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Front Cover: *Lepraria pacifica*, from Tolumne Grove in Yosemite. See article by J. Lendemer page 1. Image by James Lendemer.

# Bulletin of the California Lichen Society

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## Why *Lepraria*? Why Lichens? Eight years of studying *Lepraria* in California.

James C. Lendemer

Institute of Systematic Botany  
The New York Botanical Garden  
Bronx, NY 10458-5126, U.S.A.  
jlendemer@nybg.org

My name is James Lendemer and I'm a student working on my PhD at the City University of New York and The New York Botanical Garden in New York City. In 2008 I received a student grant from CALS to support my dissertation studies on the sterile lichen genus *Lepraria*. Although I used the funds in the first year of my work, I waited to submit this article to the Bulletin because the funding was used primarily to generate data that is beginning to be published now that I have nearly finished my dissertation.

My introduction to California almost a decade ago was a fitting one. After years of e-mails and phone calls to my friend Kerry Knudsen, we were finally going to meet in Riverside. At that time I was working for Tom Nash at Arizona State University. Tom had hired me to manage the lichen herbarium after Bruce Ryan's passing, and I moved to Tempe in the height of summer. (Everyone reading this should beware of invitations to Phoenix in the dead of winter, that's how they get you hooked!) Despite my close proximity to the *Lichen Flora of the Greater Sonoran Desert Region*, both the actual living flora and the printed books, I didn't have much opportunity to explore the natural habitats

of Arizona because I didn't drive or own a car. So you can imagine how excited I was when Kerry invited me out to California to explore the mountain ranges of southern California with him for a week. Without any coaxing I bought a bus ticket and rode the Greyhound from Phoenix to Riverside. As the desert of Arizona and eastern California gave way to date palms, hills covered with grasses, and mountain ranges coated with scrub I had no clue what lay ahead. And I certainly didn't know that the trip would set in motion a study of *Lepraria* that would consume much of the next decade of my life.

Kerry met me at the bus station in Riverside, and after brief introductions we drove off towards the Santa Ana Mountains. Climbing the crest of a ridge on a winding road I received the first of many lessons on Californian geology. I also saw many lichens for the first time outside of the color photos in Ernie Brodo's *Lichens of North America*. Although *Xanthoria elegans* and *Lecanora muralis* may not be the rarest gems of the California lichen biota, they were considerably more festive than the lichens I was used to back east in Pennsylvania. We even found the shiny brown crustose



lichen *Miriquidica scotopholis*, though at the time we didn't know what it was because the concept of it was confused (Knudsen & Owe-Larsson 2005, Lendemmer & Knudsen 2008). Eventually we made our way to a series of crumbling rock walls along an old dirt road. There, covering the decomposing granite, was a strange green crustose lichen. It was sterile, and most people at that time probably wouldn't have collected it. But having a natural aversion to following contemporary wisdom we collected ample material. We could not have known it would take another three years before Kerry could collaborate with Jack Elix in Australia to finally ascertain that this species produced argopsin and was new to science. They formally described it as *Lepraria santamonicae*, a California endemic (Knudsen & Elix 2007).

After stopping at several more sites we drove through the mountains to Kerry's house. There we talked over gin and tonics well into the evening. The next day we made our way to the heights of the San Jacinto Mountains where we visited an unusual ravine along the North Fork of the San Jacinto River. This ravine was narrow and deep, cool and shaded, and perhaps most importantly it was moist. Every surface was carpeted with *Lepraria*. I had seen some of these lichens back east, however the ones at North Fork were entirely different. In my zeal I made many collections, especially of a species with a thick felty thallus. Only later would I learn that this had been my first encounter with *Lepraria rigidula*, a rare species in central and southern California that is more common further north.

During the rest of the week we visited

many more sites, and at each one I found myself focusing on the sterile lichens. For someone in their early twenties it seemed remarkable that any organism would give up sex and reduce itself to tiny cotton balls that resemble dust and divide endlessly into the future. Needless to say, when I returned to Tempe I had a huge box of what *Lichens of North America* refers to as the dust lichens. After learning the basics of Thin Layer Chromatography from Tom I spent several months attempting to identify what I collected. When I returned east later that year to continue my undergraduate studies in Philadelphia I brought my box of *Lepraria* with me.....many remained unidentified.

Each subsequent year that followed, Kerry and I would make arrangements to spend a week or so exploring the lichens of California, and on each trip I would return with another box of *Lepraria* and a mind full of field observations. We



**Figure 1.** Terraces formed by *Lepraria caesioalba* in Tuolumne Meadow in Yosemite, CA. Photo by James Lendemmer.



continued to search the mountain ranges of southern California, collecting in the Santa Anas, San Bernardinos, Santa Monicas, and San Jacintos where we found isolated remnants of a more northern lichen biota. Encountering an entire wall of the northern species *Lepraria eburnea* on Palomar Mountain is particularly memorable. Soon Kerry began working in coastal habitats, such as those at Torrey Pines State Park and Point Loma in San Diego. There for the first time I was able to see the unusual coastal species *Lepraria xerophila*, which Tor Tønsberg had described in the Sonoran Flora. Growing with it was a less showy blue lichen which TLC revealed contained pannarin and zeorin. I had previously encountered the blue spot of pannarin while studying *Lepraria* from Pennsylvania and the Ozarks. Thus we connected the geographically disparate populations of a species we described as *Lepraria adherens* (Knudsen *et al.* 2007). Growing with *L. xerophila* and *L. adherens* at Point Loma, Kerry found another unusual species with pannarin and zeorin. It would take another three years for me to describe it as *L. terricola*, another rare California endemic (Lendemer 2010). One year we decided to attend a meeting of CALS where Kerry was scheduled to give a talk. We drove up the coast and spent time in Morro Bay, collecting in the unique chaparral communities, coastal bluffs, and riparian willow woodlands. Then we made our way to San Francisco where we attended the meeting and several local field trips (the Doells were wonderful hosts, and made a good martini!).

And so it was that in 2007 I found myself beginning my PhD studies in New

York City. I moved into an apartment in The Bronx and an office in the top floor of the museum building at the Botanical Garden. From my desk I could see the lush greenery of the grounds through my window and, more importantly, the boxes brimming with *Lepraria* stacked all around me. Earlier that year it had become clear to me that contrary to popular belief, there were discrete micro-morphological differences between *Lepraria* species (Lendemer & Harris 2007). The first course I took as a graduate student was Dominick Basile's techniques in microscopy. Starting then, and continuing for three years, I spent one day each week examining how *Lepraria* thalli were organized using a scanning electronic microscope. During this time I developed a system to describe the thallus of *Lepraria* and implemented a preliminary version to describe a new endemic species from the southeastern Coastal Plain, *L. friabilis* (Lendemer *et al.* 2008). This was when I decided to undertake a revision of *Lepraria* in North America as the topic of my dissertation.

From my previous experiences in California I knew that many species of *Lepraria*, including several that were apparently new to science, occurred in the state. Some of these species were unlike others in the genus and thus understanding them would be critical to understanding *Lepraria* as a whole. Since California figured so prominently in my early fieldwork, and hosted such a wide diversity of *Lepraria* species, I knew it would be an important part of my dissertation. So I applied for funding from CALS to support the cost of generating DNA sequences from some of my

specimens. I also requested funds to allow me to purchase more plates for TLC so that I could identify more of my collections from California and abroad.

While working up my collections from California I also borrowed on loan all of the *Lepraria* collections from the Santa Barbara Botanic Garden herbarium and the University of California Riverside herbarium. Going through these collections I came across an unusual lichen that Kerry Knudsen had collected on the Channel Islands and in Lime Kiln State Park along the Central Coast. At first we thought the species might be *L. lecanorica* which Tor Tønsberg described in the Sonoran Flora. However eventually TLC and aid from Jack Elix confirmed that the species produced erythrin, a substance typically found in the Roccellaceae which is a common family in coastal lichen communities in California. Kerry visited the site on the Channel Islands again and discovered a fertile population. This confirmed not only that the species was not a *Lepraria*, but that it was in fact an unusual member of the genus *Lecanographa* in the Roccellaceae. Unlike all of the other species in the genus, this lichen had somehow commandeered a green coccooid alga for its photobiont rather than the typical chain forming *Trentepohlia*. And so, we described *Lecanographa insolita*, another California endemic (Lendemmer & Knudsen 2010). While checking all of the specimens on loan from Santa Barbara I discovered that Shirley Tucker and Cherie Bratt had collected *L. insolita* several times on the islands and on the mainland near Santa Barbara. They had correctly guessed the species belonged to the

Roccellaceae (I'm not quite sure I could have done that from sterile specimens!) and sent some to the lichenologists working on that family for the Sonoran Flora. The specimens came back marked as not Roccellaceae, presumably because the lichen had the wrong photobiont.

The first batch of DNA sequences I generated with funding from CALS formed the first piece of a dataset representing more than four hundred individual specimens of *Lepraria*. I attempted to obtain DNA from many more samples than that, but contamination is a frequent problem with the genus because the loose airy thalli apparently provide the perfect home for quite a diversity of other unrelated fungi. These data taken together have formed the backbone of a series of revisions of various groups of *Lepraria* where molecular data was used to examine the circumscriptions of species. The first of these studies has been published in *Mycologia* (Lendemmer 2011) and involves the populations that have collectively been referred to as *L. incana* over the years. This study confirmed that the populations from western North America represent a distinct species that is chemically similar to *L. incana*. I named the species *L. pacifica* because it occurs frequently on the bark of conifers that are endemic to western North America. The type specimen came from an expedition to Yosemite National Park that Bruce McCune and Martin Hutten invited me to participate in. Indeed, the species is quite common in the redwood groves of Yosemite.

As was mentioned above, I used the hundreds of micrographs collected during my lonely days in the SEM lab in the

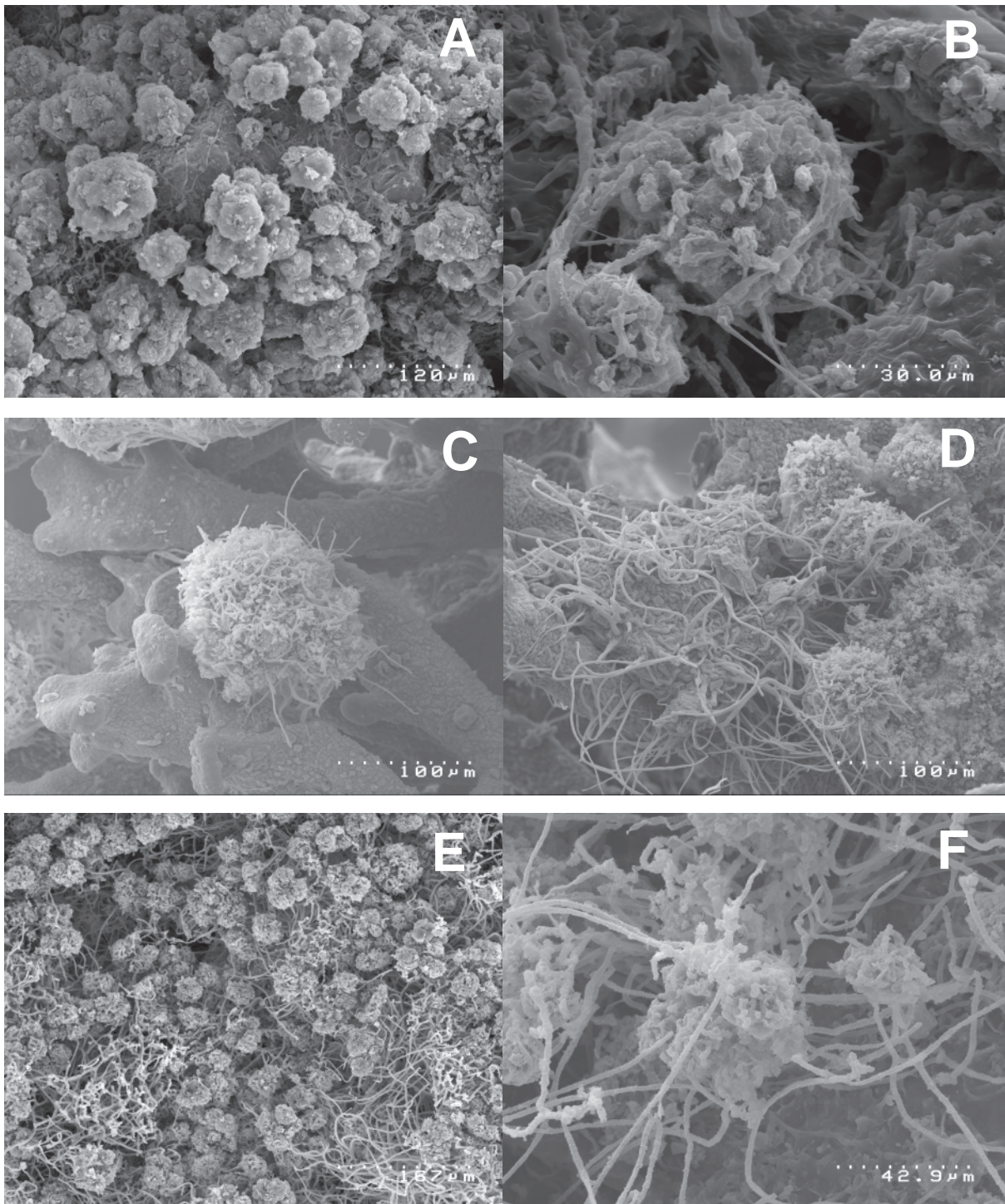
basement of Lehman College in the Bronx to form the basis of a new system to understand how *Lepraria* thalli are organized. These micrographs, reinforced by the results of the studies mentioned above, allowed me to cement my morphological concepts. This culminated in the publication of a paper in the *Lichenologist* (Lendemer 2011a) that was a profusely illustrated guide to describing the morphology of *Lepraria*.

