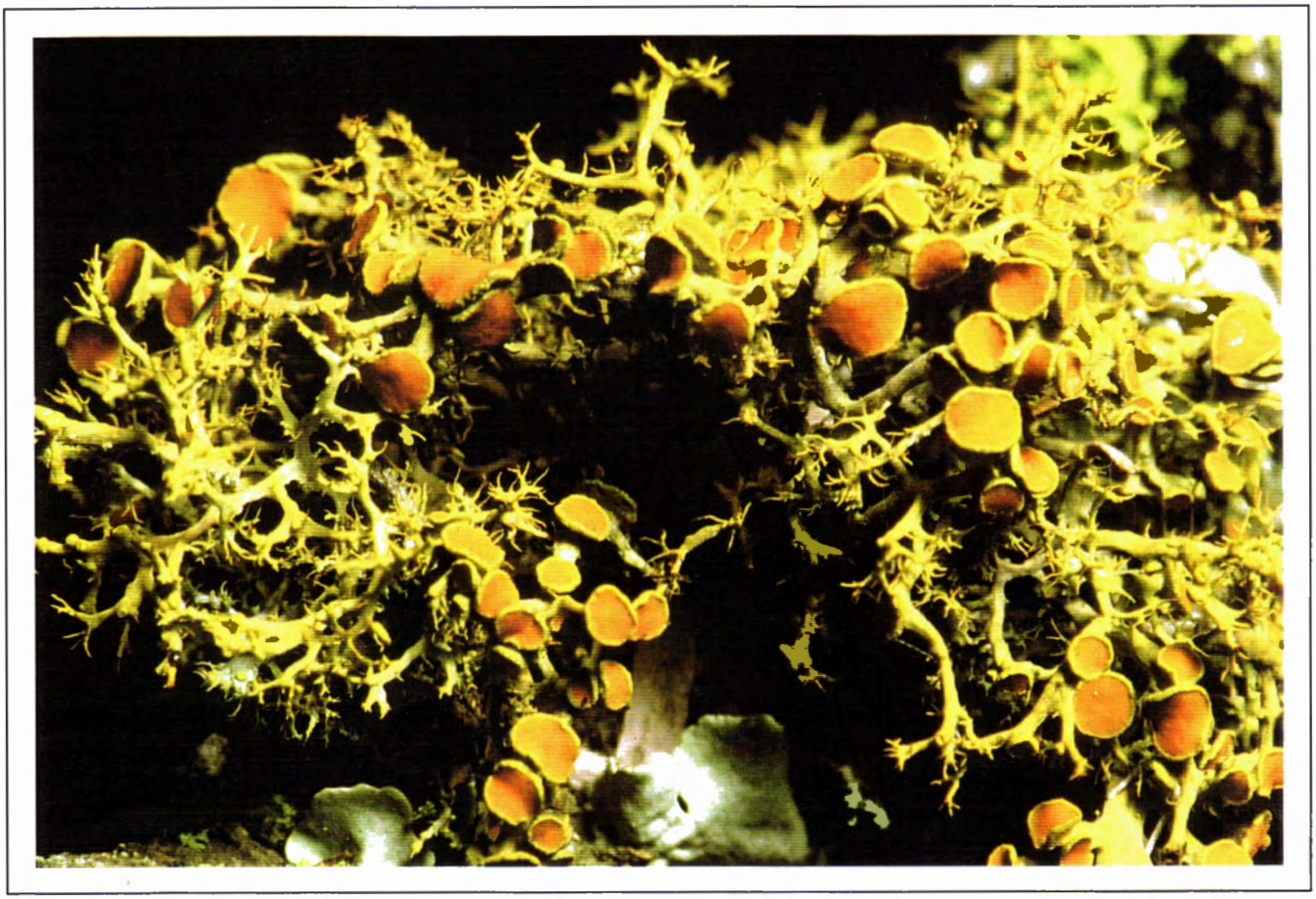
Bulletin

of the

California Lichen Society



Volume 6 No. 2 Winter 1999

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 principal focus is on California. Dues are $18 per year ($20 for foreign subscribers) payable to The California Lichen Society, 362 Scenic Ave., Santa Rosa, CA, 95407. 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, William Sanders, Richard Moe, and Darrell Wright and is produced by Richard Moe. 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 WordPerfect 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), and subsequent on-line updates: http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm. The editors may substitute abbreviations of author's names, as appropriate, from R.K. Brummitt and C.E. Powell, *Authors of Plant Names*, Royal Botanic Gardens, Kew, 1992. Style follows this issue. Reprints 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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Front Cover: *Teloschistes exilis* (Michaux) Vainio, one of the lichens included on the preliminary California Red List (see article by David L. Magney on p. 22). Photography by Richard Doell.

Back Cover: Map from Red List web page (see ucjeps.herb.berkeley.edu/rlmoe/cals.html) shows the percentage of the total number of rare California lichens that occur in each county. Note that no rare lichens have been reported from some counties. Los Angeles County, which includes several of the Channel Islands, has 36% of the lichens proposed as rare.

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Microbiotic Soil Crusts: Structure and Function

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In many arid and semiarid areas of the world, soil surfaces are consolidated by complex communities consisting of microorganisms, lichens, and bryophytes. The physical structure of microbiotic crusts varies depending on climate, soil type, and the composition of the biological community. Some crusts are flattened, polygonally cracked, and have a rough, undulating surface; while others are pedicellate and demonstrate a complex vertical microtopography. All soil crust communities contain some combination of cyanobacteria, bacteria, eukaryotic algae, and non-lichenized fungi. More structurally complex soil crusts also contain some combination of lichens and bryophytes.

Biological soil crusts have been known by a variety of names. Fletcher and Martin (1948) first used the term raincrust, but due to the fact that there are raincrusts of nonbiotic origin the term was later abandoned. Others have designated the crust by its dominant life form, i.e., algal crust, lichen crust, or moss crust. Kleiner and Harper (1972) coined the term cryptogamic soil crust, a term that has been widely used over the last 25 years. More recently, other suggestions have been made, including microphytic crust (West 1990), cryptobiotic crust (Belnap 1993), and microbiotic crust (St. Clair and Johansen 1993).

A growing body of data suggests that microbiotic crusts play several important ecological roles in arid and semiarid ecosystems. The most obvious, and likely the most important, role is stabilization of soil surfaces, which effectively controls and reduces erosion (Blackburn 1975, MacKenzie and Pearson 1979, Johansen et al. 1998). Even though the data is somewhat contradictory, there are some cases where seed germination and seedling establishment appear to be enhanced by soil crust development, especially in moist sites associated with the complex microtopography and cracking typical of well-developed soil crust communities (St. Clair et al. 1984, Eckert et al. 1986). Patterns of water infiltration and evaporation differ depending on the structure and biological composition of soil crust communities. Some crusts show increased infiltration with decreased evaporation while others demonstrate the opposite effect (Harper and Marble 1988, West 1990). Finally, microbiotic soil crusts have been shown to improve soil fertility. For example, both free-living and lichenized cyanobacteria fix significant amounts of atmospheric nitrogen (West and Skujins 1977, Jeffries et al. 1992). At least some of this nitrogen is ultimately used by the vascular plant community (Harper and Pendleton 1993). Furthermore, microbiotic crusts also contribute organic matter through primary productivity of cyanobacteria and eukaryotic algae. Due to this increased organic matter and reduced erosion of silts and clays, cation exchange capacity is often higher in crusted soils.

Microbiotic crusts in North America are most prevalent and best developed in the semiarid steppe regions of the Great Basin, Colorado Plateau, and Columbia Basin. They also extend into the hotter, more arid deserts in the southwestern portion of the United States and into Mexico. These areas differ from the semiarid regions east of the Rocky Mountains in that they have developed without the pressure of large herds of grazing ungulates (i.e. bison) and extensive wildfires. Antelope, mule deer, and elk grazed the semiarid Intermountain Area before the arrival of European settlers, but these animals did not graze in large herds and occupied crusted areas only during the colder, wetter months of the year when the crusts were less vulnerable. The prehistoric dominance of native bunch grasses, shrubs, and microbiotic soil crusts in the Intermountain West reflects the general lack of intensive grazing pressure in this region (Mack and Thompson 1982).

With the advent of European settlers and the subsequent introduction of large herds of sheep and cattle, vascular plant communities and microbiotic soil crusts have been significantly impacted. Domestic grazing animals typically do serious damage to soil crust communities through trampling, particularly during the drier, warmer periods of the year (Anderson et al. 1982b, Harper and Marble 1988). More recently, destruction of soil crusts by off-road vehicles and backpackers has become an increasing concern in many areas. Wildfires also cause serious damage to soil crust communities by killing most of the lichens, bryophytes, and algae (Johansen et al. 1982, 1984). The frequency and intensity of wildfires in the Intermountain Area has increased significantly due to the pervasive spread of several introduced annuals, for example, cheat grass (*Bromus tectorum*).

Several factors influencing the development of microbiotic crusts have been studied (Anderson et al. 1982a). Generally, the data show that silty soils with high electrical conductivity are more likely to have well developed soil crust communities. Several reclamation studies have also been undertaken to evaluate recovery patterns of soil crust components following various types of disturbance (Anderson et al. 1982b, Johansen and St. Clair 1986, Johansen et al. 1982, 1984). These studies indicate that recovery is generally slow, but may be greatly enhanced following periods of unusually high precipitation. Algae generally recover first followed by lichens and mosses. Several studies have shown that application of inoculants can accelerate recovery (St. Clair et al. 1986, Belnap 1993, Johansen et al. 1998).

Literature Cited

Anderson, D.C., K.T. Harper and R.C. Holmgren. 1982a. Factors influencing development of cryptogamic soil crusts in Utah deserts. Journal of Range Management 35: 180–185.

Anderson, D.C., K.T. Harper and S.R. Rushforth. 1982b. Recovery of cryptogamic soil crusts from grazing on Utah winter ranges. Journal of Range Management 35: 355–359.

Belnap, J. 1993. Recovery rates of cryptobiotic crusts: inoculant use and assessment methods. Great Basin Naturalist 53: 89–95.

Blackburn, W.H. 1975. Factors influencing infiltration rate and sediment production of semiarid rangelands in Nevada. Water Resources Research 11: 929–937.

Eckert, R.E., Jr., F.F. Peterson, M.S. Meurisse and J.L. Stephens. 1986. Effects of soil-surface morphology on emergence and survival of seedlings in big sagebrush communities. Journal of Range Management 39: 414–420.

Fletcher, J.E. and W.P. Martin. 1948. Some effects of algae and moulds in the rain crust of desert soils. Ecology 29: 95–100.

Harper, K.T. and J.R. Marble. 1988. A role for nonvascular plants in management of arid and semiarid rangelands. Pages 135–169 in P.T. Tueller, ed., Vegetation Science Applications for Rangeland Analysis and Management. Kluwer Academic Publishers, Dordrecht; Boston; London.

Harper, K.T. and R.L. Pendleton. 1993. Cyanobacteria and cyanolichens: can they enhance availability of essential minerals for higher plants? Great Basin Naturalist 53: 59–72.

Jeffries, D.L., J.M. Klopatek, S.O. Link and H. Bolton, Jr. 1992. Acetylene reduction by cryptogamic crusts from a blackbrush community as related to resaturation and dehydration. Soil Biology and Biochemistry 24: 1101–1105.

Johansen, J.R., A. Javakul and S.R. Rushforth. 1982. Effects of burning on the algal communities of a high desert soil near Walsburg, Utah. Journal of Range Management 35: 598–600.

Johansen, J.R., L.L. St. Clair, B.L. Webb and G.T. Nebeker. 1984. Recovery patterns of cryptogamic soil crusts in desert rangelands following fire disturbance. Bryologist 87: 238–243.

Johansen, J.R. and L.L. St. Clair. 1986. Cryptogamic soil crusts: recovery from grazing near Camp Floyd State Park, Utah, USA. Great Basin Naturalist 46: 632–640.

