Jake Ruygt, Juanita Donan, and Ralph Ingals attending. The CALS members attending were: Judy and Ron Robertson, Beth Sampson and Garyth Jones, Richard and Janet Doell, Bill Hill, Barbara Lachelt, John Rusk, Doris Baltzo, Ernie and Jean Fremont, and Joe Callizo. Joe Callizo is also the resident caretaker at the Sanctuary, which consists of a 730 acre ranch property with ranch house and barn, valley pasture land and wooded hillside with ponds and a stream. It was willed by Dr. Siegfried von Ciriacy-Wantrup (1906–1980), former professor of Agricultural Economics at the University of California at Berkeley, to the Napa County Land Trust as a nature preserve. Many of us arrived Friday night to stay in the commodious ranch house, which serves as the headquarters for visiting naturalists and scientists. Saturday morning Joe Callizo took us on a tour of the property, which ranges in elevation from 600 to about 800 ft. We investigated the variety of lichens on fenceposts, the many oak trees, and the soil and rocks along the roads and trails winding through the hillside around the old barn. We marveled at the interesting "Eyelash Dung Cup Fungus" (*Cheilymenia coprinaria*) on the cattle

manure under the oak trees by the barn. Included in the numerous lichens on fenceposts were Caliciales and Graphidaceae yet to be identified. After lunch back at the ranch house we drove to nearby Las Posadas Experimental Forest, stopping first at a wonderful boulder strewn hillside with sparsely spaced gray pine (*Pinus sabiniana*) trees just south of the Pacific Union College on the main street of Angwin. These trees are on the ridge of Howell Mountain at about 1600 ft elevation to the southwest of the Wantrup Preserve. The location was a favorite site of early Indians for chipping obsidian arrow points, and obsidian chips are still present. That evening back at the ranch house, after a tasty meal for all, we studied and discussed many of the specimens we had found. Joe Callizo talked about the history and work at the Sanctuary, and Richard Doell gave another of his masterful multiprojector slide shows on lichens.

On Sunday we drove to a serpentine rock area along Butts Canyon Rd. Serpentine areas are interesting botanically because they often harbor unusual endemic species that are capable of surviving on soils that are inhospitable through low nutrients or toxicity to other species. On a dark green serpentine roadcut cliff we found patches of a muddy-brick-colored *Aspicilia* that may represent an undescribed species.

We thank Joe Callizo for his gracious hospitality on this wonderful field trip.

Some of the species collected and identified:

Determinations: [G]=group determination, [DEB]=by Doris E. Baltzo, [BR]=by Bruce Ryan. Nomenclature conforms with Esslinger & Egan (The Bryologist 98:467. 1995).

Localities: W=Wantrup, A=Angwin, L=Las Posadas, B=Butts Canyon

*Acarospora fuscata* (Schrader) Arnold [BR] A  
*Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arn. [BR] A  
*Buellia disciformis* ? (Fr.) Mudd [BR] L  
*Caloplaca* cf. *cerina* (Hedwig) Th. Fr. [DEB] L  
*Caloplaca squamosa* (de Lesd.) Zahlbr. group [BR] B  
*Candelaria concolor* (Dickson) Stein [BR,DEB] W,B on *Pinus sabiniana*  
*Chrysothrix candelaris* ? (L.) J.R. Laundon [G]  
*Cladonia fimbriata* (L.) Fr. [G]  
*Cladonia macilenta* Hoffm. subsp. *macilenta* [DEB] [G] L  
*Cladonia pyxidata* (L.) Hoffm. [DEB] L  
*Collema nigrescens* (Hudson) DC. [BR] W  
*Evernia prunastri* (L.) Ach. [DEB] [G] B  
*Flavoparmelia caperata* (L.) Hale [DEB] W,L  
*Flavopunctelia flaventior* (Stirton) Hale [BR,DEB,G] W,L  
*Hypocenomyce scalaris* (Ach.) Choisy [BR] W



