

Bulletin of the California Lichen Society



Volume 26 No. 1 Summer 2019

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Cover image: *Ramalina puberulenta* at the Blue Oak Ranch Reserve. Photos by: Jason Hollinger and Ken Kellman.

Following in the footsteps of Henry Imshaug: Preliminary notes on California alpine lichens

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ABSTRACT

In 1955, H. A. Imshaug established baseline inventories of lichens at 12 locations in the California alpine. We present a narrative overview of our ongoing research to re-inventory these locations and investigate whether climate change is impacting the lichen biota. Four species are reported new to California, *Amandinea cacuminum*, *Caloplaca exsecuta*, *Carbonea supersparsa* and *Lecanora caesiosora*. Preliminary indications of floristic change are briefly discussed.

KEYWORDS

lichens, alpine, climate change, California, history

INTRODUCTION

In the summer of 1955, a very tall, lanky lichenologist spent three weeks in the California alpine conducting lichen inventories as part of a larger project to investigate the effect of decreasing latitude on the altitudinal range of lichen species. This was the inestimable Dr. Henry A. Imshaug (1925–2010). By the time his whirlwind tour was over, he'd not only collected enough lichens to fill 418 herbarium packets, he'd also established a *de facto* baseline inventory of California's alpine lichens.

Sixty years later, in the summer of 2014, we decided to follow in Imshaug's footsteps and resurvey the same 12 locations—a project that engaged us off and on over the next four years. Our goal was to learn to what extent, if any, California's alpine lichen flora has been impacted by six decades of global warming.



REPRINTED WITH PERMISSION FROM BRODO (2011)

Henry A. Imshaug (1925–2010) with a rockhopper penguin chick in the Falkland Islands. Photo originally appeared in a tribute to Imshaug by his former student Irwin Brodo (2011).

Background

At the time of the California inventories, Henry Imshaug was teaching at the University of Idaho, but the following year he accepted a position at Michigan State University (MSC) where he was professor of botany for the remainder of his career (Brodo 2011). In all accounts, he was an unrivaled investigator of American lichens. As Fryday and Prather (2001) have noted, “his prodigious knowledge of lichens, thorough familiarity with the literature, and careful research, resulted in his discovering over 100 new species and several genera.” By all measures (including height!) he was a giant of his time. He was also mentor to some of North America’s most prominent lichenologists, including Irwin Brodo, Dick Harris and Cliff Wetmore.

During Imshaug’s peak years of work, American lichenology was still in its formative years (Thomson 1974). For someone as meticulous and cutting edge as Imshaug, this was undoubtedly as frustrating as it was exciting. Many lichenologists routinely defaulted to European names, forcing American lichenologists either to hold their nose when their specimens did not fit the European descriptions, or else to embark on the laborious task of describing new taxa—a task that often necessitated weeks-long trips by prop plane or steamer to Europe (still recovering from World War II), where type specimens of related species could be examined. Imshaug liked neither option. Instead, he preferred to bring Europe to him, specimen by specimen. During his 35 years at MSC, he managed to assemble an impressive collection of European lichens, often in the form of exsiccata, from an equally impressive array of European lichenologists (Fryday & Prather 2001).

In 1957, Imshaug published Part 1 of his work on western alpine lichens—a 95 page landmark paper covering 85 macrolichens, together with keys and occurrence maps across 82 alpine locations throughout the west, from the San Francisco Peaks (Arizona) in the south to Banff (Alberta) in the north. His original plan was to publish three additional, even more ambitious papers—one on saxicolous microlichens, another on their non-saxicolous counterparts, and a third covering their ecology and phytogeography. Unfortunately, these were never published. In many

ways, Imshaug was a man ahead of his time; there were still simply too many taxonomic knots that needed untying for such a feat to be accomplished to his exacting standards.

Following footsteps

Fast-forward six decades. In 2014, we had recently returned from a trip to Sub-Antarctic South America, where we had fallen in love with alpine lichens. We were amazed by the diversity, abundance and sheer brilliance of the alpine lichens—*Neuropogon* covering rocks in a thick zebra striped fur, tangled masses of ground-dwelling *Alectoria*, and so many unknown-to-us soil crusts. Many alpine lichens are bipolar, a fascinating biogeographic pattern where they are found at both poles and only scattered high elevation islands in between. We were hooked. As we looked deeper into the alpine lichen research here in North America, we found a few localized works (e.g., DeBolt & McCune 1993, Eversman 1995, Glew 1998—yes, these were all led by female lichenologists!) and Thomson’s landmark Arctic



Map of survey locations in California.

Lichen Flora (1984, 1997). Then there is Imshaug's 1957 study, and we immediately saw an amazing opportunity to investigate how the alpine lichen biota has changed in the intervening 60 years.

Our first step was a test run on Nevada's 13,065 ft. high Mt. Wheeler, in eastern Nevada, where we tried out a few different sampling methods. In his paper, Imshaug cited his collection locations as mile square grids listed by Township, Range and Section—a formerly standard convention. But how much of this area did he cover? To find out, we conducted a 0.5 mile transect along the northwestern ridge to the peak. In the process, we learned that Imshaug likely collected all of his specimens within the immediate vicinity of the peak (0.1 mile or less). Our half-mile transect was interesting, but massive overkill (and left Jason so altitude sick that he was useless for the rest of the day!)

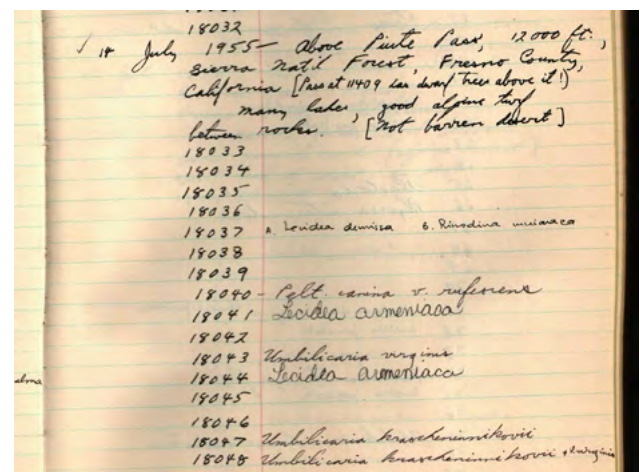
We also tested a method for non-destructive assessment of species richness and abundance of common lichens to see whether we could conduct our data collection in a manner complimentary with data collected by the Global Observation Research Initiative in Alpine (GLORIA). GLORIA is a global research project that has permanent alpine monitoring locations throughout the world to monitor climate change (Pauli et al. 2005); monitoring data includes vascular plant richness and cover, soil temperature and other variables. But we found that it was difficult to assess lichen cover within 2-dimensional quadrats established on large 3-dimensional boulders. And we quickly realized that we were trying to take on far too much in one project. In the end, we opted to use the old tried-and-true intuitive surveys, staying as close as possible to the target sites while still including a wide selection of good lichen habitat.

The following year, 2015, we began our surveys of the California alpine. After a successful survey of Mt. Lassen in September, we attempted an early October survey of Bishop Pass, Kearsarge Pass and Mt. Whitney, only to find ourselves wading through waist-deep snow. We discussed at length the insights that could come from seeing which outcrops remain snow-free during the winter, and which lichens apparently thrive even after being buried under nearly

nine months of snow. But it was freezing cold! So we vowed to return earlier the next year. Imshaug did his surveys in mid-July. If he encountered much lingering snow from the previous winter, he did not mention it in his field notes.

So it was that in early September of 2016, with the generous financial support of CALS, we set out once again to conduct our California inventories in earnest. Imshaug managed to inventory all 12 locations from Mt. Whitney to Mt. Shasta in 19 days. We figured a month for us would be more than enough time. Not so. Our surveys of Bishop Pass and Kearsarge Pass went smoothly enough, but Mt. Whitney was another matter altogether. Imshaug had completed the 22-mile trek, with a 7,000 ft. elevation gain, along with the inventory in a single day. And he collected mosses, too! Then without a break, he moved on to Kearsarge the following day, and so onward. We couldn't keep up such a grueling pace, not even close. Not only did Mt. Whitney take us three days to complete—with only six hours total on the summit—we found we needed a day in between each location to process, database and stabilize our specimens before moving on to the next one.

The pace Imshaug set himself in the summer of 1955 was little short of miraculous. What he accomplished in three weeks, took us more than four weeks spaced out over four years. On average he conducted one survey per day, with 2-6 hours of driving in between



Imshaug's field notebook from Piute Pass stored at the MSC Herbarium. Over the years other researchers have added their determinations alongside his.

each location, and 8-22 miles hiking each day. Based on what we've seen at MSC, many of his saxicolous specimens were big chunks of rock. The majority of our time at a location in the alpine is spent carefully chipping off small saxicolous specimens that can easily fit into packets. We infer that he spent about 2-4 h at each location. As for us, we aimed for two hours but often found that it took longer, sometimes up to three or four hours depending on the diversity present, the ease of collecting off the particular rock, and how challenging it was to relocate species we knew Imshaug had collected. Luckily for whoever follows in our footsteps, we documented our tracks with GPS—and our stride is much shorter!

PRELIMINARY RESULTS

We have finished our fieldwork in California and identified all of our nearly thousand specimens, but we are waiting to publish our data until we have a chance to study Imshaug's collections more thoroughly. Although 40% of his specimens remain to be identified at MSU, some intriguing patterns and interesting findings have already emerged.

We found four species new to California. Not surprisingly, all are arctic-alpine species: *Amandinea cacuminum* (Th. Fr.) H. Mayrhofer & Sheard, *Caloplaca exsecuta* (Nyl.) Dalla Torre & Sarnth., *Carbonea supersparsa* (Nyl.) Hertel and *Lecanora caesiosora* Poelt (see Appendix). We found a relict population of *Pleopsidium chlorophanum* (Wahlenb.) Zopf on Mount Whitney, apparently a very rare arctic-alpine species otherwise known in California only from (of all places) the Channel Islands (Knudsen & Kocourková 2012). And we found two populations of *Lecidea hassei* Zahlbr., a rare chemical variant of *Lecidea laboriosa* Müll. Arg. previously endemic to southern California (Hertel & Printzen 2004). Several species appear to be undescribed, including an *Arthonia* and a *Carbonea* both parasitic on *Pleopsidium flavum*, a few unusual *Buellia*, including one very close to *Buellia jugorum* (Arnold) Arnold but which contains atranorin in addition to the xanthone, and a *Lecanora* which is very close to *L. subcavicola* B.D. Ryan (known only from the type locality in Arizona) but which produces psoromic instead of alectorialic acid. Investigation of these intriguing unknowns is an ongoing project.



Nastassja on top of Mt. Whitney, note our official *Pleopsidium flavum* t-shirt!



Mount Lassen. Crater is located in foreground and summit in background left.

Some abundant and widespread species such as *Lecanora sierrae* B.D. Ryan & T.H. Nash, *Pleopsidium flavum* (Bellardi) Körber and *Umbilicaria polaris* (Schol.) Zahlbr. are present at nearly all the locations, both past and present. Far more impressive are the uncannily similar or downright identical distributions of some of the less conspicuous and less common species such as *Carbonea vorticosa* (Flörke) Hertel, an inconspicuous endolithic crustose lichen with tiny black apothecia. Despite not having any idea what it looked like while we were in the field, we managed to find it at the same three locations as Imshaug in 1955 (Mount Whitney, Mammoth Peak and Mount Shasta) plus one additional location (Kearsarge Pass).

The location that has probably changed the most is Mount Lassen. It erupted several times between 1914 and 1917, creating a new crater on the peak and presumably sterilizing the entire summit. When Imshaug visited it 37 years after the eruption, he found four species (two specimens remain to be identified so the number may be somewhat higher). Sixty years later, in 2015, we found 16 species. Most species are located opposite the crater, about a quarter mile away on the summit, whereas one species, *Lecidia laboriosa*, is thriving within several yards of the crater which continues to vent gasses. Mount Lassen may be a great place to establish permanent monitoring plots to understand establishment and growth rates of lichens in alpine volcanic habitats.



Imshaug's collection of unidentified specimens at MSC.

Air pollution may be affecting the alpine flora (McCune et al. 2007). We found *Physcia biziana* (A. Massal.) Zahlbr. to be common and well-developed at four locations. But Imshaug reported it only from one (as a pruinose form of *P. stellaris* (L.) Nyl.). Perhaps increased nitrogen deposition from agriculture in the Central Valley has contributed to the apparent increase in this eutroph; analyzing and comparing pollutant loads in Imshaug's and our specimens is worth further study.

A couple *Umbilicaria* species appear to be moving into several new locations. Imshaug was actively working on the taxonomy of this genus back in the 1950s and made numerous collections wherever he went. If he did not collect an *Umbilicaria* species at a location, there's a good chance that it wasn't there. Based on this line of reasoning, we infer that *U. virginis* Schaerer is now present at six locations where it was previously absent, and *U. decussata* (Vill.) Zahlbr. has newly arrived at three locations. What the appearance of these two species tells us about changes in climate or non-climate variables is not yet clear.

CONCLUSIONS

Today, stacks of uncurated alpine specimens from *Acarospora* to *Verrucaria* tower in a storeroom adjacent to MSC's lichen herbarium. Many are the lichenologists who have visited over the years, sorting through them in pursuit of taxonomic gold: Ahti, Brodo, Bungartz, Clerc, Coppins, Hertel, Kantvilas, Lücking, Lumbsch, Miadlikowska and Wetmore. But this has so far only scratched the surface of that enormously rich vein.

In the early 1900s, throughout montane California, Joseph Grinnell, a zoologist from the University of California, Berkeley, along with his colleagues, established baseline surveys of many mammals and birds throughout the California mountains, from foothills to alpine. Their research laid the foundation for Grinnell's concept of the ecological niche, and a century later, researchers are doing landmark work tracking how those niches have been shifting spatially in response to climate change (Moritz et al. 2008, Rowe et al. 2015, Tingley et al. 2009). While Imshaug's field notes are not nearly as detailed as Grinnell's (Herman 1986), his baseline inventories are no less relevant to our times. As climate change continues to impact the high latitudes and alpine regions more rapidly than most regions in the world (IPCC 2014), Imshaug's research in these areas provides an invaluable dataset. Beyond the occurrence data of his inventories, his specimens have also recorded the air quality of 1955, thereby providing the data necessary to disentangle the impacts of alpine air pollution from climate change.

As we continue forward on this project, we will be identifying Imshaug's specimens at MSC, comparing our datasets, and doing further analyses. We will be describing new species and generating hypotheses that can be tested in the field. It's an honor to walk in Imshaug's footsteps and carry the torch of his research into the future. Baseline data such as his are more important than ever, as our species grapples with the implications of a warming, ever-more-polluted world.