Johansen, J.R., L.L. St. Clair, D. Evans, V. Flechtner, J. Balczon, and B.L. Webb. 1998. Resilience of Microbiotic Species to Military Training Pressures: Natural and Stimulated Recovery Following Disturbance. Technical Report (Contract DACA88-95-C-0015) USACERL. 210 pages.

Kleiner, E.F. and K.T. Harper. 1972. Environment and community organization in grasslands of Canyonlands National Park. Ecology 53: 299–309.

Mack, R.N. and J.N. Thompson. 1982. Evolution in steppe with few large, hooved mammals. American Naturalist 119: 757–773.

MacKenzie, H.J. and H.W. Pearson. 1979. Preliminary studies on the potential use of algae in the stabilization of sand wastes and wind blow situations. British Phycological Journal 14: 126.

St. Clair, L.L., B.L. Webb, J.R. Johansen and G.T. Nebeker. 1984. Cryptogamic soil crusts: enhancement of seedling establishment in disturbed and undisturbed areas. Reclamation and Revegetation Research 3: 129–136.

St. Clair, L.L. and J.R. Johansen. 1993. Introduction to the symposium on soil crust communities. Great Basin Naturalist 53: 1–4.

St. Clair, L.L., J.R. Johansen and B.L. Webb. 1986. Rapid stabilization of fire disturbed sites using a soil crust slurry: inoculation studies. Reclamation and

Revegetation Research 4: 261-269.
West, N.E. 1990. Structure and function of microphytic soil crusts in wildland ecosystems of arid to semi-arid regions. Advances in Ecological Research 20: 179–223.
West, N.E., and J. Skujins. 1977. The nitrogen cycle in North American cold-winter semidesert ecosystems. Oecologia Plantarum 12: 45–53.

Additions to the Lichen Flora of San Clemente Island, California

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In the Bulletin of the California Lichen Society 3(2), 1996, Bowler, Weber, and Riefner published a checklist of the lichens of San Clemente Island that included 137 entities: 125 species or infraspecific taxa (3 identified approximately) and 12 entities identified only to genus. They also listed 11 taxa mentioned in Hasse (1903) but not encountered by them. Most of the records in the report were based on collections made by Weber and Santesson in 1966, and some were based on collections by Bowler and Riefner.

Two of the records deserve special comment. The Weber/Santesson collection #42907 that is listed as *Toninia tristis* has been annotated at COLO by Timdal as *Toninia ruginosa* ssp. *pacifica*. According to Timdal's monograph of *Toninia* (Timdal 1991), *T. tristis* does not occur in California. All of the specimens cited by Bowler, Weber, and Riefner as *Opegrapha* sp. in COLO (L-42619, L-42623, and L-42847) have been annotated by Egea as *Opegrapha brattiae* (an unpublished name).

The present report is based on collections made at San Clemente Island in 1996 and 1997. Fifty-seven species are reported for the first time; no attempt has been made to add new records of species previously listed from the island. Many of the collection sites listed are in the southern third of the island which, because of severe restrictions imposed by the U.S. Navy, had not previously been visited. In this area the canyons on the northeast side of the island are very short and steep. On the southwest side of the island the slope is more gradual although the canyon bottoms are narrow and often more difficult to traverse. Most of the collecting was done near the tops of the canyons. Younger and more agile lichenologists will find much area left to explore.

The most exciting discovery is that of *Texosporium sancti-jacobi* in two different but adjacent locations in Chenetti Canyon, one at 365 m and the other at 260 m. This is the first report of this species from any of the Channel Islands and only the fourth reported location for this lichen in California. It is interesting that in both of these collections, *Texosporium* was growing on other lichens, albeit different species. This lichen is otherwise found on detritus or on dried rabbit dung.

The following list is by no means complete as there are many more areas to explore and many more specimens to be identified. All specimens representing original records are stored in SBBG.

Locations:
BC: Box Canyon
CB: China Beach
CH: Chukit Canyon
CL: Canchalagua Canyon
CM: Living Compound
CN: Chenetti Canyon
CP: China Point
CV: Cave Canyon
EC: Eagle Canyon
MA: Camera pad "Malo"
MC: Mosquito Canyon
MR: Middle Ranch
PP: Pot Pond on road to the airport
RW: REWS site between Thirst and Chukit Canyons
SP: Spray
ST: Snapper Tower
VO: Vista Oaks

Collectors:
MD: Marla Daily
SJ: Steve Junak
All others are collections of the author.

Acarospora carnegiei **Zahlbr.**—CL: 9720, 9730.
Aspicilia caesiocinerea **(Nyl. ex Malbr.) Arnold**—ST: 9616; RW: 9808; CL: 9723.
Aspicilia calcarea **(L.) Mudd** —CL: 9702.

Aspicilia cinerea **(L.) Körber** —EC: 10134, 10149.
Buellia retrovertens **Tuck.** —RW: 9799.
Buellia turgescens **Tuck.** —EC: 10164.
Caloplaca brattiae **W.A. Weber** —ST: 9646; BC: 9742; RW: 9800, 9802; CL: 9725.
Caloplaca cerina **(Hedwig) Th. Fr.** —PP: 9572. On twigs of *Lycium*.
Caloplaca epithallina **Lynge** —CN: 10,271. On *Endocarpon*.
Caloplaca ferruginea **(Hudson) Th. Fr.**—CH: 9676. On *Prunus*.
Caloplaca ignea **Arup** —MC: 10177.
Candelariella coralliza **(Nyl.) H. Magn.** —MS: 10200, 10204.
Candelariella rosulans **(Müll. Arg.) Zahlbr.** —EC: 10161.
Candelariella vitellina **(Hoffm.) Müll. Arg.** —CL: 9718.
Cladonia pyxidata **(L.) Hoffm.** —EC: 10151.
Dendrographa leucophaea **(Tuck.) Darbish. f. minor (Darbish.) Sundin & Tehler** (cited by Sundin and Tehler, 1996 as transitional between f. *minor* and f. *leucophaea*)
Diploschistes actinostomus **(Ach.) Zahlbr.** —ST: 9740; CL: 9729, 9722.
Flavopunctelia soredica **(Nyl.) Hale** —VO: 9927. On *Quercus tomentella*.
Fuscopannaria leucophaea **(Vahl) P.M. Jørg.** —CL: 9711; MA: SJ SCI-993C.
Lecania naegelii **(Hepp) Diederich & v. d. Boom** —VO: 9926. On *Quercus tomentella*.
Lecanora meridionalis **H. Magn.** —CH: 9679. On *Prunus*.
Lichinella nigritella **(Lettau) Moreno & Egea** —CH: 9870.
Lichinella stipatula **Nyl.** —MR: 9770; CH: 9864; CV: 9836.
Melanelia fuliginosa **(Fr. ex Duby) Essl.** —ST: 9602, 9738, 9751.
Niebla dissecta **Spjut** —RW: 9830.
Niebla laminaria **Spjut** —CP: 10258, CM 10130
Niebla sorediata **Spjut** —EP: COLO Ex #185. Distributed as *Ramalina homalea*. Isotype.
Niebla sorocarpia **Spjut** —CM 10128.
Niebla testudinaria **(Nyl.) Spjut** —CP: 10255.
Opegrapha brattiae Egea & Torrente (nom. ined.), fide Egea annotation of specimen —ST: 9642.
Parmotrema stuppeum **(Taylor) Hale** —MR: 9789, 9780; CL: 9726.
Peltula omphaliza **(Nyl.) Wetmore** —CV: 9846.
Peltula patellata **(Bagl.) Swinscow & Krog** —RW: 9811.
Phlyctis argena **(Sprengel) Flotow** —VO: 9910. On *Quercus tomentella*.
Physcia tribacia **(Ach.) Nyl.** —EC: 10157, 10140, 10148; MA: SJ SCI-994 A.
Placidium chilense **(Räsänen) Breuss** —CH: 9861.
Placidium lacinulatum **(Ach.) Breuss** —CV: 9850, 9851; CH: 9859, 9860.
Pleopsidium chlorophanum **(Wahlenb.) Zopf** —CB: 10249.
Protoparmelia badia **(Hoffm.) Hafellner** —ST: 9637.
Psora pacifica **Timdal** —CV: 9856 A.
Psora tuckermanii **R. Anderson ex Timdal** —CH: 9858; RW: 9817.
Sclerophyton californicum **(Tuck.) Hasse** —MR: 9793.
Syzygospora physciacearum **Diederich** —MA: SJ SCI-994 B. On *Physcia tribacia* on rock face. Note: this is a lichenicolous heterobasidiomycete.
Teloschistes exilis **(Michx.) Vainio** —ST: 9622; On rock. VO: 9913. On *Quercus tomentella*.
Tephromela nashii **Kalb** —PP: 9588.
Texosporium sancti-jacobi **(Tuck.) Nádv.** —CN: 10312. On a white crustose lichen. CN: 10276; on *Peltula patellata*. First published record from the California Channel Islands.
Thelomma santessonii **Tibell** —CL: 9704; RW: 9806; SP: 9660; PP: 9569; MA: 10222; EC: 10155; ST: 9636; BC: 9601.
Usnea esperantiana **Clerc** —FS: MD 22. On *Quercus tomentella*.
Vermilacinia acicularis **Spjut** —EC: 10147, 10132, 10139; RW: 9829; BC: 9606.
Vermilacinia cerebra **Spjut** —CM: 10129; CP: 10257.
Vermilacinia nylanderi **Spjut** —MC: 10186
Vermilacinia pumila **Spjut** —SP: 9657, 9649; ST: 9599; CL: 9696.
Xanthoparmelia coloradoënsis **(Gyelnik) Hale** —CV: 9837, 9838; CL: 9706, 9693, 9695.
Xanthoparmelia conspersa **(Ehrh. ex Ach.) Hale** —EC: 10159.
Xanthoparmelia cumberlandia **(Gyelnik) Hale** —CL: 9699, 9710.
Xanthoparmelia plittii **(Gyelnik) Hale** —EC: 10153; MA: 10224.
Xanthoria candelaria **(L.) Th. Fr.** —CH: 9669; RW: 9801; VO: 9908; MR: 9764.

Acknowledgements

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Literature Cited

Bowler, P.A., W.A. Weber and R.E. Riefner, Jr. 1996. A checklist of the lichens of San Clemente Island, California. Bulletin of the California Lichen Society 3(2):1–8.

Hasse, H.E. 1903. The lichen-flora of San Clemente Island. Bulletin of the Southern California Academy of Sciences 2: 54–55.

Sundin, R. and A. Tehler. 1996. The genus *Dendrographa* (Roccellaceae). The Bryologist 99: 19–31.

Timdal, E. 1991. A monograph of the genus *Toninia*. Opera Botanica 110: 1–137.

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. I have chosen three of these for a trial "question and answer" column in the CALS Bulletin with the expectation that some readers may have wondered about these subjects. The column is meant to serve people who are new to lichens and do not have easy access to lichen literature, but also people with more experience who may themselves be asked questions like these. I will be happy to address questions asked by readers.

1. **Question**
What is the phylogeny of lichens? Where do they fit into the scheme of phylum, order, etc.
Answer
The whole subject of lichen phylogeny is under scrutiny at the moment, but here is some information on the subject. You can see right from the start that what we are talking about here is the fungal partner only, not the algal component of the lichen. Lichens don't really fit anywhere perfectly because they are not an "organism" in the usual sense; rather their component bionts fit separately into classification schemes.

Ainsworth & Bisby's Dictionary of the Fungi, eighth edition (Hawksworth et al., 1995, pp. 169–171, 227–228) includes a discussion about the complexity of "fungi", but it segregates as the Kingdom Fungi four phyla of what have been traditionally regarded as fungi. Two of these phyla are Ascomycota and Basidiomycota, which include the lichen fungi. Like green algae, fungi are eukaryotic, the cell nucleus being enclosed in a membrane; by contrast, the nuclear material in cyanobacteria ("blue-green algae") is not surrounded by a membrane (prokaryotic).