*Hypogymnia imshaugii* Krog [DEB] L,B  
*Hypogymnia physodes* (L.) Nyl. [DEB] L  
*Hypogymnia tubulosa* (Schaerer) Hav. [G] L  
*Kaernefeltia merrillii* (Du Rietz) Thell & Goward [BR,DEB] B  
*Lecanora muralis* (Schreber) Rabenh. [BR] A  
*Lecanora sierrae* ? B.D. Ryan & T. Nash [DEB] B  
*Lecanora varia* (Hoffm.) Ach. group ('*pseudovaria*') [BR] W  
*Lecidea cascadenis* ? H. Magn. [BR] A  
*Lecidea fuscoatra* ? (L.) Ach. or  
*Lecidea mannii* ? Tuck. [BR] A  
*Lecidea tessellata* Flörke [BR] A  
*Leptoloma membranaceum* (Dickson) Vainio [G]  
*Leptochidium albociliatum* (Desmaz.) Choisy [DEB] B  
*Leptogium corniculatum* (Hoffm.) Minks [DEB] W fence  
*Leptogium gelatinosum* (With.) J.R. Laundon [BR] W  
*Leptogium lichenoides* (L.) Zahlbr. [BR] L  
*Melanelia subargentifera* (Nyl.) Essl. [BR] W  
*Ochrolechia oregonensis* H. Magn. [BR] L  
*Ochrolechia subpallenscens* Vers. [BR] L  
*Parmelia hygrophila* Howard & Ahti [BR] L  
*Parmelia sulcata* Taylor [DEB] L  
*Parmelina quercina* (Willd.) Hale [DEB] L on oak  
*Pertusaria albescens* (Hudson) Choisy & Werner [BR] W,  
 [DEB] A  
*Pertusaria amara* (Ach.) Nyl. [BR] L  
*Physcia adscendens* (Fr.) H. Olivier [DEB] W by house, B on  
*Pinus sabiniana*  
*Physconia americana* Essl. [BR] W  
*Platismatia glauca* (L.) Culb. & C. Culb [DEB] L  
*Platismatia herrei* (Imshaug) Culb. & C. Culb L  
*Pseudocyphellaria anomala* Brodo & Ahti [DEB, G] L  
*Psora nipponica* (Zahlbr.) Gotth. [BR] B  
*Punctelia subrudecta* (Nyl.) Krog [DEB] W,L  
*Ramalina farinacea* (L.) Ach. [DEB] W by house

*Ramalina leptocarpha* Tuck. [DEB] W by house  
*Ramalina menziesii* Taylor [DEB] W  
*Rhizocarpon bolanderi* ? (Tuck.) Herre [BR] A  
*Tephromela atra* (Hudson) Hafellner [BR,DEB] W fence,B  
*Thelomma cf. occidentale* (Herre) Tibell [DEB, G] W fence  
*Trapelia involuta* (Taylor) Hertel [BR] W  
*Tuckermannopsis chlorophylla* (Willd.) Hale [BR] L  
*Tuckermannopsis orbata* (Nyl.) M.-J. Lai [G]  
*Umbilicaria phaea* Tuck. [BR, G] A  
*Usnea arizonica* Mot. [DEB] L  
*Usnea cf. hirta* (L.) F.H. Wigg. [DEB] L  
*Usnea glabrata* (Ach.) Vainio [DEB] L  
*Vulpicida canadensis* (Räsänen) J.-E. Mattsson & M.-J. Lai B  
*Xanthoparmelia coloradoensis* ? (Gyelnik) Hale [BR] A  
*Xanthoparmelia cumberlandia* ? (Gyelnik) Hale [BR] A  
*Xanthoria candelaria* (L.) Th. Fr. var. *candelaria* [DEB] W  
*Xanthoria fallax* (Hepp) Arnold var. *fallax* [G]

In addition, one or more unidentified species were recorded from each of the following genera:

*Acarospora*, *Aspicilia*, *Buellia* ?, *Caloplaca*, *Cladonia*, *Collema*, *Dermatocarpon* or *Endocarpon* ? (bright green when wet), *Hypocrenomyce*, *Hypogymnia*, *Lecidea* sensu lato, *Melanelia*, *Ochrolechia*, *Peltula* ?, *Physcia*, *Rhizocarpon*, *Rinodina*, *Staurothele*, *Verrucaria*, *Xanthoparmelia*, and *Xanthoria*.

Bill Hill

#### Lake Pillsbury Field Trip

A total of 18 people attended the CALS field trip to Lake Pillsbury in April. A detailed account, with lichen lists, will appear in the next Bulletin.

