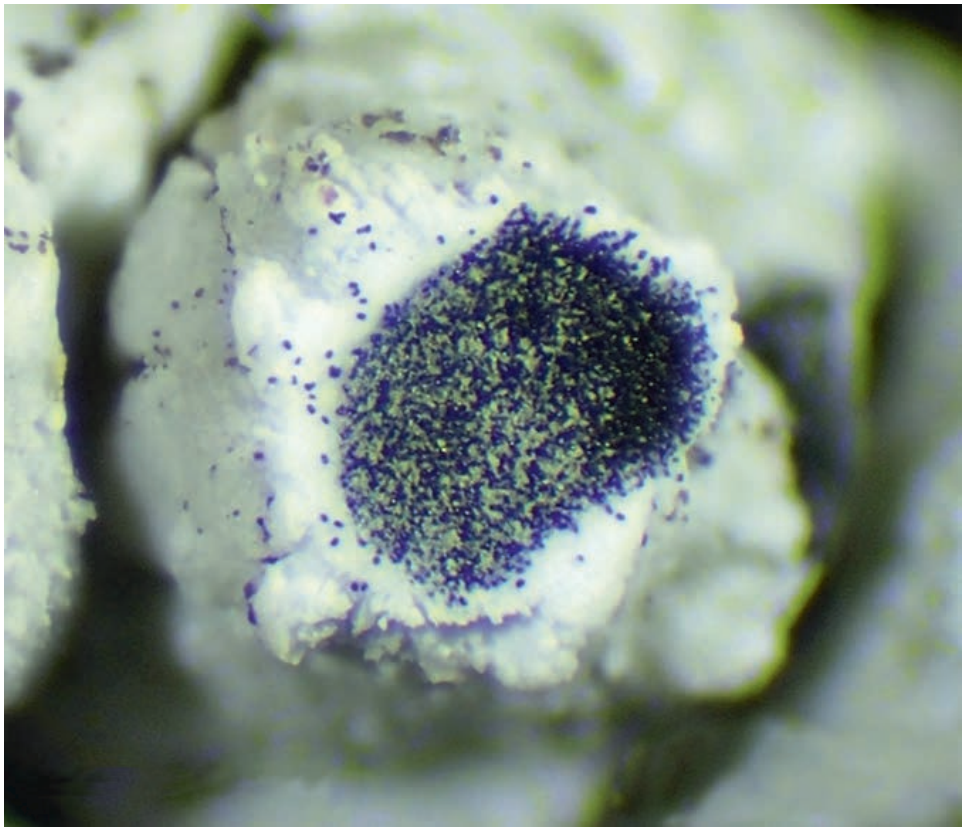
Bulletin of the California Lichen Society



Volume 25 No. 2 Winter 2018

Bulletin of the California Lichen Society

Volume 25 No. 2 Winter 2018

Contents

This issue of the Bulletin of the California Lichen Society (ISSN 1093-9148) was edited by Tom Carlberg (editor@californialichens.org) and was produced by Tom Carlberg (production@californialichens.org).

Interested in submitting an article, photo, or workshop information for an upcoming issue of the Bulletin?
The Bulletin welcomes manuscripts on technical topics in lichenology relating to western North America and on conservation of lichens, as well as news of lichenologists and their activities. The best way to submit manuscripts is by email attachments in the format of a major word processor (DOC or RTF preferred). Use italics for scientific names. Please submit figures in electronic formats with a resolution of 300 pixels per inch (600ppi minimum for line drawings); preferred minimum width for images is 2100 pixels, but widths down to 1050 pixels may be accepted. Email submissions are limited to 10MB per email, but large files may be split across several emails or other arrangements can be made. Contact Editor@californialichens.org for details of submitting illustrations or other large files. A review process is followed. Nomenclature follows Esslinger's cumulative checklist online at http://www.ndsu.edu/pubweb/~esslinge/chcklst/chcklst7.htm. The editors may substitute abbreviations of authors names, as appropriate from The International Plant Names Index - www.ipni.org/index.html. Style follows this issue. Electronic reprints in PDF format will be emailed to the lead author at no cost. The deadline for submitting material for the summer issue is April 1, 2019.

Volume 25(2) of the Bulletin of the California Lichen Society was issued on December 30, 2018.

Cover image: Loose spore bundles spilling from the mazaedium (apothecium) of *Thelomma californicum* at the UC Santa Barbara Kenneth Norris Rancho Marino Reserve; see article on p. 31. Photo by Tom Carlberg.

Lichens of the Rancho Marino and Los Osos Oaks Reserves, San Luis Obispo County, California

Jesse E. D. Miller[1], Jason Hollinger[2], and Tom Carlberg[3]

[1]Stanford University, Stanford, California 94305, jedmiller@ucdavis.edu
[2]The Great Basin Institute, Reno, Nevada 89311, pellaea@gmail.com
[3]California Academy of Sciences, San Francisco, California, 94118, tcarlberg@calacademy.org

Abstract

Several California Lichen Society members and friends explored the lichen communities of coastal San Luis Obispo County, California, on a foray in March, 2018. Lichen observations were focused on two areas: the University of California Kenneth Norris Rancho Marino Reserve in Cambria, California, and the Los Osos Oaks State Natural Reserve near Morro Bay, California. Coastal San Luis Obispo County represents an important region for lichen conservation because it contains diverse lichen communities with a number of rare species, and remnants of lichen habitats that have been fragmented by urban development. This foray highlights the conservation value of numerous coastal habitats for lichen diversity. Coastal chaparral, hypermaritime rocky shorelines, and undisturbed vegetated dune systems in particular host a notable number of rare and endemic lichen species.

Introduction

California's central and south coast provides habitat for diverse lichen communities, including a number of rare species (Carlberg & Knudsen 2007, Hasse 1916, Herre 1907, Knudsen & Kocourková 2011, Knudsen & Lendemer 2006, 2007). Numerous coastal southern California lichens are considered species of conservation concern (i.e. *Sulcaria spiralifera, Graphis saxorum, Mobergia calculiformis*; California Native Plant Society 2018) in part because urban development has caused extensive fragmentation of natural habitats (e.g., McCune and Schoch 2009). Further, shrublands that provide some of the most important lichen habitat in southern California are sensitive to wildfire, and increases in fire frequencies in California threaten lichen populations (Knudsen and Magney 2006, Miller et al. 2018). Despite these concerns, the diversity and distributions of lichen communities on the south-central coast remain incompletely understood, and further research to document species ranges and population vigor is needed.

Figure 1. Coastal sage scrub habitat at the Rancho Marino Reserve.

Several California Lichen Society members and friends explored the lichen communities of coastal San Luis Obispo County, California, on a foray in March, 2018. Lichen observations were focused on two areas: the University of California Ken Norris Rancho Marino Reserve in Cambria, California (hereafter Rancho Marino), and the Los Osos Oaks State Natural Reserve near Morro Bay, California (hereafter Los Osos).

Rancho Marino is a 202 hectare (500 acre) UC Reserve that stretches for two miles southward along the coast from the small town of Cambria, and inland from the coast to the first major ridgeline at 213 meters (700 feet) elevation. The Reserve contains several distinct habitat types, most prominently, from a lichenologist's perspective, Monterey pine (*Pinus radiata*) and live oak (*Quercus agrifolia*) forest, and coastal sage scrub (Figure 1), dominated by California sagebrush (*Artemisia californica*) and poison oak (*Toxicodendron diversilobum*). The reserve also contains a substantial coastal prairie, which is dominated by annual grasses. Old wooden fence posts throughout the preserve provide substrate for a remarkably diverse assortment of lichens (Figure 2), and a number of lichen species were found growing on sandstone in the salt-spay zone on the immediate coast, as well as on low-lying sandstone outcrops on steep slopes in the vicinity of the coastal sage scrub community.

Figure 2. Old wooden fence post covered in lichens at the Rancho Marino Reserve.

Figure 3. Epiphytic lichens are abundant in the old growth coastal chaparral at the Los Osos Oaks Reserve.

At Los Osos, we primarily explored lichens in a coastal chaparral habitat, a shrubland community that is distinct from coastal sage scrub both in terms of dominant vascular plants and lichen species composition. The old growth coastal chaparral at Los Osos is dominated by buckbrush (*Ceanothus cuneatus*) and chamise (*Adenostoma fasciculatum*). The *Ceanothus* at Los Osos are clearly quite old, with stout stems sometimes taking on an almost arboreal appearance. Lichen biomass is high on the shrubs at Los Osos (Figure 3), and a number of rare and exciting lichen species were encountered (Figure 4).

Below, we present accounts of species of particular interest that were encountered at Rancho Marino and Los Osos (Figure 5 and back cover photos). We also present a full list of species we encountered at Rancho Marino. Since our explorations at Los Osos were limited to a small portion of the Reserve, we do not include a full species list for Los Osos.

Interesting species

Buellia oidalea (Nyl.) Tuck., at Rancho Marino (back cover). This conspicuous, handsome *Buellia* was growing happily all over a few weathered Monterey pine logs on the hillside above the field station. (We found it also on twigs in the chaparral at Los Osos.) It probably wouldn't be considered uncommon, but it does have a very narrow range, confined to the coast from Oregon to Baja. It is a delight to put under the scope, because it has strikingly large muriform spores (oddly, with somewhat paler tips), densely inspersed hymenium, and a satisfying C+ orange reaction owing to presence of xanthones.

Collemopsidium foveolatum (A. L. Sm.) F. Mohr, at Rancho Marino. Check those barnacles in the tidal zone! Ken and Jason scoured the point near the Rancho Marino field station and found quite a few populations of limpets with tiny pits in their shells. We dutifully pried a few off and brought them back to the lab, but failed to detect any algae. We foolishly concluded that these were unlichenized, perhaps a parasitic Ascomycete similar to *Stigmidium*. But apparently that isn't uncommon with this species, which has such a scant thallus and its perithecia are completely immersed in little pits etched in the host's shell. McCune (2017) has a photo on p. 43.

Heterodermia namaquana Breuss, at Los Osos (Figure 5c). There were quite a number of tiny specimens of this cute little species on twigs in the old growth coastal chaparral at Los Osos. In the field the cilia are conspicuous. It is much more compact and shrubby than the more widespread *H. leucomela* (which is also present at Los Osos). Both species seemed abnormally dwarfed at this location. *H. namaquana* is found only along the coast of southern California, Baja California and South Africa.

Hypogymnia minilobata McCune & Schoch, at Los Osos. What a treat to see this species at its type locality! It is reminiscent of *H. occidentalis*, but like many things in the coastal chaparral, oddly dwarfed. *H. minilobata* is known only from a handful of coastal locations from San Luis Obispo to San Diego. Note especially its abundant gaping perforations at the lobe tips.

Hypogymnia mollis L.H. Pike & Hale, at Los Osos (back cover). This species is characteristic of coastal chaparral in southern California and Baja California. According to McCune (2009) it may be most closely related to *H. minilobata*. However, *H. mollis* has abundant soft laminal soredia (*H. minilobata* has no soredia and is usually fertile instead). It is also a good deal more common. Los Osos is the type locality for this species, where it is common on twigs in coastal chaparral (Pike and Hale, 1982).