Fungi have no photosynthetic pigments. They absorb nutrients from dead or living organisms; as decomposers of the biosphere, they break down organic products, restoring carbon, nitrogen and other components to soil and air.

Most lichen fungi are ascomycetes (spores borne inside asci); few are basidiomycetes (spores borne externally on basidia). Much more information is needed in order to clarify phylogenetic relationships, and some categories used elsewhere have been discarded in Ainsworth & Bisby's Dictionary of the Fungi of 1995, which includes 46 orders and 264 families, only a few of which include lichens.

Included within the orders (names ending in -ales, such as Lecanorales) are families (names ending in -aceae; thought to be interrelated). The families include what are construed as related genera, and within each genus is included an assemblage of species presumably more closely related to one another than they are to species in another genus. According to Hale (1974, p. 156) "species are recognized by more or less arbitrary combinations of vegetative and ascocarp characters". If we add to this chemical characteristics, DNA and other current microbiological information, the species concept becomes very complex. You will find a current discussion on this subject, with more detailed information in Tehler (1996).

2. **Question**
What are some ascomycetes that are not lichenized?
Answer
Ascomycetes are a large, widespread group of fungi, but most non-lichenized species are small and inconspicuous. Brewer's yeast, for example, is an ascomycete, as are many plant pathogens, both in the temperate zones and in the tropics. *Penicillium* is also an ascomycete. A few fleshy, mushroom-like fungi are ascomycetes, but gilled mushrooms belong to the basidiomycetes, in which the spores are borne externally.

3. Question
Corals have a way of controlling the population size of their symbiotic algal partners. Do lichens have a similar mechanism?
Answer
A study of *Flavoparmelia caperata* was cited by Ahmadjian (1993) as exhibiting some kind of control mechanism; he stated (Ahmadjian, 1993, p. 88) that "The photobiont population appeared to be under some type of limiting control, beyond what might be expected from environmental constraints. Perhaps the mycobiont produces inhibitors in older regions of a thallus that affect photobiont division." He added a quotation from Honegger's paper on pattern formation in the algal layer of lichens with stratified thalli (Honegger, 1987, Bibliotheca Lichenologica 25: 59–71), to the effect that Honegger felt that "the photobiont cells of non-growing areas are slowed down in their metabolic activity by a probably, mycobiont-derived inhibitory complex, the molecular basis of which is not yet understood."

Literature Cited

Ahmadjian, V. 1993. The Lichen Symbiosis. John Wiley & Sons, Inc. New York, i–xv, 250 p.

Hale, M. 1974. The Biology of Lichens. Second Edition. American Elsevier Publishing Co., Inc. New York, 181 pp.

Hawksworth, D.L., P.M. Kirk, B.C. Sutton and D.N. Pegler 1995. Ainsworth & Bisby's Dictionary of the Fungi. Eighth Edition. CAB International, Wallingford.

Tehler, A. 1996. Systematics, phylogeny and classification. Chapter 12. Pp 217–239, in Lichen Biology, ed. T.H. Nash, III. Cambridge University Press, Cambridge.

Preliminary List of Rare California Lichens

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Very little work has been done to date to identify which lichens occurring in California are rare. A few lichens have been placed on the Preliminary Global Red List of Lichens by the International Committee for the Conservation of Lichens (ICCL), set up by the International Association of Lichenologists (IAL), which is a specialist group connected to IUCN (World Conservation Union). That list is available at the Swedish Threatened Species Unit web-site
(http://www/dha.slu.se/guest/global.htm),
which lists only extinct and critically endangered species. The Global Red List only includes three taxa from California. Clearly, many more than three California lichen taxa are rare.

The California Native Plant Society (CNPS) has spent a great deal of time and put a lot of thought into developing its Inventory of Rare and Endangered Vascular Plants of California, now in its 5th edition. The CNPS list has become an extremely important tool for conserving the California flora, and is the standard which is used by state, federal, and local agencies, and others, when evaluating land management options, such as under the environmental evaluation process of the California Environmental Quality Act (CEQA). However, no such parallel list occurs for the lichens of California, some of which are as rare and endangered as any vascular plant or wildlife species. Unfortunately, the only practical way in which plants are considered under the CEQA process is if a list is published by a respectable group or scientist(s), such as CNPS or CALS.

Therefore, I think there is a great need to start the process of developing a list of rare and endangered lichens for California. I suggest that CALS work with CNPS to gather the necessary data to support our ranking of the California plants that we, the professional, academic, and amateur lichenologists, are most familiar with—this unique group called lichens.

For the past few years I have been pushing consultants and lead agencies in California to evaluate the lichen flora of a project site equally to that of the vascular plant flora for any project evaluated under CEQA. After all, lichens should have the same standing as vascular plants and animals. Recently, good efforts have been made with this for environmental impact reports (EIRs) in Ventura, Santa Barbara, Sonoma, and San Luis Obispo counties, so a precedent has already been set. In fact, a recent (October 1998) court ruling by the Ventura County Superior Court found a project EIR insufficient, according to CEQA Guidelines. The court found that the consultants and lead agency failed to conduct a survey of the lichen flora of the project site, or evaluate project-

related impacts on lichens. The court then ordered that such surveys and analysis must be conducted to satisfy CEQA requirements.

I recommend that we apply the same rules to California lichens for determining rarity as those used by CNPS and the IUCN. Both ranking systems can be used to properly place our California rare lichens on such a list based on: number of populations or individuals; level of threat to a taxon's existence; and distribution. As Violeta Atienza of the University of Valencia, Spain pointed out (International Lichenological Newsletter 31(2): 57. 1998), determining lichen population size and viability is challenging at best, when trying to apply methods used for vascular plants.

With these ideas in mind, I have developed a preliminary list of lichens that may be considered endangered, rare, or at least uncommon, in California. Part of the problem we face in developing such a list is that many lichenologists think that we don't know enough about the California lichen flora to be able to accurately assign rarity levels to lichen taxa. It is true that many areas of California have been poorly, or not even, collected, or documented. This is true also for vascular plants, but less so. However, we need to start somewhere and now is as good a time as any. Some taxonomic groups of lichens are poorly understood, with many species often being misidentified. Some lichen species I have considered here are believed to be too common to include, but few records are known for them in California.

This list will be revised on a periodic basis. It is often the case that, when someone publishes a flora, numerous comments are submitted to the author(s) about all those omitted taxa. While floristic and taxonomic work is never done, identifying a task and challenging others to work on it can raise considerable interest. With that in mind, I present here a preliminary list of rare California lichens.

I have suggested rarity status categories following both the CNPS and IUCN designations. Both ranking/listing criteria are provided below in Table 1 - Natural Diversity Data Base Element Ranking System.

The CNPS R-E-D Code is a numerical ranking for each of the three categories (rarity, endangerment, and distribution) that more accurately describes each plant's population levels and is specific for each of the three categories, as described in Table 2 - CNPS R-E-D Code.

CNPS categorizes each rare plant into five lists (1A, 1B, 2, 3, and 4), as described below in Table 3 - CNPS Rare Plant Lists. I find these lists generally good; however, the CNPS categories leave a large gap between List 1B and List 4, making it difficult to properly place some taxa that are clearly rare but not endangered.

I would also suggest that in future lists we consider rarity on a more local level, such as coastal versus inland, northern California versus southern California, and by county, biogeographic, or floristic region.

Each taxon has been assigned to a global and state ranking and to one of the CNPS lists; however, rare lichens will not be published in the CNPS Inventory, at least not in the sixth edition.

This preliminary list identifies 38 lichen taxa that, based on available information at the time of this publication, appear to be rare in California. Some of these may be more common while others not listed here are indeed rare and should be added to this list.

Charis Bratt reviewed this and earlier drafts of this list and together we eliminated many species that we agreed were too common to be included. Darrell Wright also reviewed the manuscript. We applied fairly high requirements for inclusion on this list, deciding not to include lichen taxa that, based on our experience and intuition, we think are seriously undercollected or documented. Unverified records of lichens in California were discounted and not included in this list. Please review this list and provide as much data and criticism as you can to me at:
FAX 805/646-6975 or
email to dmagney@aol.com.
I look forward to your assistance.

Preliminary List of Rare California Lichens

Bacidina californica **S. Ekman / Lecideaceae G2/S2.1; CNPS 4 - 3-1-3.** Marin Co.; Monterey Co., Big Sur (type locality); Santa Barbara Co., Santa Barbara foothills at SR154 & SR192 *Bratt & Magney 10,319* (Bratt herbarium); San Mateo Co.; Channel Islands. On bark of *Aesculus californica, Cupressus,* and *Umbellularia californica.* Possibly under-collected.

Bryoria pseudocapillaris **Brodo & D. Hawksw. /** Parmeliaceae **G1/S1.1; CNPS 2 - 2-3-2; Critically Endangered (B1), on Global Red List (Thor 1996).** San Luis Obispo Co., Baywood Park; Humboldt Co.; Oregon, Florence.

Bryoria spiralifera **Brodo & D. Hawksw. /** Parmeliaceae **G2/S2.2; CNPS 1B - 2-3-3.** Humboldt Co., Samoa Peninsula; Monterey Co., near Pt. Lobos; Santa Clara Co., Happy Valley *J.F. McBride s.n. Apr 1946* on *Usnea* collection (D. Wright unpubl.; F); San Luis Obispo Co. (Baywood Park, Montaña de Oro SP; Los Osos Oaks Reserve); Sonoma Co.

Caloplaca subpyraceella **(Nyl. in Hasse) Zahlbr. /** Teloschistaceae **G3/S3.3; CNPS 4 - 2-2-3.** Butte Co.; Marin Co.; Santa Barbara Co., Santa Barbara foothills

at SR154 and SR192 *Bratt & Magney 10,321* (Bratt herbarium); San Diego Co., Pt. Loma; San Luis Obispo Co.; Ventura Co., Conejo Mtn. Region, Pt. Mugu, north edge of Toland Road Landfill *Bratt & Magney* (Bratt herbarium). Possibly under-reported.

***Cladonia firma* (Nyl.) Nyl.** / Cladoniaceae **G3/S1.1; CNPS 2 - 3-3-2.** San Diego Co., Torrey Pines Reserve?; San Luis Obispo Co. (Los Osos; Baywood Park *Magney* [Bratt herbarium]); Mediterranean Region.

***Cladonia thiersii* S. Hammer** / Cladoniaceae **G2/S2.3; CNPS 4 - 2-2-3.** Marin Co., Pt. Reyes Peninsula; Sonoma Co.; Mendocino Co.; San Diego Co., Torrey Pines Reserve?.

***Coccotrema pocillarium* (Cummings) Brodo** [*Ochrolechia pacifica* H. Magn., *Perforaria minuta* Degel.] / Pertusariaceae? **G1/S1.2; CNPS 1B - 3-2-2.** Sonoma Co., SR1 near Fort Ross. Probably under-collected and under-reported.

***Cyphelium brunneum* W.A. Weber** / Coniocybaceae **G3/S3.2; CNPS 1B - 2-2-3.** Orange Co., Niguel Hill; Channel Islands.

***Gyalecta herrei* Vězda** / Gyalectaceae **G3/S3.2; CNPS 4 - 2-2-3.** Humboldt Co.; Orange Co., Aliso Pk.; Marin Co., three localities (Wright unpubl.); San Mateo Co.

***Lecania cyathiformis* Szatala** / Lecanoraceae **G1.S1.1; CNPS 1B - 3-3-3.** San Diego Co., La Jolla *Parks 3371* (UC) (Tavares 1997); San Luis Obispo Co. On *Rhus*.

***Lecanora phryganitis* Tuck.** / Lecanoraceae **G3/S3.3; CNPS 4 - 1-1-3.** Marin Co., "South Franklin Rocks"/ Tomales Bay (West and Doell 1995); Mendocino Co.; Monterey Co.; San Luis Obispo Co., Morro Rock Reserve; Santa Cruz Co.; San Francisco Co.; San Mateo Co.; Sonoma Co.