It is hard to believe that nearly five years have passed since I arrived in New York, and it is even harder to believe that I've spent eight years on *Lepraria*. Now, as my dissertation studies draw to a close the papers based on my fieldwork in California and the laboratory studies funded by CALS are beginning to be published. I would like to take this opportunity to thank CALS for supporting my work, and I would like to thank Kerry Knudsen for exposing me to CALS.

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**Figure 2.** SEM (Scanning Electron Micrograph) images of *Lepraria*. A and B are *Lepraria elobata* (Lendemer 9804). C and D are *Lepraria caesioalba* (McCune 29620). E and F are *Lepraria squamatica* (Elix 37755).

## Parasites

Kerry Knudsen

33512 Hidden Hollow Drive, Wildomar, CA 92595

kerryknudsen999@gmail.com

In healthy woodland that has not burned recently, the leaves and twigs of California oaks are adorned with many conspicuous multi-colored galls. They are formed by over 150 species of gall wasp. The gall wasp eggs hatch inside the gall and are parasitic on the oak tissue of the tumor-like gall. Research on gall formation has shown that some galls are formed by the genes of the parasite manipulating the genes of the tree (Zimmer 2001). The wasp can be identified by the shape, color, and size of the gall (Russo 2007). The galls are specific to certain species of oaks and certain parts of the trees. They are harmless to the oaks and form an important part of oak woodland ecologies. In one study, one species of gall wasp supported 70 other insect species, including parasites on the wasp as well as other herbivores that ate the galls (California Oaks Foundation 2011). One can enjoy identifying galls using the excellent *Field Guide to Plant Galls of California and Other Western States* published by the University of California Press (Russo 2007).

We often think of parasites as horrible things. There are giant tapeworms six feet long that live in the human intestine. Blood flukes can penetrate your legs as you wade in a cool pond. Ticks suck blood as they swell up like a balloon on your back after a summer hike. And they are horrible if you have one! A great read is

Carl Zimmer's modern popular science classic *Parasite Rex* (2001). Many parts of this book can give you nightmares and phobias. But the final message of the book is quite different.

Nature is full of parasites. A healthy environment has not only a diverse amount of species of mammals, birds, amphibians, reptiles, fish, insects, plants, mushrooms, and microorganisms, but it has even a greater diversity of parasites from bacteria and fungi to protozoa, nematodes, tapeworms, insects, and even vascular plants like mistletoe. For instance in a Costa Rican rainforest reserve, parasitologist David Brooks estimated for 940 vertebrate species there were an unbelievable 11,000 parasite species (Zimmer 2001). In another study in Canada, healthy eels in unpolluted rivers and streams were found to contain many parasites, while those in a polluted river contained none (Zimmer 2001). Recently Armand Kuris, professor of zoology at UCSB, said, "Parasites are at least half of all biodiversity. And they are different in some very basic ways than other life forms. However, ecological science usually ignores them. How can we possibly understand how life works if we don't look at half of the species -- the parasites?" (Science Daily, 2011).

Lichenicolous fungi, which are parasitic on lichens, are considered bio-indicators of the long ecological continuity of a habitat. For instance, you find them in

California in relatively undisturbed habitats, where they often are equal to ten per cent or more of the lichen species present. The best recent places where Jana Kocourková and I have collected lichenicolous fungi are on the north Channel Islands and in Joshua Tree, both national parks containing many undisturbed habitats. A healthy lichen flora usually has lichenicolous fungi. Though it should be kept in mind that some habitats, with no history of disturbance, may have few or no lichenicolous fungi, but usually this is because of low relative humidity or very low lichen diversity dominated by species that have no known fungal parasites.

Recently in the Sierra Nevada Mountains, along Highway 140 and the Merced River in the Sierra National Forest, I spent a few days collecting with Alan Fryday and Martin Hutten. We were interested in the lichens on the quartzite walls along the highway because several new records for California and even one for North America had been found at Pigeon Gulch during the Yosemite Bioblitz organized by Bruce McCune (Lendemer *et al.* 2010; Fryday unpublished).

Over sixty years ago the outcrops of quartzite on the north side of the Merced River had been dynamited, scrapped, and exposed to build Highway 140. This past disturbance was immediately evident as we began exploring the quartzite walls along the highway. Most had no lichens or only a few hardy species. It was obvious the rock outcrops and road cuts had not fully recovered from the building of the highway, despite the excellent growing conditions for lichens including a northern

exposure and high relative humidity.

I concentrated on hunting for lichenicolous fungi, scanning meters and meters of lichens with my hand-lens. It was exceedingly boring like fishing without getting a bite. I found no lichenicolous fungi on the quartzite walls along Highway 140.

We finally ended up back at Pigeon Gulch. The area had been disturbed by the building of the Highway 140 as well as by the operation of a barium mine. But somehow a diverse community of lichens had survived. Again I had no luck finding any lichenicolous fungi on the abundant lichens. This lack of lichenicolous fungus convinced me the founding population had been small. Maybe it had grown high up on an adjoining rock outcrop that was now buried beneath moss and dirt, out of the reach of heavy machinery and dynamite. In the last sixty years lichens had spread and recolonized a couple hundred feet of quartzite wall. But somehow a diverse community of lichens had survived on the rock wall between Pigeon Gulch and Cold Canyon.

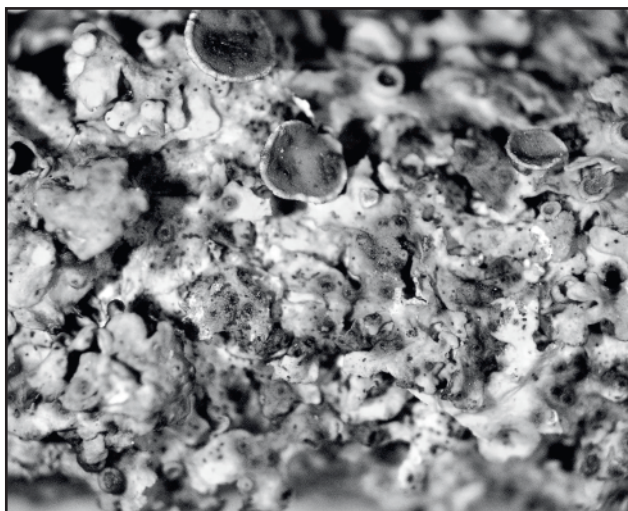
Giving up on the rock wall, I carefully climbed up Pigeon Gulch on wet rocks on the side opposite the trail. The gulch too had been disturbed during barium mining but one side of creek was a rocky wall and some boulders which had probably been undisturbed. Here, during the Bioblitz, I had collected rusty iron-loving *Ionaspsis lacustris* (With.) Lutzoni growing with the equally ferriphilous *Acarospora sinopica* (Wahlenb.) Körb., both new for California. I edged over the boulders enjoying the spray from the creek and its gentle roar. Then I slipped, banging my elbow hard on the rock. I scrambled back on my feet. It



hurt and I held my elbow in my hand. I considered climbing back out before I slipped again. But then I saw a thick patch of lichens on the wet rocks and my curiosity grew as the pain dulled. I wiped off my misting hand-lens. Feeling better, I hunkered down.

There were many wet brown thalli of *Lecidea fuscoatra* (L.) Ach., a common species in both Europe and North America, mixed with *Ionaspsis lacustris* and *Acarospora sinopica*. Immediately I spotted on *L. fuscoatra* the galls of a lichenicolous fungus. The galls were the same color as the thallus, with many perithecia, and did not appear to cause any serious damage to the lichen, which remained fertile and healthy-looking. It was not hard to guess the galls probably belonged to a *Polycoccum* or another genus with many gall-producing species. I collected a small specimen for identification (Knudsen 13646, UCR).

Like oak galls, lichen galls are conspicuous (Fig. 1). As you can see in this picture of *Polycoccum slaptoniense* which grows on *Xanthoria parietina* in Europe, like oak galls they are swollen and rise above the thallus surface, and can even be a different color than the host. The galls on *Lecidea fuscoatra* looked just like the galls of *Pyrenidium aggregatum* K. Knudsen & Kocourk. on *Phaeophyscia* (Fig. 2), but were brown. I couldn't wait to get back to UCR and my microscopes. Anyway, the rest of the trip I found no more lichenicolous fungi on the quartzite walls and road cuts along the north side of Highway 140. I often finished an hour early, popped the cap off a green bottle of Pilsner Urquell, and watched the river flow as I waited for Alan and Martin to get



**Figure 1.** *Polycoccum slaptoniense*. Photo by: Jana Kocourková.

back to the car.

Back at the UCR herbarium the next week, I quickly identified the collection as *Polycoccum kernerii* while chatting with Jana Kocourková on Skype. It has abundant branching interascal filament and dark 1-septate ornamented ascospores with a distinct gelatinous sheath, 13-16 x 7-8.5  $\mu\text{m}$ . What was especially exciting was not only was it new to California, it was only the second report for North America. It was originally collected by Hans Hertel and Tom Nash in Arizona in Coconino Co on Mongollen rim on *Lecidea tessellata* at about 2300 meters (Hafellner *et al.* 2002). Despite the type host *Lecidea fuscoatra* being quite common in Europe and North America, *P. kernerii* is currently globally rare known from less than ten collections from Europe (Czech Republic, Great Britain, France, and Greece) as well as Canary Islands in North Africa (Kocourková 2000). In Europe, there have been a relative large number of mycologists and lichenologists actively collecting lichenicolous fungi

since the 19th century. Few reports on a common lichen species are a real sign of rarity. In North America, with few collectors and much more unexplored habitat, we may find an area where *P. kernei* is frequent. Maybe. But I have looked at a lot of *Lecidea* in the field over the last ten years and never seen any galls before.

Probably *Polycoccum kernei* spread to California long ago as glaciers pushed Holarctic lichens and their parasites south and covered Washington with mile-thick sheets of ice. It possibly thrived in that unglaciated stretch of the quartzite-rich area along the Merced River, while ice carved Yosemite Valley from granite. As California dried out over the last 10,000 years it persisted in the high relative humidity along the river. But it had barely survived the 20th century, an active barium mine and the building of Highway 140.

Now *Polycoccum kernei* and some of the lichens of Pigeon Gulch are a relic of a richly diverse Holarctic lichen flora that

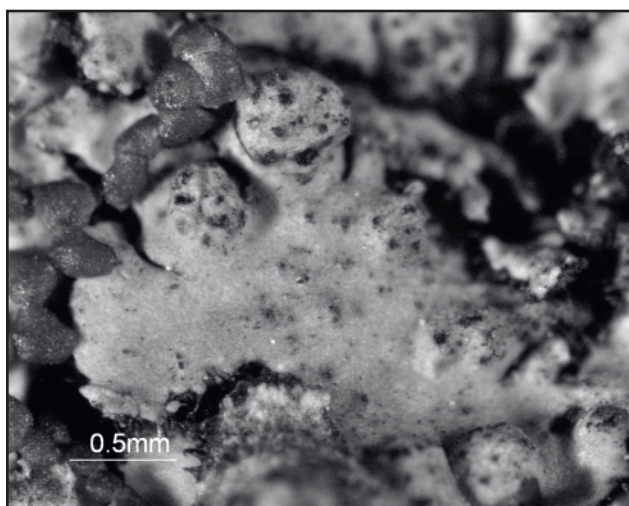
once spread for miles on quartzite along the north side of the Merced River...a lichen flora, which probably contained several species of lichenicolous fungi and lichens that may never be found in California again...gone forever from a beautiful stretch of highway that leads to the wonders of Yosemite Valley.

Prague, July 2011

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**Figure 2.** Galls of *Pyrenidium aggregatum* on *Phaeophyscia*. Photo by James C. Lendemer.