Lecanora expallens Ach., at Rancho Marino. This species is fairly rare on the southern California coast. (Judging by google search results, it must be more common in the British Isles.) We found it by the field station - just two small patches on a Monterey cypress (*Hesperocyparis macrocarpa*) twig. Like most rare things, it

Figure 4. Lichen enthusiasts can scarcely restrain themselves from diving into the chaparral at Los Osos upon discovering a population of the rare Sulcaria isidiifera.

was, of course, collected by accident! (With an unremarkable specimen of *Buellia punctata* in this case.) It is a thin sorediate crust which produces usnic acid. Because its nonsorediate thallus is endophloedic and the soralia are confluent, it appears to be essentially leprose in the field. It is usually mistaken for a *Lepraria* or *Pyrrhospora quernea*. Chemistry is the only way to reliably identify sterile specimens. In addition to usnic acid, *L. expallens* contains zeorin and the xanthone thiophanic acid (C+ orange). Our specimen gave only a very weak, ambiguous C reaction, so it should be considered tentative until confirmed with thin-layer chromatography.

L. simeonensis K. Knudsen & Lendemer, at Rancho Marino (Figure 5d). There was a thriving fertile population of this on weathered Monterey pine logs on the hillside above the field station. Like *L. expallens* (see above), it is a sorediate, usnic acid-containing *Lecanora*. However this species has a well-developed rimose-areolate thallus, forms capitate soralia and lacks xanthones (C-). It was described only recently by Lendemer and Knudsen (2009) from San Simeon State Park just four miles to the north.

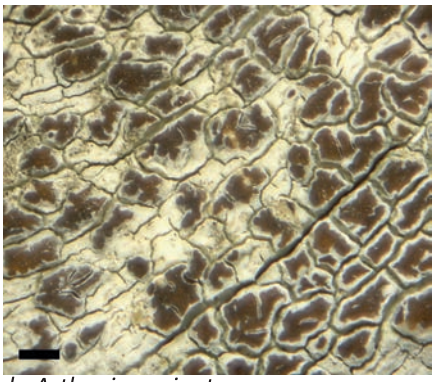
Melanelixia subaurifera (Nyl.) O. Blanco et al., at Rancho Marino (Figure 5e). On fence wood at a cattle crossing. A widespread and common brown parmelioid lichen in temperate and boreal regions of the Western Hemisphere, *M. subaurifera* reaches the southwestern limits of its range in Southern California. This is not the most southerly report for this species, but there are very few reports further south in California; from Morro Bay, Hollister Ranch, Santa Barbara, the mountains above Los Angeles, and in Arizona from the Santa Rita Mountains south of Tucson.

Micarea nitschkeana (J. Lahm ex Rabenh.) Harm., at Los Osos (Figure 5f). This was found growing on a twig in the coastal chaparral. It is a tiny button crust, distinguished from the very similar *M. denigrata* by having 3-septate spores instead of 1-septate spores and typically growing on twigs instead of wood (Fryday and Coppins 2007). While very widespread, occurring in Asia, Europe and even Tasmania, this species appears to be rare in coastal California, with only a handful of records from Sonoma County to the Channel Islands. Our specimen was collected accidentally with *Hypogymnia mollis*, so perhaps it is merely overlooked.

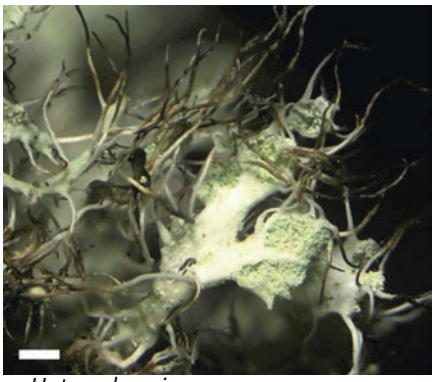
Opegrapha sp., at Rancho Marino (Figure 5g and back cover). In California, *Opegrapha* is generally found on trees, so when we found this striking black lirellate lichen growing on sandstone in the spray zone below the field station, we knew it was something interesting. Our specimen has 5-septate spores 15-17 × 4-5 µm, often-branched apothecia ca. 1.0 × 0.3 mm, with slit-like disk and distinctively cracked exciple. The only species known from California with 5-septate spores that size is *O. xerica*, however that species has unbranched apothecia and grows on trees. *O. brattiae* and occasionally *O. herbarum* will grow on rocks, however they both have 3-septate spores (Ertz and Egea 2007). In the British Flora, Pentecost and James (2009) discuss *O. cesareensis*, which looks very similar and grows in the right habitat (the "xeric supralittoral zone"). However, they stress a characteristic lilac tinge in the thallus of their material (ours has entirely endolithic thallus), and photos and descriptions make no mention of the cracked exciple seen in our specimen. This specimen clearly requires further research.

Pachnolepia pruinata (Pers.) Frisch & G. Thor, at Rancho Marino. We found two beautiful spe-

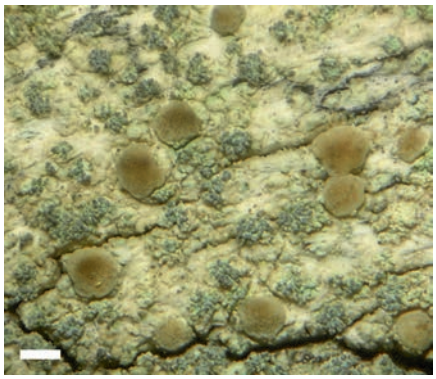
a. Arthonia pruinata



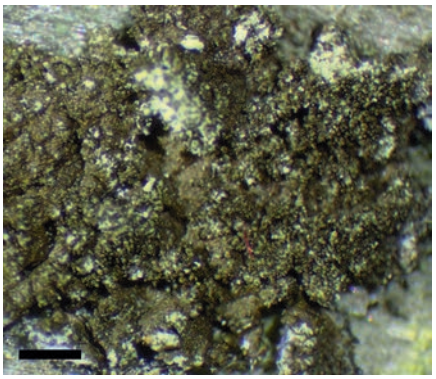
b. Arthonia pruinata



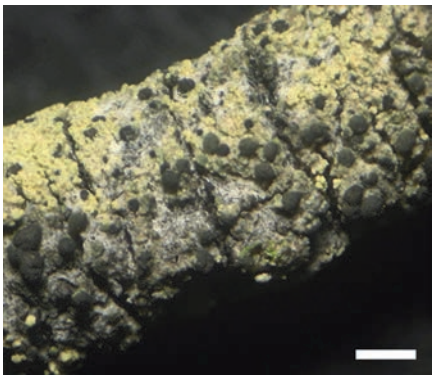
c. Heterodermia namaquana



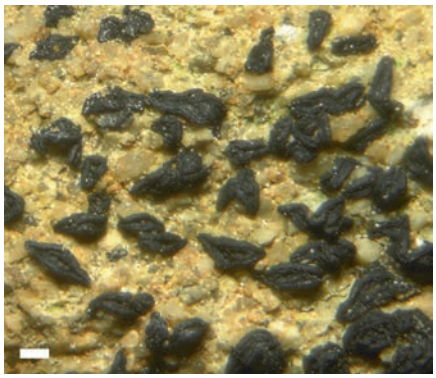
d. Lecanora simeonensis



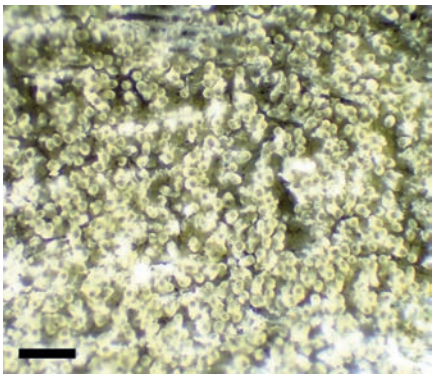
e. Melanelixia subaurifera



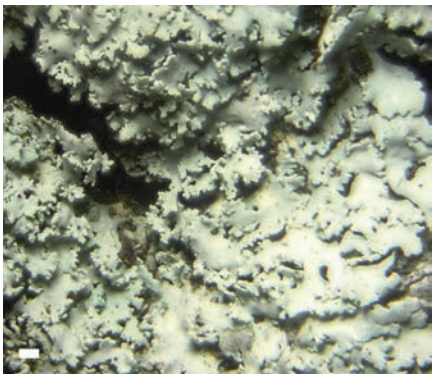
f. Micarea nitschkeana



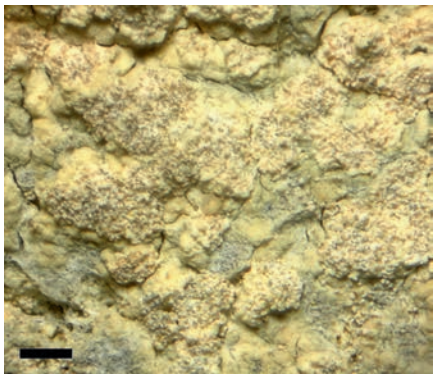
g. Opegrapha sp.



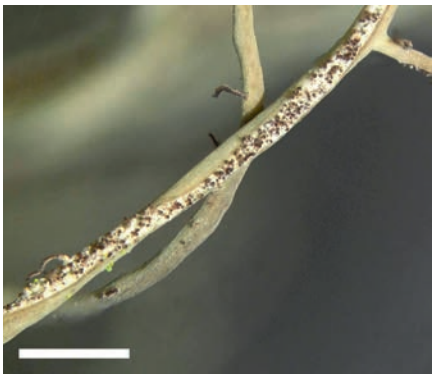
h. Pertusaria coccodes



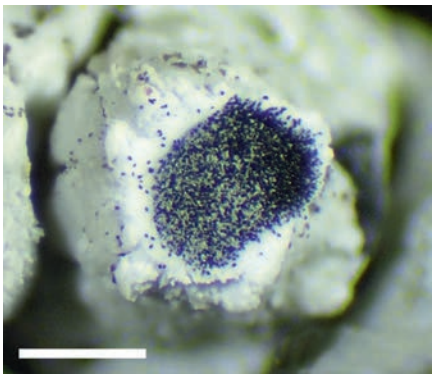
i. Physcia duplicorticata



j. Paraschismatomma ochroleucum



k. Sulcaria isidiifera



l. Thelomma californicum

Figure 5. Interesting lichens encountered in coastal San Luis Obispo County, California. All scale bars represent 0.5 mm. All photos by Jason Hollinger, except for e, h, and l by Tom Carlberg.

cimens of this growing on fence posts near the field station that could scarcely have looked more different in the field. One was heavily pruinose with scattered cracked apothecia, the other was epruinose with dense polygonal apothecia. However, both have *Trentepohlia*, are C+ bright red, and have I+ red hymenium and 4-septate, ovoid, ~15 × 5 µm spores. According to Grube (2007), this is the most common species of *Arthonia* sensu lato in the region.

Paraschismatomma ochroleucum (Zahlbr.) K. Knudsen, Ertz & Tehler, at Rancho Marino (back cover). This white, sorediate crust was abundant on Monterey cypress near the sea. It is characterized by the presence of *Trentepohlia* as its photobiont, lecanoric acid (C+ bright red) and verruculose thallus. The soralia are initially discrete, but become confluent in age, eventually essentially covering the entire thallus. The soredia darken from white in the shade to peppered-gray in exposed situations. One of our specimens (Hollinger 19834) was fertile, however no mature spores were seen. Compare with *Schizopelte crustosa* below.