***Phaeophyscia decolor* (Kashiw.) Essl.** / Physciaceae **G2/S2.3; CNPS 4 - 2-2-2.** Alpine Co., Clark Fk. Rd., Carson-Iceberg Wild.; Inyo Co.; Los Angeles Co., Eagles Roost Sand Shed-SR2; Madera Co., Rock Cr. Camp; San Diego Co., Palomar Divide Truck Trail; Shasta Co., Manzanita Cr.-SR44; Siskiyou Co., Shackleford Cr.; Tulare Co., Mt. Whitney; Tuolumne Co., Herring Cr. Rd. May be under-collected and -reported.

***Phaeophyscia kairamoi* (Vainio) Moberg** [*Physcia kairamoi* Vainio]/ Physciaceae **G2/S2.3; CNPS 4 - 1-1-2.** Inyo Co., Death Valley; Los Angeles Co., Santa Catalina I. (Los Angeles Co.); Monterey Co., Arroyo Seco Cyn. Camp; Santa Barbara Co., Black Mtn., Santa Rosa I. (Santa Barbara Co.); San Luis Obispo Co., Coon Cr., Montaña de Oro; Ventura Co., Pt. Mugu, Conejo Mtn. (Riefner 1992). May be under-collected and -reported.

***Phaeophyscia sciastra* (Ach.) Moberg** [*Physcia sciastra* (Ach.) Du Rietz] / Physciaceae **G2/S2.3; CNPS 4 - 1-1-2.** Fresno Co.: Marin Co.; Riverside Co., Pinyon Flats at SR74; Shasta Co., Manzanita Cr. at SR44; Ventura Co., Sespe Cr. at SR33. May be under-collected and -reported.

***Physcia halei* J.W. Thomson** / Physciaceae **G1/S1.2; CNPS 1B - 3-2-2.** Tulare Co., Jack Flat Camp at SR137. May be under-collected and -reported.

***Physcia magnussonii* Frey** / Physciaceae **G1/S1.3; CNPS 1B - 2-1-2.** Lake Co., Lake Pillsbury. Identification needs to be checked.

***Protoparmelia badia* (Hoffm.) Hafellner** [*Lecanora badia* (Hoffm.) Ach.] / Lecanoraceae **G4/S2.2; CNPS 2 - 2-2-1.** Calaveras Co.; El Dorado Co., Lost Lake/Sugar Pine SP; Inyo Co.; Tulare Co., Kaweah R. at SR198 at 300m; Ventura Co., Pt. Mugu; Colorado and eastward where it is common. California records need to be verified.

***Punctelia punctilla* (Hale) Krog** / Parmeliaceae **G1/S1.1; CNPS 1B - 3-3-2.** Ventura Co., Conejo Mtn. (Riefner 1992), Pt. Mugu.

***Pyrrhospora russula* (Ach.) Hafellner** [*Lecidea russula* Ach.] / Lecideaceae **G2/S2.2; CNPS 4 - 2-2-2.** Lake Co., Lake Pillsbury *Tucker 19 APR 1997* (Wright 1997); Santa Barbara Co.?; Trinity Co. Probably under-collected and -reported.

***Ramalina thrausta* (Ach.) Nyl.** / Ramalinaceae **G3/S1.2; CNPS 2 - 2-2-2.** Sonoma Co., between Cazadero and Fort Ross (Sanders 1997); Oregon; North America.

***Rhizocarpon concentricum* (Davies) Beltr.** / Lecideaceae **G1/S1.2; CNPS 1B - 3-2-2.** Mendocino Co.; San Bernardino Co., Granite Mountains (Bratt pers. comm.); San Luis Obispo Co., near Montaña de Oro (Riefner); Arizona. California collections need to be verified.

***Roccella babingtonii* Mont.** / Roccellaceae **G1/S1.1; CNPS 1B - 3-3-2.** San Clemente I. (Los Angeles Co.), Eel Pt. *Bowler 83-102* (IRVC; Bowler et al., 1996); San Diego Co.

***Roccella fimbriata* Darbish.** / Roccellaceae **G1/S1.1; CNPS 1B - 3-3-2.** San Clemente I. (Los Angeles Co.), Eel Pt. *Weber & Santesson L*-42600 (COLO), *Riefner & Bowler 89-109* (IRVC; Bowler et al., 1996); San Diego Co., Pt. Loma (Bratt 1997); San Diego Co.; San Luis Obispo Co., White Pt./Morro Bay SP.

***Roccellina conformis* Tehler** / Roccellaceae **G1/S1.1; CNPS 1B – 3-3-2.** Santa Catalina I. (Los Angeles Co.), near Avalon (*Tehler 1402a* S – Type; additional collections from Santa Catalina). On bark.

***Roccellina franciscana* (Zahlbr. ex Herre) Follman** [*Dirina franciscana* Zahlbr. ex Herre, *Schismatomma cupressum* Herre] / Roccellaceae **G2/S2.2; CNPS 1B - 1-2-3.** Monterey Co.; Santa Cruz Co.; San Mateo Co.; San Francisco Co.; San Luis Obispo Co., Morro Rock Reserve, White Pt./Morro Bay SP.

***Sulcaria badia* Brodo & Hawksw.** / Alectoriaceae **G1/S1.1; CNPS 2 - 3-3-2; Critically Endangered on Global Red List (Thor 1996).** Mendocino Co., on apple and oak in *Quercus garryana* woodland; Oregon, Benton County; Washington, Clallam County (Olympic Peninsula) (may be extirpated). Mendocino

Co. occurrences may be only viable populations. (Peterson et al. 1998.)

Sulcaria isidiifera **Brodo** / Alectoriaceae **G1/S1.1; CNPS 1B - 3-3-3.** San Luis Obispo Co., Montaña de Oro SP, Field Ranch, Morro Bay SP, Rancho Cañada de Los Osos, Baywood Park.

Teloschistes californicus **Sipman** / Teloschistaceae **G2/S2.2; CNPS 1B - 2-2-2.** Marin Co.; San Mateo Co.; Santa Cruz Co.; Channel Islands except Santa Cruz I. (Santa Barbara Co.).

Teloschistes exilis **(Michaux) Vainio** / Teloschistaceae **G3/S3.3; CNPS 4 - 1-2-1.** Los Angeles Co., Pasadena, Claremont; Marin Co., Copper Mine Gulch, McCurdy Trail at Bolinas Ridge, Mt. Tamalpais/Rock Springs (West and Doell 1995); Mendocino Co.; Riverside Co., Santa Rosa Plateau; Santa Barbara Co., Santa Barbara foothills at SR154 and SR192 (*Bratt & Magney 10,367* [Bratt herbarium]); San Luis Obispo Co., Cerro Alto SP, Montaña de Oro SP; San Mateo Co.; Sonoma Co.

Teloschistes flavicans **(Sw.) Norman** / Teloschistaceae **G3/S3.3; CNPS 4 - 1-2-1.** Los Angeles Co., Santa Monica Mtns.; Marin Co., Mt. Tamalpais, Mill Valley, "South Franklin Rocks"/Tomales Bay (West and Doell 1995); Monterey Co.; Santa Barbara Co., Pt. Sal; San Clemente I. (Los Angeles Co.), Lost Point Canyon *Weber & Santesson L-42890* (COLO); San Luis Obispo Co., Montaña de Oro SP, SR46 at Cypress Mtn.; San Mateo Co., Pilarcitos Cr. Cyn.; Channel Islands. On shrubs and branchlets.

Texosporium sancti-jacobi **(Tuck.) Nádv.** [*Cyphelium sancti-jacobi* (Tuck.) Zahlbr.] / Caliciaceae **G2/S1.1; CNPS 2 - 3-3-2; Critically Endangered, on Global Red List (Thor 1996).** San Benito Co., Pinnacles NM; San Diego Co. (likely extirpated); Santa Barbara Co., Aliso Cyn./Cuyama Valley on detritus; San Clemente I. (Los Angeles Co.) parasitic on lichens; Oregon (2 sites 6 km apart) at base of bunchgrasses; Idaho (13 sites within a 30 km radius). California populations are often associated with *Artemisia* in undisturbed Coastal Sage Scrub-Grassland habitats, on animal (rabbit) dung, and detritus.

Toninia submexicana **de Lesdain** / Lecideaceae **G4/S1.2; CNPS 2 - 2-2-2.** Los Angeles Co.; Santa Barbara Co., De la Guerra Springs; San Luis Obispo Co.; Ventura Co.; Baja California. Mostly saxicolous on basalt and serpentine, six localities on the south coast and four in Baja California (Bratt and Wright 1995).

Toninia verrucarioides **(Nyl.) Timdal** / Lecideaceae **G5/S1.2; CNPS 2 - 2-2-1.** Santa Clara Co.; Rockies; w. Europe. Apparently always on cyanophilic lichens, especially *Placynthium*, on basic rock or soil on rock; one California locality on central coast, temperate and boreal in the Rockies and western Europe (Bratt and Wright 1995).

Verrucaria mucosa **Wahlenb.** / Verrucariaceae **G1/S1.1; CNPS 1B - 1-2-1.** San Luis Obispo Co., Morro Rock Reserve.

Verrucaria tavaresiae **R. Moe** / Verrucariaceae **G1/S1.1; CNPS 1B - 3-3-3.** San Francisco Co., Fort Mason *Moe & Silva UC1512286* (Holotype); San Mateo Co.; Marin Co. (Moe 1997).

Xanthoparmelia angustiphylla **(Gyelnik) Hale** / Parmeliaceae **G1/S1.2; CNPS 1B - 3-2-2.** San Diego Co., Torrey Pines Reserve; San Luis Obispo Co., Coon Cr., Field Ranch; Ventura Co., Conejo Mtn. (Riefner 1992).

Xanthoparmelia californica **Hale** / Parmeliaceae **G2/S2.2; CNPS 1B - 2-2-2.** Sacramento Co.; Santa Barbara Co.; San Luis Obispo Co., Camarillo Peaks, Morro Bay SP.

Xanthoparmelia mougeotii **(Schaerer) Hale** [*Parmelia mougeotii* Schaerer] / Parmeliaceae **G1/S1.2; CNPS 1B - 3-2-2.** Humboldt Co.; Plumas Co.; San Luis Obispo Co., Coon Cr. at Montaña de Oro SP; Siskiyou Co.

Notes:
Nomenclature follows Esslinger, T.L. and R.S. Egan (1995) and original rarity determinations follow Hale and Cole (1988), Riefner et al. (1995), and Thor (1996). Many southern California localities are from Hasse (1913).

Abbreviations:
Cr. = Creek, Cyn. = Canyon, Fk. = Fork, km = kilometers, SB = State Beach Mt. = Mount, Mtn(s). = Mountain(s), P = Park, Pks. = Peaks, Pt. = Point, R = River, RA = Recreation Area, Res. = Reserve, SF = State Forest, SP = State Park, SR = State Route,Tr. = Trail. Abbreviations of herbaria follow Holmgren et al. (1990).

Table 1. Natural Diversity Data Base Element Ranking System

Global Ranking (G)

G1	Less than 6 viable element occurrences (populations for species) OR less than 1,000 individuals OR less than 809.4 hectares (ha) (2,000 acres [ac]).
G2	6 to 20 element occurrences OR 809.4 to 4,047 ha (2,000 to 10,000 ac).
G3	21 to 100 element occurrences OR 3,000 to 10,000 individuals OR 4,047 to 20,235 ha (10,000 to 50,000 ac).
G4	Apparently secure; this rank is clearly lower than G3 but factors exist to cause some concern (i.e., there is some threat, or somewhat narrow habitat).
G5	Population or stand demonstrably secure to ineradicable due to being commonly found in the world.
GH	All sites are historic; the element has not been seen for at least 20 years, but suitable habitat still exists.
GX	All sites are extirpated; this element is extinct in the wild.
GXC	Extinct in the wild; exists in cultivation.
G1Q	The element is very rare, but there is a taxonomic question associated with it.