ACKNOWLEDGEMENTS

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for this manuscript, though all editorial and creative errors are our own. We thank Irwin Brodo for sharing his photograph of Imshaug in the Falkland Islands. We thank the National Park Service and National Forest for working with us to make the logistics of our surveys possible and for all they do for the lands they serve. And we tip our hats to Lee Turner at the Nevada Department of Wildlife and the folks at the Great Basin Institute for encouraging us! Above all, we thank Henry Imshaug for shaping and inspiring generations of lichenologists.

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APPENDIX

New or interesting records for California:

Amandinea cacuminum (Th. Fr.) H. Mayrhofer & Sheard—CALIFORNIA. Siskiyou County: Mount Shasta, *Hollinger 15009* (pers. herb.)—An unusual member of *Amandinea* with a pseudolecanorine margin. Ours found on deeply sheltered volcanic rock near the summit.

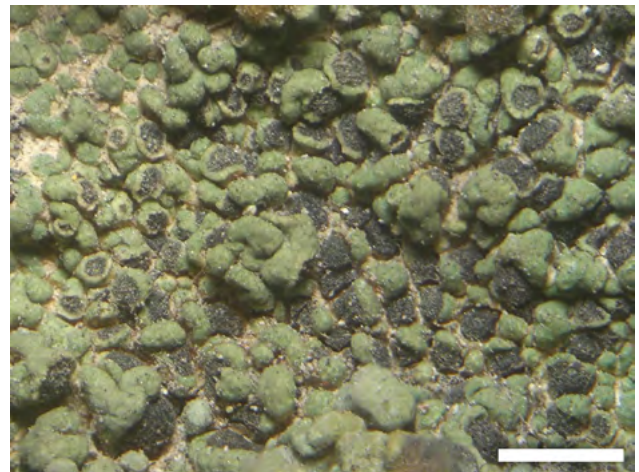
Caloplaca exsecuta (Nyl.) Dalla Torre & Sarnth.—CALIFORNIA. Fresno County: Mono Pass, *Noell 4141–4143* (pers. herb. & MSC)—Thallus absent, apothecia brownish orange with black proper margin, lacking algae. Ours growing on crumbling granite and spilling over onto nearby *Selaginella* and plant debris.

Carbonea supersparsa (Nyl.) Hertel—CALIFORNIA. Mono County: Mount Dana, *Hollinger 17647* (pers. herb.)—A lichenicolous species similar to *C. vitellina* but with attenuate spores. Ours on a sorediate *Lecanora* containing a C+ orange xanthone, possibly *Lecanora epanora* (Ach.) Ach., itself probably new to California, but too poorly developed to identify confidently.

Lecanora caesiosora Poelt—CALIFORNIA. Inyo County: Mount Whitney, *Noell 3186* (pers. herb.)—Similar to *L. cenisia* Ach., except forming pale granular soralia. Ours fertile, growing on sheltered granite. Another nearby specimen is sterile and growing on moss, *Hollinger 14996* (pers. herb.).

Lecidea hassei Zahlbr.—CALIFORNIA. Fresno County: Mono Pass, *Hollinger 18079* (pers. herb.); Siskiyou County: Mount Shasta, *Hollinger 15023* (pers. herb.)—Similar to *Lecidea laboriosa* except containing schizopeltic acid (requiring TLC). Our specimens were found on small granite pebbles, and a sheltered dacite block.

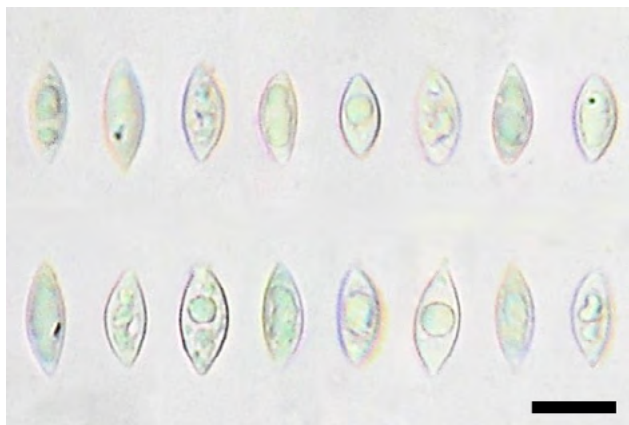
Pleopsidium chlorophanum (Wahlenb.) Zopf—CALIFORNIA. Inyo County: Mount Whitney, *Hollinger 14965* (pers. herb.)—This rare arctic-alpine species differs from the much more common and widespread *P. flavum* in forming smaller thalli with larger, oranger apothecia which become convex and emarginate in age.



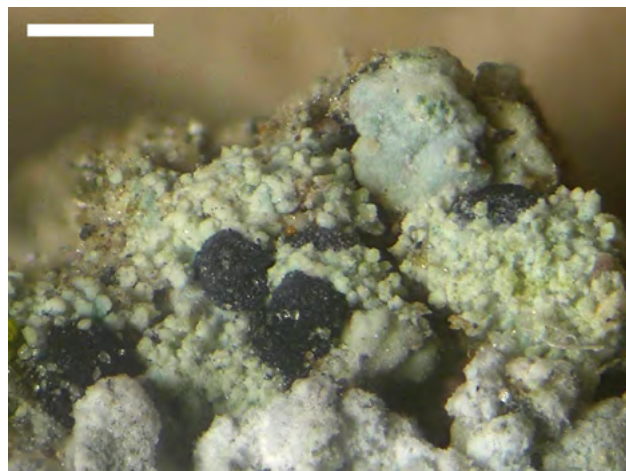
Amandinea cacuminum, scale bar 1 mm



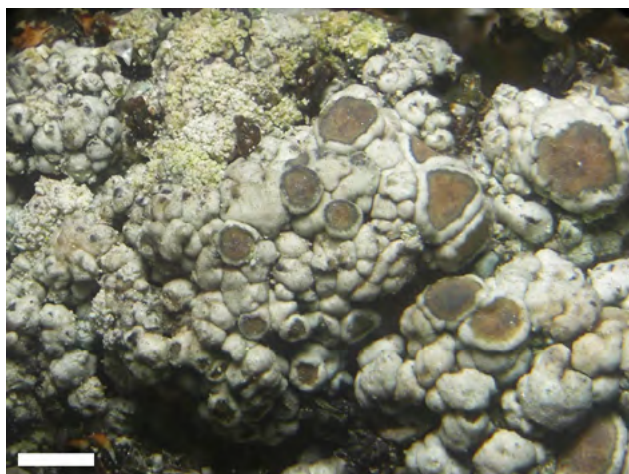
Caloplaca exsecuta, scale bar 1 mm



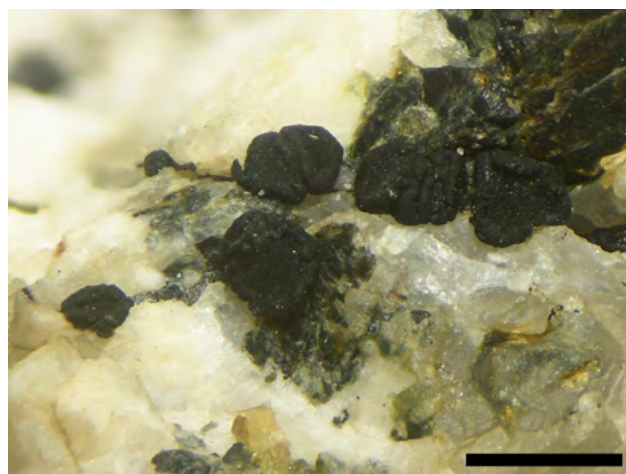
Carbonea supersparsa spores, scale bar 10 μ m



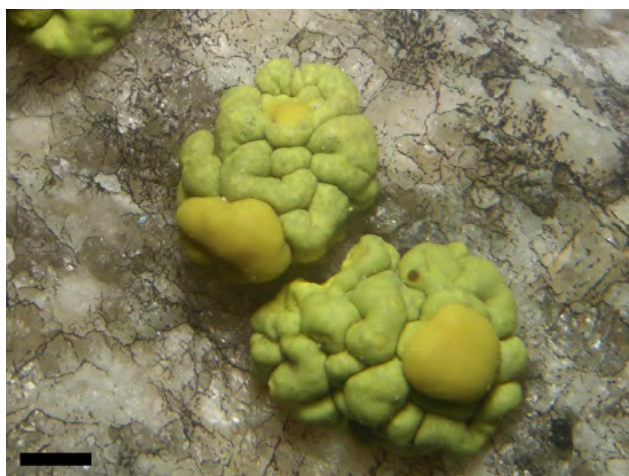
Carbonea supersparsa, scale bar 0.5 mm



Lecanora caesiosora, scale bar 1 mm



Lecidea hassei, scale bar 1 mm



Pleopsidium chlorophanum from Mount Whitney, scale bar 1 mm



Pleopsidium chlorophanum from Austria (exsiccatum at ASU), scale bar 1 mm

The lichens of the Blue Oak Ranch Reserve, Santa Clara County, California

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ABSTRACT

Members of the California Lichen Society visited the Blue Oak Ranch Reserve in January 2018, as part of the annual members meeting. Despite its proximity to metropolitan San Jose and its position leeward of numerous heavily-used interstate highways, the Reserve has a rich flora of both macro- and microlichens. 127 taxa are reported here in 69 genera, including 10 taxa of lichenicolous fungi. Two genera (*Usnea* and *Xanthoparmelia*) that require thin-layer chromatography were not evaluated comprehensively, and three specimens were identified only to genus. Two species are new reports for California: *Didymocyrtis epiphyscia*, and *Endococcus verrucosus*. This foray and others demonstrate that even in heavily-visited parts of the state, there may still be many surprises and unexpected lichen richness in areas that have never been visited by skilled lichenologists.

INTRODUCTION

Despite a long history of lichenology and a large and ever-increasing human population from which to recruit new lichenologists, California's lichen flora remains largely unexplored; the ecological factors that drive its lichen diversity remain little understood (Carlberg & Vilella 2014, Knudsen 2005, Tucker 2017). This is especially true where a lichen species reaches the supposed limits of its range in California (Carlberg 2012, Miller et al. 2017, Reese Næsborg & Williams 2015). Since comprehensive range and distribution data are lacking for most lichen species in

the state, purported range extensions are provisional, and may instead be no more than points that serve to fill large data gaps (Benson et al. 2012, Beyer & St. Clair 2004, Carlberg et al. 2017, Knudsen & Crawford 2014, Peterson 2005, Spribille & Björk 2008). Additionally, focused lichen inventories demonstrate that data gaps are frequent and often large. It is common for such inventories to report species that are new county or regional records (Carlberg et al. 2017, Knudsen & Kocourková 2012, Sheehy 2014, 2017).

These reports suggest that there remain many lichen species that have not been reported for California. In the last 18 or so years, large-scale efforts such as the *Lichen Flora of the Greater Sonoran Desert Region* (Nash et al. 2002, 2004, 2007), the *Catalog of lichens, lichenicoles and allied fungi in California* (Tucker 2014), and the publication of *Microlichens of the Pacific Northwest* (McCune 2017) have increased our baseline knowledge, especially for crustose lichen species, across the state. These publications report many lichen species new to California, or new to science. They also document range extensions for many familiar species. The fact that the pace of new lichen descriptions and new lichen records continues demonstrates that the lichen diversity to be found in California, a state already renowned for its biogeographic and vascular plant diversity, has not yet been fully comprehended.

The following notes on interesting species and list of species are primarily our work, but many other individuals contributed as well. See the Bulletin of the California Lichen Society 25(1):18–22 for a report of the meeting itself. Photographs are by the authors unless otherwise noted.

THE RESERVE

The University of California Berkeley manages the Blue Oak Ranch Reserve (BORR) as part of the University of California Natural Reserve System. Directed by Zac Harlow, BORR is a 3,280-acre property in Santa Clara County that sprawls over the west slope of the Diablo Range five kilometers east of San Jose and approximately 10 km northwest of Mt. Hamilton. The Reserve is bounded to the south by Joseph Grant County Park and to the north and west by Santa Clara Valley Water District property and Alum Rock Park.

The Reserve ranges in elevation from 450 to 870 meters, and contains several large catchments of Aguagae Creek, which flows into Penitencia Creek and Coyote Creek before reaching San Francisco Bay. The rest of the reserve is part of the Smith Creek watershed, and flows into the steep and nearly

inaccessible Arroyo Hondo before making its way into the Calaveras Reservoir.

The climate is Mediterranean: August temperatures range from 17°C to 26°C, and January temperatures from 3°C to 9°C. Precipitation averages 609 mm per year, mostly during the winter months. Fog is an important source of moisture, occurring as often as three out of four days in low-lying areas, but less than once every five days on the ridges (McLaughlin et al. 2014). As a result, California's state lichen *Ramalina menziesii* is prolific along the western valley bottom of the Reserve and forms a "bathtub ring" on hill slopes as the valley deepens to the south.

Cretaceous era sedimentary and metamorphic rocks form most of the bedrock geology of the reserve. Chert formations underlay the western portion of the reserve with intermittent outcrops while greywacke sandstone composes the mid and upper elevations. Ridges of unstable *mélange* perch above the Arroyo Hondo to the east; these exhibit many young slides and deeply cut drainages. Oak savanna and oak woodland are predominant in upslope and ridge environments, composed of valley and blue oaks interspersed with black oak woodland, coast live oak, and bay laurel.



Nonnative annual grassland dominates the open spaces, but native perennial grassland, sage scrub, chamise chaparral, and wildflower fields also persist on the reserve. Lowland areas contain riparian forests of massive valley oaks, bay-laurels, coast live oaks, sycamores, big-leaf maple, and white alder. Foothill pines occur only in Arroyo Hondo and on the slopes above its confluence with North Creek. Chaparral patches occur on many south-facing and some west-facing slopes.

Habitats within Blue Oak Ranch Reserve support at least 461 vascular plant taxa, 130 species of birds, approximately 41 species of mammals, 7 species of amphibians, more than 14 species of reptiles, seven species of fish, and unknown numbers of invertebrates. Species lists are available at <http://www.blueoakranchreserve.org/explore/species-lists.html>.

METHODS

During our visit, nine members of the lichen society either collected lichens or made lichen observations on iNaturalist (www.inaturalist.org). The first three authors were the primary collectors. Common and easily identified taxa were generally noted but not collected. Collections were examined in the evening using dissection and compound microscopes and relying on McCune (2017) and Nash et al. (2002, 2004, 2007) as the primary general references for identification.

RESULTS

The first three authors made 100 lichen collections. Of these, collections by TEC and JPH are deposited in their personal herbaria. KMK collections are deposited at the UC Santa Cruz herbarium. All three authors continued identification efforts at their personal laboratories. In addition to these collections, six observers posted 101 iNaturalist observations.