Pertusaria coccodes (Ach.) Nyl., at Rancho Marino (Figure 5h). On wood of a down Monterey pine log in an open field. A rare lichen for California! A diminutive off-white crust whose thallus is barely visible through the forest of brown-tipped isidia which comprises most of what you see in the field. It has 45 synonyms listed in the Consortium of North American Lichen Herbaria (CNALH 2018). This species has an oceanic distribution, and appears most frequently (74% of reported global records) in Norway, Sweden, Denmark, and Germany, but rare in in the United States (9% of reported records) and extremely rare in California (1.5%). In northern California it might easily be mistaken for *Loxosporopsis corallifera* Brodo, Henssen & Imshaug, which has proportionately longer and more cylindrical isidia than *P. coccodes*. The two species also differ chemically and in their responses to UV light; *P. coccodes* is K+ red, UV-, and *L. corallifera* is K-, UV+ off-white. See Tucker (2017) for additional analysis and comparisons.

Physcia duplicorticata Weber & Thomson, at Los Osos (Figure 5i). This was found growing on the leaning bole of a large live oak. This relatively rare coastal California endemic has been discussed recently in the CALS bulletin by Knudsen et al (2016) and Esslinger (2017). It is primarily known from around the Bay Area; it was described by Weber and Thomson (1975) from Point Reyes. Knudsen et al (2016) reported it from the Santa Monica Mountains.

Schizopelte crustosa Ertz & Tehler, at Rancho Marino. We found one specimen of this on Monterey pine bark on the hill above the field station. It is very similar in some ways to *Paraschismatomma ochroleucum*, especially when sorediate. Both have *Trentepohlia*, lecanoric acid (C+ bright red), white thallus, and multiseptate spores. However, *S. crustosa* has shorter, less-septate spores which turn brown in age. When sterile, *S. crustosa* can be distinguished from *P. ochroleucum* by having a smoother (less verruculose) thallus. Both species are endemic to the southern California and Baja California coast.

Sulcaria isidiifera Brodo, at Los Osos (Figure 5k and back cover). This is the crown jewel of Los Osos. This spectacular, narrowly endemic hair lichen is known from only a handful of localities in this region. We thrashed through the dense old growth chaparral for some time looking for it. We were fooled repeatedly by the similar-looking *S. spiralifera* before we finally

stumbled on the type population. Both species grow deep within the shelter of old growth chamise (*Adenostoma*) and mountain mahogany (*Cerco-carpus*), often requiring a distinct disregard for clothing and dignity to get a close enough look to check for the characteristic, striking isidia which line the long, twisting pseudocyphellae of *S. isidiifera*. Additionally, *S. isidiifera* tends to be a bit more shrubby, coarser, and perhaps on average paler than *S. spiralifera*. By contrast, *S. spiralifera* tended to have a slightly more reddish tinge and somewhat finer more pendulous branches which matted together a little.

Sulcaria spiralifera (Brodo & D. Hawksw.) Myllys, Velmala & Goward, at Los Osos. At any other site, where not overshadowed by *S. isidiifera*, this species would be a rare and noteworthy find! It is found only in scattered sites along the coast from California to Washington. It is separated from the similar *S. badia* by the presence of norstictic acid (in Los Osos Oaks material; K+ yellow turning red and producing abundant needle-shaped crystals in a squash mount) or alectorialic and barbatolic acids (the *Bryoria pseudocapillaris* chemotype) and shorter pseudocyphellae (Myllys et al. 2014). *S. badia* contains only atranorin (K+ yellow, KC-, P- or very weak, slow yellow).

Thelomma californicum (Tuck.) Tibell, at Rancho Marino (Figure 5l and back cover). On a wood fence post of the eastern boundary fence of Rancho Marino. A not uncommon species restricted (mostly) to the West Coast of North America, from Humboldt Bay to Baja California (but see also Knudsen 15833 UCR-242148 (CNALH 2018), in the southern Sierra Nevada Mountains). The asci disintegrate as the spores mature, forming an apothecium that is a loose powdery mass of spores (a mazaedium).

Authorship statement

JM organized the foray and all authors attended and contributed to lichen identifications; JH (and Ken Kellman) performed the vast majority of the identifications. JM wrote the first draft of the introduction to the paper. JH and TC wrote the first drafts of the species accounts. All authors contributed to editing and revising the entire paper.

Acknowledgements

Ken Kellman contributed significantly to the species lists presented in this paper. We are grateful to Don Canestro and Rancho Marino for welcoming us to the Reserve and supporting this project, and we thank Los Osos for allowing us to collect lichens. Don Canestro, the Reserve Manager at Rancho Marino, died unexpectedly shortly after this project was completed. He stewarded the Reserve for almost two decades, facilitating a great variety of research and sharing expert ecological knowledge with many visitors. He will be greatly missed.

References

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 31 October 2018].

Consortium of North American Lichen Herbaria. 2018. http://lichenportal.org/portal. Accessed on 30 October 2018.

Carlberg, T. & K. Knudsen. 2007. *Sulcaria isidiifera*, Sponsorship for the CALS Conservation Committee. Bulletin of the California Lichen Society 14 (2): 45–47.

Ertz, D. & J.M. Egea. 2007. *Opegrapha* In: T.H. Nash, III, C. Gries & F. Bungartz: Lichen Flora of the Greater Sonoran Desert Region. Volume 3. Lichens Unlimited, Arizona State University, Tempe, pp. 255–266.

Esslinger, T.L. 2017. *Physcia millegrana* can be excluded as an adventive in California. Bulletin of the California Lichen Society 24(1): 19–21.

Fryday, A.M. & B.J. Coppins. 2007. *Micarea* In: T.H. Nash, III, C. Gries & F. Bungartz: Lichen Flora of the Greater Sonoran Desert Region. Volume 3. Lichens Unlimited, Arizona State University, Tempe, pp. 246–250.

Grube, M. 2007. *Arthonia* In: T.H. Nash, III, C. Gries & F. Bungartz: Lichen Flora of the Greater Sonoran Desert Region. Volume 3. Lichens Unlimited, Arizona State University, Tempe, pp. 39–61.

Hasse, H. E. 1916. The lichen flora of southern California 17:1. Govt. Print. Off.

Herre, A..W.C.T. 1907. Lichen distribution in the Santa Cruz Peninsula, California. Botanical Gazette 43(4):267–273.

Knudsen, K., T.L. Esslinger & T. Wheeler. 2016. *Physcia duplicorticata* rediscovered in the Santa Monica Mountains. Bulletin of the California Lichen Society 23(1): 13–15.

Knudsen, K., and J. Kocourková. 2011. Rare lichens of the southern California chaparral. The Chaparralian 8(1): 10–12.

Knudsen, K. & J.C. Lendemer. 2007. *Cladonia firma*, Sponsorship for the CALS Conservation Committee. Bulletin of the California Lichen Society 14 (2): 40–44.

Knudsen, K. & J.C. Lendemer. 2006. *Cladonia firma* in San Luis Obispo County, California. Bulletin of the California Lichen Society 13 (2): 29–34.

Knudsen, K., and D. Magney. 2006. Rare lichen habitats and rare lichen species of Ventura County, California. Opuscula Philolichenum 3: 49–52.

Lendemer, J.C. & K. Knudsen. 2009. Two new usnic acid containing species of *Lecanora* from western North America. Opuscula Philolichenum 6: 73–80.

McCune, B. 2017. Microlichens of the Pacific Northwest: Volume 1 Key to the genera. Wild Blueberry media LCC, Corvallis, Oregon. 218 pp.

McCune, B. 2017. Microlichens of the Pacific Northwest. Volume 2: Keys to the species. Wild Blueberry Media, Corvallis, Oregon, USA. 755 pp.

McCune, B., and C. Schoch. 2009. *Hypogymnia minilobata* (Parmeliaceae), a new lichen from coastal California. The Bryologist 112:94–100.

Miller, J. E. D., H. T. Root, and H. D. Safford. 2018. Altered fire regimes cause long term lichen diversity losses:1–11.

Myllys, L., S. Velmala, H. Lindgren, D. Glavich, T. Carlberg, L.S. Wang & T. Goward. 2014. Taxonomic delimitation of the genera *Bryoria* and *Sulcaria*, with a new combination *Sulcaria spiralifera* introduced. The Lichenologist 46(6): 737–752.

Pentecost, A. & P.W. James. 2009. *Opegrapha* In: C.W. Smith, A. Aptroot, B.J. Coppins, Fletcher, O.L. Gilbert, P.W. James & P.A. Wolseley. The Lichens of Great Britain and Ireland. The British Lichen Society, London, pp. 631–647.

Pike, L.H. & M.E. Hale, Jr. 1982. Three new species of *Hypogymnia* from western North America (Lichenes: Hypogymniaceae). Mycotaxon 16: 157–161.

Tucker, S.C. 2017. Rare Lichens Collected in California by Judith (Judy) and Ron Robertson. Evansia 34:3; 74–84

Weber, W.A. & J.W. Thomson. 1975. *Physcia duplicorticata* Weber & Thomson sp. nov. from California. Mycotaxon 3: 102–104.

Appendix. Lichen species encountered at the University of California Ken Norris Rancho Marino Reserve in San Luis Obispo County, California. Species without collection numbers were observed but not collected. All collections have been retained in the authors' personal herbaria, and duplicates of some KMK collections have also been deposited at UCSC. JH=Jason Hollinger, KMK=Ken Kellman, and TC=Tom Carlberg.

Taxon	Authorities	Collection number
Acarospora socialis	H. Magn.	JH 19822, KMK 8867
Amandinea punctata	(Hoffm.) Coppins & Scheid.	JH 19827, KMK 8841, TC 05641
Arthonia pyrrhuliza	Nyl.	TC 05658
Aspicilia pacifica	Owe-Larss. & A. Nordin	JH 19819a, 19821
Athallia pyracea	(Ach.) Arup, Frödén & Søchting	JH 19828
Buellia abstracta	(Nyl.) H. Olivier	JH 19813
Buellia cf. halonia	(Ach.) Tuck.	JH 19812
Buellia oidalea	(Nyl.) Tuck.	KMK 8856, JH 19839
Buellia pullata	Tuck.	JH 19811
Buellia stellulata	(Taylor) Mudd	JH 19811, 19818
Calicium abietinum	Pers.	KMK 8842, JH 19807
Calicium glaucellum	Ach.	KMK 8853
Calicium tigillare	(Ach.) Pers.	
Caloplaca saxicola	(Hoffm.) Nordin	JH 19823
Chrysothrix xanthina	(Vainio) Kalb	JH 19837
Cliostomum griffithii	(Sm.) Coppins	JH 19809, TC 05656
Collemopsidium foveolatum	(A. L. Sm.) F. Mohr	
Dimelaena radiata	(Tuck.) Müll. Arg.	JH 19811, 19819
Diploicia canescens	(Dickson) A. Massal.	
Diploschistes muscorum	(Scop.) R. Sant.	JH 19817
Evernia prunastri	(L.) Ach.	
Flavoparmelia caperata	(L.) Hale	
Flavopunctelia flaventior	(Stirton) Hale	TC 05638
Heterodermia leucomela	(L.) Poelt	
Hypogymnia enteromorpha	(Ach.) Nyl.	TC 05639
Hypogymnia heterophylla	L. Pike	KMK 8854
Lecania cf. *Franciscana*	(Tuck.) K. Knudsen & Lendemer	JH 19792, 19793
Lecania cf. *Pacifica*	Zahlbr. ex B.D. Ryan & van den Boom	
Lecanora caesiorubella	Ach.	JH 19830, TC 05636
Lecanora confusa	Almb.	JH 19838
Lecanora expallens	Ach.	JH 19827
Lecanora simeonensis	K. Knudsen & Lendemer	JH 19841
Lecidella asema	(Nyl.) Knoph & Hertel	JH 19814
Lecidella scabra	(Taylor) Hertel & Leuckert	JH 19815
Lichenostigma maureri	Hafellner	JH 19808
Lichenostigma subradians	Hafellner, Calatyud & Nav.-Ros.	JH 19822
Melanelixia subaurifera	(Nyl.) O. Blanco et al.	TC 05663
Micarea denigrata	(Fr.) Hedl.	JH 19842

Appendix, continued...