## Notes on Hyper-maritime Foliicolous Lichen Communities of Northern California

John Villella

324 Avery St. Ashland, OR 97520

johnvillella@yahoo.com

Tom Carlberg

1959 Peninsula Drive Arcata, CA 95521

tcarlberg7@yahoo.com

*Hypermaritime foliicolous lichen communities were investigated at several locations in Northern California. The composition of these communities was found to be species depauperate when compared to tropical foliicole communities but resembles them in several ways. Observations of species rarely encountered in California are given and their known distribution in coastal California and the Pacific Northwest is discussed. Novel substrates for some species are discussed and several lichens are recorded as new to California.*

### Introduction

Cryptogams that grow on the leaves of higher plants (termed foliicoles) are a conspicuous and diverse community of organisms in tropical forests. Bryophytes, subaerial algae, cyanobacteria, and lichens are the most conspicuous groups represented in these communities. Foliicolous lichens found here form a diverse assemblage of species and in some areas they form the majority of lichen species encountered on the landscape. Leaf substrates colonized in these habitats include long-lived evergreen broadleaf species, palms, and understory vines among others. Many of the lichen species encountered here are obligate foliicoles

and are confined to tropical regions. Genera commonly found in these communities include: *Arthonia*, *Bacidina*, *Byssoloma*, *Coenogonium*, *Enterographa*, *Fellhanera*, *Graphis*, *Opegrapha*, *Strigula* and many others.

As one moves into higher latitudes foliicolous lichen communities become more species depauperate and less conspicuous on the landscape. Despite this, areas in those latitudes that have mild enough climates can host unique foliicolous communities. One such area in North America is the hypermaritime coastal strip along the Pacific Ocean. This area is well documented as a refugium for otherwise subtropical and tropical macrolichens (Glavich *et al.* 2005) and this is also the area where one can encounter interesting foliicolous lichen communities. Perennially moist habitats such as the coastal strip and waterfall splash zones further inland seem to favor foliicolous lichen communities in Western North America (Spribille *et al.* 2009). Tucker noted that a search of appropriate foliicolous habitats might turn up new lichen records for northern California (Tucker 2009). Although not as diverse or well developed as their tropical equivalents these communities

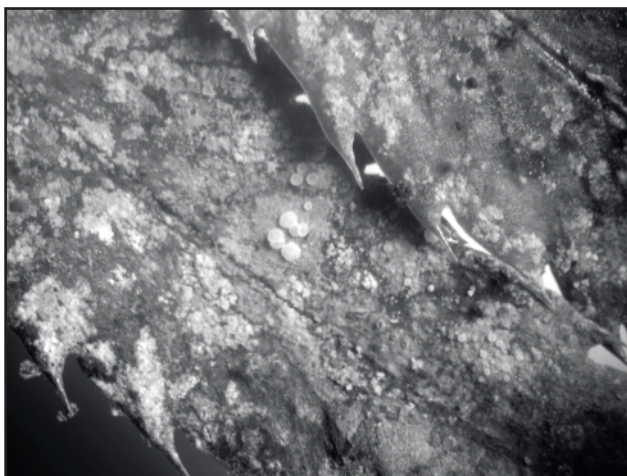


nonetheless represent a unique assemblage of species and a growth habit noteworthy in California (Figure 1).

There are some major differences between tropical and temperate foliicole communities. Lichens encountered in temperate communities are almost always facultative foliicoles, and many are widespread and common epiphytes. Temperate foliicolous communities also tend to be dominated by lichens and free living algae with relatively fewer bryophytes or cyanobacteria represented. Host species are obviously different as well, with long lived conifer and ericaceous shrub leaves hosting the most well-developed foliicole communities. Evergreen huckleberry, Grand fir, and Sitka spruce are probably the most commonly encountered hosts for these communities in the Pacific Northwest. Folicle communities are less often encountered on sword fern and salal.

For this paper, hypermaritime foliicole communities were investigated at three locations in Humboldt County, California in 2011. The sites are described below. Photography is by the authors unless otherwise noted.

**Ma-le'l Dunes Cooperative Management Area** - This location is a series of stabilized and dynamic dunes on the northern peninsula separating Humboldt Bay from the Pacific Ocean, composed of open dunes, dunes covered in dune mat vegetation, and forested areas covered with an overstory of *Picea sitchensis*, *Myrica californica*, *Pseudotsuga menziesii*, *Pinus contorta* var. *contorta* and *Salix hookeriana*. Topography includes dune swales at or below the water table, resulting in vernal



**Figure 1.** Northern California foliicolous lichen community on sword fern including lichens *Fellhanera bouteillei*, *Enterographa oregonensis*, *Arthonia muscigena*, and free living algae *Trentepohlia* sp., *Phycopeltis* sp.

pools in the open dune areas, and semi-permanent bogs in the forested areas that include *Lysichiton americanus*, and provide year-round humidity. The dominant understory species include *Polystichum munitum*, *Gaultheria shallon*, *Arctostaphylos uva-ursi*, *Garrya elliptica*, *Rubus ursinus* and *Vaccinium ovatum*. Understory cover values are typically 100%. This site had dense pockets of foliicolous lichens growing in rain-shaded microclimates on *Vaccinium ovatum* and *Picea sitchensis*.

Foliicolous species encountered here: *Fellhanera bouteillei*, *Scoliciosporum* sp., *Opegrapha herbarum*, *Opegrapha* sp., *Enterographa oregonensis*, and *Chrysothyrix candelaris*.

**Big Lagoon State Park** - This coastal state park centers around a brackish lagoon that is fed by Maple and Tom Creeks, and by seasonally intermittent streams. The sand spit separating it from the Pacific Ocean breaches periodically

during the winters, draining the lagoon but also allowing incursions of salt water. The forests surrounding the lagoon on three sides are dominated by *Picea sitchensis*, *Pseudotsuga menziesii*, *Pinus contorta* var. *contorta*, with *Polystichum munitum*, *Gaultheria shallon*, *Vaccinium ovatum*, and *Maianthemum dilatatum* in the understory. There are many broken snags that serve as seabird roosting areas and dense foliicolous communities were found on *Picea sitchensis* needles at the bases of these snags. Rain-sheltered *Polystichum munitum* fronds host a diverse community. *Trentepohlia* and *Phycopeltis* were both observed to be common epiphyllous green algae. *Vaccinium ovatum* was targeted at this site but no foliicoles were located on this substrate here.

Foliicolous species encountered here: *Arthonia muscigena*, *Enterographa oregonensis*, *Fellhanera bouteillei*, *Chrysothyrix candelaris*, *Opegrapha herbarum*, and *Opegrapha* sp.

**Lanphere Dunes Unit of Humboldt Bay National Wildlife Refuge** - This coastal dune complex is composed of stabilized and unstabilized dunes. Largely through the 1940 conservation efforts of Hortense Lanphere, it contains the most pristine remaining dune ecosystem in the Pacific Northwest (California Coastal Conservancy, 2008) and supports rare and representative examples of older forested dunes, young active dunes, dune swale wetlands, and coastal salt marsh. The forest cover on the stabilized dunes is dominated by *Pinus contorta* ssp. *contorta*, *Picea sitchensis*, *Abies grandis* and *Garrya elliptica*, with lesser amounts of *Pseudotsuga menziesii* and *Arbutus menziesii*. The understory is dominated by

*Vaccinium ovatum* and *Gaultheria shallon*, with *Pteridium aquilinum* and trace amounts of *Polystichum munitum*.

Foliicolous species encountered here: *Enterographa oregonensis*, *Fellhanera bouteillei*, *Chrysothyrix candelaris*, *Scoliciosporum* sp., *Opegrapha herbarum*, *Arthonia* sp., and *Opegrapha* sp. 1.

#### **Noteworthy Species Encountered**

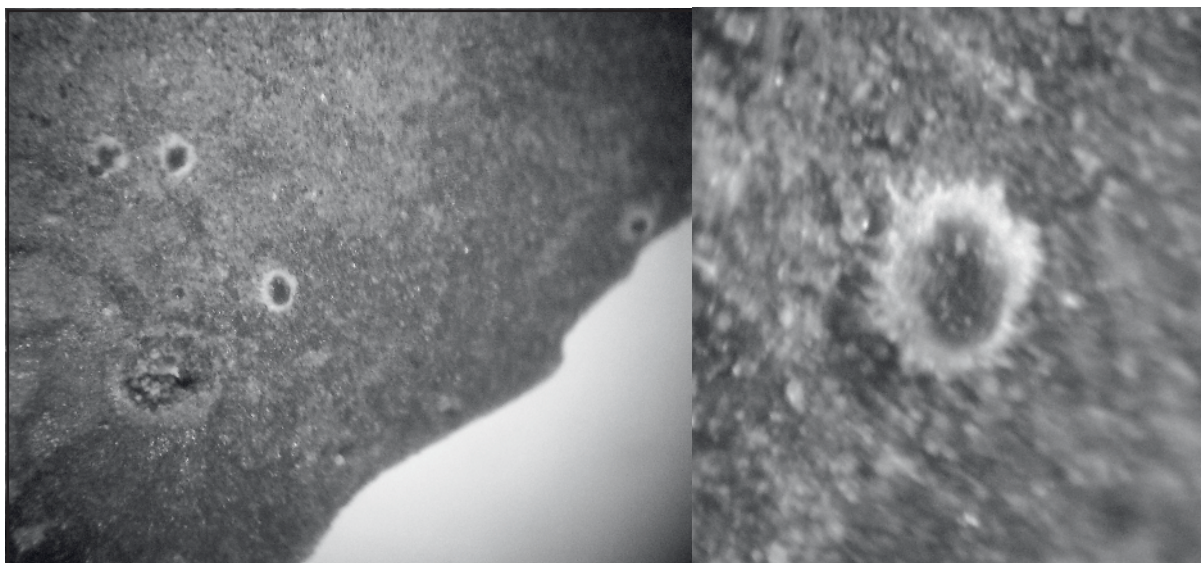
*Arthonia muscigena* Th. Fr. Villella 11-16

This species is widespread in Europe with reports from The Czech republic (Palice 1999), Ukraine (Vondrák *et al.* 2010) and the British Isles (Coppins 1989). It is reported as epiphytic in ruderal habitats and foliicolous on *Buxus* in Belgium and Luxembourg (Diederich *et al.* 2011). It is also reported from Macronesia (Haffelner 2008).

In Oregon and British Columbia it grows as a foliicole on evergreen huckleberry and Sitka spruce in the company of *Enterographa oregonensis*, *Fellhanera bouteillei* and *Chrysothyrix candelaris* (Sparrius and Björk 2008). It is also reported on an unspecified substrate in the Queen Charlotte Islands (Brodo 12089D CNALH record). This species occurs in the foliicole community on sword fern with *Enterographa oregonensis*, *Fellhanera bouteillei* and *Chrysothyrix candelaris*. This is the first report of this species for California.

*Byssoloma* (Figure 2).

Three species in this genus are reported from the Pacific Northwest and two species have recently been reported from northern California. *Byssoloma leucoblepharum* is reported from Mendocino Co. as an epiphyte (Tucker 2009). It has also been reported as an



**Figure 2:** *Byssoloma subdiscordans* on *Vaccinium ovatum* from the City of Reedsport municipal watershed, Douglas County OR.

epiphyte on *Alnus rubra* in coastal British Columbia (Aproot 1996). *Byssoloma marginatum* is reported growing on redwood leaves in the upper canopy (Williams & Sillett 2007) in northwest California as well as on unspecified substrate along the Pacific Northwest associated with *Micarea xanthonica* (Coppins & Tønsberg 2001). *Byssoloma subdiscordans* is reported from coastal locations in southern Oregon (Sparrius & Bjork 2008). In Washington it is known to occur on *Thuja plicata* and *Tsuga heterophylla*. Richard Droker records *B. subdiscordans* on *Tsuga heterophylla* in Meadowdale Park in Edmonds, Washington at sea level a couple hundred meters from Puget Sound where it was quite abundant on several leaves and twigs growing in association with *Fellhanera bouteillei* (Droker pers. comm.). In Ireland it grows on non-native *Picea sitchensis* (Coote *et al.* 2008). Although we encountered no foliicolous *Byssolma* during this study we have seen it in similar

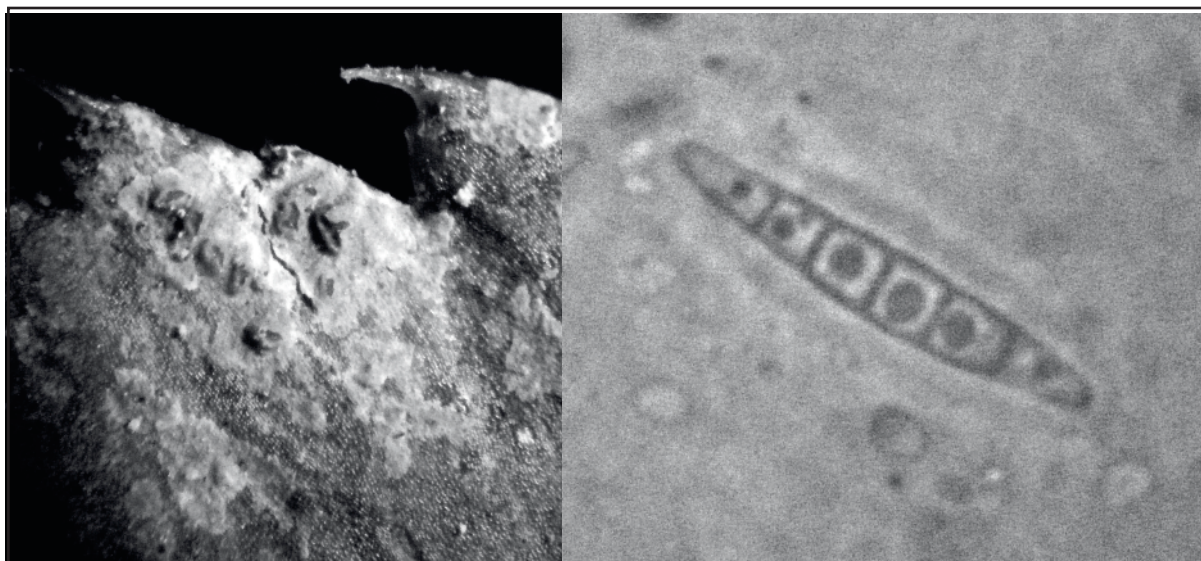
habitats in southern Oregon. It may also occur in the hypermaritime foliicolous lichen communities in Northern California.