127 taxa were found representing 69 genera. All taxa are listed in alphabetical order in Appendix 1. Each entry includes information on substrate and a reference to the author's personal collection number, if applicable. The notation "sub Primary name" is used for hitch-hikers – secondary species present on specimens which were collected for, and filed under, a different primary name. We included iNaturalist observations for taxa that were not collected, but only where the identification seemed unequivocal. These taxa are denoted by the prefix "iNat" followed by the observation number. To see any particular observation go to <https://www.inaturalist.org/observations/XXX> and replace "XXX" with the observation number.

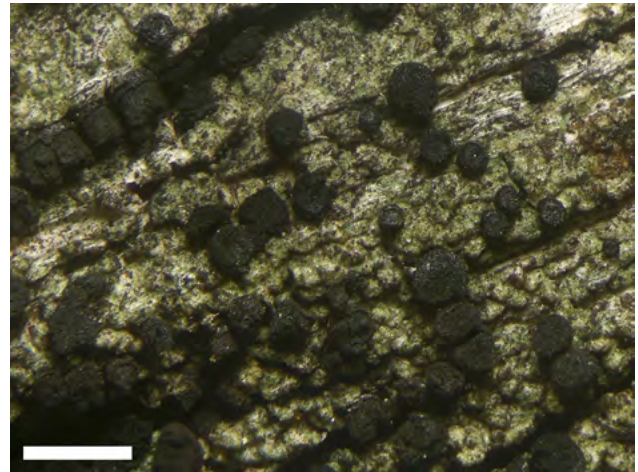
DISCUSSION

Since the true range of California lichens is still being discovered, work such as this foray is vitally important. This is especially true since virtually no qualified universities or scientific institutions are conducting such work. Thus the job of surveying, identifying and cataloging lichens in the state is left to non-professional groups like the California Lichen Society.

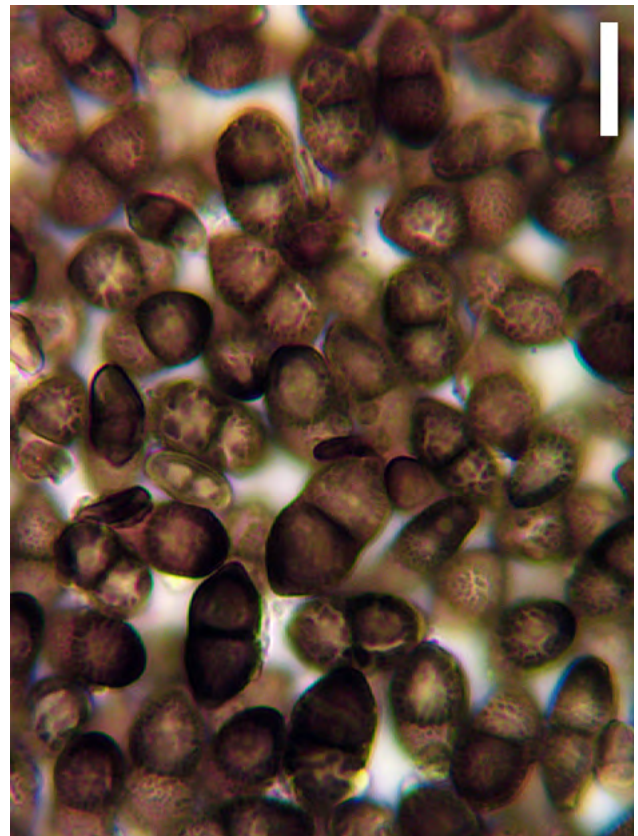
Although many of the taxa in Appendix 1 are well known from central coastal California, many others are not. Others present unique challenges for identification. In the following section, the authors discuss the items they deem especially noteworthy.

SPECIES OF INTEREST

Acolium sp. – Prieto & Wedin (2017) showed that *Cyphelium*, a genus of mostly lignicolous crustose lichens with sessile or immersed, mazaediate apothecia, was heterogeneous. The species with distinct gray-brown thallus, sessile apothecia and exciple thickened underneath the apothecium have been moved into the genus *Acolium*. This affects several species in California formerly placed in *Cyphelium*: *A. chloroconium* Tuck., *A. karelicum* (Vainio) M. Prieto & Wedin and *A. inquinans* (Sm.) A. Massal. We encountered an anomalous specimen in this group, covering an old live oak stump in an open field. It is similar to *A. karelicum* owing to its small apothecia (0.3–0.6 mm), but the spores are much smaller, $(10.8)11.0\text{--}13.7(15.3) \times 5.5\text{--}7.5(7.9) \mu\text{m}$ (N=45), and vary from verruculose to cracked-plated. *A. karelicum* has strongly cracked-plated spores $13\text{--}21 \times 8\text{--}13 \mu\text{m}$ (McCune 2017).



Acolium sp., scale bar = 1 mm



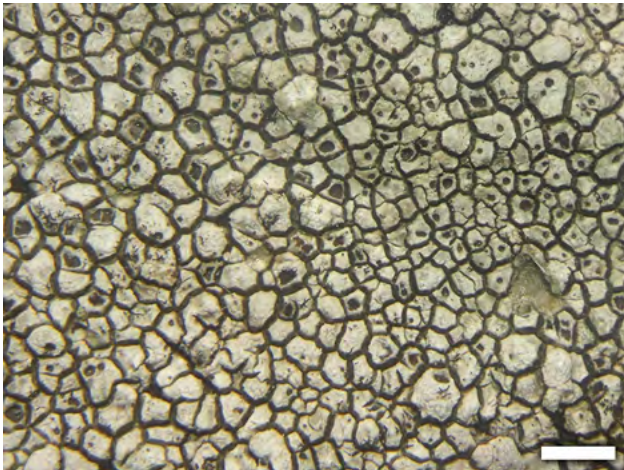
Acolium sp. spores, scale bar = 10 μm

Aspicilia sp. – This is a well-developed, pale gray, chinky-areolate specimen with unusually small, thin, polygonal areoles. It has small, innate, epruinose, black apothecia, short hymenium (70 µm), submoniliform paraphyses, small spores (ca. 13 × 7 µm) and small conidia (ca. 4–8 µm). It is K- and P-. It was found on sunny siliceous rocks on an open, south-facing slope.

Buellia badia (Fr.) A. Massal. – This is a highly versatile species, with a well-developed chocolate brown thallus, relatively small spores and short conidia. It is common on siliceous rocks, especially growing over various saxicolous crusts. Ours was growing on *Aspicilia* sp. and *Dimelaena oreina*.

Caloplaca demissa (Körber) Arup & Grube – This species looks more like a sorediate *Dimelaena thysanota* than a *Caloplaca*, and in fact was called *Lecanora demissa* (Körber) Zahlbr. until Arup & Grube (1999) finally sequenced it and discovered it was closely related to *Caloplaca cerina* and *C. variabilis*. It forms delicate brown lobate rosettes, often pruinose toward the tips, with granular marginal soralia.

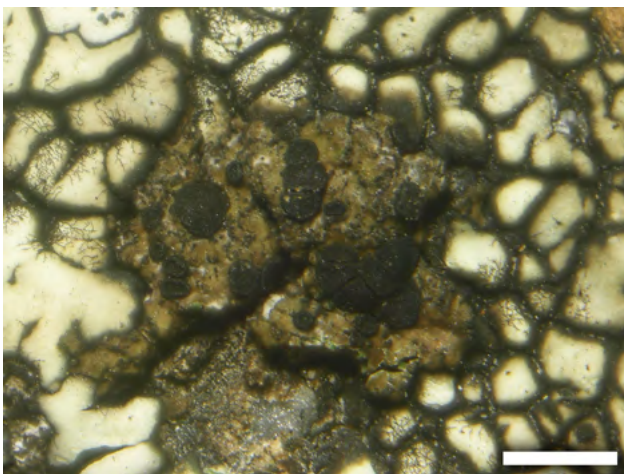
Caloplaca peliophylla (Tuck.) Zahlbr. – This is a rare species endemic to California and Baja California (Wetmore 1994, Nash et al. 2007). Our specimens are atypical in being dull gray instead of the usual shiny brown, and the epihymenium is K-. *C. peliophylla* may belong to the highly variable *C. albovariegata* (de



Aspicilia sp., scale bar = 1 mm



Caloplaca demissa, in situ, scale bar approx. 1 mm



Buellia badia growing on *Dimelaena oreina*, scale bar = 1 mm



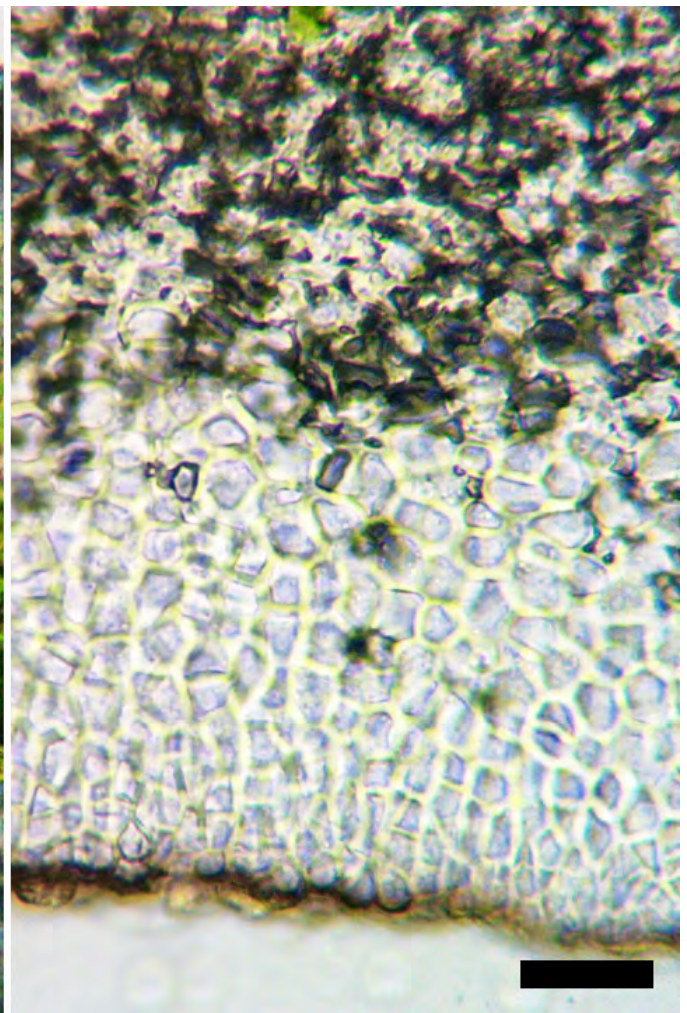
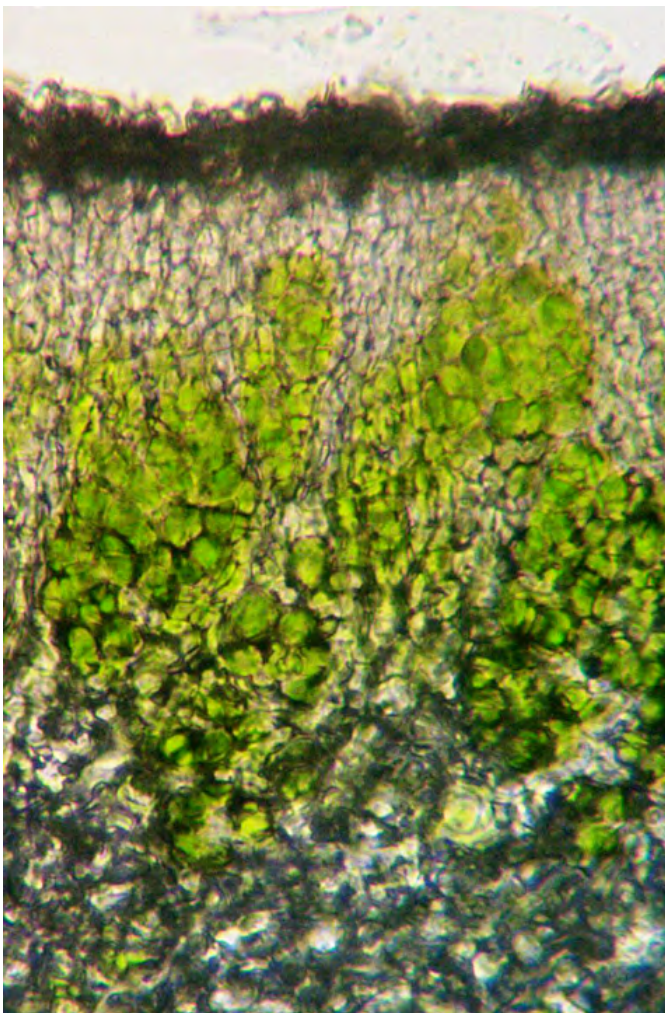
Caloplaca peliophylla, scale bar = 1 mm

Lesd.) Wetmore complex, but differs from typical *C. albovariegata* in having brown apothecia, continuous algal layer, and usually being distinctly shiny.

Dermatocarpon leptophylloides (Nyl.) Zahlbr.—This is a strange species of *Dermatocarpon* which looks more squamulose than umbilicate. This specimen was especially misleading because algae fills much of the upper cortex making the cortex appear thin and indistinct, leading us to call it *Placopyrenium conforme* Breuss for some time. However the structure of the cortices (especially the angular-columnar structure of the lower cortex), spore size, and lack of stipe-like holdfasts rule out that rare species (known only from the Columbia Plateau). The spores in our specimen are simple and narrowly ellipsoid, $13\text{--}21 \times 4.5\text{--}6 \mu\text{m}$.