Taxon	Authorities	Collection number
Mycocalicium subtile	(Pers.) Szatala	
Myriolecis dispersa	(Pers.) Śliwa, Zhao Xin & Lumbsch	JH 19816
Niebla cephalota	(Tuck.) Rundel & Bowler	
Ochrolechia arborea	(Kreyer) Almb.	TC 05652
Opegrapha erosa	Egea & Ertz	TC 05659
Opegrapha herbarum	Mont.	JH 19824
Opegrapha niveoatra	(Borrer) J.R. Laundon	JH 19825
Opegrapha sp.		JH 19794
Opegrapha xerica	Torrente & Egea	KMK 8840
Pachnolepia pruinata	(Pers.) Frisch & G. Thor	KMK 8870
Paraschismatomma ochroleucum	(Zahlbr.) K. Knudsen, Ertz & Tehler	JH 19826, 19834, 19835
Parmotrema hypoleucinum	(Steiner) Hale	
Pertusaria coccodes	(Ach.) Nyl.	TC 05646
Physcia phaea	(Tuck.) J.W. Thomson	KMK 8865
Placynthiella uliginosa	(Schrader) Coppins & P. James	
Polycauliona candelaria	(L.) Frödén, Arup, & Søchting	KMK 8868b
Polycauliona ludificans	(Arup) Arup, Frödén & Søchting	KMK8864
Polycauliona luteominia	(Tuck.) Arup, Frödén & Søchting	KMK 8842, JH 19791, 19812
Pseudothelomma ocellatum	(Körber) M. Prieto & Wedin	KMK 8869; JH 19832
Pyrrhospora quernea	(Dickson) Körber	JH 19840
Ramalina canariensis	J. Steiner	
Ramalina farinacea	(L.) Ach.	
Ramalina leptocarpha	Tuck.	
Ramalina menziesii	Tuck. non Taylor	
Ramalina pollinaria	(Westr.) Ach.	
Ramalina subleptocarpha	Rundel & Bowler	
Rinodina gennarii	Bagl.	JH 19812
Sarcogyne regularis	Körber	KMK 8874
Schizopelte crustosa	Ertz & Tehler	JH 19806
Stigmidium epixanthum	Hafellner	JH 19822
Thelomma californicum	(Tuck.) Tibell	KMK 8859, TC 05637
Thelomma mammosum	(Hepp) A. Massal.	JH 19818
Trapeliopsis flexuosa	(Fr.) Coppins & P. James	TC 05657
Usnea fragilescens	Hav. ex Lynge	
Usnea perplexans	Stirton	
Usnea rubicunda	Stirton	
Verrucaria acrotella	Ach.	JH 19811
Verrucaria calkinsiana	Servít	JH 19812
Verrucaria prominula	Nyl.	JH 19795
Verrucaria viridula	(Schrader) Ach.	JH 19821

Modeling for *Sulcaria badia* on the Shasta-Trinity National Forest, California

Tom Carlberg[1] and Jenny A. Moore[2]

[1]Six Rivers National Forest, 1330 Bayshore Way, Eureka, CA 95501; tecarlberg@fs.fed.us
[2]Cleveland National Forest, 10845 Rancho Bernardo Road Suite 200, San Diego, CA 92127; jamoore@fs.fed.us

Abstract

Sulcaria badia Brodo & D. Hawksw. is a Forest Sensitive species on three National Forests (NFs) in Northern California. Data from the PRISM (Parameter-Elevation Regressions on Independent Slopes Model) Climate Group at Oregon State University and the U.S. Forest Service's Existing Vegetation (EVEG) GIS layers were used to construct a habitat model based on the climate, elevation, and vegetation variables present at known sites of *S. badia* in northern California. Fourteen of these areas were surveyed in 2014. Two new detections of *Sulcaria badia* were made based on modeled habitat. *Sulcaria badia* occupies anomalous habitat on Six Rivers NF. Management recommendations include pre-disturbance surveys and habitat retention.

Introduction

Sulcaria badia Brodo & D. Hawksw. is a fruticose epiphytic Pacific Northwest endemic lichen with a historical distribution from the Olympic Peninsula in Washington in the north to the general area of Laytonville, California in the south (Figure 1), a range of approximately 940 kilometers. The confirmed contemporary range is from Corvallis, Oregon to Lake Pillsbury in Mendocino County, CA, a distance of approximately 580 kilometers, and not further than 130 kilometers from the Pacific Ocean (Carlberg 2014). Reports of *S. badia* from the Sierra Nevada in California have been determined to be various species of *Bryoria* (Schroeder 2006).

"Thallus pendent, 20–50cm long, flaccid; branching mainly isotomic-dichotomous, angles between the dichotomies mainly acute and rounded; branches markedly flattened and twisted, conspicuously sulcate, 0.25 - 0.4 (1.0) mm diameter at the base, with short, slender almost perpendicular lateral branches; dull chestnut-

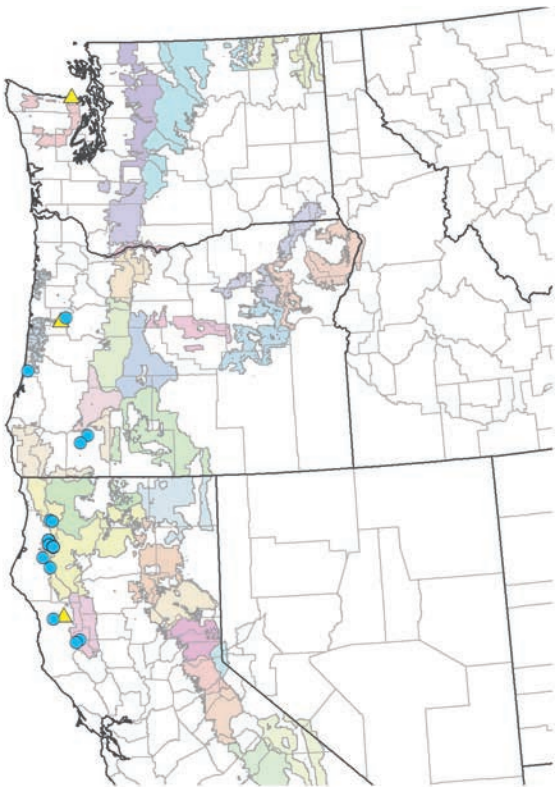


Figure 1. Historic sites for Sulcaria badia in the Pacific Northwest. Pastel colors are National Forests. Yellow triangles are sites presumed extirpated.

brown to almost badious or yellowish-brown in parts. True lateral spinules, isidia and soralia absent. Pseudocyphellae conspicuous, white, linear, extremely long, most developing into deep furrows (Figures 2, 3). Apothecia and pycnidia unknown. Acetone extract K+ yellow, C-, KC+ yellow, P+ yellow or brownish" (adapted from Brodo & Hawksworth 1977).

The type locality is an old orchard near Philomath, OR. Habitat at historic sites is described as "on trees, especially apple and oak trees, in well-lighted *Quercus garryana* (Garry oak) communities" (Brodo & Hawksworth 1977). In Oregon, *Sulcaria badia* is known from well-lighted *Quercus garryana* savannas on the fringes of low-elevation broad river valleys (McCune & Geiser 2009; Wineteer 2004), usually adjacent to creeks. On Six Rivers NF it is found within or adjacent to mesic mid- to late-mature *Pseudotsuga menziesii* (Douglas-fir) stands with *Quercus kelloggii* (black oak) or *Notholithocarpus densiflorus* (tanoak) at elevations <790m (Carlberg 2014; Figure 4). Most occurrences on Six Rivers NF are associated with vegetation that indicates moist conditions (*Corylus* (hazelnut) and *Cornus* (dogwood)); there is also a relatively high diversity of other alectorioid species of lichens, e.g. *Alectoria sarmentosa* and species of *Bryoria* and *Nodobryoria* (Carlberg 2014). The habitat in the Laytonville area, which Peterson et al. (1998) consider to be optimal habitat, is open flat valleys at around 518m elevation dominated by large oaks, mostly *Quercus garryana* (sic; Peterson et al. 1998). The habitat in the vicinity of Lake Pillsbury is moist mixed hardwood/conifer forests containing *Pseudotsuga menziesii, Pinus ponderosa* (ponderosa pine), *Quercus lobata* (valley oak), *Q. garryana,* and *Fraxinus latifolia* (Oregon ash), at elevations below 610m (Toren & Nilles 2003; Toren 2004;

Figure 2. Sulcaria badia.

Figure 5). Peterson et al (1998) record *Sulcaria badia* growing on *Quercus lobata, Q. kelloggii, Fraxinus latifolia, Acer macrophyllum* (bigleaf maple), and *Pseudotsuga menziesii*. In an atypical site, it was found on *Pinus contorta* var. *contorta* (shore pine) and *Arctostaphylos columbiana* (hairy manzanita) in hypermaritime dune forests in Oregon.

Post-2006 surveys in California have increased the number of occurrences in California from nine to 44, raising the possibility that this lichen

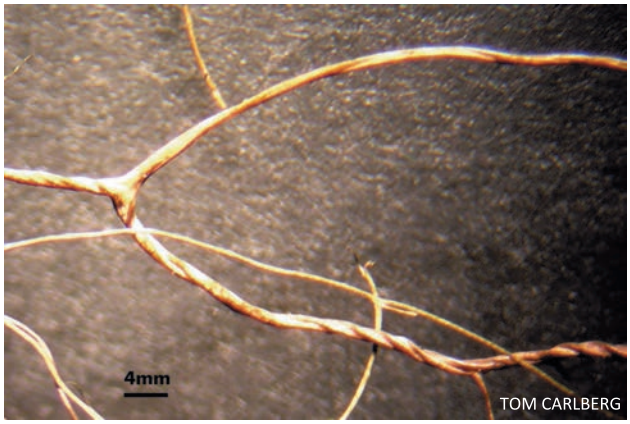


Figure 3. Sulcaria badia, showing strongly twisted branches.

Figure 4. Atypical habitat as found on Six Rivers National Forest.

is undercollected or overlooked, although it should be borne in mind that the occurrences tend to be clustered, indicating a probable dispersal limitation, since neither sexual nor asexual reproductive structures are known in the species; it is assumed to reproduce via thallus fragmentation (Brodo & Hawksworth 1977; Peterson et al. 1998; Carlberg & Toren 2006). Population trends are unknown, since no monitoring is taking place, although three of the historical occurrences are presumed to be extirpated: one on the Olympic Peninsula in Washington, one in Philomath in central Oregon, and a third at Round Valley, California (Peterson et al. 1998; Hutten 2004; McCune 2004; Figure 1).