State Ranking (S)

S1	Less than 6 element occurrences OR less than 1,000 individuals OR less than 809.4 ha (2,000 ac). S1.1 = very threatened S1.2 = threatened S1.3 = no current threats known
S2	6 to 20 element occurrences OR 3,000 individuals OR 809.4 to 4,047 ha (2,000 to 10,000 ac). S2.1 = very threatened S2.2 = threatened S2.3 = no current threats known.
S3	21 to 100 element occurrences OR 3,000 to 10,000 individuals OR 4,047 to 20,235 ha (10,000 to 50,000 ac). S3.1 = very threatened S3.2 = threatened S3.3 = no current threats known
S4	Apparently secure within California; this rank is clearly lower than S3 but factors exist to cause some concern (i.e., there is some threat, or somewhat narrow habitat). NO THREAT RANK.
S5	Demonstrably secure to ineradicable in California. NO THREAT RANK.
SH	All California sites are historic; the element has not been seen for at least 20 years, but suitable habitat still exists.
SX	All California sites are extirpated; this element is extinct in the wild.

Notes:

1. Other considerations used when ranking a species or natural community include the pattern of distribution of the element on the landscape, fragmentation of the population/stands, and historical extent as compared to its modern range. It is important to take a bird's eye or aerial view when ranking sensitive elements rather than simply counting element occurrences.
2. Uncertainty about the rank of an element is expressed in two major ways: by expressing the rank as a range of values (e.g., S2S3 means the rank is somewhere between S2 and S3), and by adding a ? to the rank (e.g., S2?). this represents more certainty than S2S3, but less than S2. (Natural Diversity Data Base 1997.)

Table 2. CNPS R-E-D Code

Rarity (R)

1	Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.
2	Distributed in a limited number of occurrences, occasionally more if each occurrence is small.
3	Distributed in one to several highly restricted occurrences, or present in such small numbers that it is seldom reported.

Endangerment (E)

1	Not endangered.
2	Endangered in a portion of its range.
3	Endangered throughout its range.

Distribution (D)

1 More or less widespread outside California.

2 Rare outside California.

3 Endemic to California

Skinner and Pavlik, 1994.

Table 3. CNPS Rare Plant Lists

1A Plants Presumed Extinct in California

1B Plants Rare, Threatened, and Endangered in California and Elsewhere

2 Plants Rare, Threatened, and Endangered in California, But More Common Elsewhere

3 Plants About Which We Need More Information - A Review List (but likely rare)

4 Plants of Limited Distribution - A Watch List

Skinner and Pavlik, 1994.

Literature Cited

Bowler, P.A., W.A. Weber and R.E. Riefner, Jr. 1996. A checklist of the lichens of San Clemente Island, California. Bulletin of the California Lichen Society 3(2): 1–8.

Bratt, C. 1997. Lichens of Cabrillo National Monument, Point Loma, San Diego. Bulletin of the California Lichen Society 4:1–3.

Bratt, C. and D. Wright. 1995. *Toninia* in California. Bulletin of the California Lichen Society 2(1):5–7.

Esslinger, T.L. and R.S. Egan. 1995. A sixth checklist of the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. The Bryologist 98:467–549.

Hale, M.E., Jr. and M. Cole. 1988. Lichens of California. (California Natural History Guides: 54.) University of California Press, Berkeley. 254 pp.

Hasse, H.E. 1913. The lichen flora of southern California. Contributions from the United States National Herbarium 17(1):1–132.

Holmgren, P.K., N.H. Holmgren and L.C. Barnett. 1990. Index Herbariorum. Part 1: The Herbaria of the World. Eighth edition. New York Botanical Garden, New York. 693 pp.

Moe, R. 1997. *Verrucaria tavaresiae* sp. nov., a marine lichen with a brown algal photobiont. Bulletin of the California Lichen Society 4: 7–11.

Natural Diversity Data Base. 1997. Special plants list. (Quarterly publication, mimeo.) California Department of Fish and Game, Natural Heritage Division, Sacramento, California. August.

Peterson, E.B., D.M. Greene, B. McCune, E.T. Peterson, M.A. Hutten, P. Weisberg and R. Rosentreter. 1998. *Sulcaria badia*, a rare lichen in Western North America. The Bryologist 101:112–115.

Riefner, R. E. 1992. The lichen flora of Conejo Mountain, Ventura County, California. Museum of Systematic Biology, University of California, Irvine. Unpublished report.

Riefner, R.E., Jr., P.A. Bowler and B.D. Ryan. 1995. New and interesting records of lichens from California. Bulletin of the California Lichen Society 2(2):1–11.

Sanders, W. 1997. *Ramalina thrausta* (Ach.) Nyl. in California. Bulletin of the California Lichen Society 4:6.

Skinner, M. and B. Pavlik. 1994. Inventory of Rare and Endangered Vascular Plants of California. Fifth edition. (Special Publication No. 1.) California Native Plant Society, Sacramento, California.

Tavares, I.I. 1997. *Lecania cyathiformis*, a forgotten California lichen. Bulletin of the California Lichen Society 4:11.

Thor, G. 1996. Preliminary global red list of lichens. International Committee for the Conservation of Lichens, Swedish Threatened Species Unit, SLU, Uppsala, Sweden. 10 September 1996.

Tucker, S. and C. Bratt. 1996. Lichens collected at the Hastings Natural History Reservation, Monterey County, California, during the CALS foray of January 20–21, 1996. Bulletin of the California Lichen Society 3(1):8–9.

West, R. and J. Doell. 1995. Marin County field trip. Bulletin of the California Lichen Society 2(1):10–11.

Wright, D. 1997. Field trip to the Lake Pillsbury area, Lake County, California, April 19–20, 1997. Bulletin of the California Lichen Society 4:28–32.

Editorial Note

With this issue of the Bulletin, the Society has begun to compile a list of rare and endangered lichens of California. Because the lichens of the state are not well known, we can't examine extensive lists of published records and choose those species with few records. We must propose species that are thought to be rare based on first-hand and published field experience. We can publish a preliminary list of taxa thought to be rare or endangered, but then we need to assess the list, or help others to assess it.

Published records are not the only source of information about distribution. Public (and possibly private herbaria) around the state, and in other states and countries, which have specimens of lichens from California, must be inventoried.

It is not a trivial matter to obtain information from collections, however. Some of the specimens may be stored without identification, or with only preliminary identification. Some unidentified material may be stored under the name of a more easily identified lichen with which it is growing. Some of the specimens may be identified only to genus. Some of the specimens may be misidentified. Some that are correctly identified may be stored using names that differ from presently accepted names. So for each taxon thought to be rare, a search must be made in herbaria allowing for all these possibilities.

It is very likely that collection effort throughout the state has not been uniform. It would be good to try to visit areas that are underrepresented in herbaria and that have not been mentioned in the literature.

The assessment of the list needs to be coordinated if we are to avoid duplication of effort. It is with this coordination in mind that I have put together a web site that incorporates the list published in this issue together with other species gleaned from the literature. It also includes in a separate list taxa considered but rejected as being too common. This web list is intended to allow interested lichenologists to propose species for inclusion in the red list, to offer documentation for records of proposed species, to allow argument about the status of a species, and to give a county-by-county picture of rare taxa. I hope that people will add information to the list from the literature, from old collections, and from new collections. If interest in this collaborative effort is high, it may be possible or necessary to expand the scope. For example, it might be convenient to prepare checklists from field trips using a similar online collaborative method.

I hope that many of you will be interested in contributing to this work in progress, which can be found at the CALS website: ucjeps.herb.berkeley.edu/rlmoe/cals.html.

Notes on Lichen Names

Isabelle I. Tavares and Richard L. Moe

If lichenologists are to communicate unambiguously about lichens, the names that they use must follow a stable naming system. The system used is the International Code of Botanical Nomenclature (Greuter et al., Regnum Vegetabile 131.1994), mentioned in an earlier note. Unfortunately, in spite of the existence of the Code, confusion about names arises from time to time. Sometimes the confusion results from misunderstanding (or ignorance) of the Code, sometimes from modifications in the Code. In the present note we discuss three names in the local lichen flora that are subject to confusion.

1. *Heterodermia leucomela* or *leucomelaena*?

Principle V of the Code states that scientific names of taxonomic groups are treated as Latin regardless of their derivation. Articles 23, 32, and 60 of the Code govern construction of names. The name of a genus is a noun in the singular number and the name of a species is the genus name plus a specific epithet, which is usually an adjective agreeing grammatically with the genus name.

The name *Heterodermia leucomelaena* (L.) Poelt (Nova Hedwigia 9:31. 1965), now also seen as *H. leucomela, e.g.,* Moberg and Nash (Bryologist 102: 7. 1999), is based on the name *Lichen leucomelos* Linnaeus (Species

Plantarum, ed. 2, 2: 1613. 1763). The roots of the epithet are Greek —*leukos*, meaning white, and *melas*, meaning black. The Latin word "Lichen" is masculine in gender, and therefore the adjectival epithet should have a masculine ending. When Acharius (Methodus qua omnes detectos lichenes, Stockholm, 1803, p. 256) transferred this species to *Parmelia*, he was obligated to render "melos" in feminine, to agree with the gender of the generic name. He apparently transliterated the original Greek adjective into the Latin "leucomelus", and then used the appropriate feminine ending "a" to arrive at *Parmelia leucomela*. He used the same epithet later in transferring the species to *Borrera*. The spelling "leucomelaena" apparently originated with Humboldt, Bonpland, and Kunth (Nova Genera et Species Plantarum 8: 108. 1825), who cited a record from South America as *Borrera leucomelaena*. These authors apparently reasoned that the feminine ending of the epithet should follow the Greek feminine ending, "melaina", and therefore corrected Acharius. There is no justification in the Code for this correction, although Articles 32.6, 60.1, 61.4, and Recommendations 23A.3(a), 60.E.1, 60.F.1 are somewhat conflicting. The species was subsequently transferred to *Anaptychia*, *Hagenia*, *Physcia*, and *Teloschistes*, always as "*leucomela*". Vainio (Acta Societatis Fauna et Flora Fennica 7 (1):128. 1890) reintroduced the spelling "*leucomelaena*" in citing a record from Brazil, and Poelt used the variant in transferring the species to *Heterodermia*. In our opinion, "*leucomela*" is the spelling that should be used.

2. *Caloplaca subpyracella* or *Caloplaca subpyraceella*?

With regard to questions about spelling of epithets, it is sometimes necessary to explore etymology. The epithet *subpyraceella* was proposed by Nylander (in Hasse, Bulletin of the Torrey Botanical Club 24: 446. 1897) for a species from Santa Monica that he placed in *Lecanora*. Although it was not explicitly stated, the epithet was presumably chosen to denote a similarity to *Lecanora subpyracea* Nylander, the suffix "*-ella*" often being used for this purpose. Interestingly, "*subpyracea*" was explicitly chosen to denote a similarity to *Lecanora pyracea* Nylander. Although the epithet is correctly formed according to the compounding rules in the Code, Zahlbruckner (Botanische Centralblatt 23: 149. 1902), when transferring *L. subpyraceella* to *Caloplaca*, accidentally or intentionally dropped an "e", and retained the erroneous variant later. Numerous references, including one in the Bulletin of the California Lichen Society (2[2]: 3. 1995) have reflected Zahlbruckner's error. The North American Checklist (The Bryologist 98: 467–549. 1995) uses the correct spelling, *subpyraceella*.