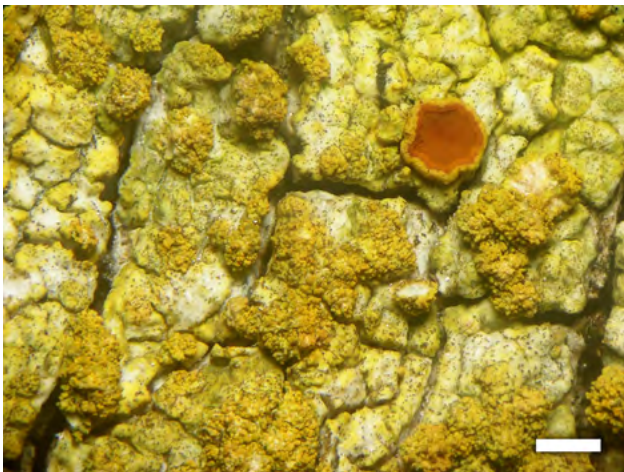
Dermatocarpon leptophylloides, in situ, scale bar = 1 mm



Dermatocarpon leptophylloides, left: upper cortex, right: lower cortex, scale bar = 25 μm (herbarium specimen from Sierra Nevada)

Didymocyrtis epiphysciae Ertz & Diederich (syn.: *Phoma physciicola* Keissler) – This lichenicolous species has been reported only once before from California (as *Phoma physciicola*) from Santa Barbara County on an undetermined *Physcia* species (Diederich 2003). Our specimen was growing on *Xanthoria polycarpa* and has relatively narrow conidia, and therefore belongs to *D. epiphysciae* sensu lato. (See Ertz et al. 2015 for a much more detailed discussion.) This species forms clusters of tiny black, semi-immersed pycnidia in the host hymenium and sometimes also thallus. Pycnidia are (50)100–150 μm ; conidiogenous cells 4–7 μm ; conidia ellipsoid, 1-2-guttulate, (4.0)4.6–6.1(7.8) \times (3.2)3.5–4.2(5.0) μm . This is a particularly diverse and character-poor group of fungi whose taxonomy is therefore largely based on in vitro cultures, but most lichenicolous species have never been cultured.

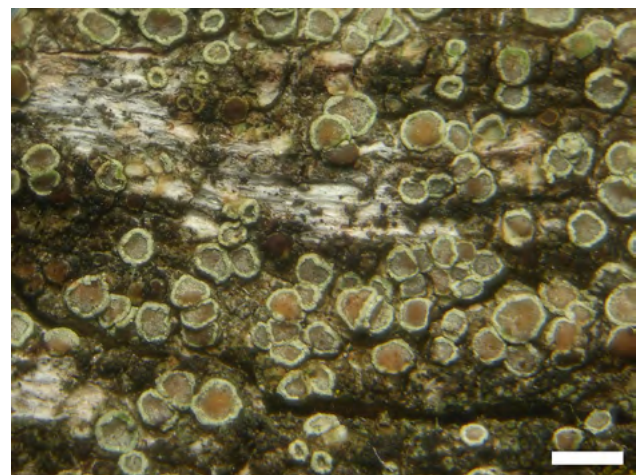
Gyalolechia cf. *persimilis* (Wetmore) S ochting, Fr od en & Arup. (syn.: *Caloplaca persimilis*) – This is a yellowish, sorediate species of *Caloplaca* s. lato. It is reported from both the desert interior (Arizona to Texas) as well as coastal California (Wetmore 2004, Nash et al. 2007). Coastal material, however, differs from inland material in several respects. Ours are brighter-colored, C-, and have apothecia with a distinct thalline outer rim. In these respects, ours is similar to the eastern species *Solitaria chrysophthalma* (Degel.) Arup, S ochting & Fr od en, but that species never has capitate soralia, and has larger spores (Wetmore 2004). It is locally abundant on some oaks on the ridgeline.



Gyalolechia cf. *persimilis*, scale bar = 1 mm

Lecanora coniferarum Printzen – This is very similar to *L. laxa* ( liwa & Wetmore) Printzen. Both are epiphytic, contain usnic acid, have weakly warty-areolate thallus and lightly pruinose apothecia. According to Printzen (2001) the spores of *L. coniferarum* are longer: (9)9.8–11.6(13) μm versus (6.5)7.8–9.6(12) μm . But while this may be true on average, we have seen numerous specimens of *L. laxa* in the Sierras and the Great Basin with spores up to 13 μm long (Hollinger pers. observations). *L. laxa* is probably more reliably distinguished by its much more constricted, flexuose apothecia which become substipitate and concave. *L. coniferarum* apothecia remain sessile throughout all stages of development, and if anything become slightly convex in age. In both species baby apothecia have somewhat inrolled apothecial margins, but those of *L. laxa* are distinctively urceolate. Also, the amphithecial cortex tends to be much better developed in *L. laxa*, sometimes exceeding 100 μm laterally and even more basally. *L. coniferarum* has a thinner cortex ranging from 5–10 μm above to 20–35(50) μm below. The thicker cortex gives *L. laxa* a waxier appearance, while *L. coniferarum* tends to look dull and dusty.

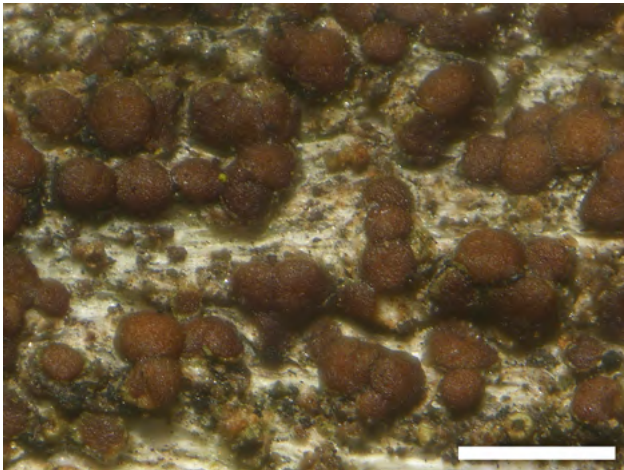
Lecanora sp. – This strange population in the *L. saligna* group lacks usnic and isousnic acids and contains an unknown substance charring brownish just above norstictic acid in solvent C. It was locally abundant on one fallen oak on the ridgeline. The spores are 8–10(11) \times 4–4.5 μm .



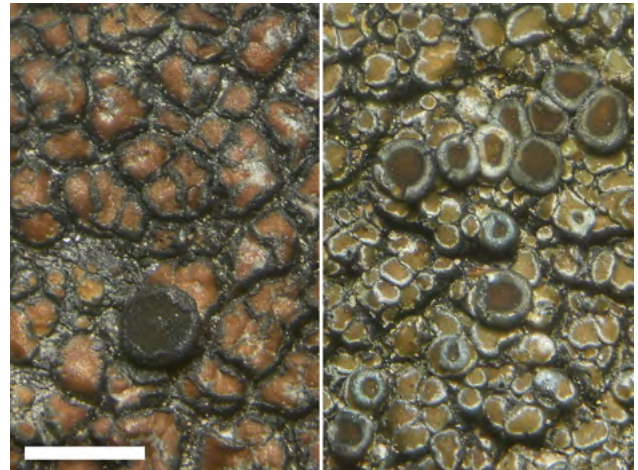
Lecanora coniferarum, scale bar = 1 mm

Lichenostigma sp. – This is one of many undescribed lichenicolous fungi which form beautiful, delicate, spidery webs of vegetative hyphae on various host species. The most common and well-known species is probably *L. cosmopolites* which grows on *Xanthoparmelia* species (the usnic acid ones, not the brown ones that used to be in *Neofuscelia*). The one here was growing on *Umbilicaria phaea*, has verruculose, radiating vegetative hyphae in strands 2-3 cells thick, 60–80 µm, subglobose ascomata, and hyaline, thinly halonate, 1(2)-septate spores measuring 10–11(13) × 6–7(9) µm that turn pale brown when over-mature. Most species of *Lichenostigma* grow within the epinecral layer on top of the cortex, apparently doing little harm to the host.

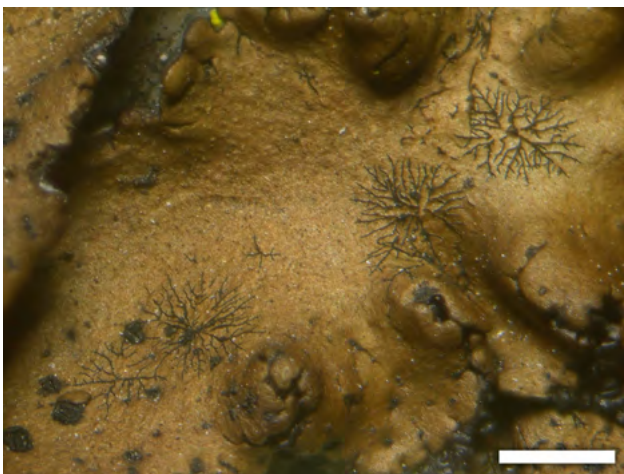
Miriquidica scotopholis (Tuck.) B. D. Ryan & Timdal – This is an interesting species whose young apothecia are lecanorine with a thalline margin, but in older specimens they can turn pure black and appear lecideine. Such lecideine specimens resemble members of the *Lecidea atrobrunnea* and *L. fuscoatra* groups, differing only in subtle microscopic and chemical characters: *Miriquidica* has *Lecanora*-type instead of *Lecidea*-type asci, and many species of *Miriquidica* contain miriquidic acid which is not found in the *Lecidea atrobrunnea* and *L. fuscoatra* groups. *Rhizocarpon bolanderi* is also similar, but it has huge, dark, muriform spores. *M. scotopholis* grows on siliceous rocks.



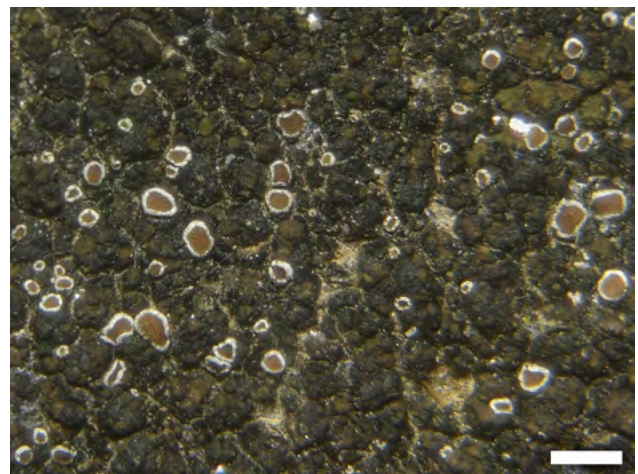
Lecanora sp., scale bar = 1 mm



Miriquidica scotopholis, left: lecideine form, right: lecanorine form, scale bar = 1 mm



Lichenostigma sp. growing on *Umbilicaria phaea*, scale bar = 1 mm



Myriolecis semipallida, apparently lichenicolous on *Verrucaria* sp., scale bar = 1 mm

Myriolecis semipallida (H. Magn.) Śliwa, Zhao Xin & Lumbsch (syn.: *Lecanora semipallida*) – The apothecia of this species are often found scattered among other lichens on shaded rocks. It is generally considered a calciphile, but also occurs on siliceous rocks. Ours appears to be lichenicolous, growing scattered over a *Verrucaria* on a weakly calcareous metamorphic rock on the ground. The thallus is usually very poorly developed or absent altogether, and the apothecia typically have dusty white margins contrasting with a yellowish to brownish disk. It is easily distinguished in the lab from the similar species *M. dispersa* by its distinctively KC+ orange and often UV+ yellow apothecia (*M. dispersa* is KC- and UV-). Sometimes when the KC reaction is weak and ambiguous, it helps to cut off an apothecium and to perform the test directly on a microscope slide against a white background.

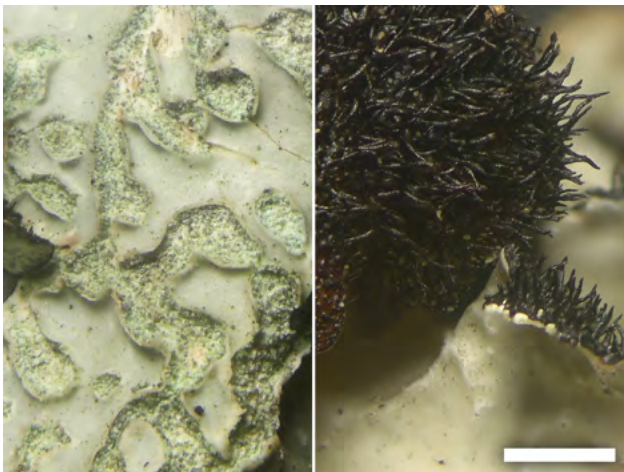
Parmelia barrenoae Divakar, M. C. Molina & A. Crespo – This species is a relatively recent segregate from *P. sulcata* (Divakar et al. 2005) which has simple or forked rhizines instead of the squarrose rhizines of *P. sulcata*. The way the cortex opens to reveal the soralia is also different, especially in well-developed specimens. In warmer, drier climates it may be more common than *P. sulcata* (Villella et al. 2018).

Polycauliona stellata (Wetmore & Kärnefelt) Arup, Frödén & Søchting (syn.: *Caloplaca stellata*) – This occurs throughout western North America, and seems to be especially common in California

(CNALH 2019). It particularly likes deeply sheltered nooks at the base of siliceous cliffs or underneath siliceous boulders. When well-developed (such as our specimen), it forms beautiful, delicate, orange, lobate rosettes with irregular marginal soralia. Older specimens can become almost entirely sorediate, and you have to search carefully for intact lobes. Such specimens can easily be mistaken for *Flavoplaca citrina* (Hoffm.) Arup, Frödén & Søchting, but *F. citrina* is restricted to calcareous rocks.

Polycoccum evae Calat. & V.J. Rico – This is one of several lichenicolous fungi known to grow on *Dimelaena oreina*. It has been reported once before from Yosemite (Hutten et al. 2013). It forms small, black, mostly-immersed perithecia in the host areoles which resemble very closely the host's pycnidia. It can also easily be mistaken for *Endococcus oreinae* Hafellner. *Polycoccum evae* has similar but slightly larger (17–25 × 6–11 versus 16–20 × 5–7 μm), 1-septate, brown spores, but unlike *Endococcus oreinae*, its spores are verruculose with a diffuse perispore, and like all *Polyococcum*, it has persistent interascal filaments. The paraphysoids of *Endococcus* dissolve by maturity like most members of the Verrucariales.

Ramalina puberulenta Riefner & Bowler – This species is easily recognized with a hand lens by the fine puberulence (tiny hyaline hairs) covering the entire thallus. It has a patchy distribution throughout California's central and southern coastal mountains as



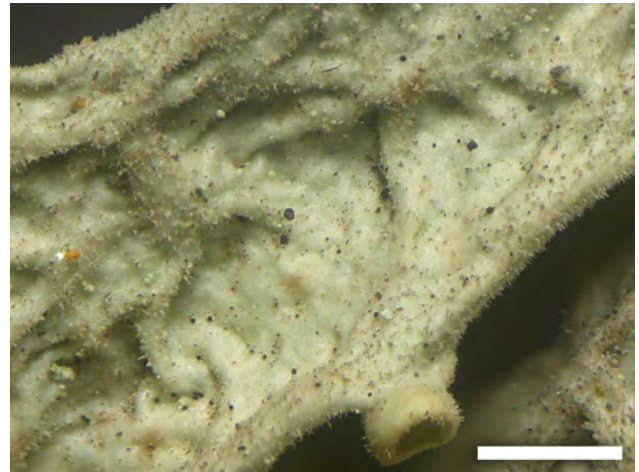
Parmelia barrenoae, left: characteristic eroded soralia, right: simple rhizines, scale bar = 1 mm



Polycauliona stellata, scale bar = 1 mm

far south as Los Angeles (historically), with sporadic reports from more northerly inland areas (CNALH 2019, Carlberg personal observation). It appears to be a California endemic, but was not reported from Baja California in the treatment of *Ramalina* in the Sonoran Flora (Nash et al. 2004).