It is a Forest Sensitive plant on the Mendocino, Shasta-Trinity and Six Rivers National Forests in northern California. It is a species of conservation concern with the California Lichen Society's Conservation Committee (2015), with a Heritage-equivalent state rank of S2S3.2, and a CNPS-equivalent Rare Plant Rank of 4.2 (species of limited distribution). Between 2004 and 2013 it was dropped from the Oregon Biodiversity Information Center publication *Rare, Threatened and Endangered Species of Oregon* (2013).

Study area and GIS analysis

The study area for this project is an area roughly defined by the South Fork of the Trinity River immediately east of South Fork Mountain; a rectangle with a northwest corner at 41.14495° N latitude and -123.55483° W longitude, and a southeast corner at 40.23415° N latitude and -122.85050° W longitude (Figure 6).

A three-pronged approach was used to generate maps showing potential habitat for *Sulcaria badia*. The primary variables were meteorological:

Figure 5. Oak woodland habitat at Lake Pillsbury. This is typical habitat for *Sulcaria badia*.

mean annual values for percent relative humidity (RH), dew temperature (°C), temperature (°C), and wet days, which are the number of days in a year that receive >1.0mm of precipitation. Meteorological data originated as raster files from the PRISM Climate Group at Oregon State University (PRISM 2010), which provides an interpolation of climate data based on elevation change, among other parameters. The PRISM files have a cell size/resolution of 700 meters. The secondary variable was vegetative; the model was restricted to stands of vegetation containing large-diameter *Pseudotsuga menziesii* trees with a diameter at breast height (dbh) >61cm, as defined by EVEG, using Regional Dominance Type 1 = DF (Douglas-fir), and a CWHR (California Wildlife Habitat Relationships) tree size ≥ class 5 (greater than 61 cm) as surrogates. The third variable was elevation in meters, using Forest Service digital elevation models (DEMs) to restrict the habitat model to areas less than 914 m.

The modeling process involved successively intersecting each of the PRISM meteorological files with a shapefile containing point locations of known sites of *Sulcaria badia* to extract meteorological values for each site. With the intent of making the model more relevant to northwest California, values for the Olympic Peninsula site were excluded, as were values from all of the Oregon sites except for the two in north-central Jackson County. Similarly, values from reported locations of *S. badia* from the Califor-

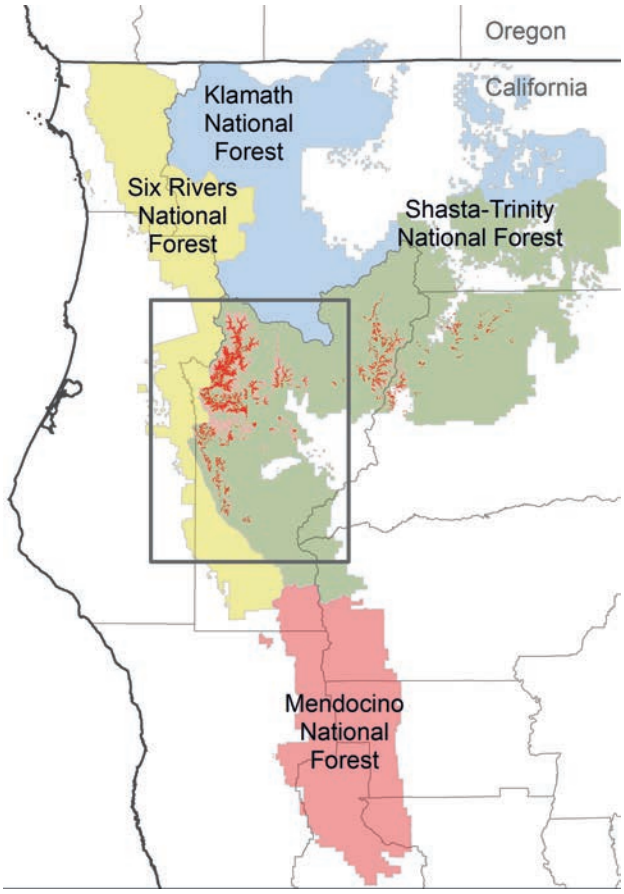


Figure 6. Study area. Colored areas are National Forest lands.

nia coast south of the San Francisco Bay area were not used in the model, primarily because these data would skew the accuracy of the model away from the study area and secondarily because these reports are unverified. The result of these intersections is in the appendix, which contains values for 40 *S. badia* sites within the study area for all meteorological variables under consideration.

The maximum and minimum values from the appendix were used to restrict each meteorological raster. For example, the relative humidity raster was restricted so that only cells whose value fell between 61% and 72% RH were allowed to display. Similarly, restrictions were applied to the raster files for mean annual dew temperature, mean annual temperature, and number of wet days. The new restricted rasters were then intersected with each other, with the result that any cell in the final climate raster 1) has a dew temperature between 0.7°C and 5.0°C; 2) a RH value between 61% and 72%; 3) a mean annual temperature between 9.9°C and 13.5°C; and 4) receives >1.0mm precipitation between 84 and 116 days of each year (appendix).

Similarly, EVEG was queried to produce a shapefile of polygons of *Pseudotsuga menziesii* vegetation type with trunk dbh >61cm. This new shapefile was then used to further restrict the model, so that in addition to the additive climate variables listed above, each cell now had values of *Pseudotsuga menziesii* vegetation type and trunk dbh >61cm. Those cells were then stratified using Forest Service DEMs to cause the model to display areas below 914m elevation differently from those above 914m elevation.

A last consideration was to avoid parts of the Shasta-Trinity NF that had experienced wildfire, on the grounds that a) thalli appearing as litterfall would have burned, and b) populations in tree crowns would be dead where high-intensity/high mortality fires had taken place. The Forest's fire history shapefile was added to the maps produced for the project. No effort was made to stratify burned areas by severity, size or time elapsed since fire, since fire behavior can be variable.

Within the areas identified by the model, survey locations were chosen based on ease of access, with more remote locations receiving a lesser preference. At each location visited, a decision was made whether to survey or not, depending on 1) whether it matched the vegetation pre-

dicted by EVEG (Douglas-fir veg type, with regular trunks >61cm dbh); 2) if there were vegetative indicators of a mesic habitat (i.e. *Cornus, Corylus, Linnaea borealis* [twinflower], etc.); and 3) if alectorioid lichens were present. Fourteen locations were surveyed (Figure 7).

Results and Discussion

Two new detections of *Sulcaria badia* were made as a result of these model-directed surveys, both in lower slope positions immediately proximal to the South Fork Trinity River. One site is at 732m elevation in the general vicinity of Forest Glen, between the Scott Flat and Hell Gate campgrounds, as litterfall near an open-grown "wolf" Douglas-fir in a forest dominated by *Pseudotsuga menziesii* with a strong presence of *Quercus kelloggii* and *Acer macrophyllum*. The understory was open and the dominant shrubs were *Toxicodendron diversilobum, Rubus leucodermis* (white-skin raspberry) and *Corylus cornuta*. *Pinus ponderosa* was also present. The other site is at 442 m elevation near Lake Mountain Ranch between Canyon and Monroe Creeks just off County Road 311, as litterfall in a uniformly mid-mature *Pseudotsuga menziesii* forest with occasional boles up to 91cm dbh, and a moderately dense *Notholithocarpus densiflorus* understory with trunks uniformly <8cm dbh. Both of these sites are within 32 kilometers of a known *Sulcaria badia* occurrence on Six Rivers NF in the Pilot Creek watershed.

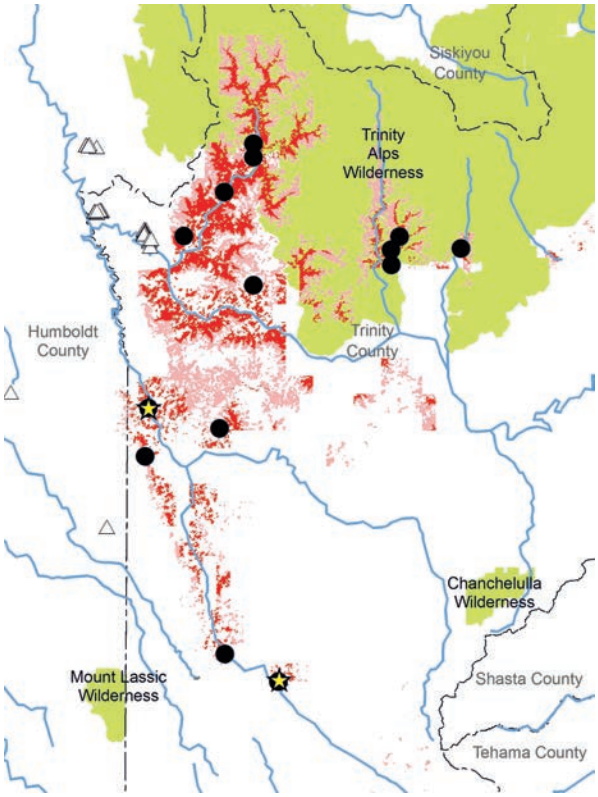


Figure 7. Study area. Black circles are survey areas, white triangles are Sulcaria badia sites, yellow stars are model-based detections. Red areas met all model criteria and were less than 914m elevation; pink areas met all criteria but were above 914m elevation. Green areas are wilderness. Blue lines are rivers and major creeks in the Trinity River watershed. This figure also shows the clumpy distribution of known sites.

At the Forest Glen site, *Bryoria* species were present; at Lake Mountain Ranch they were absent. This is unlike most other California sites, where *Bryoria* species tend to be common to abundant. The presence of *Pinus ponderosa* at the Forest Glen occurrence, indicating drier conditions, is a significant difference from any of the Six Rivers NF occurrences; however *P. ponderosa* is present at all of the Mendocino and Lake County occurrences (Laytonville and Lake Pillsbury). Of the two new sites, the Lake Mountain Ranch location most resembles Six Rivers NF habitat, being especially similar to locations on Waterman Ridge. But with more California location information and more surveys, it is becoming clear that the habitat of *Sulcaria badia* locations in California outside of Six Rivers NF conforms to the habitat described from Oregon: open well-lit mixed hardwood/conifer forests where *Quercus* (or *Notholithocarpus*) species are present. This habitat

also seems suitable for species of *Bryoria*, and it appears that the presence of alectorioid lichens within this habitat can frequently but not always be used as a survey trigger.

Sulcaria badia is easy to overlook because of the small size of its filamentous branches, typically <1.0mm diameter, and its resemblance to species of *Bryoria*. However, it is also easy to train botanists to survey for it successfully, as the identifying characteristics are distinct and easily recognized, despite their small size. Thirty-five new sites of *Sulcaria badia* have been found on Six Rivers NF since 2009, comprising eleven occurrences (using the CNPS ¼ mile rule), the majority of which have been the result of project clearance surveys conducted by botanists who had no prior specialized training. While these numbers raise the question of its rarity, it should be borne in mind that the sites are highly clustered; along Waterman Ridge, a single 20-hectare area encompasses four sites and two occurrences; on Campbell Ridge, 20 hectares encompasses eight sites and two occurrences. In the area around Trinity Village, twelve sites are found within 10 hectares (all one occurrence), and another four sites are found within a 12 hectare area (two occurrences).