3. What's in a synonym?

Care should be taken in listing synonyms. Arup (Bryologist 96: 466. 1993) treated *Caloplaca bolanderi* Tuck. as a variety of *C. luteominia* (Tuck.) Zahlbr. In the same treatment, he considered *Caloplaca laeta* H. Magn. as conspecific with *C. luteominia*, which is an older name. However, he did not indicate whether *C. laeta* was a synonym of var. *luteominia* (disk of apothecium yellowish-orange to reddish-orange) or of var. *bolanderi* (disk scarlet to vermilion). Magnusson (Botaniska Notiser 1944: pp. 65, 77) described the disk color of *C. laeta* as cinnabar to miniate (Stearns, Botanical Latin, 1966, pp. 401 defined these as vermilion and "flame-scarlet," respectively). Arup (1993, p. 468) mentioned that *C. laeta* differed from *C. luteominia* var. *luteominia* only by having a thin thallus, but he also emphasized the intense orange color of the apothecia of var. *luteominia* as contrasted to the scarlet apothecia of var. *bolanderi*. This would suggest a closer similarity of *C. laeta* to *C. luteominia* var. *bolanderi*. There are no nomenclatural consequences, but if var. *bolanderi* were reinstated as a separate species or transferred to a different species, the disposition of *C. laeta* would be uncertain.

NEWS AND NOTES

(compiled by Judy Robertson)

Donors and Sponsors

We would like to recognize the following members of CALS who subscribed in 1999 at the Donor or Sponsor level: Stephen Buckhout, May Chen, Lori Hubbart, Greg Jirak, Boyd Poulsen, Subir Sanyal, Stella Yang.

Symposium

Lichens Exposed was the theme of the first CALS Symposium, held on Sunday, November 7 in the Goethe Room of the California Academy of Sciences in San Francisco. Over 60 participants came to see and hear presentations, view lichens under the microscope, browse lichen literature,

examine lichen specimens, and visit with other lichenologists. Attending were students from local colleges and universities, members of the California Native Plant Society, the San Francisco Mycological Society, our Society, and others interested in lichens. In welcoming the attendees, CALS President Judy Robertson summarized the history of CALS. Nine people, many of whom had taken Dr. Harry Thiers's lichenology class at San Francisco State University, held the first official meeting on January 31, 1994. Now CALS has over 130 members from the United States, Canada, and Europe. Judy reminded us that the mission of the Society is to promote the study, conservation, and appreciation of lichens and that the Society has worked towards this goal through sponsoring workshops, field trips, seminars, providing lichen displays at various exhibits, maintaining a website and semi-annual publication of the CALS Bulletin. She invited those attending who were not members of CALS to join in partnership with us to *expose* others to the beauty, variety, usefulness, and uniqueness of lichens.

The first presentation was a dramatic multimedia slide show of lichen images by Richard Doell. A retired geophysicist, Richard was introduced to lichens by his wife, Janet, a founding member of the Society. The slide presentation combined his interest in lichens with his talent as an photographer. He used four slide projectors and a stereo system to fill the room with light, color, and sound. Photo images making small specimens appear much larger than life moved in and out on the screen emphasizing the amazing variety of life forms displayed by lichens. The presentation was truly a lovely *exposure* to the beauty of lichens and an enticing beginning to the day.

Janet Doell gave the next presentation. Janet fell in love with lichens in 1978 and took Dr. Thiers's lichenology class. In her master's thesis project, she used the technique of lichenometry to date a rock fall in Nevada. Janet's task at the Symposium was to *expose* the participants to *All There Is to Know About Lichens* in 40 minutes. She explained that lichens can be found worldwide from the Arctic to the Antarctic, from the desert to the tropics, emphasizing that lichens are a very successful combination of fungi and algae. Janet outlined the major groups of lichens using slides to illustrate various diagnostic characters. She gave us some common names of lichens, such as Lace Lichen (*Ramalina menziesii* Taylor), Old Man's Beard (*Usnea* sp.), Oak moss (*Evernia prunastri* [L.] Ach.), Wolf lichen (*Letharia* sp.), Rock Tripe (*Umbilicaria* sp.) She told us some of the present and historical uses of lichens, from food for humans (*Umbilicaria* and related species eaten by Eskimos and Laplanders), food for animals (*Cladina* sp. eaten by caribou and reindeer), fixatives in perfume (*Evernia prunastri*), antibiotic ointments (*Usnea* sp.), diapers (*Ramalina menziesii* historically by California Indians), dyes (*Letharia* sp., *Ochrolechia* sp.), to pollution monitoring—*the* most important use of lichens today. Janet emphasized that there are so many mysteries still to be solved about lichens that the amateur lichenologist can make real and significant contributions to this growing and changing knowledge. A question and answer period followed.

At the break, participants were able to purchase framed lichen photos by Richard Doell, CALS posters, and raffle tickets, peruse lichen literature and share in coffee, juice, muffins, and donuts.

Our third *Lichens Exposed* presentation was by Darrell Wright. Darrell became interested in vascular plants in 1970 and produced a vascular flora of Deer Park Valley in Marin County, California. In 1977 he discovered lichens and is now studying the genus *Usnea* in Northern California.

In his *Miscellaneous Lichen Topics,* Darrell covered the topic of collecting ethics. His suggestion was that our own collecting should set an example of sensitivity and attention to the conservation of this group of slow-growing plants. He emphasized that lichens are being compromised by pollution and habitat destruction.

His next topic was *Lichen chemistry, what good is it?* Darrell pointed out that simple spot tests using common reagents such as Clorox® (the C test) and KOH (the K test) can be very important in lichen identification. These reagents react with stable and reliable secondary products produced by lichens to give characteristic colors. More specialized tests such as thin layer chromatography (TLC) and DNA analysis yield even more information about lichens. However, these tests are not readily available to the amateur lichenologist.

Darrell's last topic was *An Overview of some Usnea species in California*. He began with a history of *Usnea* studies. Then he explained that lichens in the genus *Usnea* are very sensitive to air pollution and their presence or absence can be used to determine the concentration of sulfur dioxide in the air. He noted what is probably a reference to this lichen in Henry Wadsworth Longfellow's poem Evangeline:

> This is the forest primeval.
> The murmuring pines and the hemlocks,
> Bearded with moss, and in garments green, indistinct in the twilight,
> Stand like Druids of eld, with voices sad and prophetic,
> Stand like harpers hoar, with beards that rest on their bosoms.

Using slides Darrell then outlined the diagnostic characters of each of the *Usnea* species so that participants would be

able to tell them apart by the end of his talk. He noted that longitudinal sectioning of the central branch is key to identifying species. The relative width, thickness and color of cortex, medulla and axis are diagnostic to each species. Chemical spot tests are valuable as well. Species reviewed were *Usnea ceratina* Ach., *Usnea longissima* Ach., *Usnea filipendula* Stirton, *Usnea cavernosa* Tuck., *Usnea rubicunda* Stirton, *Usnea arizonica* Mot., *Usnea cornuta* Körber, *Usnea fragilescens* Hav. ex Lynge, *Usnea wirthii* Clerc, *Usnea hirta* (L.) F.H. Wigg., and *Usnea subfloridana* Stirton. He emphasized the wide variability encountered in this genus, and, as we examined the last slide of his presentation, we had the opportunity to analyze the specimen using the diagnostic criteria he had covered. A question and answer period followed, with Darrell answering questions on topics ranging from lichen dispersal to the medical uses of *Usnea*. A lunch of sandwiches, cheese and crackers, chips and salsa, veggies with dip, sodas, and cookies was served.

The Lichens of the Channel Islands by Cherie Bratt was the final presentation of our Symposium. Cherie curates the lichen herbarium at the Santa Barbara Botanic Gardens. She has introduced lichenologists from around the world to these islands, five of which form the Channel Islands National Park and are therefore accessible to the public. The history of most of the Islands includes sheep and cattle ranching in the late 1800's to 1900's. Cherie began exploring the islands 20 years ago and discovered that little lichen collection had been done. The primary records were collections by Blanche Trask in the late 1800's, many of which are cited by H.E. Hasse in his 1913 publication *The Lichen Flora of Southern California*. Trask's personal herbarium was destroyed by a fire in Avalon. Cherie has compiled 20 years of data which gives us much information about the distribution and variety of lichens on the Channel Islands. 540 species of lichens have been collected with only 1 endemic species: *Niebla ramosissima* Spjut found on one slope on San Nicolas Island. Five species are reported from all eight islands: *Buellia halonia* (Ach.) Tuck., *Caloplaca bolacina* (Tuck.) Herre, *Leprocaulon microscopicum* (Vill.) Gams ex D. Hawksw., *Physcia tenella* (Scop.) D.C. and *Schizopelte californica* Th. Fr. Eight species are recorded from seven islands: *Caloplaca coralloides* (Tuck.) Hulting, *Caloplaca rosei* Hasse, *Dendrographa minor* Darbish., *Reinkella parishii* Hasse, *Dimelaena radiata* (Tuck.) Müll. Arg., *Xanthoria candelaria* (L.) Th. Fr., *Vermilacinia ceruchoides* (Rundel & Bowler) Spjut, and *Vermilacinia cephalota* (Tuck.) Spjut & Hale.

Cherie talked about some unusual distributions of lichens on the islands. *Hypogymnia* species are found only on the four northern islands and *Roccella* species only on the four southern islands with one unusual site on Santa Rosa Island. Some soil lichens found on the islands are usually associated with desert habitats. She explained that some lichens considered rare and endangered on the mainland (*Teloschistes exilis* [Michaux] Vainio, *T. flavicans* [Sw.] Norman) are common on the islands. She closed by emphasizing that there is still much research to be done in the field of lichens and encouraged all to find a little niche of study, to stick with it through the frustrations, to have fun, and to enjoy the satisfaction in their work.

The winners of the door prize and raffle received a lichen photo by Richard Doell. The rain was heavy at the close of the day and only a few hardy individuals went outside for the Lichen Walk in Golden Gate Park. Judy closed the symposium confirming that truly our purpose of *Exposing Lichens* had been accomplished.

Thanks were given to the planning committee and all those who helped provide food and set up for the day: Janet and Richard Doell, Mikki McGee, Barbara Lachelt, Susan Crutchfield, Bill Hill, Doris Baltzo, Judy Robertson, Stella Yang, Stephen Buckhout, Debbie Gillespie.

Compiled from reports by Cherie Bratt, Janet Doell, Judy Robertson, and Darrell Wright

Fungus Fair—"Fin de Siècle"

Six CALS members manned a booth for the Fin de Siècle Fungus Fair, held at the beloved Hall of Flowers (since redubbed "County Fair Building"), 9th Ave. entrance of Golden Gate Park, on 11th and 12th December, 1999. It was a grand time for the participants. Grand displays of mushrooms tried valiantly to steal the show from the lichens—whether or not they succeeded depended on the eyes of the beholders.

About 1000 people were treated to displays of mushrooms and other fungi from the Bay Area, gathered and culled by the members of the Mycological Society of San Francisco, which is now 50 years old. More than 250 species of mushrooms were on display in natural settings, and presentations of multimedia slide shows, cooking demonstrations and tastings, crafts, and items for sale intrigued all.

Barbara Lachelt planned and set up the main lichen display this year, with help from Janet Doell and Judy Robertson. Richard Doell, came by on Sunday to help. Bill Hill and Mikki McGee showed lichens in detail on the microscope table. Five microscopes perhaps vied successfully for attention.
Mikki McGee

Workshops

CALS Fall Workshop Series at San Francisco State University

"The Morphology of Foliose and Fruticose Lichens".
September 11, 1999.
This first workshop in the Fall Series took place at Hensill Hall Room 401 and was led by Barbara Lachelt. A variety of lichens were on display with each morphological character easily identified. Participants used drawings and explanations to become familiar with each term. After lunch we used these characters to key unknown specimens. Participants were May Chen (CNPS) Debbie Gillespie, David Herlocker, Bill Hill, Barbara Lachelt, Mikki McGee, Judy Robertson and Stella Yang.