Rhizoplaca glaucophana (Nyl. ex Hasse) W. A. Weber – This distinctive California endemic is known from several dozen populations ranging from the Lassen Foothills near Los Molinos to just inside Baja California (Carlberg et al. 2017, CNALH 2019). The thalli in our population are so reduced that it looked more like a white *Acarospora* in the field; however, the banana-shaped spores are quite distinctive.



Ramalina puberulenta, showing characteristic puberulence, scale bar = 1 mm



Rhizoplaca glaucophana, in situ, scale bar approx. 1 mm

Trapelia glebulosa (Sm.) J.R. Laundon – This ubiquitous but inconspicuous species can be found reliably on siliceous pebbles in disturbed areas such as road-cuts. It is most noticeable during the rainy season, when the fresh, damp apothecia are a striking pink. Later in the season they turn black and apparently die (Hollinger pers. observation). They often have faint remnants of thalline material clinging to the margin, sometimes making them appear almost lecanorine. The dispersed, tiny, pale areoles and pinkish apothecia are sufficient to identify this in the field. In the lab it can be verified readily with a C test: *T. glebulosa*, like all *Trapelia*, is C+ pink/red. The similar species *T. coarctata* (Turner ex Sm. & Sow.) M. Choisy has a thin, almost continuous white thallus. Also present at BORR is *T. obtegens* (Th. Fr.) Hertel, essentially a sorediate form of *T. glebulosa*. It is either rare or overlooked.

Verrucaria prosoplectenchymatica Servit – This is a fairly unusual species in our flora owing to its distinctive “Zellnetztyp” involucrellum, which consists of a thin dark outer layer, and a paler inner layer in which the pigment is restricted to the cell walls (particularly clear in very thin sections). It has quite large spores: 24–30 × 9–14 μm (Breuss 2007).

Xanthocarpia crenulatella (Nyl.) Frödén, Arup & Søchting (syn.: *Caloplaca crenulatella*) – This common species has scattered, orange apothecia and an endolithic to poorly developed orange thallus. It seems to be widely distributed, with many records

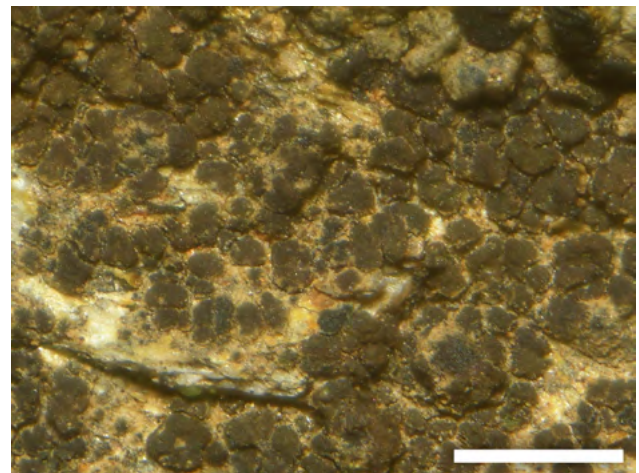


Trapelia glebulosa, scale bar = 1 mm

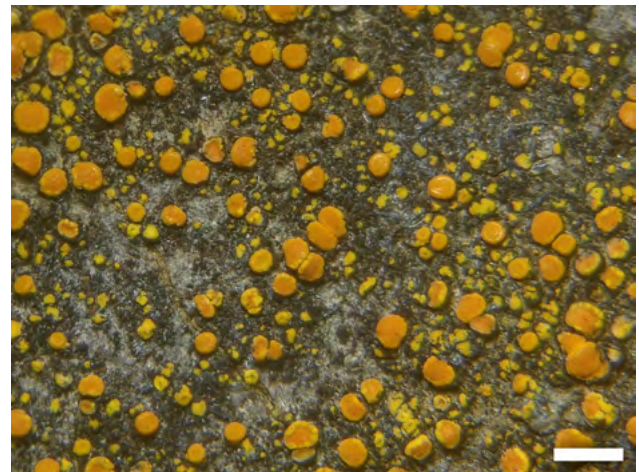
in the southern half of California and in the Great Plains (CNALH 2019). It is generally considered a calciphile, and therefore not expected to be common in the area around San Francisco Bay. Ours was found together with *Candelariella aurella* (Hoffm.) Zahlbr. on a weakly calcareous metamorphic rock on the ground.

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Verrucaria prosoplectenchymatica, scale bar = 1 mm



Xanthocarpia crenulatella, scale bar = 1 mm

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Appendix 1. Species of lichens and lichenicolous fungi identified from Blue Oak Ranch Reserve, from the California Lichen Society foray on January 27, 2018. Nomenclature follows Esslinger (2018). Lichenicolous fungi are preceded by a (*); cyanolichens are **bolded**. JPH = Jason Hollinger; KMK = Ken Kellman; TEC = Tom Carlberg; iNat represents an iNaturalist observation number (www.iNaturalist.org). The abbreviation “sub” is used for the identification of a secondary lichen in a mixed collection in which the primary species is indicated in italics following the word “sub”; both identifications will reference the same collection number.

Taxon authority	Substrate	Collection #(s) / notes
<i>Acarospora fuscata</i> (Schrader) Arnold	siliceous rock in roadbank	JPH 18722 (sub <i>Aspicilia confusa</i>)
<i>Acarospora socialis</i> H. Magn.	siliceous rock in roadbank	JPH & KMK not collected, iNat 9647934
<i>Acarospora thamnina</i> (Tuck.) Herre	siliceous rock in roadbank	JPH & KMK not collected, iNat 9647935
<i>Acolium</i> sp.	old oak snag on grassy hillside	JPH 18709, 18744, KMK 8788
<i>Amandinea punctata</i> (Hoffm.) Coppins & Scheid.	<i>Quercus agrifolia</i> twig	JPH 18738
<i>Aspicilia</i> cf. <i>confusa</i> Owe-Larsson & A. Nordin	siliceous rock in roadbank	JPH 18722, 18759 / conidia too short
<i>Aspicilia cuprea</i> Owe-Larsson & A. Nordin	siliceous rock in roadbank	JPH 18715
<i>Aspicilia knudsenii</i> Owe-Larsson & A. Nordin	siliceous rock in roadbank	JPH 18726
<i>Aspicilia phaea</i> Owe-Larsson & A. Nordin	siliceous rock in roadbank	JPH 18720, 18721, 18751
<i>Aspicilia</i> sp. A. Massal.	siliceous rock in roadbank	JPH 18716 / see notes in article
<i>Athallia pyracea</i> (Ach.) Arup, Frödén & Søchting	<i>Quercus agrifolia</i> trunk on ridge	JPH 18732 (sub <i>Pertusaria albescens</i>)
<i>Buellia abstracta</i> (Nyl.) H. Olivier	siliceous rock in roadbank	JPH 18727, KMK 8801
<i>Buellia badia</i> (Fr.) A. Massal.	on <i>Aspicilia</i> and <i>Dimelaena</i> oreina on siliceous rock on grassy hillside	JPH 18713
<i>Caloplaca demissa</i> (Körber) Arup & Grube	shaded vertical siliceous? rock in oak woodland	JPH 18752 (sub <i>Lecidella asema</i>)
<i>Caloplaca peliophylla</i> (Tuck.) Zahlbr.	schistaceous rock on ground	JPH 18753, 18756 / dull gray, epihymenium K-
<i>Candelaria pacifica</i> M. Westb. & Arup	<i>Quercus agrifolia</i> twig	JPH 18739 (sub <i>Lecanora chlarotera</i>)
<i>Candelariella aurella</i> (Hoffm.) Zahlbr.	calcareous rock on ground	JPH 18750 (sub <i>Xanthocarpia crenulatella</i>)
<i>Candelariella vitellina</i> (Hoffm.) Müll. Arg.	top of siliceous boulder	JPH 18718 (sub <i>Rhizoplaca glaucophana</i>)
<i>Cladonia fimbriata</i> (L.) Fr.	down log	TEC not collected
<i>Cladonia pyxidata</i> (L.) Hoffm.	roadbank	TEC not collected
<i>Cliostomum griffithii</i> (Sm.) Coppins	old oak snag on grassy hillside	JPH 18705 (sub <i>Lecanora confusa</i>)
<i>Collema crispum</i> (Huds.) Weber wex Wigg.	mosses over oak roots	KMK 8797a
<i>Collema furfuraceum</i> (Arnold) Du Rietz	<i>Quercus douglasii</i> trunk bark	TEC not collected, iNat 9652200
<i>Collema nigrescens</i> (Hudson) DC.	<i>Quercus douglasii</i> trunk bark	TEC not collected
<i>Cyphelium tigillare</i> (Ach.) Ach.	old oak snag on grassy hillside	JPH 18708, KMK 8788
<i>Dermatocarpon leptophyllodes</i> (Nyl.) Zahlbr.	shaded vertical rock	KMK 8806
* <i>Didymocyrtis epiphyscia</i> s. lato Ertz & Diederich	on Xanthomendoza and Xanthoria polycarpa apothecia	= <i>Phoma physciicola</i> Keissler. JPH 18738a (sub <i>Xanthoria polycarpa</i>)

Appendix 1. Species of lichens and lichenicolous fungi identified from Blue Oak Ranch Reserve (cont.)

Taxon authority	Substrate	Collection #(s) / notes
<i>Dimelaena oreina</i> (Ach.) Norman	granitic boulder on grassy hillside	JPH 18710 (sub <i>Lecanora mellea</i>)
<i>Dimelaena thysanota</i> (Tuck.) Hale & W. L. Culb.	granitic boulder on grassy hillside	JPH 18717
<i>Diploschistes muscorum</i> (Scop.) R. Sant.	on <i>Cladonia</i> and spilling over onto soil of roadbank	JPH & KMK not collected
<i>Diploschistes scruposus</i> (Schreber) Norman	siliceous rock	JPH & KMK not collected
<i>Endocarpon pusillum</i> Hedwig	soil roadbank	JPH 18764, KMK 8786
<i>Evernia prunastri</i> (L.) Ach.	live oak twig	JPH & KMK not collected
<i>Flavopunctelia flaventior</i> (Stirton) Hale	live oak twig	JPH 18736, TEC 05618
<i>Fuscopannaria mediterranea</i> (Tav.) P. M. Jørg.	mossy rock	TEC not collected
<i>Gyalolechia</i> cf. <i>persimilis</i> (Wetmore) Søchting, Frödén & Arup.	live oak trunk on ridge	JPH 18729
<i>Hypocenomyce scalaris</i> (Ach. ex Lilj.) M. Choisy	old oak stump	KMK 8795
<i>Lecanora albellula</i> Nyl.	old oak snag on grassy hillside	JPH 18707
<i>Lecanora carpineae</i> (L.) Vainio	<i>Quercus agrifolia</i> twig	JPH 18706
<i>Lecanora chlarotera</i> Nyl.	<i>Quercus agrifolia</i> twig	JPH 18739
<i>Lecanora confusa</i> Almb.	old oak snag on grassy hillside	JPH 18705, KMK 8789
<i>Lecanora coniferarum</i> Printzen	downed live oak log	JPH 18734, KMK 8798
<i>Lecanora mellea</i> W.A. Weber	granitic boulder on grassy hillside	JPH 18710
<i>Lecanora saligna</i> (group)	downed live oak log	JPH 18735 / strange chemistry
<i>Lecidea fuscoatra</i> (L.) Ach.	siliceous rock in roadbank	JPH 18725 / pale gray form
<i>Lecidella asema</i> (Nyl.) Knoph & Hertel	shaded vertical rock	JPH 18752
<i>Lecidella carpathica</i> Körber	siliceous rock in roadbank	KMK 8800
<i>Lecidella elaeochroma</i> (Ach.) M. Choisy	<i>Quercus agrifolia</i> twig	JPH 18740a
<i>Lepraria rigidula</i> (B. de Lesd.) Tønsberg	crack in shaded vertical rock	JPH 18752 (sub <i>Lecidella asema</i>) / long projecting hyphae
<i>Leprocaulon knudsenii</i> Lendemmer & Hodkinson	crack in shaded vertical rock	JPH & KMK not collected
<i>Leptochidium albociliatum</i> (Desm.) M. Choisy	mossy <i>Quercus agrifolia</i> root	JPH & KMK not collected, iNat 9653423
<i>Leptogium milligranum</i> Sierk	mossy <i>Quercus lobata</i> root	KMK 8797a
<i>Leptogium pseudofurfuraceum</i> P. M. Jørg. & Wallace	<i>Quercus agrifolia</i> trunk on ridge	JPH 18730, TEC 05615
<i>Letharia vulpina</i> (L.) Hue	down log	TEC not collected, iNat 9664169 and others
* <i>Lichenostigma cosmopolites</i> Hafellner & Calatayud	on <i>Xanthoparmelia mexicana</i>	JPH 18753 (sub <i>Caloplaca peliophylla</i>)
* <i>Lichenostigma</i> sp. Hafellner	on <i>Umbilicaria phaea</i>	JPH 18712 (sub <i>Umbilicaria phaea</i>)
* <i>Lichenothelia convexa</i> Henssen	unlichenized, on bare rock and overgrowing nearby lichens	JPH 18723 (sub <i>Polysporina simplex</i>)

Appendix 1. Species of lichens and lichenicolous fungi identified from Blue Oak Ranch Reserve (cont.)