On Six Rivers and Shasta-Trinity NFs, *S. badia* appears to be a canopy species in relatively heavy conifer forests (Figure 4), and to date very few thalli (<5) have been found that were not litterfall lying on the ground. This is not the case on the Mendocino, where numerous thalli occur on the boles and low branches of the conifer and hardwood substrates in these very open well-lit habitats (Figure 5).

McCune & Geiser (2009) rank it as a mesotroph, with detections occurring where nitrogen deposition is between 2.5 and 4.5kg/hectare/year, with a specific nitrogen requirement of 3.4kg/ha/year. Peterson et al. (1998) raise the question of sensitivity to air quality, especially in regard to the apparent extirpation of a historic site in Round Valley, where geographic constraints prevent a high air turnover and where the primary winter heat is from burning wood. This leads to high particulate deposition (wood ash) with a low pH, at a time of year when the lichen is metabolically active. While no parts of National Forests are far from areas affected by wildfire, several of our surveys and both detections took place near or immediately adjacent to areas that have experienced wildfires of various sizes and intensities. The Lake Mountain Ranch detection was in the near vicinity of the Slide Fire (2008; 405 hectares), the Sims Fire (2004; 1619 hectares); and the Gulch Fire in 1987 (2752 hectares). The detection near Forest Glen is across the highway from the edge of the Flume fire from 1987 (5261 hectares).

It is not possible to know what the status of these populations was historically, but the presence of *Sulcaria badia* at these locations may mean that it has the potential to be unaffected by nearby fire or its residual deposition. Wildfires occur in the dry season, when the lichen is inactive, and it is possible that the resulting deposition, being a one-time event, is insufficient to cause a die-off at the landscape level. This is a very different situation from either Round Valley, where deposition is an ongoing occurrence, or from a fuels-reduction-related controlled understory burn, both of which cause deposition that takes place during the season when the lichen is actively growing and metabolizing.

Management Recommendations

Threats to *Sulcaria badia* include threats to its habitat that are generally applicable to lichens:

actions that disrupt stand conditions, including substrate removal and changes to the light/moisture/temperature regime necessary to the survival of the lichen. However, it should be noted that in general, carefully managed thinning, pruning and prescribed fires would be beneficial to *S. badia* habitat because of the reduced possibility of stand-replacing fires; as such, active management to reduce the risk of wildfire and create a heterogeneous forest should be considered. This is more true on the Six Rivers and Shasta-Trinity NFs where *S. badia* apparently resides in a middle- to upper-crown position, than it is on the Mendocino, where there are healthy populations low to the ground which could be directly impacted by low-canopy activities.

Because the species is rare, one of the primary threats is the inadvertent destruction of unreported populations; pre-disturbance surveys would reduce this possibility. When thinning near known sites, it is important to have a botanist designate substrate trees that will not be cut.

Literature cited

Brodo, I.M., D. Hawksworth. 1977. *Alectoria* and allied genera in North America. Opera Botanica 42:1-164

California Lichen Society Conservation Committee. 2015. http://californialichens.org/conservation/sulcaria-badia. Accessed July 22, 2018.

Carlberg, T. 2014. Internal data from Six Rivers National Forest.

Carlberg, T., D. Toren. 2006. *Sulcaria badia*, Sponsorship for the CALS Conservation Committee. Bulletin of the California Lichen Society 13:(2).

Hutten, M. 2004. Personal communication. mhutten@olypen.com

McCune, B. 2004. Personal communication. Oregon State University, Corvallis, OR.

McCune, B., L. Geiser. 2009. Macrolichens of the Pacific Northwest. Second Edition. Oregon State University Press, Corvallis, Oregon. 448 pp.

Oregon Biodiversity Information Center. 2013. Rare, Threatened and Endangered Species of Oregon. Oregon Biodiversity Information Center, Portland, Oregon. 94 (98 pp. PDF)

Peterson, E.B., D.M. Greene, B. McCune, E.T. Peterson, M.A. Hutten, P. Weisberg, R. Rosentreter. 1998. *Sulcaria badia*, a rare lichen in western North America. Bryologist 101(1): 112-115.

PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu, created 4 Feb 2010

Schroeder, R. 2006. Personal communication. Arizona State University Lichen Herbarium.

Toren, D. 2004. Personal communication. Mendocino National Forest.

Toren, D., P. Nilles. 2003. Management recommendations for *Sulcaria badia* Brodo & D. Hawksw. a rare lichen occurring in the Lake Pillsbury area of Lake County, CA; Mendocino National Forest. Unpublished internal document, USDA Forest Service, Mendocino National Forest.

Wineteer, M. 2004. Personal communication. USDI Bureau of Land Management, Medford Resource District.

Appendix. Geographic and repository data, meteorological and elevation variables at known sites of *Sulcaria badia* used in model. Latitude and longitude values are rounded. Wet days = number of days receiving >1.0mm precipitation. BLM = Bureau of Land Management Medford Office; CAS = California Academy of Sciences; MNF = Mendocino National Forest, Willows, CA; SRNF = Six Rivers National Forest, Eureka, CA; US = Smithsonian Institution; WTU = Burke Museum, University of Washington Herbarium.

State	County	Repository	Latitude	Longitude	Dew temperature (°C)	Relative humidity (%)	Mean temperature (°C)	# of wetdays	Elevation (m)
CA	Humboldt	SRNF	41.2	-123.5	3.7	63	12.8	109	482
CA	Humboldt	SRNF	41.2	-123.5	3.7	63	12.8	109	509
CA	Humboldt	SRNF	40.9	-123.6	4.2	63	13.1	106	561
CA	Humboldt	SRNF	40.9	-123.6	4.2	63	13.1	106	546
CA	Humboldt	SRNF	40.9	-123.6	4.2	63	13.1	106	607
CA	Humboldt	SRNF	40.9	-123.6	4.2	63	13.1	106	509
CA	Humboldt	SRNF	40.9	-123.5	3.9	63	12.8	112	610
CA	Humboldt	SRNF	41.3	-123.5	4.3	63	13.2	103	570
CA	Humboldt	SRNF	40.6	-123.7	0.7	62	9.9	116	914
CA	Humboldt	SRNF	40.5	-123.5	1.3	61	10.8	91	789
CA	Lake	CAS	39.3	-122.9	3.9	62	13.5	87	555
CA	Lake	MNF	39.3	-123	3.9	61	13.4	88	597
CA	Mendocino	US	39.7	-123.2	3.5	62	13.2	84	433
CA	Mendocino	WTU	39.7	-123.4	3.6	61	12.9	101	518
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	604
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	555
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	610
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	380
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	354
CA	Trinity	SRNF	40.8	-123.5	3.5	63	12.7	97	366
CA	Trinity	SRNF	40.8	-123.5	3.5	63	12.7	97	405
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	549
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	631
CA	Trinity	SRNF	40.9	-123.5	3.8	63	12.9	105	604
CA	Trinity	SRNF	40.9	-123.5	3.9	63	13	103	660
CA	Trinity	SRNF	40.9	-123.5	3.9	63	13	103	640
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	518
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	439
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	469
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	451
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	433
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	418
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	418
CA	Trinity	SRNF	40.8	-123.5	3.3	63	12.3	106	418
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	293
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	402
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	372
CA	Trinity	SRNF	40.8	-123.5	3.7	63	12.8	97	317
OR	Jackson	BLM	42.5	-122.9	5	72	11.7	104	503
OR	Jackson	BLM	42.6	-122.7	3.8	69	10.9	116	576
				minimum	0.7	61	9.9	84	293
				maximum	5	72	13.5	116	914
				mean	3.6	63	12.6	103	530

Where did the word lichen come from?

Kerry Knudsen[1] and Jana Kocourková[2]

Faculty of Environmental Sciences, Czech University of Life Sciences Prague, Department of Ecology
Kamýcká 129, Praha - Suchdol, 165 00, Czech Republic.
[1]knudsen@fzp.czu.cz
[2]jana.kocourkova@lfmotol.cuni.cz

The root of the word lichen comes from Greek and originally meant to lick. Ringworm is a contagious skin disease caused by several species of fungi. It forms an itchy circular rash. Athlete's foot is a type of ringworm. Google ringworm and checkout the images. The Romans called ringworm and other skin eruptions with pustules lichen. Both animals and humans can get ringworm and possibly the name in Latin refers to animals licking the infected skin. The first use of this word in English was in about 1675 for skin diseases. Now Lichen planus, for instance, refers to dermatological disorders with pustules and ringworm is used for the fungal disease. The Romans also used the word lichen for medicinal plants that healed these skin diseases. Linneaus introduced the name Lichen for a genus of plants in the class Cryptogamia in the order Algae. It should be kept in mind that until the end of 19th century lichens as we know them were considered plants. Eventually the word lichen took on its modern meaning of fungi in a symbiotic relation with algae and/or cyanobacteria in the 20th century.

Lichen islandicus Linneaus, (now *Cetraria islandica*). It was considered a medicinal plant in the 19th century. You can buy in Europe cough drops made with this medicinal lichen for congested lungs.

California Lichen Society Grants Program

The California Lichen Society offers small grants to support research pertaining to the lichens of California. No geographical constraints are placed on grantees or their associated institutions, but grantees must be members in good standing of the California Lichen Society. The Grants Committee administers the grants program, with grants awarded to an individual only once during the duration of a project. Grant proposals should be brief and concise.

Grant Applicants should submit a proposal containing the following information:

- Title of the project, applicant's name, address, phone number, email address, and the date submitted.
- Estimated time frame for project.
- Description of the project. Outline the purposes, objectives, hypotheses where appropriate, and methods of data collection and analysis. Highlight aspects of the work that you believe are particularly important and creative. Discuss how the project will advance knowledge of California lichens.
- Description of the final product. We ask you to submit an article to the Bulletin of the California Lichen Society, based on the results of your work.
- Budget. Summarize intended use of funds. If you received or expect to receive other grants or material support, show how these fit into the overall budget. The following list gives examples of the kinds of things for which grant funds may be used if appropriate to the objectives of the project: expendable supplies, transportation, equipment rental or purchase of inexpensive equipment, laboratory services, salaries, and living expenses. CALS does not approve grants for outright purchase of capital equipment or high-end items such as computers, software, machinery, or for clothing.
- Academic status (if any). State whether you are a graduate student or an undergraduate student. CALS grants are also available to non-students conducting research on California lichens. CALS grants are available to individuals only and will not be issued to institutions.
- Two letters of support from sponsors, academic supervisors, major professors, professional associates or colleagues should be part of your application. These should be submitted directly from the author to the committee Chair.
- Your signature, as the person performing the project and the one responsible for dispersing the funds. All of the information related to your application may be submitted electronically.

Review: Members of the Grants Committee conduct anonymous evaluation of grant proposals once a year based on completeness, technical quality, consistency with CALS goals, intended use of funds, and likelihood of completion. Grant proposals received by November 1 each year will be considered for that year's grant cycle. The Grants Committee brings its recommendations for funding to the Board of Directors of the California Lichen Society, which has final say regarding approval or denial.

Grant Amounts: CALS typically offers two grants of $750.00 and $1000.00 each year. Typically grants are awarded to two separate individuals, however depending on the quality of the applications and the amount of funding available, the committee maintains the option to disburse funds as appropriate. All grants are partially dependent on member contributions, therefore the amounts of these awards may vary from year to year.