*Enterographa oregonensis* Sparrius & Björk. Villella 11-10, Villella 11-18, Carlberg 02532, Carlberg 02636.

This recently described lichen (Sparrius & Bjork 2008) is distinguished by its irregular pseudostroma, halonate 5-septate spores and *Phycopeltis* photobiont. It is very recognizable with a hand lens, due to the orange color of the discs of the open, curved, ellipsoid to lirellate apothecia.

Prior to this publication this species was known from only two other locations, both from coastal foliicole communities, in Oregon and in British Columbia (Björk pers. comm.). In northern California locations, as in those more northern locations, *E. oregonensis* often co-occurs with *Arthonia muscigena*, *Fellhanera bouteillei*, and *Chrysothrix candelaris*. At Big Lagoon State Park it was found growing only on *Polystichum munitum* in





**Figure 3.** *Enterographa oregonensis* on sword fern, and multiseptate halonate spore.

a rain sheltered location approximately 20 feet inland from the waterline in the campground. It is common on the leaves of *Vaccinium ovatum* and *Picea sitchensis* at Ma-l'el Dunes, more typical substrates in its northern ranges. At Lanphere Dunes it was also common growing on many of the same substrates as above and additionally on *Abies grandis*. According to Sparrius and Björk (2008) it is a strict

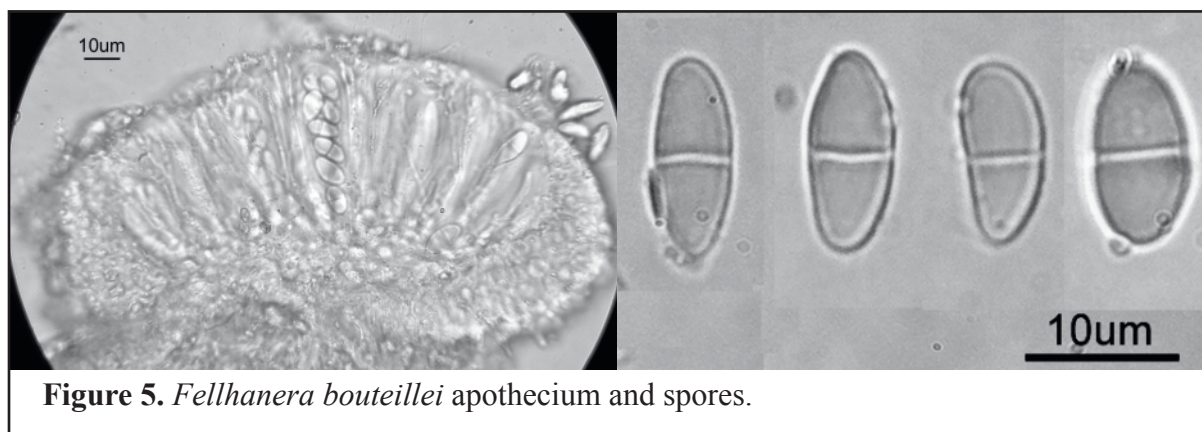
foliicole at other locations but we found it to also grow on twigs at some of the locations that we observed this species. This is the first report of this species growing on sword fern (Figure 3.) and grand fir and the first report of this genus and species in California (Tucker 2009).

***Fellhanera bouteillei*** (Desm.) Vězda. (Figure 4). Villella 11-09, Carlberg 00372, Carlberg 02698.



**Figure 4.** *Fellhanera bouteillei* on sword fern.

This is a common and well-known lichen that has an almost worldwide distribution (Thor *et al.* 2000). It is reported as an epiphyllous lichen in other temperate locales including Italy (Puntillo & Vězda 1994), Turkey (Aslan *et al.* 2005), Japan (Asahina 1932), Chile (Lucking *et al.* 2003) and Australia (Sipman 1991). Although it was known to be somewhat common in Sweden as late as the 1950s, it has declined in Scandinavia since then as air quality has deteriorated (Arup & Ekman 1994). It may be sensitive to air pollution as it has recently been found recolonizing the Netherlands, in an area from which it had



**Figure 5.** *Fellhanera bouteillei* apothecium and spores.

been extirpated in the past (Sparrus 1999), although it is known to be common in the Puget sound area of Washington growing associated with eutrophic species.

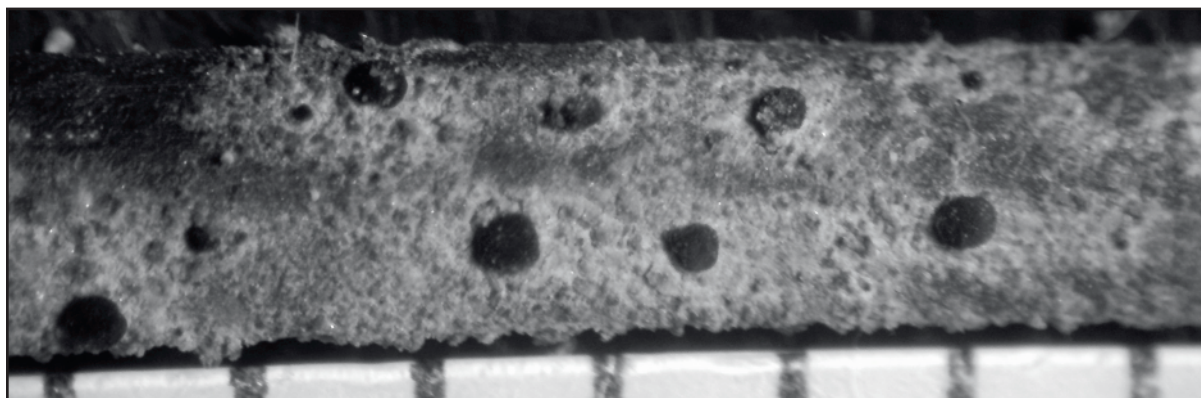
In British Columbia it occurs in the Queen Charlotte Islands and on the coast. It is also found as an epiphyte and is even reported on rock in maritime Washington (Rhoades 2008). In Oregon it occurs on the coast (Jim Riley 1545 CNALH record) and inland (B. McCune 25695 CNALH record). In our experience it is almost always a conspicuous lichen species in temperate Western North American foliicole communities (Figure 1). Microscopically it is recognized by a colorless hymenium with an exciple that is later excluded, and by 2-celled colorless

spores (Figure 5).

In California this species was first reported as a foliicole from Santa Cruz Co. (Santesson 1952) and it has subsequently been reported as an epiphyll on redwood leaves in the mid-canopy in more inland locations in Humboldt County (Williams & Sillett 2007). This species was common as an epiphyte and as a foliicole at all of the locations visited during this study. It was observed growing as a foliicole on *Abies grandis*, *Polystichum munitum* (Figure 4), *Vaccinium ovatum*, *Pinus contorta* and *Picea sitchensis*.

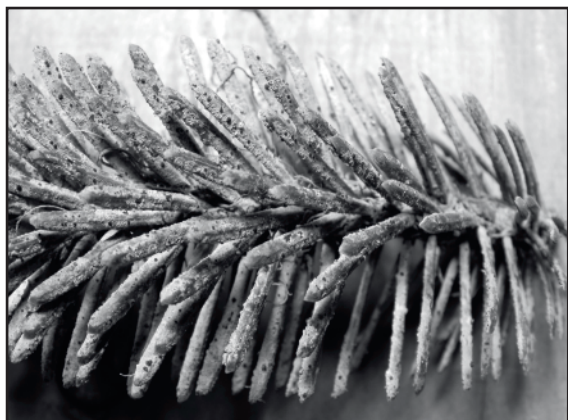
***Scoliciosporum* sp.** (Figure 6). Villella 11-12, Villella11-14, Carlberg 02534, Carlberg 02705.

This lichen has been collected by



**Figure 6.** *Scoliciosporum* sp. on *Picea sitchensis* needle from Ma-le'l Dunes Cooperative Management Area.





**Figure 7.** Habit of *Scoliciosporum* sp.

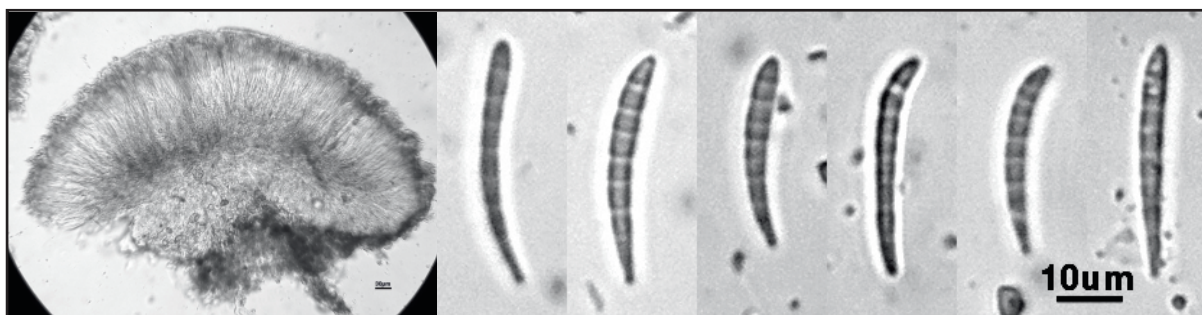
numerous individuals (McCune, pers. com., Kofranek, pers. com.) but is apparently undescribed. It is distinguished by the colorless hymenium except for the green epihymenium, and the relatively straight spores (Figure 8). Miller *et al.* (2011) report a similar undescribed *Scoliciosporum* as a foliicole on *Picea sitchensis* (Kofranek 4037), and *Vaccinium ovatum* (McCune 29875) where it is said to be mostly restricted to the coastline (Miller *et al.* 2011). It appears to be conspecific with the specimens cited here (McCune pers. comm.).

At Ma-le'l Dunes Cooperative Management Area this lichen was found growing abundantly in the sheltered dune forest on *Picea sitchensis* twigs and

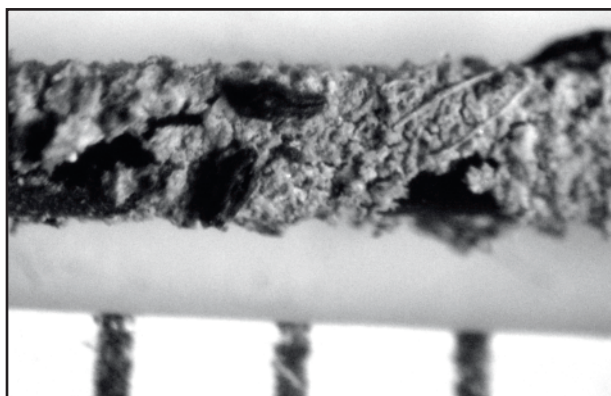
needles (Figures 6 & 7), possibly to the exclusion of all other epiphyllous species on some of the needles it occupies. It was also found on sheltered *Vaccinium ovatum* leaves, but where the dune forest breaks against the open dunes, a location exposed directly to incoming Pacific storms, it grows on twigs and needles of *Pinus contorta* var. *contorta*. At Lanphere Dunes it was also found on *Abies grandis* foliage.