Taxon authority	Substrate	Collection #(s) / notes
<i>Massalongia carnosa</i> P. M. Jørg.	soil in crack of shaded vertical rock face	JPH 18743
<i>Melanelixia californica</i> A. Crespo & Divakar	<i>Quercus agrifolia</i> twig	KMK 8801
<i>Melanelixia subargentifera</i> (Nyl.) O. Blanco et al.	<i>Quercus agrifolia</i> branch	JPH 18736 (sub <i>Flavopunctelia flaventior</i>)
<i>Melanohalea subolivacea</i> (Nyl.) O. Blanco et al.	<i>Quercus agrifolia</i> twig	KMK 8791
<i>Miriquidica scotopholis</i> (Tuck.) B. D. Ryan & Tindal	weakly calcareous schistaceous rock on ground, and on top of granitic boulder on grassy hillside	JPH 18711, 18757
<i>Myriolecis semipallida</i> (H. Magn.) Śliwa, Zhao Xin & Lumbsch	lichenicolous on <i>Verrucaria</i> on siliceous rock in roadbank	JPH 18758
<i>Ochrolechia subpallescens</i> Versegly	<i>Quercus lobata</i> trunk bark	TEC 05619, 05620 / outer margin cortex C-, inner cortex C+R-Y, margin medulla C-, disk C+R
<i>Parmelia barrenoae</i> Divakar, M. C. Molina & A. Crespo	<i>Quercus agrifolia</i> twig and branch	JPH 18761, KMK 8804
<i>Parmelia sulcata</i> Taylor	<i>Quercus lobata</i> twigs	TEC 05616
<i>Parmelina coleae</i> Argüello & A. Crespo	<i>Quercus agrifolia</i> twig	KMK 8805
<i>Peltigera collina</i> (Ach.) Schrader	road bank in deep valley	JPH 18763 / fertile
<i>Pertusaria albescens</i> (Hudson) M. Choisy & Werner	<i>Quercus agrifolia</i> trunk on ridge	JPH 18732, KMK 8796
<i>Phaeophyscia orbicularis</i> (Necker) Moberg	<i>Quercus agrifolia</i> trunk on ridge	JPH 18733 (sub <i>Tremella phaeophysciae</i> , fertile)
<i>Phlyctis argena</i> s. lato (Sprengel) Flotow	<i>Quercus agrifolia</i> branch	JPH 18737 / strict form has discrete soralia
<i>Physcia adscendens</i> (Fr.) H. Olivier	<i>Quercus agrifolia</i> twig on ridge	JPH 18762
<i>Physcia aipolia</i> (Ehrh. ex Humb.) Fűrnr.	<i>Quercus agrifolia</i> twig on ridge	JPH 18762
<i>Physcia phaea</i> (Tuck.) J. W. Thomson	shaded vertical rock	JPH 18753 (sub <i>Caloplaca peliophylla</i>)
<i>Physcia stellaris</i> (L.) Nyl.	<i>Quercus agrifolia</i> twig	JPH 18741, TEC 05625
<i>Physcia tenella</i> (Scop.) DC.	<i>Quercus agrifolia</i> twig on ridge	JPH 18762, TEC 05623
<i>Physcia tribacia</i> (Ach.) Nyl.	both exposed and extremely sheltered faces of granitic boulders on grassy hillside	JPH 18719, JPH 18765
<i>Physconia americana</i> Essl.	<i>Quercus agrifolia</i> branch on ridge	TEC 05617
<i>Physconia californica</i> Essl.	<i>Quercus agrifolia</i> branch on ridge	JPH 18760
<i>Physconia enteroxantha</i> (Nyl.) Poelt	<i>Quercus agrifolia</i> branch on ridge	JPH 18762 (sub <i>Physcia</i> spp.)
<i>Physconia perisidiosa</i> (Erichsen) Moberg	<i>Quercus agrifolia</i> branch on ridge	JPH 18762 (sub <i>Physcia</i> spp.)

Appendix 1. Species of lichens and lichenicolous fungi identified from Blue Oak Ranch Reserve (cont.)

Taxon authority	Substrate	Collection #(s) / notes
<i>Polycauliona candelaria</i> (L.) Frödén, Arup, & Söchting	<i>Quercus agrifolia</i> snag on grassy hillside	JPH 18704
<i>Polycauliona</i> cf. <i>igneae</i> (Arup) Arup, Frödén & Söchting	siliceous rock on grassy hillside	photo only, unusually small
<i>Polycauliona polycarpa</i> (Hoffm.) Frödén, Arup, & Söchting	<i>Quercus agrifolia</i> twig	JPH 18738a
<i>Polycauliona stellata</i> (Wetmore & Kärnefelt) Arup, Frödén & Söchting	deeply sheltered surface under siliceous boulder on grassy hillside	JPH 18714
* <i>Polycoccum evae</i> Calat. & V.J. Rico	on <i>Dimelaena oreina</i>	JPH 18710 (sub <i>Lecanora mellea</i>)
<i>Polysporina simplex</i> (Taylor) Vězda	siliceous rock in roadbank	JPH 18723
<i>Protoparmeliopsis muralis</i> Esslinge(Schreber) M. Choisy	granitic boulder on grassy hillside	JPH & KMK not collected
<i>Punctelia jeckeri</i> (Roum.) Kalb	<i>Quercus agrifolia</i> branch	KMK 8793
<i>Ramalina farinacea</i> (L.) Ach.	<i>Quercus lobata</i> twigs	TEC? not collected, iNat 9634161
<i>Ramalina leptocarpha</i> Tuck.	<i>Quercus lobata</i> twigs	TEC not collected
<i>Ramalina menziesii</i> Taylor	<i>Quercus lobata</i> twigs	TEC not collected, iNat 9664908
<i>Ramalina puberulenta</i> Riefner & Bowler	<i>Quercus agrifolia</i> branch	JPH 18754, KMK 8808, TEC 05621
<i>Ramalina subleptocarpha</i> Riefner & Bowler	<i>Quercus lobata</i> twigs	TEC not collected
<i>Rhizocarpon geographicum</i> s. lato (L.) DC.	shaded vertical rock	KMK 8807
<i>Rhizoplaca glaucophana</i> (Nyl. ex Hasse) W. A. Weber	top of granitic boulder on grassy hillside	JPH 18718 / range extension
<i>Rinodina laevigata</i> (Ach.) Malme	<i>Quercus agrifolia</i> branch	KMK 8802, KMK 8803
<i>Rinodina oregana</i> H. Magn.	<i>Quercus agrifolia</i> trunk on ridge	JPH 18732 (sub <i>Pertusaria albescens</i> , poor specimen)
<i>Rinodina polyspora</i> Th. Fr.	<i>Quercus agrifolia</i> twig	JPH 18740
<i>Rinodina pyrina</i> (Ach.) Arnold	<i>Quercus lobata</i> trunk bark	TEC 05624 / spores (11.6) 12.9 (15.2) × (6.4) 7.3 (8.7); N=7; ID based primarily on spore size
<i>Scytinium</i> cf. <i>lichenoides/subaridum</i>	soil in crack of shaded vertical rock	JPH 18743, KMK 8809 / like <i>subaridum</i> but lobes are wrinkled and too thin; like <i>lichenoides</i> but the isidia are dimpled and predominantly laminal
<i>Scytinium gelatinosum</i> (With.) Otálora, P. M. Jørg. & Wedin	soil in crack of shaded vertical rock	JPH 18742
<i>Scytinium lichenoides</i> (group)	mossy rock	TEC not collected
<i>Scytinium palmatum</i> (Hudson) Gray	mossy rock	TEC not collected, iNat9639632
<i>Scytinium tenuissimum</i> (Dickson) Otálora, P. M. Jørg. & Wedin	soil roadbank	JPH 18766, 18767
<i>Sticta fuliginosa</i>	mossy boulder under old live oak among poison oak	JPH & KMK not collected, iNat 9638375

Appendix 1. Species of lichens and lichenicolous fungi identified from Blue Oak Ranch Reserve (cont.)

Taxon authority	Substrate	Collection #(s) / notes
* <i>Stigmidium squamariae</i> (B. de Lesd.) Cl. Roux & Triebel	on apothecia of <i>Lecanora mellea</i>	JPH 18753 (sub <i>Caloplaca peliophylla</i>)
* <i>Stigmidium xanthoparmeliarum</i> Hafellner	on <i>Xanthoparmelia</i> sp.	JPH 18711 (sub <i>Miriquidica scotopholis</i> , poor specimen)
<i>Thelomma occidentale</i>	on fence post	iNat 9652761
<i>Trapelia glebulosa</i> (Sm.) J.R. Laundon	common on siliceous pebbles on roadbanks throughout	JPH 18755, KMK 8787
<i>Trapelia obtegens</i> (Th. Fr.) Hertel	siliceous rock in roadbank	JPH 18749
<i>Trapeliopsis flexuosa</i> (Fr.) Coppins & P. James	raied live oak log in oak woodland	
* <i>Tremella phaeophysciae</i> Diederich & M. S. Christ.	on <i>Phaeophyscia orbicularis</i>	JPH 18733
<i>Umbilicaria phaea</i> Tuck.	granitic boulders on grassy hillside	JPH 18712
* <i>Unguiculariopsis lettaui</i> (Grubmann) Coppins	on <i>Evernia prunastri</i>	
<i>Usnea brattiae</i> P. Clerc	<i>Quercus agrifolia</i> branch	JPH 18728
<i>Usnea intermedia</i> (A. Massal.) Jatta	<i>Quercus lobata</i> twigs	TEC not collected, iNat 9664456
<i>Usnea</i> spp. Dill. ex Adans.	<i>Quercus lobata</i> twigs	TEC not collected
<i>Verrucaria fuscoatroides</i> Servit	siliceous rock in roadbank	JPH 18746, 18747
<i>Verrucaria muralis</i> Ach.	siliceous rock in roadbank	JPH 18748
<i>Verrucaria prosoplectenchymatica</i> Servit	siliceous rock in roadbank	JPH 18724
<i>Xanthocarpia crenulatella</i> (Nyl.) Frödén, Arup & Söchting	calcareous rock on ground	JPH 18750
<i>Xanthomendoza hasseana</i> (Räsänen) Söchting, Kärnefelt & S. Y. Kondr.	<i>Quercus agrifolia</i> twig	
<i>Xanthomendoza oregana</i> (Gyelnik) Söchting, Kärnefelt & S. Y. Kondr.	mossy root of <i>Quercus agrifolia</i> on ridge	JPH 18731
<i>Xanthoparmelia mexicana</i> (Gyelnik) Hale	siliceous rock in roadbank	JPH 18753 (sub <i>Caloplaca peliophylla</i>)
<i>Xanthoparmelia</i> spp. (Vainio) Hale	granitic boulders on grassy hillside	nonisidiate specimens we didn't collect

Lichens of Alum Rock Park, Santa Clara Co., California

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The Lichen Consortium (CNALH) lists 119 collections and 62 lichen species found in Alum Rock Park in the Diablo Mountain Range in Santa Clara County near San Jose, California. The total lichen species number is now 79 species, including the recent collections by CALS members, summarized in Carlberg (2018). Albert Herre was the earliest to collect in Alum Rock Park, in 1905, 1906, and 1909; 52 of his records are in CNALH. Two Alum Rock collections putatively by Hasse are likely based on errors identifying the collector. The collection of *Dimelaena oreina* (Hasse 29 [US]) has the same date and location as a collection by Herre at the same institution (Herre 29 [US]). The collection of *Peltula euploca* (Hasse 2300 [ASU]) duplicates the provenance data of a collection by I. Tavares (Tavares 2300), a collection that is also at ASU. It is unlikely that Hasse, working mostly around Los Angeles, personally collected at Alum Rock. Professor A. J. Sharp of Tennessee in 1951 collected a *Cladonia* sp. (duplicates held at Cal. Academy and at TENN) at Alum Rock Park. Shirley Tucker and her husband Kenneth Tucker visited Alum Rock in 1966, as part of her plan to try to visit as many of Herre's collecting spots as possible (this plan did not progress far, as many places were hard to locate). Nineteen of Tucker's collections from Alum Rock Park are in CNALH. Doris Baltzo and Isabelle Tavares visited Alum Rock Park in 1968; there are 29 CNALH lichen records for Baltzo and 19 for Tavares.

The CALS group reported only on macrolichens, mostly corticolous although several of the species can occur on other substrates. The total list herein from Alum Rock Park includes 40 crustose lichens, or ~50% of the known lichen flora of the Park. The list includes 26 rock lichens (32% of the total), mostly crusts but including also peltate or umbilicate ones such as *Peltula* and *Umbilicaria* species. The list includes seven species that grow primarily on soil. Collecting and identifying crustose lichens, as well as those on rock or soil, is likely to yield a complete assessment of the lichen flora of an area.

The CALS article (Carlberg 2018) included the first California report of *Physcia alnophila* (Vain.) Loht., Moberg, Myllys and Tehler. This species was described by Löhtander and others (Löhtander et al. 2009), and only six CA reports are in CNALH, typical for a newly described species. These CA collections of *Physcia alnophila* include mostly old collections by Marshall Howe in 1894 and others through 1944, from Placer, Plumas, San Diego, and Siskiyou counties [NY]. The only recent CA collection reported is one by T. Spribille from Mendocino Co. in 2011 [UBC]. The species has also been collected in OR, Wash., Mont., ID., and Alaska.

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Lichen collections from Alum Rock Park

The collector and institutional location of the collection are given for a few taxa, where the specimen needs further identification or verification. Readers can obtain details in CNALH for any of the collections listed. Synonyms are listed in italics in addition to current nomenclature. *= collected in 2018

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- Acarospora* sp. (rock crust; *D. Baltzo* 677-68 [UC])
Arthonia polygramma (bark crust, *A. Herre* 18 [F])
Arthopyrenia analeptella (*Herre* 3-A [F]; misidentification for *N. Amer.*)
Aspicilia gibbosa = *Circinaria gibbosa*
Athallia pyracea (bark crust) Syn.: *Caloplaca pyracea*
-

Lichen collections from Alum Rock Park (cont.)

Buellia disciformis (bark crust) Syn.: *Hafellia disciformis*
Caloplaca citrina = *Flavoplaca citrina*
Caloplaca luteominia v. *luteominia* = *Polycauliona luteominia* v. *luteominia*
Caloplaca pyracea = *Athallia pyracea*
Caloplaca saxicola (rock crust)
Caloplaca stanfordensis (bark crust)
Caloplaca subsoluta = *Squamulea subsoluta*
Candelaria concolor (foliose on bark)
Circinaria gibbosa (rock crust) Syn.: *Aspicilia gibbosa*
Cladonia coniocraea (fruticose on soil)
Cladonia sp. (fruticose on soil; A. Sharp s.n. [CAS, TENN])
 **Collema coccophorum* (foliose on soil) Syn.: *Enchylium coccophorum*
 **Collema furfuraceum* (foliose on bark)
 **Collema nigrescens* (foliose on bark)
 **Collema tenax* (foliose on soil and rock) Syn.: *Enchylium tenax*
 **Dermatocarpon miniatum* (foliose on rock)
Dimelaena oreina (rock crust)
Dimelaena radiata (rock crust)
Endocarpon pallidum (soil crust)
 **Evernia prunastri* (fruticose on bark)
Flavoplaca citrina (rock crust) Syn.: *Caloplaca citrina*
 **Flavopunctelia flaventior* (foliose on bark)
Flavopunctelia soledica (foliose on bark)
Hafellia disciformis = *Buellia disciformis*
Lecania brunonis (bark crust)
Lecanora horiza (bark crust)
Lecanora muralis (rock crust)
Lecanora pacifica (bark crust)
Lecanora scotopholis = *Miriquidica scotopholis*
Lecanora strobilina (bark crust)
Lecidea atrobrunnea (rock crust)
Lecidea atrolutescens (rock crust) = *Lecidea mannii*
Lecidea fumosa (Herre s.n., MICH) = *Lecidea fuscoatra*
Lecidea fuscoatra (rock crust) Syn.: *Lecidea fumosa*
Lecidea mannii (rock crust) Syn.: *Lecidea atrolutescens*
Lecidella euphorea (bark crust)
Leptogium californicum (foliose on bark)
Leptogium laceroides B. de Lesd. (foliose on bark; A. Herre s.n. [UC])
 **Leptogium lichenoides* (foliose on bark and moss) Syn.: *Scytinium lichenoides*
 **Leptogium palmatum* (foliose on soil and rock) Syn.: *Scytinium palmatum*
Leptogium tenuissimum (foliose on moss and soil)
Miriquidica scotopholis (rock crust) Syn.: *Lecanora scotopholis*
Ochrolechia oregonensis (bark crust)

Lichen collections from Alum Rock Park (cont.)