## NEWS AND NOTES

### Mycological Society of San Francisco

The MSSF hosted a slide show and demonstration of the amazing flexibility of the 1930's through 1960's "Medical student" microscope, January 28, 1997. Ten members of the MSSF came to see how simple, home-made and inexpensive accessories could aid the Medscope in revealing secrets of fungal specimens. "Critical" (Abbe-Nelsonian), polarized, darkfield, oblique, and Rheinberg "optical staining" illumination techniques were emphasized. CALS member Mikki McGee used bits of plastic, simple lenses, and other "whiz-bang penny-gizmos" (her preferred term) to de-mystify and de-technologize the effective use of this marvelous instrument, which is now readily available second-hand from many sources.

Mikki McGee

### Mushroom Fair

The theme of the Lichen Exhibit at the best-ever Mushroom Fair in San Francisco, December 8, 1997 was the lichens of various plant communities. This was Janet Doell's idea based on the article she and Darrell Wright wrote for the Bulletin. Ten large colored prints were surrounded by their appropriate lichens.

Lynn Marsh unified the exhibit with her banner of a California transect. Bill Hill manned his microscopes for a stream of impressionable children and their parents. Music accompanied Richard Doell's striking slides, which were shown three times during the day. Others essential to our success were Cheryl Beyers and Beth Sampson.

Barbara Lachelt

## News and Notes

### New and Newly Republished Texts on the Lichens of the Pacific Northwest

From Bruce McCune:

1. Noble, W.J. 1982. The Lichens of the Coastal Douglas-fir Dry Subzone of British Columbia. Ph.D. Thesis, University of British Columbia, Vancouver. Part II reprinted and updated in 1997 by Bruce McCune with permission of the author. 238 pages, spiral bound. \$20-.

Bruce says the original thesis was and remains "the single most valuable book for people interested in learning the crustose lichen flora west of the Cascade Range..." His version assigns Ms. Noble's unknowns where appropriate to species published since 1982, updates nomenclature and provides an index as well as pointers to recent publications on a number of groups. Additions to the original text are clearly indicated.

2. McCune, B. 1997. Key to the Lichen Genera of the Pacific Northwest. 77 pages. Stapled cloth tape binding. \$6-.

These draft keys attempt to include all lichenized fungi known from the Pacific Coast inland to the Continental Divide in Montana, north to coastal southeast Alaska and south to northern California. The book includes a key to the sterile crusts reported for the region.

Bruce adds: "I am selling these in an attempt to recover my photocopying costs, but am not trying to profit by them." Send orders to:

Myrica,  
1840 NE Seavy Avenue,  
Corvallis, OR 97330, USA.

For shipping add \$4- for surface mail to any destination. For air mail add \$10- (western hemisphere), \$15- (Europe), or \$20- (elsewhere). Payment should be by U.S. check in U.S. dollars, made out to Bruce McCune, or by cash in U.S. or Canadian dollars, DM, or Swedish kroner. For more information e-mail Bruce at [mccune@proaxis.com](mailto:mccune@proaxis.com) or write him at the address above.

## UPCOMING EVENTS

**September 20-26 1997.** Lichen workshop and Santa Cruz Island field trip, Santa Barbara Natural History Museum. Participation in the workshop (Saturday and Sunday, September 20 and 21) can be one day or both days, but let the organizers know your plans. Attendance for the full length of the field trip (September 22-26) is necessary because of transport limitations.

### Workshop:

Bring your own puzzling lichen collections for assistance in identification, or collections that you want to verify against herbarium specimens in the Bratt-Tucker herbarium at SBNHM. Charis Bratt and Shirley Tucker will be on hand to assist or confer.

The emphasis will be on identifying lichen crusts from California, and we will have the necessary equipment, supplies, and references on hand. We will demonstrate how to section apothecia, and how to look for spores and other features necessary for identification.

Crusts are usually the most difficult to identify and least often collected, but are also intriguing. Once identified in the lab, many crusts can be sight-identified later, in the field. Those who saw the handsome red apothecia of the crust *Haematomma pacificum* (*Ophioparma rubricosa* (Müll. Arg.) S. Ekman is the name used in Esslinger & Egan, *The Bryologist* 98:467. 1995) on the Lake Pillsbury trip will agree that field identification of some crusts is possible.