Stefan Ekman has reported a new coastal U.S. *Scoliciosporum* with a green hymenium, that differs in having a streaky green hymenium and somewhat wider, more numerous septate spores. Another species with green in the epihymenium that occurs in California is *S. umbrinum*, which occurs as a bark epiphyte and it has a mixed blue-green and olive-brown epihymenium. It also differs from our specimen in that it has distinct green-yellow C+ pink soralia (Ekman & Tønsberg 2004).

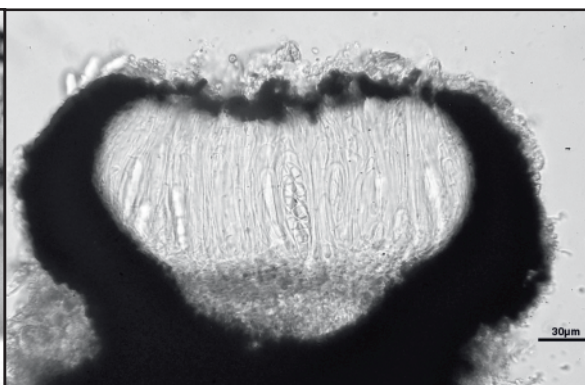
Description: Thallus crustose, thin, scurfy-granular, the granules greenish-brown and corticate; apothecia biatorine, translucent pink to red to nearly black, 0.14 - 0.75mm diameter, becoming hemispherical, often raised above the general level of the granular thallus (broadly stipitate?), and appearing dusty;



**Figure 8.** *Scoliciosporum* sp. apothecium cross section and spores.



**Figure 9.** Habit of *Opegrapha herbarum*.



**Figure 10.** *Opegrapha herbarum* cross-section of apothecium.

proper exciple poorly developed, hyphal cells resembling paraphyses; hymenium 40-54µm, colorless with green- to dark green epihymenium, without crystals; hypothecium green, without crystals; asci broadly clavate, to 14µm; ascospores 5-9 celled, 25-33 x 3-4µm, acicular to fusiform, straight or broadly curved, widest above center, tapering gradually below broadest point, 8/ascus. Found to occur as a foliicole on *Picea sitchensis*, *Pinus contorta* var. *contorta*, *Abies grandis*, and *Vaccinium ovatum*.

***Opegrapha herbarum*** Mont. Carlberg 02544, Carlberg 02639.

This species is fairly common from British Columbia to California. In this study it was found as a dominant in proximity to a snag used as a bird perch, and occurring on understory *Picea sitchensis* needles and twigs (Figure 9). It

is commonly encountered on bark and twigs in California and the Pacific Northwest in hypermaritime localities (CNALH records) but we could find no records of it being recorded as a foliicole.

Thallus black or dark brown; apothecia (Figure 10) lirellate, black, 0.25 - 0.50 x 0.18 - 0.25mm; margin slit-like or more-or-less open, sometimes with thalline fragments; exciple carbonized; hymenium 67 - 99µm, colorless with blackened epihymenium; hypothecium light brown; asci cylindrical; ascospores (Figure 11) 4-celled, occasionally the terminal cell poorly developed or missing, 18 - 20 x 6 - 7µm, fusiform, straight or slightly curved, 8/ascus.

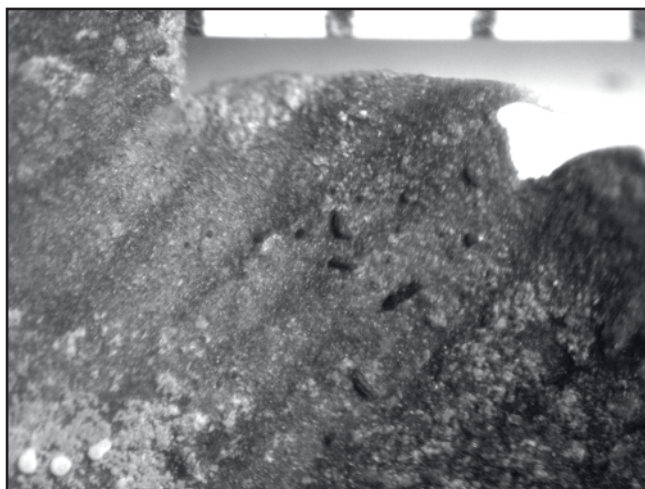
***Opegrapha* sp. 1.** Villella 11-08, Villella 11-22.

The tiny black lirellate apothecia apparently belong to an *Opegrapha*. This

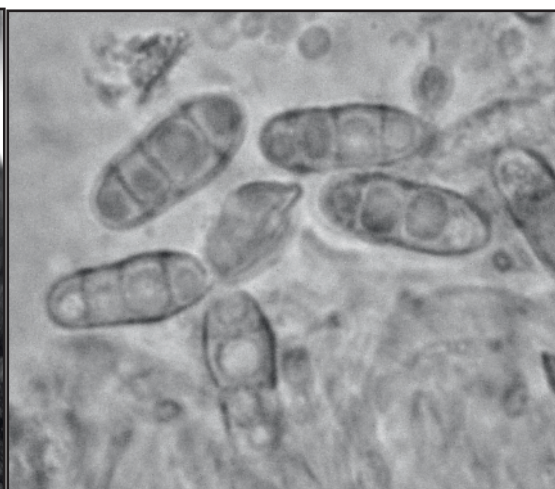


**Figure 11.** Spores of *Opegrapha herbarum*.





**Figure 12.** Habit of *Opegapha* sp. 1.



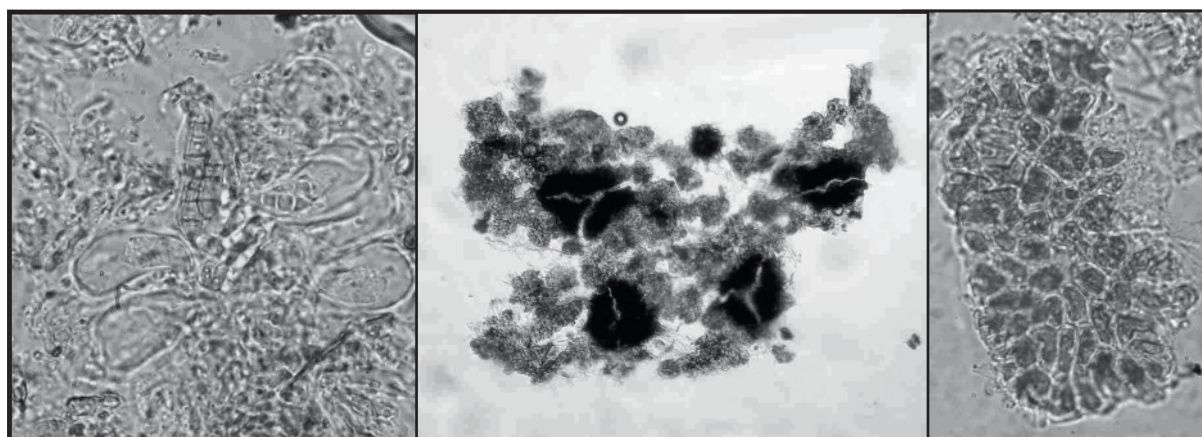
**Figure 13.** Spores of *Opegapha* sp. 1.

specimen was collected on *Polystichum munitum* alongside *Fellhanera bouteillei*, *Enterographa oregonensis*, *Arthonia muscigena*, and *Chrysothrix candelaris* (Figure 12). Thallus clear or very light brown, very thin and more-or-less clear, allowing the bright orange of the photobiont to show through. Apothecia (Figure 14) round to lirellate, black 0.1 - 0.4 x 0.1mm; margin slit-like or more-or-less open; exciple carbonized; asci cylindrical; ascospores (Figure 13) three-septate, approximately 5µm wide and

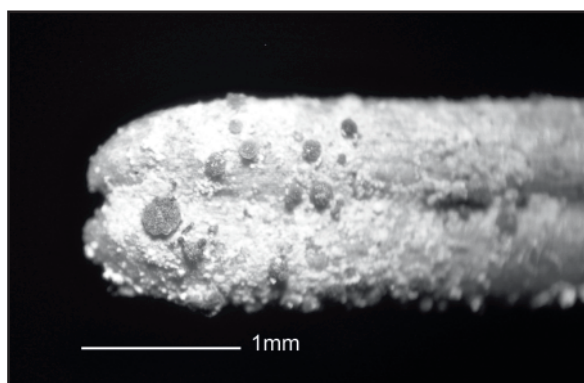
often with the penultimate cell a bit longer than the others. The spores age to brown with minute papillae. The photobiont is *Phycopeltis* (Figure 14). In Santesson's foliicolous crust monograph (Santesson 1952), none of the eight species of *Opegapha* treated match (Björk pers comm.).

*Arthonia* sp. 1 Carlberg 02635, Carlberg 02695.

This species of *Arthonia* was detected while sectioning apothecia of *Fellhanera bouteillei*; it was at first assumed that the



**Figure 14.** *Opegapha* sp. spores and asci, squash mount, and *Phycopeltis* photobiont. Photography by C. Björk.



**Figure 15.** *Arthonia* sp. habit.

*Fellhanera* apothecia had aged to brown (Figure 15). The resemblance is superficial, as the structure of the apothecium is different, and the spores are larger and more complex (Figure 16). Apparently a species nova, in our determination it most closely resembles *A. "vivida"* in ed. Björk.

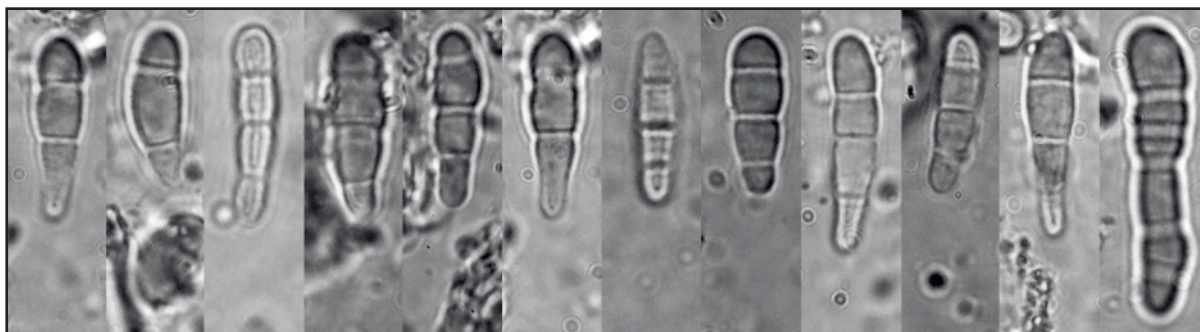
#### Recruitment and Development of Epiphylls

Some substrates hosting epiphyllic lichen species are relatively long-lived. A rule of thumb among botanists on the northwest coast is that conifer needles last about seven years, but a literature search resulted in almost no professional publications on leaf longevity. In any case, the important question is not "How old is

the leaf?" but "How long does it take an epiphyllic lichen to colonize and reproduce?"

We took branches from Sitka spruce, grand fir and evergreen huckleberry, and made a census of lichens on them. Branches were selected that had obvious fresh tender leaves at the tips, indicative of current years' (2011) growth, and cut them apart at each bud scale scar. The bud scale scar is the scar remaining on the branch from the terminal bud, which is the maximum extent for each prior years' growth. Each resultant branch segment represented one year's growth, and was surveyed for epiphylls that were mature enough to have produced apothecia or lirellae, except for *Chrysothrix candelaris*. Many sterile thalli were encountered, but in the absence of reproductive structures, no attempts were made to identify these. Lichens growing on twigs or on dead leaf tissue were not counted. Squash mounts of fertile structures were made to assist identification. The results are in Table 1.

No ascomata were encountered on any 2011 growth, although sterile crustose thalli were frequently present on these fresh green leaves, especially if the leaves were adjacent to older substrates hosting



**Figure 16.** *Arthonia* sp. spores.

**Table 1.** Maximum ages for reproductive thalli of some foliicoles on three substrates, collected during the summer of 2011. Y = reproductive thallus present.

<b>Growth From Year</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>2006</b>
<i>Chrysothrix candelaris</i>		Y	Y	Y	Y	Y
<i>Enterographa oregonensis</i>		Y	Y	Y	Y	Y
<i>Fellhanera bouteillei</i>		Y	Y	Y	Y	Y
<i>Opegrapha</i> 1		Y	Y	Y	Y	Y
<i>Opegrapha herbarum</i>						
<i>Heterodermia leucomela</i>		Y				
<i>Scoliciosporum</i> sp.				Y		Y
<i>Arthonia vivida</i> in ed.		Y	Y	Y	Y	Y
<b>TOTAL for all substrates</b>	<b>0</b>	<b>7</b>	<b>5</b>	<b>7</b>	<b>6</b>	<b>6</b>

abundant epiphylls. All substrates had at least two fertile epiphyllic species on growth from 2010. Casual observation of new leaves makes it clear that colonization of the substrate takes place within a few months of the emergence of new growth, especially when abundant propagules are present; however the development of ascomata seems to require a longer period of time. From the data in Table 1 it can be inferred that approximately one year is needed. These ascomata were all truly fertile, that is, spores were present (necessary to distinguish between *Arthonia vivida* (in ed.) and *Scoliciosporum* sp., for example). While *Opegrapha herbarum* was found as a foliicole on other occasions, it was not encountered while aging substrates.