Parmelia quercina = *Parmelina coleae*
Parmelina coleae (foliose on bark) Misapplied name: *Parmelia quercina*
Peltula bolanderi (peltate on rock)
Peltula euploca (peltate on rock)
Peltula obscurans v. *hassei* (squamulose on rock)
Pertusaria chiodectonoides (bark crust)
Pertusaria hymenaea (bark crust)
Pertusaria pustulata (bark crust)
Phaeophyscia constipata (foliose on soil, moss, or rock)
 **Phaeophyscia hirsuta* (foliose on bark or rock)
 **Physcia adscendens* (foliose on bark)
 **Physcia alnophila* (foliose on bark)
 **Physcia dubia* (foliose on rock)
 **Physcia tribacea* (foliose on rock)
Physconia americana ((foliose on bark; A. Herre s.n. [ASU, F])
Physconia detersa (foliose on bark)
 **Physconia enteroxantha* (foliose on bark)
 **Physconia fallax* (foliose on bark or rock)
 **Physconia perisidiosa* (foliose on bark)
Polycauliona luteominia var. *luteominia* (rock crust) Syn.: *Caloplaca luteominia* v. *luteominia*
Protoparmeliopsis peltata (umbilicate on rock; A. Herre 31 [F]) Syn.: *Rhizoplaca peltata*
Pseudocyphellaria anthraxis (foliose on bark)
Psora luridella (soil crust)
 **Ramalina farinacea* (fruticose on bark)
 **Ramalina leptocarpa* (fruticose on bark)
Rhizocarpon geminatum (rock crust)
Rhizoplaca peltata = *Protoparmeliopsis peltata*
Rinodina badiexcipula (bark crust; S. Tucker 6147 [SBBG])
Sarcogyne regularis (rock crust)
Squamulea subsoluta (rock crust) Syn.: *Caloplaca subsoluta*
Staurothele sp. (rock crust; I. Tavares 227B [UC])
Sticta fuliginosa (foliose on bark)
Thelidium sp. (rock crust; I. Tavares 2289 [UC])
Thelomma mammosum (rock crust)
Toninia aromatica (soil or rock crust)
Umbilicaria phaea (umbilicate on rock)
Verrucaria sp. (rock crust; I. Tavares 2277 [UC])
 **Waynea californica* (squamulose on bark)
 **Xanthomendoza fulva* (foliose on bark)
 **Xanthomendoza hasseana fulva* (foliose on bark)
 **Xanthoria parietina* (foliose on bark and rock)
Xanthoria polycarpa (foliose on bark)
Zahlbrucknerella sp. (fruticose-filamentous; D. Baltzo 1213 [UC]; A. Henssen 1367 1b [UC])

CALS Grants Committee report for the 2018 grant cycle

Hello CALS members! The 2018 grant cycle was a very successful one on several fronts: the grants committee received five applications, all excellent, and with some special help we awarded more grant funding than in any previous year. Applicants requested \$5,711 in funding and CALS was able to provide \$5,000. As reported in the winter 2018 issue, the Board of Directors of the California Lichen Society found that our finances allowed for an increase in grant funding from our baseline of \$1,750 to \$3,000. This was possible because of the generosity and loyalty of all of our CALS members. In addition to the Board's increase, the program received a spontaneous gift of \$2,000 from Dr. Shirley Tucker, who as a grants evaluator for the committee felt that all the 2019 applicants deserved at least partial funding. Many thanks to everyone who helped make 2018 a successful grants year.

In January 2019 the chair of the CALS Grants Committee was passed to Dr. Rikke Reese Næsberg, who was recently selected to fill the newly-created position of Tucker Lichenologist at the Santa Barbara Botanic Garden. She has served very capably on the committee for several years, and I look forward to seeing the program grow under her guidance!

My observations over the years are that grant recipients undertake projects that are more technically advanced, more ecologically challenging, and more profoundly fundamental than in the program's earlier years. I am however pleased to see that basic inventory work continues; Toby Spribille observed in a recent (2008) paper, that in North America, in the last ten years,

“... hundreds of species of crustose lichens have been reported as new to science or new to North America as a result of projects such as the Sonoran Lichen Flora and intensified inventory efforts in eastern North America and the Pacific Northwest/ western Canada. The fact that the rate of new descriptions and first records is not letting up belies the potential depth

of the well of lichen diversity in North America.”

I cannot imagine that the situation in California is any different.

REFERENCES

Spribille, T. & C.R. Björk. 2008. New records and range extensions in the North American lignicolous lichen flora. *Mycotaxon* 105:455-468.

Alpine lichen identification in Kings Canyon National Park

Principal investigator: Dena Paolilli

Graduate Student, Biological Sciences Department, California Polytechnic State University, San Luis Obispo, CA 93407

Funding provided: \$1,000.00

Summary: This project is in conjunction with a Master's thesis monitoring change in high-elevation vascular plant vegetation throughout Kings Canyon National Park, resurveying 150 permanent National Resource Inventory plots that were originally established between 1985 and 1994, in order to directly test for shifts in high elevation plant communities.

Forty plots have already been surveyed for lichens. During the summer of 2019, an additional 110 plots will be surveyed. These data will provide a baseline dataset of species presence and abundance of lichen functional groups, in order to assess future changes in lichen diversity in this sensitive environment. All specimens will be deposited in the Hoover Herbarium at California Polytechnic in San Luis Obispo in agreement with the National Park Service. The final product will be an inventory of lichens in the high alpine of Kings Canyon National Park, submitted for publication at a peer reviewed regional botany journal, such as *Madroño*, and an article for the *Bulletin of the California Lichen Society*.

Improving DNA reference libraries for metabarcoding lichen diversity

Principal investigator: Rachel Keuler

Graduate student, Department of Biology, Brigham Young University, Provo, UT 84606

Funding provided: \$1,000.00

Summary: DNA barcoding has been shown to successfully identify a high percentage of lichen-forming fungi to the correct species and genus, particularly in those cases where the lichen flora is well known. However, DNA barcoding is only as informative as the DNA reference libraries available. DNA-based metabarcoding studies of lichenized fungi are currently limited by the lack of comprehensive, curated DNA reference libraries. The primary objective of this project is to create a more comprehensive DNA reference library by incorporating lichens from a currently under-sampled region.

I intend to sample lichens from the Mojave Desert in February 2019, focusing on species not currently included in our DNA reference library. Samples will be curated at the lichen herbarium of Brigham Young University (BRY-C), the standard DNA barcoding region (the ITS marker) will be amplified and sequenced, and these data will be integrated into our broad DNA reference library. The initial description of the reference library will be complete and submitted for peer-review by January 2020, with a separate article prepared for the Bulletin of the California Lichen Society.

Are lichens always haploid? Challenging the dogma and confirming a novel reproductive possibility

Principal investigator: Carly Anderson Stewart

Doctoral student, Tripp Lab, Ecology and Evolutionary Biology Department, University of Colorado, Boulder CO 80302

Funding provided: \$961.00

Summary: This project will determine for the first time whether or not lichens form diploid or polyploid organisms via bioinformatics pipelines and chromosome visualization techniques. Ploidy—the number of sets of chromosomes in a cell—can be viewed as a type of reproductive methodology. Lichens can theoretically reproduce in many ways: ascospores, conidia, hyphae, and lichenized diaspores of varying chromosome numbers. However, the ploidies of these structures, and the lichen thallus itself, have never been studied. If lichens can produce both haploid (n) hyphae and diploid ($2n$) reproductive tissues, when these are united with haploid (n) conidia, two different types of reproduction have occurred. The products would be diploid ($2n$) tissue and triploid ($3n$) tissue, respectively.

We will use a two-part process. Part 1) We will use a novel bioinformatic pipeline with newly-generated lichen metagenomic data to estimate levels of ploidy. When we have a library of possible non-haploid lichens according to our allele ratio pipeline, we can advance to part 2), chromosome analysis. Performing traditional chromosome squashes using the Germ Tube Burst Method (GTBM) and/or the protoplasm method from available cultures on pipeline-assessed lichens can confirm what the pipeline suggests bioinformatically. Together, bioinformatic data and chromosome analysis can unequivocally confirm or reject the dogma that lichens are haploid. Part 1 of this project is already underway, and initial findings suggest that many lichens are diploid, including lichens from California.

Determining the succession of functional traits in biological soil crusts after a grassland fire

Principal investigator: Brianne Palmer

Doctoral student, San Diego State University and University of California, Davis, Davis CA 95616

Funding provided: \$1,039.00

Summary: Biological soil crusts (BSCs) are important for many ecosystem functions and harbor a high diversity of lichens, mosses, and bacterium. Despite their importance in global ecosystems, BSCs are overlooked in many ecosystem assessments, particularly in California. BSCs are vulnerable to disturbance. Therefore it is important to understand how they are impacted by disturbance, how they undergo succession, and the shifts in their ecosystem roles after disturbance. The purpose of this project is to access the successional pathway of BSCs and the shifts in ecosystem function after a fire in a Southern California grassland.

To study these interactions, I will use a combination of field observations to determine the general community composition, biogeochemistry to understand the extent of the functional change, and shotgun metagenomic sequencing to identify the species composition and functional genes present in the community. The combination of these techniques will allow me to understand the ecological function of BSCs across successional stages and propose a change in the basic successional model from species composition to a functional approach.

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

Principal investigator: Christopher Adlam

PhD Candidate, Department of Plant Sciences, University of California Davis, Davis CA 95616

Funding provided: \$1,000.00

Summary: Recent research shows that lichen communities in California are threatened by altered fire regimes. By removing the canopy, high severity fires eliminate suitable substrates and create hot and dry microclimates that do not support lichen growth, impacting ecosystem process such as nutrient cycling and precipitating a loss of biodiversity. While this loss of habitat is serious, it is also temporary. In the Klamath Mountains, shrubs resprout and become developed by 5 to 10 years after fire, and the canopy closes by 20 to 30 years after fire. Do different lichen species recover at different rates? Which substrates provide important habitat early on in the recovery of lichen communities? Are there factors that affect recovery rates, such as distance to edge of the burn patch, number of surviving trees, or site characteristics (insolation, elevation)?

In a pilot study this summer, I found that lichens were wiped out by high severity fires, but largely unaffected by low severity fire. Because I had only a small sample size from this first effort, I will set up 50 plots in areas that have burned at different severity levels in the past 40 years. Lichens will be sampled using standard plots (11.3m radius). All species will be identified. Abundance will be estimated using standard methods. Multivariate analyses will be used to determine how lichens change over time after fire and what environmental factors affect the recovery process.

News and Notes

Practical index for the Sonoran Flora

Do you have the three volumes of the *Lichen Flora of the Greater Sonoran Desert Region*? Yes? Have you memorized which volume contains the genus that you are currently working on? No? Do you like continually referring to the index in volume III? No? I thought not... CALS member Ken Kellman has not memorized them either (although he's probably getting closer), so he decided to build a tool to help himself out. He has transcribed the accepted taxa from the taxon index in volume III into a two-page PDF file. If you print three copies of this and trim them to size (7.75 x 8.50), you can neatly glue them inside the front cover of each volume, where they will be very handy for all your future work. Every lichenologist who uses these absolutely *loves* them. As for myself, I now only use the official index when I need to find one of the taxa that are *not* accepted by the authors of the *Sonoran Flora*. Visit <http://californialichens.org/resources/> to download.

—Tom Carlberg

Bruce Ryan's lichen glossary

Ampliarate.
D-layer.
Filiform sciophilous lirella.
Trichogyne.
Epipsamma.
Alutaceous.

The 53 page glossary of lichen terminology compiled by the late Dr. Bruce D. Ryan remains an exhaustive resource for novices and experienced alike, defining and distinguishing lichen vocabulary from the vague and obscure to the conspicuous and clear. Obsolete terminology (platygonidia etc.) is included, which may be useful and/or interesting to those working with historical records and documents. Visit <http://californialichens.org/resources/> to download.

—Tom Carlberg

Tucker luncheon

On March 15, friends of CALS gathered at the Santa Barbara Botanic Garden for a luncheon honoring Dr. Shirley Tucker for her many contributions to the garden, including the recent endowment of a permanent lichenologist research position (a first for the state!). Dr. Rikke Reese Næsborg, the garden's first Tucker Lichenologist, organized the event, where she and CALS president Tom Carlberg gave presentations. Rikke discussed her plans for exciting new lichen research and Tom gave an overview of Dr. Tucker's long history with CALS, including several fun historic photos. The luncheon concluded with a visit to the new state-of-the-art underground fire-proof herbarium (nearly 36,000 lichen specimens!) and a sunny tour of the garden's extraordinary outdoor collections.

The next day, Rikke organized an excursion to Santa Cruz Island for the local and visiting lichen enthusiasts. After several stops for whales, we finally reached the island and could begin lichenizing. Favorites of the day included finding the fog lichens *Niebla polymorpha* and *Niebla cephalota*, discovering a crusty lichen growing on soil (*Thrombium epigaeum*), photographing those cute *Riccia* liverworts, a debate about California's sorellate *Ramalina* species and the sight of 11 lichenologists out having a great time. Many thanks to Rikke and the Santa Barbara Botanic Garden for organizing this fun event and to Shirley for making it all possible.

—Jes Coyle

Call for reviewers

The CALS Bulletin Content Editors are seeking reviewers! If you are interested in contributing to CALS by helping to review articles submitted to the bi-annual Bulletin, please let us know at editors@californialichens.com. We are especially interested in folks with expertise in systematics, ecology and evolution, and/or genomics.