Obligations of recipients: 1) Acknowledge the California Lichen Society in any reports, publications, or other products resulting from the work supported by CALS. 2) Submit an article to the Bulletin of the California Lichen Society. 3) Submit any relevant rare lichen data to California Natural Diversity Data Base using NDDB's field survey forms. See http://californialichens.org/conservation for additional information.

How to submit an application: Please email submissions or questions to the committee Chair at grants@californialichens.org **by November 1 of the current calendar year**. The current Chair is Tom Carlberg.

News and Notes

Lichens in the Southern California desert

Jana Kocourková and Kerry Knudsen of the University of Life Sciences in Prague have received a Czech-American grant to work for four years on the biodiversity of lichens, lichenicolous fungi, saxicolous microfungi, and soil crusts in the Chihuahuan Desert of New Mexico with comparative work in California at Joshua Tree National Park. Parts of the project with will be carried out in cooperation with Jason Stajich's lab at University of California Riverside, Nicole Pietrasiak's lab at New Mexico State University, and with Matthais Schultz at Universität Hamburg.

~Reported by Kerry Knudsen

Huddart Bio-Blitz, co-sponsored by CALS, took place on September 29, 2018

The California Lichen Society joined forces with a host of organizations in the ongoing project to conduct grassroots bio-blitzes in each of the county parks of San Mateo. Huddart County Park, located near Woodside, has many habitats suitable to lichen diversity, including Douglas-fir, mixed Redwood, and mixed Oak. Additionally, because this area experienced much early logging in the nineteenth-century, there are old rocks and rock surfaces strewn throughout the upper reaches of the park.

There were numerous participants with an interest in lichens present on September 29, in-

Bioblitzers get ready at Huddart County Park, in San Mateo County.

Scytinium palmatum. One lichen found during the BioBlitz on a sandy and mossy bank of a fire road.

cluding CALS board member Julene Johnson. The lichen enthusiasts may have made a few new converts, too! There was assuredly plenty to look at, with over fifteen species of lichens identified. Especially noteworthy were *Lobaria pulmonaria* (Tree Lungwort; in particularly dramatic, large stands), *Lobaria anthrapsis*, *Scytinium palmatum* (Antlered Jellyskin), and *Hypogymnia tubulosa* well-dispersed around the park, such that fungi and lichen observations were second only to plants as an iNaturalist category!

The many benefits of participating in bio-blitzes were obvious at this event: increased knowledge of local lichens, expanding the number of naturalists who notice and care about lichens, and building a network of alliances with other nature organizations. All of our observations were uploaded to iNaturalist, where they can be reviewed for decades to come. The promise of citizen-science is coming to fruition, as databases and participation are expanding exponentially.

The next Huddart Bio-blitz is scheduled for Saturday April 27, 2019. It will focus on the eastern trails in the park, with the same range of habitats in a more compressed space. It will be tremendous fun, taking place during the City Nature Challenge weekend. Admission to the park is free to Blitzers on that day. It will be sponsored by the same coalition, including San Mateo County Parks, Sequoia Audubon Society, the California Academy of Sciences, California Native Plant Society, California Center for Natural History, and Yerba Biodiversity, with CALS.

~Reported by Jennifer Rycenga

CALS FOUNDING MEMBER DORIS BALTZO CELEBRATED HER 90TH BIRTHDAY!

We had a modest party at the Jepson Herbarium at UC Berkeley to celebrate Doris Baltzo's 90th birthday on July 29, 2018. We emailed an announcement to as many as we could and some who could not attend emailed back, including: Irwin Brodo who sent his very best wishes: "Her work on the California lichens has been immensely important to folks in the CALS and all of us interested in west coast species. Be sure to tell Steve Sharnoff about the get-together!", although Steve is no longer in Berkeley. The only time I remember meeting Doris was at Steve and Sylvia's home. I remember it as a very nice evening." Ted Robertson was in Costa Rica until the end of the month. "Give Doris my best". Bob Case was teaching another class at the RPBGarden. Julene Johnson could not get away from work during the middle of the day. Bart O'Brien was away from the Botanic Garden until July 25th. Kathy Faircloth regretted not being able to come, but had a hand in getting the Birthday Cake! Irene Winston could not make it, but was there in spirit. There were several more whose email addresses did not work.

The birthday bash! From left: Jason Alexander, Kim Kersh, Bill Hill, Doris Baltzo, Brent Mischler, Margriet Wetherwax, Alice Gore and Lynn Yamashita.

Full of life and spry at 90, Doris E. Baltzo was born July 29, 1928 and grew up in San Francisco, graduating from Balboa High School in 1946. She was ahead of her time, achieving an associates degree from UC Berkeley in 1948, a B.A. in Biology from the same institution in 1963, and a Masters of Arts from San Francisco State University. Her thesis topic was A Study of the Lichens of Mount Diablo State Park. Since then she has authored numerous publications, and been involved in a variety of other works and presentations. Her most recent years have been spent working on her lichen collections at her home in Pleasant Hill, annotating and sending them to the UC Berkeley Jepson Herbarium.

Doris has not only been involved with lichens. During a hiatus from university education, she got married, had a daughter Alice and a son Dan; She sang 14 years in the chorus for SF Opera, and taught voice lessons at her home in Pleasant Hill, CA (since the late 1960's). Her garden at her home is a wonder to behold. It was a most befitting celebration honoring her as we all know her for her avid work with lichens, and especially regarding the genus Usnea.

~Reported by Bill Hill

Upcoming Events

SAVE THE DATE!
California Lichen Society Annual Meeting
January 25-27, 2019
UC Davis Quail Ridge Reserve, near Lake Berryessa

The California Lichen Society (CALS) annual meeting and 25th birthday celebration will be held at the UC Davis Quail Ridge Reserve during the last weekend in January 2019.

UC Davis' Quail Ridge Reserve is a peninsular projection of land at the southeast corner of Lake Berryessa. It is a mosaic of grasslands, woodlands, chaparral, and closed canopy oak forests with a rich mixture of trees, shrubs, native grasses, and herbs. The peninsula has a Mediterranean climate with hot, dry summers and cool, wet winters. It lies in the rain shadow of the Inner Coast Range. Six woodland communities have been identified within the Reserve: 1) interior live oak; 2) interior live oak - blue oak; 3) mixed oak; 4) blue oak; 5) valley oak alliance, and 6) foothill pine/mesic non-serpentine chaparral association. The first five of these are dominated by five species of oaks including two evergreen and three deciduous species. The evergreen oaks are interior live oak (*Quercus wizlizeni*), and the rare hybrid oracle oak (*Q. xmorehus*). The deciduous oaks include black oak *(Q. kelloggii*), blue oak (*Q. douglasii*), and valley oak *(Q. lobata*).

View from Quail Ridge, looking north.

As always, the meeting activities are open to CALS members and also to members of the public. Due to limited access to the Reserve, anyone interested in attending must RSVP to tom@californialichens.org. Those who do so will receive a link to a Google doc where they can fill out their info for arrival and departure, accommodations, plus pot luck contribution and ride-sharing. Participants must also sign UC photo and liability waivers. Maps and geographic coordinates will be distributed to those who RSVP. Tent cabin and camping accommodations are available at the ranch for $10/person/night if you wish to spend Thursday, Friday or Saturday nights.

2019 ANNUAL MEETING SCHEDULE

Friday, January 25, 2019
Local lichen hike proximal to the Reserve – location TBD, followed by check-in at Quail Ridge Reserve.

Saturday, January 26, 2019
10:00am – 4:00pm Meet at the Quail Ridge Reserve at the field station, if you're not already there; we will pass out trail hiking maps and head out at 10:30. Bring a picnic lunch to eat on the trail, and dress for the weather.

4:00 – 6:00pm Time for socializing, working on your lichen specimens, iNaturalist postings, etc.

4:30 – 5:30pm Open meeting of the California Lichen Society's Board of Directors. The Board will have an agenda, but we will be happy to set it aside to hear from members of the society.

6:00 – 7:00pm Potluck dinner

7:00 – 8:00pm CALS grant recipients

Our guest speakers have always informed you about new and exciting things lichenological; but this year they also represent some of the best and brightest grant recipients ever funded by the California Lichen Society. Titles of their projects are given here; for more complete descriptions of their work, visit california lichens.org. Or better yet, attend!

Kevin Ball
Analyzing lichen samples for basidiomycete yeast presence

Christopher Adlam
Loss and recovery of lichen communities after wildfire in the Klamath Mountains

Alexandra M. Weill
Post-fire chaparral lichen community recovery: implications for effects of altered fire regimes on biodiversity

Sunday, January 27, 2019
9:00am – 2:30pm Casual lichenizing and use of field lab (a few microscopes will be available)
3*:00pm* Check-out

Saturday dinner
Dinner on Saturday night will be pot-luck. There is a large group kitchen. If your contribution requires cooking, please bring it in an oven-ready container to minimize kitchen prep time at the field station; refrigerators will be available beginning when you arrive. Bring serving spoons or forks, as needed. Cups, glasses, plates and utensils will be available, and tea, teakettle, coffee, coffee maker, creamer, etc. will be provided.

Other Meals
Apart from the sharing that happens with the Saturday potluck, meals will be your responsib-

ility. There is a large group kitchen. Cups, glasses, plates and utensils will be available, and tea, teakettle, coffee, coffee maker, creamer, etc. will be provided. Washup is also your responsibility!

The weather
Dress appropriately, although Quail Ridge is located in a part of California with a benign winter climate. Average high and low temperatures (Fahrenheit) in January are 57º and 39º, respectively. Record highs and lows have been 72º and 21º. Average drizzle or rainfall occurs on 10 days of this month. We will hike in sun, overcast, fog or light rain, but not if we are miserable.

Accommodations
Quail Ridge has three types of lodging available, all for $10/person/night. There are eight tent cabins that can take four persons each, for a total of 32 persons. There is a "Researcher House" that has three bedrooms with a total of 10 beds, a kitchen and living room, and a laundry. Camping is also possible at the same rates as other accommodations. Bring your own sleeping bags, linens, and pillows; the accommodations include bare mattresses only. There are flush toilets and shower in the field station.

Advance reservations for lodging at Quail Ridge are necessary at the time of RSVP and will be allocated on a first come, first serve basis. More luxurious accommodations in the nearby towns of Woodland (30 miles), Davis (26 miles) or Vacaville (24 miles) are also available, but they are your responsibility to locate and reserve. There is also the option of lakeside cabin rentals at the Markley Cove Resort, two miles up Highway 128.

For additional information
Google "Quail Ridge Reserve" for location, descriptions and photos of facilities, the natural history of the Reserve, species lists, etc etc.

Workshop: Identifying Lichens to Genus
Date: Saturday, March 23, 2018
Time: 9:00am – 4:00pm
Location: Chico State University Herbarium
Instructor: Tom Carlberg
Course Fee and registration: see links below

*Think small.*The complicated symbiotic organisms we know as *lichens* are often identified in the field by characters that are about 1mm in size. They are largely intolerant of poor air quality and disturbance, yet are found in some of the harshest environments on earth, and are able to withstand the vacuum of space. There are reported to be 5241 species of lichens in North America and more than 1800 species in California, yet few people are able to place names on even the most common lichens, which means that 1) an essential component of most natural resource inventories is lacking, and 2) roughly 1/3 of the lichens known in North

Calploaca epithallina

America can be found in California! Opportunities to learn about identifying lichens are infrequent, although the basic characters used in identification can easily be learned in a day.