We could not age sword fern fronds in the same way, since the entire frond is produced within a single growing season, and bud scale scars are not present. A casual survey of professional botanists resulted in “guesstimates” of frond age ranging from one to three years, with additional time sometimes added for fronds that had died but not yet fallen to the ground. A more productive response

was made by Emily Limm, of Save the Redwoods League (Limm, pers. comm.): “I’ve monitored leaf demography on *Polystichum munitum* and can say with certainty that the leaves live for about 30 months before they start to turn brown. New fronds emerge between March and June and then begin to die in the fall of their second year. The leaves don’t detach from the base though, so it isn’t unusual to see half-brown fronds lingering on the crown base for another 6 months beyond that.”

The reproducing species encountered on sword fern fronds were *Fellhanera bouteillei*, *Enterographa oregonensis*, *Arthonia muscigena*, and the ascomata would have had a maximum age of approximately 2.5 years, with the potential to be a few months older than that. Given the generally distressed appearance of the most heavily occupied fronds, it is doubtful that they were the current year’s emergents.

#### **Acknowledgements**

Both authors are grateful for the assistance received from several individuals, most especially Curtis Björk, who provided both determinations and



verifications of some of the specimens, and who consulted on likely habitat, leading us to become avid birders, or at least avid bird-roosters. We also thank Dr. Walker for teaching us techniques for aging plant stems, Emily Limm for consulting on sword fern frond ages, and Jesse Miller *et al.* for permission to cite their pending paper on the Oregon coast.

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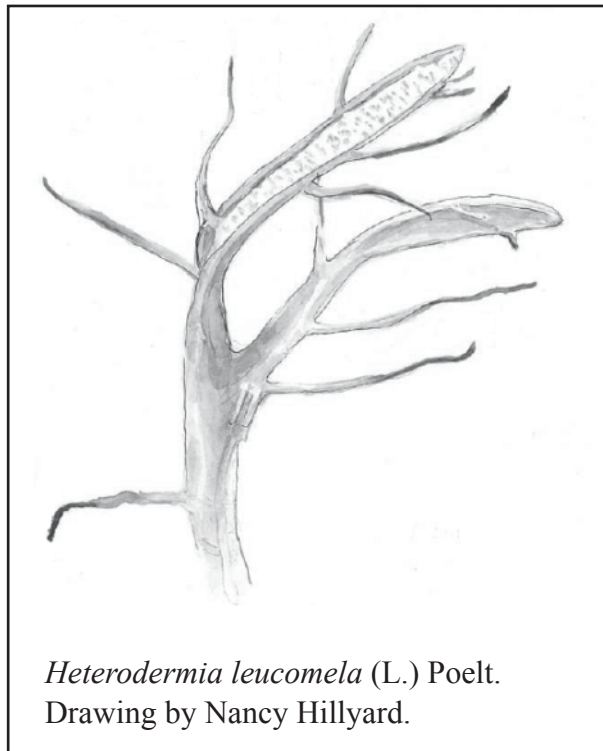
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*Heterodermia leucomela* (L.) Poelt.  
Drawing by Nancy Hillyard.

## News and Notes

### Drawings of Foliicolous Lichens From Costa Rica

Scattered throughout this Bulletin are drawings by Nancy Hillyard. Here is some information about these drawings. These drawings are part of my work book and were made to help me learn. My interest in lichens started about 10 years ago, and after studying some of the more obvious lichens, I began to notice the tiny crustose "dots" underneath. They seemed to be a bigger challenge.

When Dan Norris came back from Costa Rica with a collection of leaves covered with liverworts and lichens, I offered to see what I could do with the lichens. It was a whole new ballgame. Each day was filled with new and wonderful shapes to learn about. Since I was studying foliicolous lichens on my own, I often had to refer back to the drawings and change the name first applied. Now maybe others will be inspired. Enjoy.

~Nancy Hillyard

### Meeting of the California Lichen Conservation Working Group

On September 15th the first meeting of the California Lichen Conservation Working Group met at the Forest Service's Pacific Southwest Research Station in Davis. This meeting was organized by Forest Service botanists Diane Ikeda, Cheryl Beyer and Tom Carlberg under the auspices of the USFS Region 5 Lichen Center of Excellence. A diverse representation of people interested in furthering lichen conservation in California were in attendance, and the topic of the meeting was focused on the

process of ranking rare lichens with the California Natural Heritage Program. Chair of the California Lichen Society Conservation Committee, Eric Peterson, was in attendance, as well as representatives of the California Native Plant Society, Yosemite National Park, Region 5 National Forests, and private consulting companies. Several topics were discussed including habitat based conservation and the idea of designating "Important Lichen Areas" to promote lichen appreciation in California similar to the Important Bird Areas program of the Audubon Society. The California Lichen Conservation Working Group hopes to produce a brochure that can be given to interested parties that explains the role of lichens in the ecosystem and shows many of the wonderful forms that are represented in the California lichen flora. Several roles for volunteers were identified including working on conservation sponsorships, leading field



Elizabeth Hessom

outings to lichen hotspots, and development of lichen related materials. If you are interested in getting involved please contact Cheryl Beyer of the USFS region 5 Lichen Center of Excellence or Eric Peterson of the CALS Conservation Committee.

### **Elizabeth Hessom Receives CALS Grant**

Elizabeth C. Hessom has always loved the outdoors, and studying plants. Encouraged by her family's summer camping trips every year, Elizabeth kept journals of plants she saw, including lichens. She nicknamed them "rock fuzzies" at an early age until she learned to identify them properly. This love of the outdoors only increased over the years, and Elizabeth attended California State University, Fullerton to earn her B.S. in Biological Science, focusing in Biodiversity, Ecology and Conservation Biology. While at CSUF, Elizabeth was accepted into an NSF-funded Undergraduate Mentoring program in Environmental Biology called SCERP, or the Southern California Ecosystems Research Program. Within SCERP Elizabeth conducted research projects in multiple Californian ecosystems and eventually focused her undergraduate research on studying embolism repair through diurnal and seasonality changes in two chaparral shrub species, *Malosma laurina* and *Ceanothus crassifolius*. Elizabeth was awarded for her presentation of this research at the 36th Annual Society for the Advancement of Hispanics, Chicanos, and Native Americans in Science (SACNAS) Conference in Dallas, Texas, and was

funded to travel to present this research at the 2010 American Society of Plant Biologists (ASPB) Conference in Montreal, Canada. This same summer, Elizabeth traveled to see the northern California sequoias with her family, and was blown away by all the different varieties of lichen and how prevalent they were. Elizabeth started researching these "rock fuzzies" of her youth on her own, and considered studying them further. After earning her B.S., Elizabeth chose to pursue a M.S. degree in Environmental Sciences at the University of California, Riverside. There under the guidance of Dr. Pamela Padgett from the USDA Forest Service, and Dr. David Parker, from the University of California, Riverside, they designed a project incorporating lichens, specifically focusing on how gaseous nitric acid and ammonia affect crustose lichen from Joshua Tree National Park. Elizabeth is excited on how this research project is developing and is eager to keep CALS updated on her progress.

### **Joshua Tree National Park Student Climate Change Summit**

*High school students explore climate change and study lichens at Joshua Tree National Park.*

"I can't talk about climate change because I don't know what it's about and I don't want to give a biased opinion," commented Anthony at the beginning of the Joshua Tree Student Climate Change Summit. "You can't build a house without the foundation."

The Joshua Tree National Park Student Climate Change Summit, a partnership between Joshua Tree National Park, the Wildlands Conservancy and National



Parks Conservation Association, provided that foundation for 30 Coachella Valley high school students this May. The day long summit included presentations about climate change, lichens and wildlife corridors. The students went on a guided discovery hike of Black Rock Canyon and participated in a hands-on science project monitoring the park's lichens. The Joshua Tree Student Climate Change Summit was very fortunate to have Kerry Knudsen, a famous lichenologist, to help instruct students and guide the research project.

The day began with an activity led by Ranger Caryn Davidson called "Barometer." Davidson read a statement and the students lined up under signs which ranged from "Strongly Agree" to "Strongly Disagree." The goal of the activity was to generate discussion among the high school students and our staff and to tease out opinions and attitudes about climate change.

When Ranger Davidson said, "I spend a lot of time thinking about climate change," the majority of the students moved to the "Strongly Disagree" sign. But a student named Denise had a different view, "I do worry about changes to our earth's climate and how it will affect wildlife." When Davidson stated, "Climate change is human caused and must be addressed by humans," almost all the students stood under the "Strongly Agree" sign. One student raised her hand and said, "It's up to the people to be interested in climate change. Some people only see what they want to see."

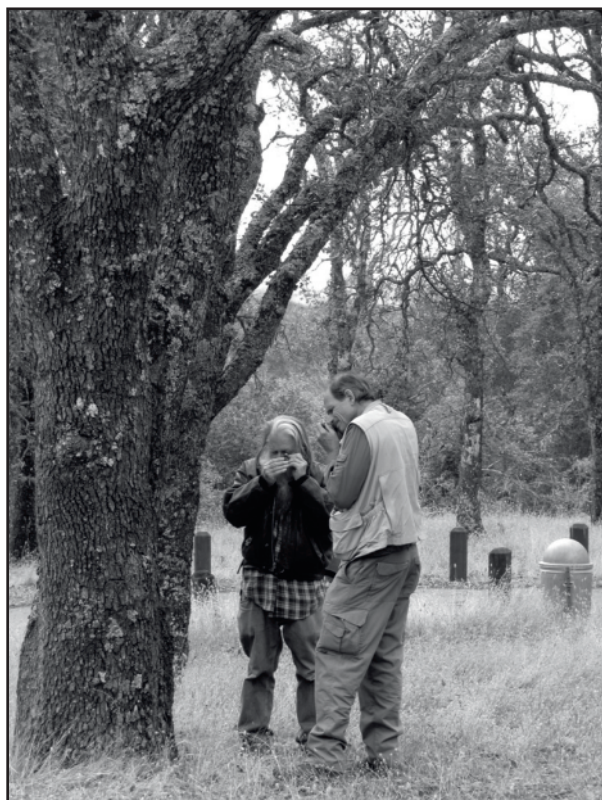
During the guided discovery hike, students used hand lenses purchased from a grant from the California Lichen Society to closely examine desert plants, lichens

and insects slurping the nectar of wildflowers along one of the trails in Black Rock Canyon. The students seemed especially intrigued with lichens and insects, but also articulated differences between varieties of desert plants. The value in this activity is that the students made their own observations about flora's similarities and differences, as opposed to just memorizing the name of the plant.

After a delicious pizza lunch, students learned about the lichen monitoring project from Mitzi Harding, a vegetation specialist at Joshua Tree National Park. Harding discussed the overall goals of the monitoring project- to track how a changing climate may affect Black Rock Canyon's lichen diversity and growth. She also taught the students scientific protocol and broke them into teams for the project. The team I facilitated organized themselves and began recording the different types of lichens on coded cellophane envelopes. They measured and calculated the overall area of the different presentations of lichen.

During the end of the day debriefing session, back at the Black Rock Canyon Visitor Center, students gave the day an overall "Thumbs Up" and expressed fascination for the often overlooked lichens of Black Rock Canyon. Several students, who said they didn't like the desert, expressed an appreciation for its fragile ecosystem and beautiful forms. And what about the subject of climate change? "If you have kids and grandkids one day, you want them to be able to live and see nature," summed up one young desert enthusiast.

Kerry Knudsen and Jana Kocourkova are currently working on a baseline



Bill Hill and Ted Robertson at Mt. Diablo State Park.

inventory of the lichens, lichenicolous fungi, and saxicolous microfungi of Joshua Tree NP. Currently we have 120 lichenized taxa, with several undescribed taxa and new state records.

~ Seth Shteir

*Seth Shteir is California Desert Field Representative for the National Parks Conservation Association.*

### Notes on the CALS Mt Diablo Field Trip, November 5, 2011

On a frigid afternoon in November, a small group of brave lichen hunters met at the Junction Ranger Station in Mt Diablo State Park to explore the lichen habitats and common lichens on the mountain. One of the missions of the expedition was to collect lichen specimens for the CALS

display at the Mycological Society of San Francisco's fungus fair (December 3-4, 2011). The theme of the CALS display was lichens of Mt Diablo revisited...40 some years after Doris Baltzo's thesis work. There was interest among the lichen hunters to schedule additional field trips to continue on this theme of comparing the lichen flora of past and present. Check the CALS website for future field trips to Mt Diablo or come help identify specimens we've collected at our identification workshops (first and third Wednesday of the month at College of Marin).