Blitzing at Sam McDonald

Despite intermittent rain, a dedicated group of BioBlitzers explored the varied habitats of Sam McDonald County Park on March 2, 2019. This Blitz was part of the ongoing partnership between CALS, Sequoia Audubon Society, California Academy of Sciences, and San Mateo County Parks (see <https://www.inaturalist.org/projects/san-mateo-county-parks-bioblitzes> for an overview of this partnership). Attendees included some significant CALS leaders and members, including CALS President Tom Carlberg.

This was 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 at Stanford to become the Superintendent of Athletic Fields for the university. He left his extended properties in La Honda for the betterment of the community and especially for children. For additional information on the park and Sam McDonald: <https://parks.smcgov.org/sam-mcdonald-park-history>.

Before the Blitz started, I had boasted that we could

observe 20 different lichen species; Tom looked at me askance. He was right to doubt: we would only get 19 named species (and seven other genus-level entries)! Due to our wet weather, fungi and lichens were well-represented overall, accounting for nearly 40% of the 212 species observed. Twenty-eight observers recorded over 1000 observations on iNaturalist: truly a blitz! (see <https://www.inaturalist.org/projects/2019-sam-mcdonald-park-bioblitz> for full results)

Lichenologists from beginners to experts are a tremendous asset to BioBlitzes, not only because we care about lichens, but our attentive eye to small objects can reveal insects, fungi, and more. But we also benefit from the Blitzes, as we attract new enthusiasts to our lichen passion. This happened with a newcomer, who was enchanted by the variety of lichens on the back of a road sign, and then kept shadowing the lichenologists in her group. It was like introducing a kid to the concept of a candy shop!

Stay tuned for future BioBlitzes with this partnership. One is being planned in the fall at Devil's Slide County Park - a rich habitat for *Niebla* and crustose rock lichens.



Happy Post-Blitzers (left to right) Donna Pomeroy (SAS), Rebecca Johnson (CAS), Dwight Agan, Tom Carlberg (CALS), Robert Siegel (CALS), Leslie Flint (SAS), JK Johnson (CALS), Jennifer Rycenga (SAS, CALS), Tom V (CALS), Katherine Wright (San Mateo County Parks), Alison Young (CAS)



Grumpy Post-Blitzer Clowns - Tom Carlberg and Robert Siegel having some goofy fun post-Blitz

Tentative species list from the Sam McDonald County Park BioBlitz:

Oakmoss (*Evernia prunastri*)
 Common Greenshield Lichen (*Flavoparmelia caperata*)
 Ciliate Strap Lichen (*Heterodermia leucomela*)
 Beaded Tube Lichen (*Hypogymnia apinnata*)
 Imshaug's Tube Lichen (*Hypogymnia imshaugii*)
 Hooded Tube Lichen (*Hypogymnia physodes*)
 Rim Lichens (*Lecanora*)
 Bitterwort Lichen (*Lepra amara*)
 Dust Lichens (*Lepraria*)
 Skin Lichens (*Leptogium*)
Lobaria anomala
Lobaria anthraspis
 Tree Lungwort (*Lobaria pulmonaria*)
 Crab's Eye Lichens (*Ochrolechia*)
 Ruffle Lichens (*Parmotrema*)
 Tree Pelt Lichen (*Peltigera collina*)
 Pore Lichens (*Pertusaria*)
 Rosette Lichens (*Physcia*)
 Varied Rag Lichen (*Platismatia glauca*)
 Lace Lichen (*Ramalina menziesii*)
 Tuckerman's Coral Lichen (*Sphaerophorus tuckermanii*)
 Peppered Moon Lichen (*Sticta fuliginosa*)
 Variable Wrinkle Lichen (*Tuckermannopsis orbata*)
 Arizona Beard Lichen (*Usnea intermedia*)
Usnea ceratina
 Red Beard Lichen (*Usnea rubicunda*)

—Jennifer Rycenga

The Bulletin of the California Lichen Society as an Open Access journal

On several occasions during the past few years an interesting idea has come up in regards to member and public access to the Bulletin of the California Lichen Society and the increasingly popular opinion that scientific information of any kind should be freely available. This opinion has developed to the point that there are now thousands of publishers granting access to their content outside of traditional subscription-based business models. Please note that this is not always a matter of giving freely what was once sold; there are numerous definitions of open access (OA), and many implementations of the concept, i.e. Gold

OA, Bronze OA, Gratis, Libre, etc. etc. Some open access journals solicit fees from authors who wish to make their individual works OA; other journals include both OA and non-OA content. Wikipedia has a simple explanation of basic open access concepts. More elaborate descriptions are readily available; see Peter Suber's work at <http://legacy.earlham.edu>

Until now, CALS has reserved for its members the online and paper access to the two most recent years of the Bulletin. All issues of the Bulletin older than two years have *always* been available to anyone to read, download or distribute, subject to the copyright all authors retain for their own work, and the copyright that CALS retains for any complete issue of the Bulletin. This is pretty much the way Bronze OA operates.

It is easy to think of your membership dues as a subscription to the Bulletin, but they are not and never have been; your dues (and donations; thanks to so many of you!) help to fund our very active grants program, make it possible for CALS to have a presence at conferences and symposiums, and of course pay for the printing costs of the Bulletin.

The CALS Board of Directors has decided on the following definition and guidelines for open access for the Bulletin of the California Lichen Society; we wish to keep it simple, so here it is:

- Peer review of major articles will still take place
- Complete issues of the Bulletin of the California Lichen Society remain copyrighted by the California Lichen Society
- Authors and photographers still retain ownership of their work, and have permission to use and distribute their submitted material and photos

So far this is just as it has always been; read the inside front cover of any Bulletin issue after winter 2013.

The most important thing that we are changing is that

- Beginning with Volume 26 issue 1 (summer 2019, the issue you hold in your hand), the eBulletin version of this publication will be available on our website at no charge

Paper copies will still be mailed out to members in good standing who have requested hardcopy. This

decision is in response to repeated and reasonable discussions during the last three years that CALS should make our Bulletin open access. This does not mean that CALS no longer needs your support! “Gratis” means that material in the Bulletin is free to read; it does not mean that it is free to produce. We *sincerely* hope that CALS members will not relinquish their memberships because of this change.

The most important potential advantages surrounding this change for both CALS and the public are:

- Increased access for libraries
- Increased submissions from authors, knowing their results will be more widely distributed more quickly
- Googling for an author’s work can lead a reader to the CALS website rather than to other venues
- In line with this increased web presence, OA can bring broader international relevance and readership
- Publicly-funded research is immediately available to the public that funded it, at no charge
- A potential uptick in CALS memberships when more people realize we freely publish current up-to-date research
- Increased support and interest as people realize that we support open-access publishing
- An assumption that even if we do not grow as a result, we will probably not suffer

Rest assured, we will closely monitor our membership rates over the next year or so, but our hope is that you will continue to support California lichenology through CALS just as you have always done.

—Tom Carlberg
on behalf of the CALS Board of Directors

Upcoming Events

Northwest Lichenologists Foray

Astoria, OR, September 17

This year's NWL Foray will be held at Lewis and Clark National Historical Park in Astoria, OR, 17-19 September 2019. This promises to be a really fun outing, with a spectacular array of lichens. We will camp on the lawn of a Park-owned house, with a kitchen and great room available for cooking and our work. Please contact Daphne Stone (daphstone@gmail.com) to reserve a spot.

Certified Lichenologist Exam and Training Offered by Northwest Lichenologists

Charleston, OR, October 4 - 6

This is the every-other-year west-side lichen certification, open to anyone. The exam is offered every two years, and the location is changed each year, so this will be a great opportunity to be certified in Oregon. After this year, the next exam will be held in 2021, and will probably be in Washington.

The NWL Lichen Certification Exam will take place 4-6 October at Oregon Institute of Marine Biology, in Charleston OR. This is the first time we will hold the exam and training right on the coast, highlighting lichens that require cool moist conditions found there. The exam will be challenging but rewarding, with the opportunity to find some strictly coastal species. The training is for those who want to learn more about lichens; we will search a plot together and go through what we find using various keys, with the examiners to help. As in recent years, we will also offer this event as a learning experience, teaching newcomers to the field of lichenology how to identify lichens as well as a bit about their ecology and importance. Examiners are Daphne Stone and Adrienne Kovasi.

THIS YEAR: You can choose to attend the certification as a training, instead of an exam with certification. You will still collect lichens on the plot but after collection, you will work through your identifications with help from the examiners, both lichenologists. This gives you a chance to learn how to work on difficult genera. Relevant literature will be shared with these trainees.

WHY DO IT? Lichen Certification is a valuable addition to your resume, agency botanists and private contracting companies view it as a plus when considering who gets federal contracts and internal jobs.

LODGING: Oregon Institute of Marine Biology's cottages hold several participants and each cottage has a shared kitchen and multiple bedrooms. Attendees should bring and prepare their own meals or walk down the street to a restaurant. **TIMING:** Check in Friday evening, Oct 4. Exam starts 8:30 a.m. on Saturday, Oct 5, finishes by 4 p.m. on Sunday.

COST: Cost will be \$100 plus lodging and facility rental (\$81) for a total of US\$181. Cost and registration are the same whether you are doing the training or the certification.

REGISTRATION: Registration is open from April 14 to Sept. 27, 7 days before the event. Payment is required for registration. To reserve your spot, register at <http://northwest-lichenologists.wildapricot.org/>

Northern California Lichen Retreat

Weaverville, CA, October 12 - 20

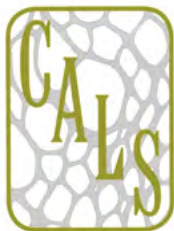
Eric Peterson is planning to take a week for lichens and lichen interested folk are invited to join. Rather than a short trip with a detailed schedule, this is a long-duration event with a casual come-and-go attitude for whatever time you have. One or both weekends may have overnight camping/hiking trips into higher mountains. Weekdays will be a combination of day trips and microscope time at the Peterson house. Good food and drink are likely too. Camping for a few is available at the house, more at nearby campgrounds. For more information contact Eric: epeterson@calacademy.org

Summer Lichenology Field Seminars at Eagle Hill Institute: Crustose and Foliose Lichens

Taught by Fred Olday

Steuben, Maine, October 25-27

Eagle Hill is located on the coast of Eastern Maine, between Acadia National Park and Petit Manan National Wildlife Refuge. Visit the Eagle Hill Institute website for more information: www.eaglehill.us



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 normally 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 NDDDB'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, 2019**. The current Chair is Rikke Reese Næsborg.

President's Message

Dear CALS members – Our committees are changing!

Our long-standing Conservation Committee Chair, Eric Peterson, has decided to step down from the chair, and has asked John Vilella to step in his place. John has agreed, and hopes to foster new efforts for sponsoring and conserving California's rare lichen species. They intend to make the transition in September, at the committee's in-person meeting. The committee has recently begun exploring some options around the concept of Important Lichen Areas, similar to the Audubon Society's Important Bird Areas, or the California Native Plant Society's Important Plant Areas. This could conceivably fit into California's Biodiversity Initiative, or perhaps add habitat-based conservation to our existing species-based efforts.

I was curious to see how long Eric had chaired the committee, so I consulted Bulletin back issues, a reliable source but a lengthy task, now that there are 25 years' worth of issues. I was shocked to find that he assumed the chair position 17 years ago, in 2002! Prior to that it was in the able hands of David Magney and Charis Bratt. The committee was started in 1998, when CALS was only four years old.

Another change – With the Board's approval I have handed the chair of the Grants Committee to Rikke Reese Næsborg. Rikke is a very highly qualified lichenologist, having taken a Ph.D. from Uppsala University for her taxonomic revision of the genus *Lecania*, based on molecular and morphological characters. She is also an accomplished canopy researcher (see "What's in the trees at Muir Woods", CALS Bulletin 21:1), and most recently has accepted the brand-new position of Tucker Lichenologist at the Santa Barbara Botanic Garden.

Not only are our committees changing, but the Society as a whole is moving forward. At the annual members meeting at Quail Ridge last January, members and Board members alike voted strongly in favor of changing the Bulletin to a completely open-access journal. It's not a completely comfortable step for CALS, which depends on membership dues and

generous member donations (thank you all!) to print and distribute our Bulletin, and to fund our grants program. Concerns were expressed that we might lose members, now that *anyone* can access all issues of the Bulletin at any time. We will have to see how this evolves. For a more complete understanding of what the change to open access entails, see the announcement in our News and Notes section.

If these changes sound interesting to you, perhaps it's time to get more involved!

Best to all,
Tom

Tom Carlberg
President@californialichens.org



SUE CALLA

Bioblitzing with Betty White at Marin Headlands



CALIFORNIA LICHEN SOCIETY

PO Box 472, FAIRFAX, CALIFORNIA 94978

The California Lichen Society (CAL S) 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 CAL S 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

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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

Board Members of the California Lichen Society

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Vice president: Hanna Mesraty, VicePresident@californialichens.org

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Treasurer: Kathy Faircloth, Treasurer@californialichens.org

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Committees of the California Lichen Society

Conservation: Eric Peterson, Chairperson, Conservation@californialichens.org

Grants: Rikke Reese Næsborg, Chairperson, Grants@californialichens.org

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Photos from the Tucker Luncheon at Santa Barbara Botanic Garden and excursion to Santa Cruz Island

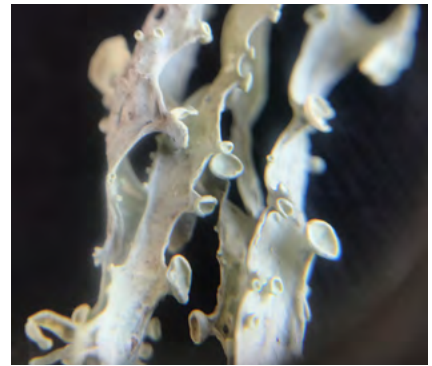
Clockwise from upper left: Lichenologists gather at the Santa Barbara Botanic Garden to celebrate Shirley Tucker (From left to right, in the front row: Adrienne Kovasi, Roger Rosentreter, Shelly Benson, Jes Coyle, Linda Geiser; back row: Julene Johnson, Rikke Reese Næsborg, Tom Carlberg, Charis Bratt, Ken Kellman, Hanna Mesraty, Daphne Stone; center, Shirley Tucker); *Lecanora caesiorubella*; *Ramalina leptocarpha*; lichenologists excited to be on Santa Cruz Island; CALS President, Tom Carlberg, and Northwest Lichenologists President, Daphne Stone, put their heads together to ponder the lichens of Santa Cruz Island.



RANDY WRIGHT, COURTESY SANTA BARBARA BOTANIC GARDEN



HANNA MESRATY



HANNA MESRATY



HANNA MESRATY



JULENE JOHNSON