"Squamulose Lichens"
October 16, 1999
Led by Judy Robertson, the participants spent the morning studying and comparing the morphology, reproductive structures and photobionts of various squamulose lichens. After lunch we used keys to put a name on each of the specimens. Participants were Cheryl Beyer, May Chen, Debbie Gillespie, David Herlocker, Bill Hill, Daniel Jacob, Barbara Lachelt, Lori Hubbart, Greg Jirak, Marck Menke, and Judy Robertson

"Picture-Book Microscopic Images"
November 13, 1999
Mikki McGee led this workshop. She was well prepared as she took us step by step through various methods of staining lichen sections. Preparations were taken through the stages of sectioning, soaking, clearing, staining, and mounting. Many of the illustrations we see in lichen books of microscopic features used for identifying specimens became "doable" after attending this workshop. Participants were Norton Benner, Denise Gregory, Bill Hill, Mikki McGee, and Judy Robertson.

CALS would like to thank Dr. Dennis Desjardin at San Francisco State for providing the space and equipment for us to hold these workshops. The availability of dissecting and compound scopes and the close proximity of reference specimens in the Thiers Herbarium makes SFSU an ideal place to hold our workshops.

CALS in the News

Transect (Vol 17, No.2), the publication of the University of California Natural Reserve System, highlighted the CALS Field trip to the Sweeney Granite Mountains Desert Research Center in the East Mojave.

The article, entitled *Granite Mountains Lichens No Longer Overlooked* gave an overview of CALS activities on the Reserve, explained the symbiotic relationship of algae and fungi in lichens, and emphasized the uses of lichens especially in pollution monitoring. CALS has recently set up plots on the reserve which will be monitored for change over the next decades. Data will give information about the air quality in the East Mojave area. For a copy of the article contact:
Transect Editor,
Natural Reserve System,
University of California,
1111 Franklin Street, 6th Floor,
Oakland, CA 94607-5200:
Phone 510-987-0150
e-mail: jennifer.bello@ucop.edu
http://nrs.ucop.edu/pubs/pubs.html

ANNOUNCEMENTS

Have you seen *Texosporium sancti-jacobi*? I am a graduate student with Dr. Bruce McCune, and I'm currently working on a status report for the rare lichen, *Texosporium sancti-jacobi*. Any information on collections and unvouchered sightings will be compiled in a report that will be submitted to the U.S. Fish and Wildlife Service, and considered when assessing the federal status of the species under the ESA. I'm particularly interested in new (since 1990) sightings. Negative information is important also! Have any searches (formal or informal) been conducted for this species? I'd like to hear from anyone who has a sense of how much searching has been done in California. Thanks for any help you can provide.

Jeanne Ponzetti
ponzetti@televar.com
(509)925-5770

Volunteers Wanted:
CALS has the opportunity to work with the California Native Plant Society (CNPS) to establish management plans and ecosystem health evaluations for the US Forest Service. Emily Roberson, CNPS Senior Land Management Analyst, would like to enlist the help of CALS members so that lichens can be incorporated into this process. You can contact Emily at emilyr@cnps.org. or 510-649-0460, if you are interested in becoming involved. This is a great opportunity to bring the importance of lichen monitoring to

the forefront and further the CALS mission of promoting the conservation of lichens. Several CALS members have already volunteered to help, but we particularly need volunteers to work with CNPS in the Sierras and in southern California.

Education/Outreach Committee

So that we may do a better job of educating the public about lichens, we plan to form a CALS Education/Outreach Committee. The committee's first two projects will be to develop a simple handout for use on lichen hikes, and a slide show that can be given to interested groups, e.g., CNPS chapters, around the state. The handout will be a couple of pages of basic introductory lichen information which hike leaders can distribute before the hike. Normally, it will be supplemented by a list of taxa expected to be seen on the hike. The slide show will consist of an hour's worth of slides and narrative that introduces lichens to the public. Both projects are intended as outreach tools to make the general public aware of lichens, and their importance in the ecosystem. If you are interested in serving on the Education/Outreach Committee, please contact Greg Jirak at gajirak@mcn.org, or 707.882.1655.

New book:

A Color Guidebook to Common Rocky Mountain Lichens, by Larry L. St. Clair, with photographs by the author and Sylvia and Stephen Sharnoff. Keys, descriptions, and photographs for nearly 200 species, 242 pp. ISBN 0-8425-2454-1. M.L. Bean Life Science Museum, 290 MLBM, Brigham Young University, Provo UT 84602. Paperback $19.95.

UPCOMING EVENTS

Saturday, January 29, 2000

Field Trip to San Francisco Crystal Springs Watershed

CALS member Bill Freedman has been our host and leader for our two field trips into the Watershed. Bill is affiliated with the San Francisco Mycological Society, so CALS has been able to enter the area under their umbrella. Our upcoming field trip promises to be very special, as Bill reports.

> I am overjoyed to report that we have just received permission to enter a segment of the Watershed seldom seen by the public in recent years. It is one of the most picturesque areas in the county. We will park in the large field on the north where Skyline Blvd. meets the end of San Bruno Ave., then car-pool to an intersection in the heart of the Watershed called "5 Points". We will hike down to Pilarcitos Lake through a Monterey Pine plantation and follow the road south to Stone Dam—the first of the dams to be built to supply water to San Francisco. It reeks with history. People who could afford a carriage or get transportation on holidays or week-ends used to come to this remote area. Concrete water receptacles were erected for the horses as well as concrete seats and areas for tables. Bring your cameras. Last time we were there we saw old signs posted on trees, some nearly covered with moss.
>
> Because the location is one of the oldest areas used in the past, I am hoping that we might find really ancient or interesting lichens. It is such an isolated place that pollutant levels must have been low. Stone Dam itself should provide lichens and we once could cross the dam to reach the first redwood flume on the other side. I can't promise that today.
>
> The distance from the autos to the dam is about two mostly flat miles. Good hiking shoes are recommended. Surrounded by impounded water, there is no water source there now! We bring our own.

We are limited to 35 people, so an early reservation is requested. We will be entering the Watershed at 10 and be leaving by 3 P.M.

If you are interested in participating, please contact Stella Yang or Stephen Buckhout at
yscottie@pacbell.net 408-255-6233
or Marck Menke at
menke@sfsu.edu
415-824-8959

Saturday, January 29, 2000 following the field trip to the Watershed.

Lichen Workshop, Pot-luck Dinner, CALS Birthday Celebration, General Meeting, and Lichen Travelogue

Our plans are to return from the Watershed field trip to San Francisco State University (401 Hensill Hall). Bring your lichen specimens and we will spend time identifying them using the excellent microscopes at SFSU.

At 5:30 we will hold a CALS General Meeting where you

can be part of the planning for the next two years as a new slate of officers takes over. 6:00 P.M. Pot-luck dinner will be in the unique setting of a SFSU biology lab. This was quite an event two years ago. Our birthday celebration will be part of the dinner.

"Lichen Travelogue" will be the finale. Barbara Lachelt, a founding member of CALS, will take us on a trip as she explores for lichens around the world. Please contact Stella Yang at yscottie@pacbell.net or 408-255-6233 to let her know what you can bring to share at the pot luck dinner.

Wednesday February 16, 2000 7:00 P.M.
Talk on Rare and Endangered Lichens
by David Magney

University Herbarium, 1001 Valley Life Sciences Bldg., University of California, Berkeley

David Magney, chairman of the CALS Conservation Committee, will talk on the subject of rare and endangered lichens. Lichen conservation has lagged behind that of vascular plants because of uncertainty about which lichens are rare and endangered. David is working with other members of CALS to put lichen conservation at the forefront. David was responsible for the effort to name *Ramalina menziesii* as the California State Lichen. There is no cost for the evening and refreshments will follow. If you have questions, please call Judy Robertson at 707-584-8099 or JKSRR@aol.com

Saturday February 26, 2000 10 A.M.
Field Trip to Stebbins Cold Canyon Reserve, Solano Co.
http://nrs.ucop.edu/reserves/stebbins/

CALS is joining with the Davis Botanical Society for this field trip to Stebbins Cold Canyon Reserve, part of the University of California Reserve System. Located between Blue Ridge on the west and Pleasants Ridge on the east, the reserve is a 45-minute drive west of Davis or a two-hour drive northeast of San Francisco. Five or six plant communities have been identified on the preserve: grassland, savanna, chaparral, live oak woodland, and riparian woodland. Collecting reference specimens will be permitted as we will compile a list of species for the Reserve. If you are interested in participating, please contact Stella Yang or Stephen Buckhout at yscottie@pacbell.net or 408-255-6233.

March 10—12, 2000
Microbiotic Soil Crusts and Lichens of the Eastern Mojave Desert
Larry St. Clair
Location: Desert Studies Center, Mojave Desert
This short course in microbiotic soil crusts will emphasize the basic structural and functional aspects of arid land soil crust communities. We will also learn about desert lichens that are not part of the soil crust community. Classroom instruction will include information about the biological components of soil crusts, their ecological roles, the nature and dynamics of their interactions with vascular plant communities, the ecological consequences of damaging soil crust communities, and their potential for reclamation. In the laboratory we will discuss and practice identifying some of the more prominent members of the soil crust community and other desert lichens. A day long field trip will investigate microbiotic crust communities at several locations in the eastern Mojave Desert. For more information please call Staci Markos or Betsy Ringrose at (510) 643-7008 or e-mail smarkos@socrates.berkeley.edu
Course fee: $160 members / $175 non-members. There will be an additional facilities use fee (includes room and board and will be billed approximately 60 days prior to the course).

Wednesday, March 15, 2000 7:00 P.M.
Talk on Bryophytes
Mona Bourell
University Herbarium, 1001 Valley Life Sciences Bldg., University of California, Berkeley

We find many lichens growing on moss. Sometimes, we have to ask the question "Is it lichen or is it moss?" Only close examination gives an answer. Find out about mosses from Mona Bourell, a founding member of CALS, and Senior Curatorial Assistant in the Department of Botany, California Academy of Sciences, San Francisco. She will give a slide presentation of bryophytes. After this evening we will be able to put some names on those plants that are not lichens. There is no charge for the evening. Refreshments will be served. Please contact Judy Robertson, 707-584-8099 or JKSRR@aol.com if you have questions.

Saturday, March 25, 2000
Workshop: Lichen Identification/Use of Keys/Specimen Preparation
401 Hensill Hall, San Francisco State University
10 A.M. to 4 P.M.
This workshop will be an opportunity to identify your own specimens using high quality dissecting and compound scopes. We will use a variety of lichen keys, observe herbarium specimens for comparison and identification and discuss specimen preparation and storage. This workshop was originally scheduled for December 1999 but cancelled due to conflict with the San Francisco Mycological Society Fungus Fair. If you attend the San Francisco Watershed or Stebbins Cold Canyon Preserve field trips, please bring any collected specimens for identification.

For more information contact:
Judy Robertson,
707-584-8099 or
JKSRR@aol.com.

Saturday April 8, 2000 10:00 A.M.
Field Trip to Rock Springs, Mt. Tamalpais, Marin County

Join us for a lichen walk around Rock Springs, high on Mt. Tamalpais. Barbara Lachelt has led many trips to this area and knows the lichen flora well. We will meet in the parking area at Rock Springs at 10 A.M. The trip will end shortly after lunch. Please contact Stella Yang or Stephen Buckhout at yscottie@pacbell.net or 408-255-6233 if you are interested in participating.

Wednesday, April 19, 2000, 7:00 P.M.
Algae in lichens and out
Richard Moe
University Herbarium, 1001 Valley Life Sciences Bldg.,
University of California, Berkeley

Phycologist and Bulletin Managing Editor Dick Moe will take us into the realm of algae. We will learn about algae associated with fungi in lichens as well as free-living algae. There is no charge for the evening. Refreshments will be served. Please contact Judy Robertson, 707-584-8099 or JKSRR@aol.com if you have questions.