A preliminary list of the lichen encountered provided by Nancy Hillyard are listed below:

*Aspicilia cf pacifica*  
*Buellia dispersa*  
*Buellia tyrolensis*  
*Cladonia furcata*  
*Cladonia pixidata*  
*Flavopunctelia soredica*  
*Gyalecta herrei*  
*Nephroma laevigatum*  
*Ramalina farinacea*  
*Rhizocarpon cf. pusillum*  
*Stereocaulon cf rivulorum*  
*Teloschistes flavicans*  
*Tephromela atra*  
*Usnea hirta*  
*Usnea rubicunda*  
*Vermilacinia laevigata*  
*Xanthoparmelia californica*  
 ~Shelly Benson

### Snake River Plains Herbarium - Now Online

Roger Rosentreter has his lichen collection (Boise State U.) data based and is accessible now on the North American

Consortium of lichen herbaria.  
<http://symbiota.org/nalichens/index.php>

### Lichens and animals continued - the egg cases of lacewings

A couple years ago the Bulletin (16:2; winter 2009) had a photo essay of lichens being used by animals for a variety of purposes: nesting material, tunnel construction, camouflage and others. I occasionally find another example of animals using lichens, but until recently I have not been able to get a photo that was good enough to convey what was actually happening. I also did not know which entity was using the lichen.

A recent conversation with John Vellella, the Editor of the Bulletin, informed me that these were the egg cases of a species of lacewing. Specifically, this is the case of a species of green lacewing, a common and widespread insect that is considered beneficial because (depending on the genus) either the larvae or the adults are a predator on numerous common garden pests (beneficial to humans, that is!). Egg cases can be

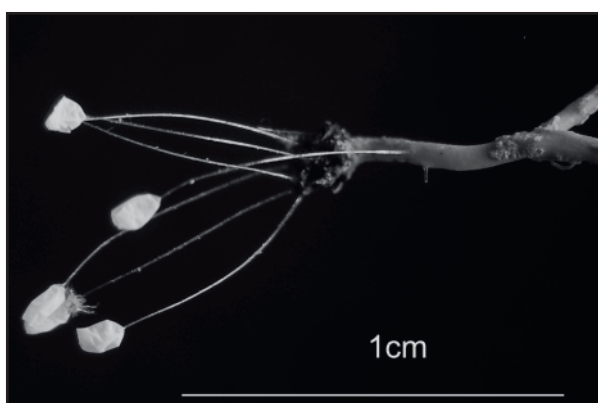
purchased from certain garden supply shops, with instructions for establishing lacewing populations in your garden. A web search on lacewing egg case is very informative, the majority of sites being sponsored by county agricultural administrations, university agriculture departments, or commercial sites offering biocontrols for garden and crops. There are also sites by amateur naturalists that have images of lacewing larvae using what look like soredia to camouflage themselves.

The reason for the filamentous stalk has been interpreted in a couple ways, both of which center around protection from predators: it is said to prevent ants from getting to the eggs, or it helps keep the larvae apart (which reduces predation on each other). There is a scientific paper in support of the latter interpretation (Růžička 1997) in which the researcher induced the female lacewing to lay eggs (with stalks) in a petri dish. Another dish had eggs with the stalks removed. In the absence of any other food, hatching larvae ate more of the eggs without stalks than with.

I have found these eggs on species of *Usnea*, and this year for the first time on *Alectoria sarmentosa*, as in the photo below.

**Růžička, Z. 1997.** Protective role of the egg stalk in Chrysopidae (Neuroptera). *Eur. J. Entomol.* 94:111-114.

~Tom Carlberg



**Figure 1.** Lacewing egg cases on *Alectoria sarmentosa*.



## Upcoming Events

### CALS Annual Meeting

It's that time of year again when CALS members get together to hold an annual meeting and celebrate the work of our founding members in creating the California Lichen Society. See the schedule of events below and feel free to come for just part or all of the festivities. CALS Annual Meeting Schedule, January 28, 2012

Field trip to Huckleberry Botanic Regional Preserve: 9:30-3:00

Board meeting at Brickyard Landing (open to the general membership): 3:45-5:30

Pot-luck dinner at Brickyard Landing: 5:45-6:45

Evening presentation (to be determined) at Brickyard Landing: 7:00-8:00

### Field Trip to Huckleberry Botanic Regional Preserve

Where to meet: Parking lot for Huckleberry Botanic Regional Preserve, see driving directions below.

When: 9:30 AM to 3:00 PM, January 28, 2012

What to bring: This is a NO-COLLECTING field trip so bring your hand lens, camera, and field guides. Also bring a lunch and field gear to keep you comfortable while on the trail.

Driving directions: From Highway 24 in Oakland, take the Fish Ranch Road exit just east of the Caldecott Tunnel. Continue .8 miles to Grizzly Peak Blvd. Turn left and go 2.4 miles on Grizzly Peak to Skyline Boulevard. Turn left and drive approximately one-half mile to the park entrance on the left, past Sibley Volcanic Regional Preserve. Website:

<http://www.ebparks.org/parks/huckleberry>

About the Preserve: Huckleberry Preserve has a relic plant association similar to vegetation now found on the islands off the Santa Barbara coast. The rocks are of Claremont shale/chert formation that can be seen as hard, brittle bands with soil that has a low poor water holding capacity.

Lichens are found in the bay laurel/oak/chinquapin/manzanita assemblage. There are many *Cladonia* spp. on the soil. On a visit in May 2010, we saw the following along with numerous others.

*Parmelia hygrophila*

*Parmotrema* K+Y medulla = *P. perlatum*;  
K- = *P. arnoldii*

*Ramalina farinacea*

*Hypogymnia physodes*

*Cladonia chlorophaea* group

*Cetraria orbata* = *Tuckermannopsis orbata*

*Hypogymnia tubulosa*

*Cladonia squamosa* Medulla UV-, K+Y,  
P+Y = var. *squamosa*

*Cladonia bellidiflora*

*Cladonia* spp.

### Driving Directions to Brickyard Landing, Point Richmond, CA

From the West: On 580 go east across the Richmond Bridge, exit on Canal Blvd., turning right or south, continue on Canal across Cutting Blvd. and until the center divide disappears and you come to a stop sign. Turn right onto Seacliff Drive, continue on Seacliff as it goes over the hill to the next stop sign, where you enter Brickyard Cove Road. You will soon see

the five large buildings of Brickyard Landing on your right. Turn right onto Brickyard Way at the main entrance, and then turn right again almost immediately onto Brickyard Cove Lane. After passing the tennis courts you will see the gate to the Clubhouse on your left. Park and walk in past the swimming pool and you will see the Clubhouse straight ahead.

From the East: Go west on 580 until Canal Blvd., turn left or south and continue as directed above.

### **Ongoing Lichen Identification Workshops, College of Marin, Science Center**

first and third Wednesday of each month, 6pm - 9pm unless otherwise announced). We encourage you to attend these regular lichen identification workshops at the College of Marin, Science Center Room 190/191, 835 College Avenue, Kentfield. Dr. Paul DaSilva has graciously allowed us to use the classroom and scopes. Please RSVP to Bill Hill, who organizes the logistics (contact Bill at 4156866146). We bring our own lichens and/or work with others on theirs. There are usually snacks. Parking at the college is \$3 or evening parking for free on Kent Ave. behind the Science Center. Directions to Kentfield Campus of College of Marin: From Highway 101 take Sir Francis Drake Blvd west, turn left at College Ave (7th stoplight) and right into parking lots on right. The science building is the large low one story building with parking underneath. We are in room 190 or 191.

### **Tilden Botanical Garden Workshops**

This is a 'regular' lichen study group meeting on the second Saturday of the

month (unless otherwise announced). We variously tour the Botanic Garden to observe and identify the lichens there, and also meet at the visitor center for a lichen identification workshop. Bring specimens you would like us to work on or just join us in the learning. Everyone is welcome. There is free parking and admission is free at the Garden.

### **Identifying Lichens to Genus**

Chico State University, Chico CA

Saturday, March 3, 2012, 9:00am - 4:00pm

The emphasis of this workshop will be identifying genera of lichens in the northern Sierra Nevada foothills. The workshop will start in the lab with handouts and a Powerpoint presentation covering lichen basics – anatomy, reproduction, ecology, and morphology. Lunch will be in the field while seeing lichens in action, possibly with some hands-on collecting. Afternoon will be back in the lab for guided exploration, using dissecting microscopes, reference materials, chemical reagents, and vouchers provided by the instructor or participants' collections.

Please bring dissecting tools, a hand lens, and lunch. Participants will benefit more from the workshop if they are experienced with using dichotomous keys.

The workshop will be led by Tom Carlberg. Tom has a degree in Botany from Humboldt State University. He has been a cryptogamic botanist for ten years, working for the Forest Service, private contractors, and non-profit organizations. He is the past Editor of the Bulletin of the California Lichen Society (CALs), and a member of the Society's Conservation

Committee. In addition to CALS, he also belongs to the American Bryological and Lichenological Society and the British Lichen Society.

Please register in advance; class size is limited to 16 participants. Registration information is available at the Friends of Chico State Herbarium website at <http://www.csuchico.edu/biol/Herb/Events.html>. Details of workshop content can be obtained by contacting Tom at [tcarlberg7@yahoo.com](mailto:tcarlberg7@yahoo.com).

### **Calicioid Lichen Workshop**

The Northwest Lichenologists and the Cryptogam Biodiversity Observatory at Southern Oregon University in Ashland Oregon is proud to present a two day workshop with Dr. Steve Selva on the calicioid lichens and fungi March 16th -18th 2012. Starting with an optional field day in the Cascade Siskiyou National Monument followed by two days of lectures and lab identification time, this workshop will explore the fascinating world of the interesting and diminutive stubble lichens, focusing on identification and ecology of our pacific northwest flora. In depth identification of several of the most prominent genera will be given including *Calicium*, *Chaenotheca*, *Sphinctrina*, *Chaenothecopsis*, and *Cyphelium* among others. Microscopes and reagents will be available to participants. This workshop is open to all on a first-come basis, with space for about twenty people. Bring your unidentified specimens to work on. Please reserve your spot early! To reserve make a check out to Daphne Stone and sent it to: Daphne Stone, 30567 Le Bleu Rd. Eugene Oregon, 97405. Please also send your address

phone number and email for updates. Questions? Contact Daphne Stone [daphstone@gmail.com](mailto:daphstone@gmail.com) or John Villella at [johnvillella@yahoo.com](mailto:johnvillella@yahoo.com).

### **Forest Service Lichen Walk Cleveland National Forest Riverside County June 23 2012**

Join lichenologist Kerry Knudsen, lichen curator at the UCR Herbarium, and Forest Service botanist Kate Kramer for an informal lichen walk down Tenaja Trail in the San Mateo Wilderness on June 23 2012. We will meet at the Tenaja Trailhead at 9AM. Directions: From Interstate 15, take Clinton Keith Road south to Tenaja Road. Follow Tenaja Road southwest to Cleveland National Forest road (FS road 7S01, watch carefully for this turnoff). Turn right and follow this road about 1 mile to the Tenaja Trailhead. We will leave from the trailhead and go as far as the group wishes towards Fisherman's Camp. This is the first of four Forest Service lichen walks in southern California. For more information please contact Kerry Knudsen [kerryknudsen999@gmail.com](mailto:kerryknudsen999@gmail.com).

### **The 83rd Annual Meeting of the Northwest Scientific Association**

Owyhee Plaza Hotel in Boise, Idaho, March 28-31, 2012.

Our theme this year is: Networking Science: communication, collaboration, and conservation in a time of change. Dr. J. Michael Scott, Distinguished Professor Emeritus in the Department of Fish and Wildlife Resources at University of Idaho, will present a keynote address. We will have



several symposia including: Geo-Integration: Making sense of the overload of spatial data, portals, and analysis tools Sagebrush ecosystems: linking biophysical drivers and species change across trophic levels. The role of citizen scientists in research and education and more!

Presentations will address a broad range of topics and issues in natural and applied sciences. Please consider attending the meeting to learn about scientific research in the Northwest and present a paper or poster to share the results of your ongoing work. In keeping with our theme, we encourage presentations that emphasize interdisciplinary research, incorporate a range of participants, or represent collaboration across agencies.

The Northwest Scientific Association has a strong history of supporting student research and our meetings provide a great venue for students to interact with professionals. There are reduced registration rates for students.

We have exciting field trips planned for Saturday.

Please visit the Society's web page ([www.northwestscience.org](http://www.northwestscience.org)) for more details on registration, abstract submission, and updates about the meeting.