This one-day workshop will focus on identifying the lichens of the lower Cascade foothills to genus. The morning will be spent covering lichen basics – anatomy, morphology, and reproduction of lichens. Lunch will be spent in the field, with lichens, and possibly some hands-on collecting. Afternoon will be back in the lab for guided exploration, using dissecting 'scopes, reference materials, chemical spot tests, and vouchers and a key provided by the instructor. Please bring dissecting tools, a hand lens, a thumb drive, and lunch. Participants will benefit more from the workshop if they are experienced with using dichotomous keys.

The workshop will be led by Tom Carlberg. Tom has a degree in Botany from Humboldt State University. He has been a cryptogamic botanist for 19 years, working for governmental agencies, private contractors, and non-profit organizations. His current special interest is ageing lichens that grow on the leaves of evergreen vascular plants. He is the President of the California Lichen Society (CALS), and chair of the Society's Grants Committee. In addition to CALS, he is a member of the American Bryological and Lichenological Society and the British Lichen Society.

Registration and fee information are available at: http://www.friendsofthechicostateherbarium.com/eventsviewcalendar/. For other questions, please contact: tcarlberg7@yahoo.com.

Two Bioblitzes in San Mateo County Parks in 2019

Lichenologists, get ready for the new year! And get ready to visit some unexplored terrain! The San Mateo County Parks District is organizing *two* bioblitzes in early 2019, and one of them

A fascinating perspective! Maria Lewytzkyj-Milligan took this photo along the Raptor Trail in the newly opened Pole Mountain Reserve that Sonoma Land Trust purchased.

involves a visit to a remote part of the Pescadero Creek complex. Interested? Keep reading...

Sequoia Audubon and CALS are going to bioblitz Sam McDonald!
Date: Saturday, March 2nd, 2019
Time: 8:30 am – 1:00 pm
Location: Sam McDonald County Park
Fee: waived for Blitzers
Pre-registration required; An EventBrite registration will be in place later; please google "San Mateo County Parks Bioblitz"

This park is remote and undervisited, so much so that even the birders out there have not recorded many species from this location! This is a great opportunity to find new lichen records for San Mateo County and see some exciting new landscapes.

Meet at 8:30 am in the main parking lot for Sam McDonald County Park, 13435 Pescadero Creek Road, Loma Mar, California. This is a relatively remote park; leave time for the winding mountain roads. The Blitz and wrap-up will run until about 1:00 pm. The admissions fee for the park will be waived for blitzers. In addition to CALS, other organizations co-sponsoring this event include California Academy of Sciences, the **California Lichen Society**, Sequoia Audubon Society, and San Mateo County Parks.

This is also an exciting location to visit because of Sam McDonald's history. One generation removed from slavery, he was an African-American from Louisiana who rose up through the ranks to become Superintendent of Athletic Fields for Stanford. He left his extended properties in La Honda for the betterment of the community, especially for children. So this is an excellent place for presenting a more racially diverse history of San Mateo County. For additional information on the park and Sam McDonald: https://parks.smcgov.org/ sam-mcdonald-park-history.

Join Sequoia Audubon and CALS at Huddart County Park for a bioblitz!
Date: Saturday, April 27, 2019
Time: 8:30 am – 1:00 pm
Location: Huddart County Park
Fee: waived for Blitzers
Pre-registration required; An EventBrite registration will be in place later; please google "San Mateo County Parks Bioblitz"

Lichenologists needed! Sequoia Audubon is continuing their successful partnership with San Mateo County Parks, California Academy of Sciences, and the **California Lichen Society** for this BioBlitz. This year we will focus on the eastern side of Huddart Park to discover and document as many species of birds, plants, mammals, lichens, invertebrates, and reptiles as we can within the day, and add these to our 2018 effort! Please meet us on April 27 at Huddart Park, 1100 Kings Mountain Road in Woodside, California. This second Blitz will cover the eastern half of the park, which, in addition to redwood and Douglas fir, has more oak habitat than the western side.

Part of the blitz will be a Wrap-Up session where you'll have an opportunity to upload your findings to iNaturalist, discuss your findings with taxonomic experts, and learn more about partner organizations. You can also review the existing Huddart iNat project: https://www.inaturalist.org/projects/2018-huddart-park-bioblitz. Huddart is a site which needs more data points in this ambitious community science project!

President's Message

Dear CALS members – I know, I know, you just got the summer 2018 Bulletin, and suddenly the winter issue shows up in your mailbox just a month later! Mea culpa, the delays are entirely my responsibility, but I think the wait for the summer issue was worth it. And with the winter issue in hand, your cup hopefully runneth over! This is the first issue under the guidance of our new editors **Jes Coyle and Justin Schaffer**, and they have done an excellent job with their professional responsibilities. I look forward to the results of their future work!

I feel very happy with the state of the CALS grants program; since Erin Martin assumed the chair of the committee in 2008, the number and quality of applications we receive have steadily grown. For the 2018 grant cycle we received applications from students in California, Utah and Colorado, all looking into significant aspects of lichen science that pertain both directly and indirectly to California lichenology. Because of the high scores these applications received and after a careful review of our finances, the **CALS Board of Directors** (**Hannah Mesraty, Sarah Minnick, Kathy Faircloth, Julene Johnson, and Ken Kellman**) voted to increase the 2018 grant funding from $1750 to $3000. This increase is possible entirely because of our members (that's you!), both through membership fees and the generous donations we receive from you. A full report on the 2018 grant cycle will be in the summer 2019 issue.

I also have to thank the grants committee members who review applications consistently and carefully each year. Thanks go out to: **Rikke Reese Naesborg**, who has just accepted the

At L.E. Horton fen in Del Norte County, looking for *Imshaugia aleurites* on fire-kille Port Orford-cedar

Tucker Lichenologist position at Santa Barbara Botanic Garden; **Caleb Caswell-Levy**, a Ph.D. candidate in Integrative Biology in Brent Mishler's lab at UC Berkeley; **Julene Johnson**, a neuroscientist studying ageing at UC San Francisco; and **Shirley Tucker**, Lichen Curator at UC Santa Barbara's Cheadle Center for Biodiversity and also lichen researcher at the Santa Barbara Botanic Garden.

I want to make special mention here of the ongoing generosity of **Shirley Tucker**, who saw that the funding applied for was greater than the funding being offered, even with the Board's increase. Her assessment (which agreed with the committee's impromptu comments) was that it

would be a shame to let any of these projects slip away. She took action, and made a $2000 contribution to the CALS grants program! The result is that every project on the table for 2018 will receive at least partial funding. My thanks to you, Shirley: from CALS and the Grants Committee, but especially on behalf of those who applied to CALS to fund their work.

CALS has also struck up an unexpected alliance with the Sequoia Audubon Society in San Mateo County, largely due to the interest in lichens their Chapter President, **Jennifer Rycenga**, has recently acquired. In addition to the BioBlitz summary in this issue, there will be two more blitzes in early 2019; see Upcoming Events for details.

I suppose no winter issue would be complete without an appeal to our members for their ongoing support and patronage. We would like to have a table presence at more conferences, and have knowledgeable or enthusiastic CALS members at more forays and field trips. Donations are great, we definitely will *not* turn them away, but what would you think of initiating a short hike, perhaps just at a local park that you know has some interesting lichens that you are familiar with? What if it's just a holiday present to your friends, to show them why you (ahem) like lichens?

Hoping to see you all in the field! Lichenologically yours,

Tom Carlberg
President@californialichens.org

California Lichen Society

PO Box 472, Fairfax, California 94978

The California Lichen Society (CALS) seeks to promote the appreciation, conservation, and study of lichens. The interests of the Society include the entire western part of the continent, although the focus is on California.

Members receive the Bulletin of the California Lichen Society (print and/or online access), voter rights in society elections, access to the CALS community, and notices of meetings, field trips, lectures, and workshops.

Membership Dues (in $US per year)

Student and fixed income (online eBulletin only) - $10
Regular - $20 ($25 for foreign members) Family - $25
Sponsor and Libraries - $35 Donor - $50
Benefactor - $100
Life Members - $500 (one time)

Find CALS online!
californialichens.org
twitter.com/CALichenS
iNaturalist.org/users/cals
facebook.com/californialichens

Membership dues can be made payable to:
California Lichen Society, PO Box 472, Fairfax, California 94978

To join or renew online, please visit www.californialichens.org/membership

---

Lichens from Rancho Marino and Los Osos Oaks

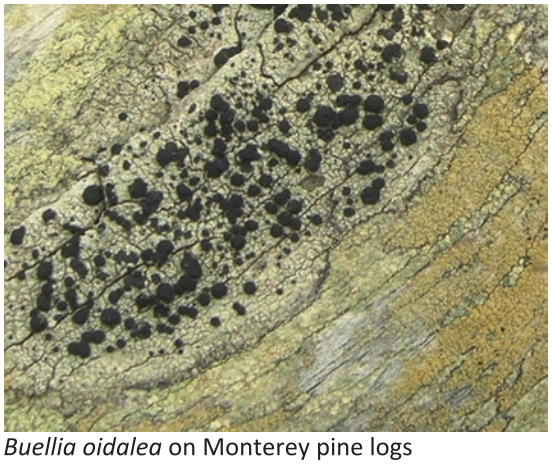
Some of the interesting lichens encountered by CALS members and friends in coastal San Luis Obispo County, California. All scale bars represent 0.5 mm. All photos by Jason Hollinger.

Thelomma californicum loves fence posts

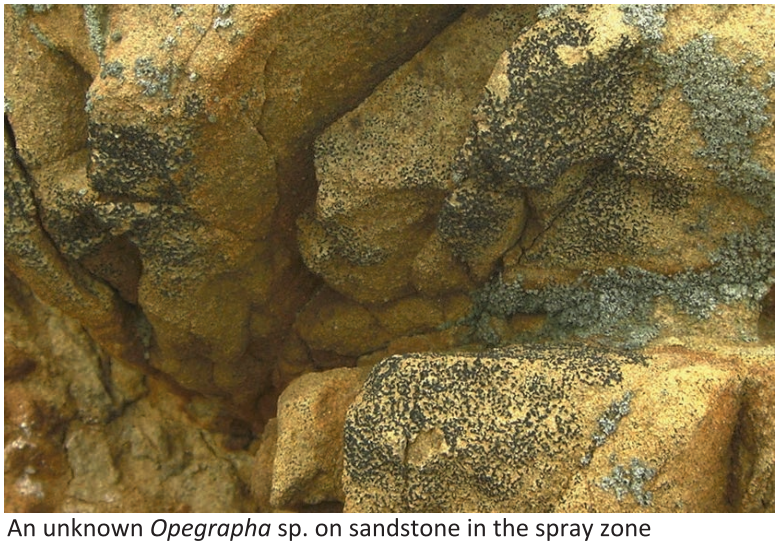
Paraschismatomma ochroleucum on Monterey cypress logs

Sulcaria isidiifera at its type locality; a very narrow endemic

Hypogymnia mollis at its type locality



Buellia oidalea on Monterey pine logs



An unknown *Opegrapha* sp. on sandstone in the spray zone