Wednesday, May 17, 2000, 7:00 P.M.
To Be Announced
University Herbarium, 1001 Valley Life Sciences Bldg.,
University of California, Berkeley

June 16—19, 2000
Field trip to James San Jacinto Mountains Reserve,
Riverside Co.
http://www.jamesreserve.edu/factoids.html

James San Jacinto Mountains Reserve is part of the University of California Reserve System. Located in Riverside County, the Reserve is on an alluvial bench at the lower end of Hall Canyon, a steep, western flank of Black Mountain. In this remote wilderness setting, we will explore habitats of mixed conifer and hardwood forest, montane chaparral, and montane riparian forest for lichens. Collecting will be permitted as we will provide the Reserve with a list of lichens collected. There will be dormitory style accommodations, kitchen facilities, showers, and a lab-museum room. The cost will be very reasonable with an overnight stay of approximately $10 plus meals. If you would like to attend please contact Stella Yang or Stephen Buckhout at yscottie@pacbell.net or 408-255-6233.

October 6—8, 2000
Field Trip to Hopland Field Research Station

The University of California Hopland Field Research Station is located in the foothills of the Mayacamas Mountains, part of the Coast Ranges, and is about a 2.5 hour drive from the Bay Area. We will explore woodland and chaparral for lichens. We can collect reference specimens to provide a lichen list for the Station. Bunkhouse accommodations with cooking facilities will be available and the cost will be very reasonable.
http://endeavor.des.ucdavis.edu/hrec/overview.html
Look for more information in the CALS Summer Bulletin.

Book Review

Trevor Goward. The Lichens of British Columbia. Illustrated Keys. Part 2—Fruticose species. 319 + v pages, 14 figures, about 450 line drawings of key characters, 128 distribution maps. British Columbia Ministry of Forests Research Program Special Report No. 9. Crown Publications, 521 Fort Street, Victoria, B.C. V8W 1E7, 250-386-4636 (place orders at this telephone number). 1999. Price $55 Canadian (=$33 U.S.) Paperback.

Here Goward sustains the high quality of the first book (Foliose Species, Special Report No. 8, 1994). Part 2 adheres to the same basic format with the author's line drawings of key characters in the margins of the keys near the appropriate couplets. The keys to *Cladonia*, *Stereocaulon*, and *Usnea* should be especially valuable for dealing with those difficult groups. In the case of the key to *Usnea*, which is not at all identical to that in Halonen, Clerc, Goward, Brodo and Wulff (Synopsis of the genus *Usnea* [lichenized Ascomycetes] in British Columbia, The Bryologist 101: 36-60, 1998), it would have been better to have sketched a thallus with enough cortex sliced away to expose the full width of the interior of the branch so that the CMA ratios might be better appreciated. The illustrated key to photobionts looks potentially very helpful, and the equally well-illustrated section on identifying lichens will make good reading even for some seasoned workers. Almost as a bonus, the book contains a thorough treatment of Caliciales, included on the basis of their minutely fruticose stalked apothecia. As I noted for Part 1 (BCALS 1[2]: 4, 1994), if a copy of this had not come into my hands, I would definitely send for one.
Darrell Wright

Lichen Communications—E-mail, the Internet, and Computer Cams

Bill Hill

Just within the past 5 years since the founding of CALS, it seems everyone has begun communicating electronically. Even with the first few issues of our Bulletin, Darrell Wright was performing his editorial tasks with e-mail, and now there may be only a few members who are *not* online. Although we still have the CALS Bulletin, the Bryologist, and the Lichenologist delivered on paper, lichenology internet websites are sprouting up rapidly all over the planet. We have our own for the California Lichen Society, thanks to our technologically up-to-date editor, Dick Moe (ucjeps.herb.berkeley.edu/rlmoe/cals.html).
You can find the e-mail address for nearly anyone who has chôsen to be known lichenologically at
www.botany.hawaii.edu/lichen/
(the International Association of Lichenologists) or
www.botanik.biologie.uni-muenchen.de/botsamml/lias/emaillist.html
(Botanische Staatssammlung München, Germany).

E-mail mailing lists have become a standard vehicle for online discussion of a myriad of topics, whereby anyone who has subscribed to a "mailing list" can send a message to all others on the list. Clifford Smith, veteran lichenologist in Hawaii, has already for years hosted the lichens-l e-mail discussion list (subscribe by e-mailing the message "SUBSCRIBE LICHENS-L [your first name] [your last name]" to listproc@hawaii.edu. Once subscribed, you can write to everyone on the list by writing e-mail to "LICHENS-L@hawaii.edu"). The latest in identification keys, immediately available on the web and often complete with color pictures, are increasing in number by the day. For instance, Clifford Wetmore has an excellent compendium on *Caloplaca* (www.tc.umn.edu/~wetmore/Calop.html),
and Harrie Sipman in Germany is attempting to keep up with a list of online keys (www.bgbm.fu-berlin.de/bgbm/staff/wiss/Sipman+H/keys/default.htm).
This is a moving target, however. For example, a couple of months ago when I went to view what I thought were great pictures of some Usneas on Eric Peterson's website at Oregon State University (ucs.orst.edu/~peterser/),
his whole *Usnea* key was gone! Instead he had a thorough treatment of his current interest—the Caliciales (ucs.orst.edu/~peterser/ Caliciales.html),
with links to some great pictures by Steve Selva at the University of Maine at Fort Kent (academic.umfk.maine.edu/lichens/stubble.htm).

Speaking of great pictures, I think nothing rivals the fantastic images at the Sharnoffs' lichen website (www.lichen.com/). I can't wait to see their book of North American Lichens in print! But as graduate students come and go from universities and faculty move around, their websites come and go also. For instance, Eric Peterson is already warning us that his future "website" will be www.geocities.com/ResearchTriangle/Campus/2056/.
The internet may have given us "instant access" but as of yet, it is not as "permanent" as printed paper.

Computer Cams and Pictures of Lichens

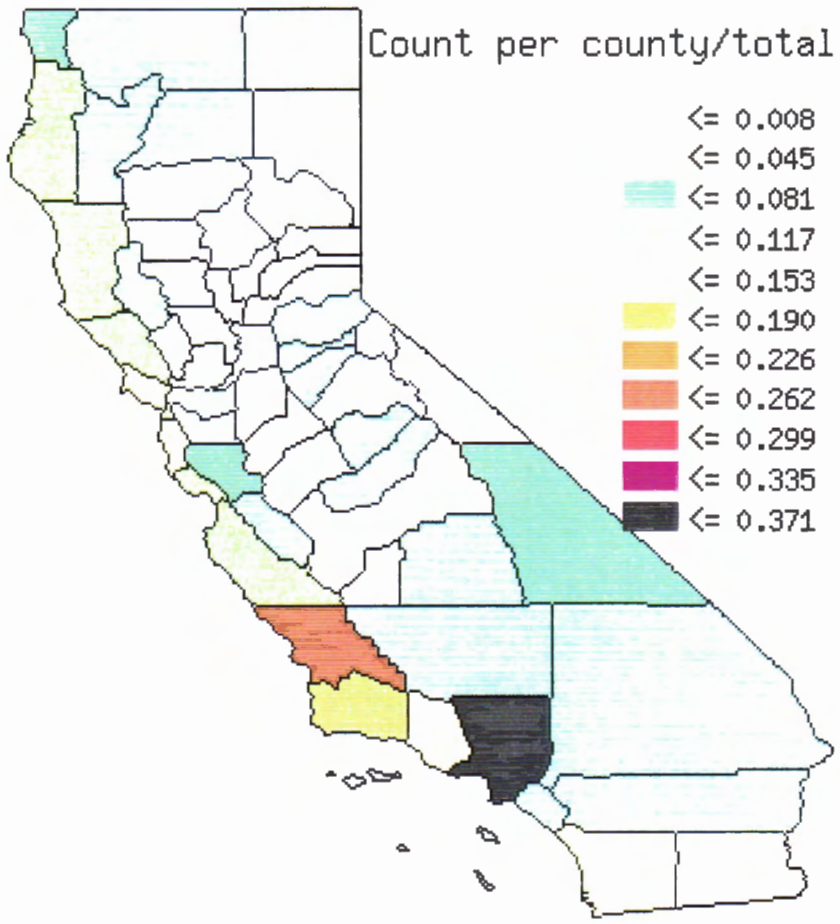
Given that lichens are such a visual experience (well, we don't listen to them like we do to birds...), I am glad to see that good pictures are getting easier to come by with our new communications medium. It has been so frustrating to imagine what a specimen might look like given just printed text. Thus, I was elated to find a 640x480 pixel computer camera, referred to as a cam, for $55 at a local computer show. These are the little "eyeballs" that you put on your computer to send pictures of yourself to your friends by e-mail. This particular cam (VCAM model CU-98 "Eye For PC" USB Digital Camera, manufactured in Taiwan) plugs into the "new" Universal Serial Bus of a PC computer with a CPU of Pentium or above and requires the Windows98 operating system. But there are increasingly many cam versions available on the market for different computers. The point is—the technology is here now. Using a shop vacuum cleaner hose attachment, cut and milled appropriately as a holder with the help of a friend, I was able to mount the cam onto the eyepiece of a microscope (with a large rubber band, and hose clamp to hold the modified attachment on the eyepiece). Where some microscopes had eyepieces too large in diameter (30mm) for the modified vacuum cleaner attachment (which accommodated 25-28mm eyepieces), a workable holder could be made from a cut-up neck of a 64fl. oz. plastic Snapple® drink bottle. Now that is economy in recycling! An image can be "acquired" or "scanned" into an image editing program on the computer (such as Micro soft Photo Editor, Corel PhotoHouse, Adobe Photoshop, etc. or software that comes with the cam), cropped or otherwise edited there, and then saved as a file in some image format. Of the many image formats, I find that "jpg" is the most universal over the internet, and compact while still retaining picture quality. "Bmp" or "bitmap" format retains the most detail but gives you considerably larger files, and not everyone seems to be able to decipher them. "Gif" format is also compact and common on the internet, but has a

reduced color resolution. Although these cam images are not the resolution of those obtained with "professional" (and very expensive) photomicrography equipment, they are good enough for e-mailing colleagues and experts with a quick closeup of a lichen that you are puzzling over.

PRESIDENT'S MESSAGE

At CALS recent Symposium "Lichens Exposed" I was impressed with the diversity of life forms we see in lichens. What a mystery that the combination of fungus and alga can result in specimens so different as leaf-like to crust, bright orange to black, near microscopic to feet long. This reminds me of the diversity in our membership as well. Students, professional lichenologists, advanced amateurs, beginners, those who see the beauty of lichens through the lens of a camera, those who tally their numbers and weight in survey, those who struggle to name and identify, those who donate freely time and resources, those with long vision, those with special expertise, those with much energy and dedication, those who are willing to be a member of CALS only to receive the Bulletin. Different, yet we all share a common interest in lichens. As I review 1999, I feel CALS has been very successful. We have hosted seminars by prominent lichenologists Professor David Richardson and Dr. Larry St. Clair; sponsored our Fall Workshop Series at San Francisco State University; travelled to San Francisco Crystal Springs Watershed, Pepperwood Preserve, San Francisco Bay for an algae field trip, Lincoln Park, San Simeon State Park, Samoa Peninsula and Horse Mountain. We hosted our first student-led workshop and set up permanent lichen monitoring plots at the Sweeney Granite Mountains Reserve. Our "Lichens Exposed" Symposium held in November at the California Academy of Sciences was very well attended and received.As this term of office ends, I would like to thank Board Members Darrell Wright, Cherie Bratt, Bill Hill, and Dick Moe, and our Editors, Dick Moe, William Sanders, Isabelle Tavares, Shirley Tucker, and Darrell Wright. I would especially like to acknowledge Dick Moe and Isabelle Tavares for the fine quality of the CALS Bulletins and thank Dick Moe for maintaining the CALS Website. I give special thanks to Janet Doell who has been an invaluable mentor to me these last 2 years and I would like to thank every member of CALS for your participation and your support.The goals of CALS are to promote the study, appreciation and conservation of lichens. Each member does this in his or her unique way. As CALS moves into the Millenium, I look forward to our upcoming meetings, field trips and workshops and an increase in conservation efforts and education outreach. My challenge to you is to expand the circle of "Lichens Exposed", for "exposing" more people to the study and appreciation of these unique plants is the key to their preservation.

Judy Robertson



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