Please forward this information to colleagues, other departments, or students who may be interested in presenting research results.

#### IMPORTANT DATES:

Open Call for Papers and Registration:  
November 10, 2011

Early registration deadline (reduced rates): February 1, 2012

Abstract Deadline: February 7, 2012



Drawing by Nancy Hillyard.

83rd Annual Meeting of the NW Scientific Association: March 28–31, 2012

#### 2012 Lichenology Seminars at Eagle Hill

...on the coast of Maine...Between Acadia National Park and Petit Manan National Wildlife Refuge

<http://www.eaglehill.us/programs/nhs/nhs-calendar.shtml>

Lichens and Lichen Ecology

May 27 - Jun 2. David H.S. Richardson and Mark R.D. Seaward

Crustose Lichens: Identification and

## Ecology

Jun 3 - 9. Stephen R. Clayden  
Sterile Crustose Lichens: An Introduction  
with a Special Emphasis on Identification

Jun 10 - 16. James Lendemer  
Lichen Chemistry: Spot Tests and TLC in  
Lichen Identification

Jun 17 - 23. Scott S. LaGreca and  
Thorsten T. Lumbsch

Lichen Research Tutorials

Jun 24 - 30. Richard Harris  
Lichens, Biofilms, and Gravestones

Jul 8 - 14. Judy Jacob and Michaela  
Schmull

Information on lodging options, meals,  
and costs may be found at  
[http://www.eaglehill.us/programs/general/  
application-info.shtml](http://www.eaglehill.us/programs/general/application-info.shtml)

There is an online application form at  
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Descriptions and syllabi will be  
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we can help with questions. Prior  
discussions of personal study objectives  
with instructors are welcome.

Humboldt Institute, PO Box 9, Steuben,  
ME 04680-0009

207-546-2821, Fax 207-546-3042

E-mail - [office@eaglehill.us](mailto:office@eaglehill.us)

In support of field biologists,  
researchers, field naturalists, faculty  
members, and students with interests in  
the natural history sciences, Eagle Hill  
offers specialty seminars at different  
ecological scales for those who are  
interested in understanding complex  
natural history questions. Seminars range  
from watershed level subjects, and  
subjects in classical ecology, to highly  
specialized seminars in advanced biology,  
taxonomy, and ecological restoration.

In support of scientific illustrators and  
artists, Eagle Hill offers a diverse range of  
workshops focusing on natural history art.

Eagle Hill has long been recognized as  
offering hard-to-find seminars and  
workshops which provide important  
opportunities for training and meeting  
others who are likewise dedicated to  
continually learning more about natural  
history.

Eagle Hill field seminars and workshops  
are of special interest because they focus  
on the natural history of one of North  
America's most spectacular and pristine  
natural areas, the coast of eastern Maine  
from Acadia National Park to Petit Manan  
National Wildlife Refuge and beyond.  
Most seminars combine field studies with  
follow-up lab studies and a review of the  
literature. Additional information is  
provided in lectures, slide presentations,  
and discussions. Seminars are primarily  
taught for people who already have a  
reasonable background in a seminar  
program or in related subjects, or who are  
keenly interested in learning about a new  
subject.

## PRESIDENT'S MESSAGE

As we enter the New Year of 2012, CALS is celebrating its 18th Birthday with our Annual Membership Meeting. Ever since we began with the founding meeting of the California Lichen Society on January 29, 1994 at the Santa Cruz cabin of Richard and Janet Doell, we have held our 'Birthday' Membership Meeting on the last Saturday of January - this time on January 28, 2012. This year it will be held again at the clubhouse at the Doell's Brickyard Landing condo in Point Richmond as it has traditionally been held for years. Our meeting is a full day including a field trip followed by a Board meeting, a social hour, potluck dinner, and discussions amongst CALS members present, and presentation about - what else? - lichens! Our Birthday Annual Meeting helps put our Society in perspective, and we chat about where we have been and where we are going, our strengths and weaknesses, and our plans for the future.



And life goes on. We pick up new members at events like the San Francisco Mycological Society Fungus Fair, CAL Day at UC Berkeley, and various conferences, joint field trips, as well as other various workshops. Despite the passing on of several of our cherished and most active members, other members give us new energy by continuing the planning and organizing of our activities- and CALS lives on!!!

I want to personally thank Irene Winston for her fastidious 'hosting' of our monthly workshops at Tilden Park Botanic Garden. Despite her busy personal schedule, she is constantly coordinating upcoming plans and events, including our major Bay Area annual events - the Lichen Exhibit at the annual Fungus Fair and CAL Day in Berkeley!

Susan Crocker is relieving Janet of the sales and distribution of the our popular Lichen Miniguide.

Diane Renshaw will revive our lichen study presence at the Stanford University Jasper Ridge Biological Preserve, where Janet Doell had been a docent and brought \*lichenology\* there some years ago.

Our Vice President Shelly Benson helps with much organizing, and with Tom Carlberg continues our lichen survey at the San Francisco Presidio. Tom and Shelly are also instrumental with our presence at several events including the Northern California Botanists Association conference in January 2011. In these events we invariably gain new members, some of whom have become very active members in CALS!

Eric Peterson has been continuing as Chair of our Conservation Committee, as well as breathing new life into our californialichens.org presence online.

And then there are members Hanna Mesraty and Theresa Bukovics who attended our field trip and worked with Doris Baltzo to continue her study of Lichens of Mount Diablo (which by the way, was the 'centerpiece' of our Fungus Fair Exhibit in December!).

I also want to mention that Janet Doell continues on with now spearheading the declaration



of *Ramalina menziesii* Taylor as the State Lichen of California. She has contacted her state representative and the decree will hopefully be introduced during the current session of the State legislature. Janet expounds:

"This species was chosen for this honor because:

1. It grows from the northern to the southern borders of the state along the coast where coastal fog is present.
2. It also grows, to a lesser extent, in more inland areas at least as far as 130 miles from the coast.
3. It is the only lichen in California with netting, which makes it easy to identify even by those not very well acquainted with lichens.
4. It is a beautiful lichen.

There is no California State Lichen at present."

We had a display of the many forms of *Ramalina menziesii* at the Fungus Fair, and 28 people signed a 'petition' acknowledging their support of the declaration.

A surprising outreach discovery with visitors at the Fungus Fair this year was the enormous popularity of giving away lichen samples glued to small cards with the generic names of the lichens printed on them. A box full of them made by Janet Doell was quickly emptied on the first half of the first day of the Fair. The specimens were all windfalls, blown out of the trees in storms last winter, most of them from the Doell's cabin in the Santa Cruz Mountains. These little take-home samples probably made a lot of visitors at the Fungus Fair aware of the existence of lichens for the first time, and Nancy Hillyard made up some more for the second day. We must do this kind of 'souvenir' outreach again. Once people are 'bitten' by the beauty of lichens, they become forever aware of them and their appreciation advances our environmental and conservation efforts to make all our hard work worthwhile!

Another lichenological success that I try to nurture is the regularity and proliferation of ongoing Lichen Workshops. Besides field trips in conjunction or not with other nature organizations, it is workshops where people most effectively get hands-on experience with identifying and understanding lichens. For beginners and experts alike this learning is an endless and lifetime process. In the San Francisco Area, I revived our ID Workshops at the College of Marin after a summer hiatus, and they are now being held on the first and third Wednesday evening of the month; and I learned from Irene to make it an RSVP event to insure our awareness of attendance.

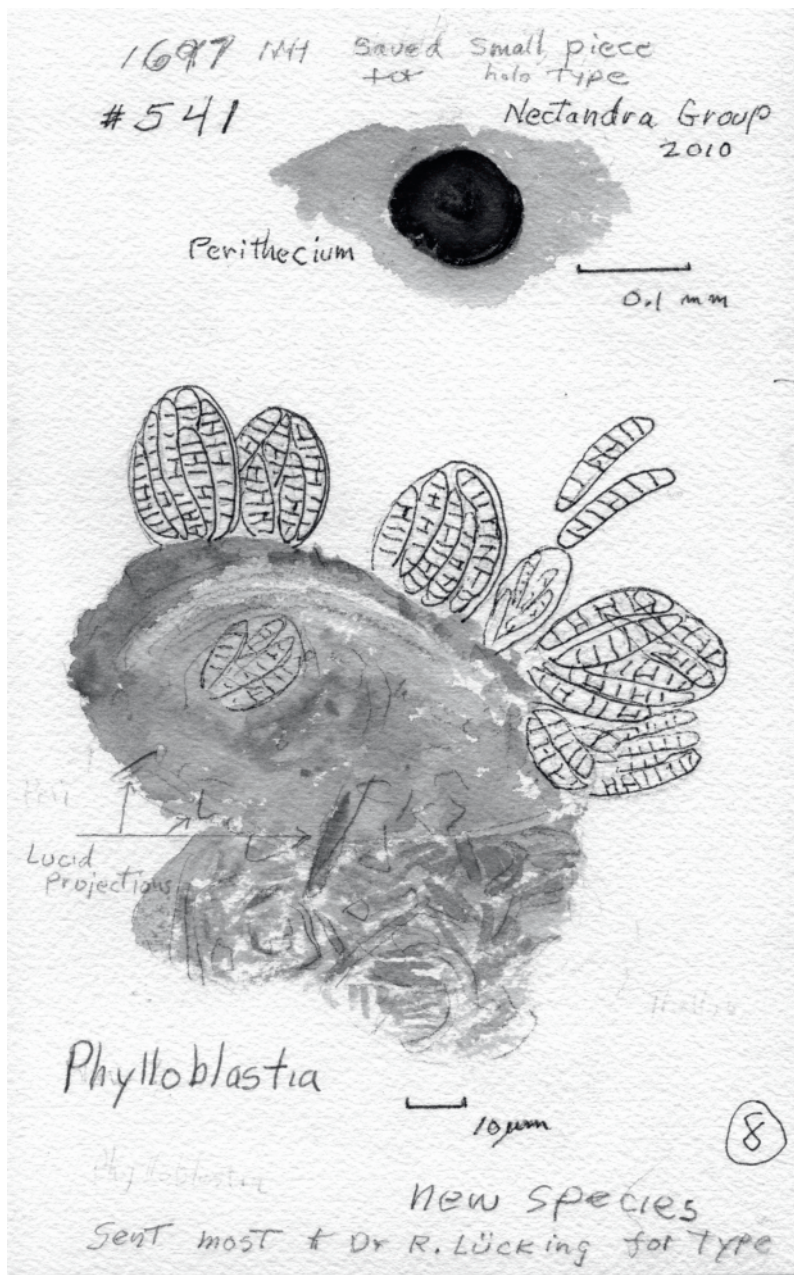
Besides College of Marin and Irene's Tilden Botanic Garden workshops on the second Saturday of the month, we may be having regular workshops now at Stanford's Jasper Ridge with Diane Renshaw, with the first meeting and fieldtrip there on Saturday February 18. Stay tuned. Then there are plans for workshops sometime soon in the Martinez/Concord area with Ted Robertson, and we are considering workshops again at San Francisco State University, with its laboratory space with excellent microscopes as well at the herbarium and reference library there.

I am hoping that we can have each workshop location equipped with an effective reference library for working on identifications, as well as perhaps a reference collection of

specimens - once we 'ween' people with using microscopes and keys (and perhaps revising many of the confusing parts of the keys!), and introducing them to where and to whom to look further, they can gain confidence and their own abilities will grow without as much dependence on 'experts'. And as I just mentioned, this learning is a lifelong process - none of us knows everything, ever.

So Happy Enlichenment! Lets see what the New Year brings!

--Bill Hill, for the California Lichen Society



*Phylloblastia* sp. new to science. Drawing by Nancy Hillyard.

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## Contents

Why <i>Lepraria</i> ? Why Lichens? Eight years of studying <i>Lepraria</i> in California ~James C. Lendemer	1
Parasites ~Kerry Knudsen	7
Notes on Hyper-maritime Foliicolous Lichen Communities of Northern California ~John Villella and Tom Carlberg	11
News and Notes	24
Upcoming Events	29
President's Message ~Bill Hill	34

### Back Cover:

A. *Arthotheliopsis serusiauxii*. Drawing by Nancy Hillyard.

B. Northern California foliicolous lichen community on sword fern; See article by J. Villella and T. Carlberg page 11. Photo by John Villella.

C. Spores of *Opegrapha herbarum*. See article by J. Villella and T. Carlberg page 11. Photography by John Villella.

D. Bill Hill, Hanah Maestry, and Shelly Benson.

E. Galls of *Pyrenidium aggregatum* on *Phaeophyscia*. Photo by James C. Lendemer.

F. *Polycoccum slaptoniense*. Photo by: Jana Kocourková.

G. Habit of *Scoliciosporum* sp.

H. *Scoliciosporum* sp. on *Picea sitchensis* needle from Ma-le'l Dunes Cooperative Management Area.