Macrolichens (foliose and fruticose types) also can be brought, compared, and studied.

### What to bring for the workshop:

A plentiful supply of single-edge razor blades because you can only get good sections if you change blades frequently. Your own forceps and other favorite tools. We will have some on hand, but not the best. Hand-lens. Some dissecting scopes will be available, but not enough for everyone. A hand-lens is handy to be able to check certain features such as isidia, soredia, cyphellae, etc.

Field trip:

Depart by plane from Camarillo Airport on Monday, Sept. 22; time to be determined. Boat travel (considerably cheaper, but much longer) is also possible. We bring our own food, cook our own meals, and stay at the field station on Santa Cruz Island. Vehicles will be available for travel on the rather rough roads. A laboratory will be available; a few microscopes will be brought along for use by the group.

More detailed information about the trip, as it becomes available, will be sent to those who express an interest, by phone or mail.

Write:

Charis Bratt  
Santa Barbara Museum of Natural History  
2559 Puesta del Sol Road  
Santa Barbara, CA 93105

Phone: (805) 682-4711; X327;  
e-mail: cbratt@compuserve.com; or  
102631.367@compuserve.com

**October 18, 1997 and December 13, 1997**—Saturday Workshops organized by Judy Robertson [(707) 584-8099], to be held at San Francisco State University from 10AM to 4 PM. Details to be announced on the CALS Web site.

**November 15, 1997 and January 10, 1998**—Saturday Workshops organized by Judy Robertson [(707) 584-8099], to be held at the University of California, Berkeley from 10AM to 4 PM. Details to be announced on the CALS Web site.

**December, 1997**—CALs will again have two tables at the Mushroom Fair of the San Francisco Mycological Society at the beginning of the month. CALs has participated in these events for years, presenting informative displays of lichens, demonstrating lichen structures with a microscope and other things of this nature. If you have never been involved in one of these extravaganzas please consider donating some time to designing, building, or manning one of our tables. A little new blood never hurts in such projects. Call Janet Doell at (510) 236-0489 if you are interested.

**January 31, 1998**—Field trip to San Francisco watershed property in San Mateo County, followed by 1. a corporate meeting at San Francisco State University for the installation of new officers and 2. a lecture and 3. dinner arranged in the vicinity. On Sunday the 1st of February there will be a tour of Stanford's Jasper Ridge Biological Preserve for those interested. Please make a note of these dates. Details will appear in our winter Bulletin.

**Other plans for 1998, exact dates not yet available**— A second field trip to Oregon with lichenologists from that area in late May or June; and a fall field trip to the Sweeney Granite Mountains Desert Research Center, part of University of California Natural Reserve System in the Eastern Mojave Desert.

#### PRESIDENT'S REPORT

The California Lichen Society continues to grow and thrive, with the membership up to 150 and the treasury in good health. Reports on our 1997 activities to date appear elsewhere in this Bulletin and will not be enumerated here.

My primary goal for CALS over the next few months is to see small local informal study groups forming in the Bay Area and elsewhere in the state. We have a lot of new members who describe themselves as beginners and who are anxious to learn something about lichens

and how to determine them. This goal is more easily reached if a few people are working together. CALS member Judy Robertson has taken on the task of helping such groups get organized. Those of you living in the San Francisco Bay Area have already heard from her.

Anyone wanting more information on this project either to join a group or to start one, contact Judy Robertson at (707) 584-8099.

Janet Doell

# The Bulletin of the California Lichen Society

Vol. 4. Part 1

1997

Lichens of Cabrillo National Monument, Point Loma, San Diego	Charis Bratt	1
Bleach Residues in Herbarium Paper May Damage Lichen Collections	Darrell Wright	3
<i>Ramalina thrausta</i> (Ach.) Nyl. in California	William Sanders	6
<i>Usnea longissima</i> Ach. in San Mateo County	Janet Doell	6
<i>Verrucaria tavaresiae</i> sp. nov., a Marine Lichen with a Brown Algal Photobiont	Richard Moe	7
<i>Lecania cyathiformis</i> , a Forgotten California Lichen	Isabelle I. Tavares	11
Reports of Field Trips		12
News and Notes		15
Upcoming Events		16
President's Report		17