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Front Cover: *Xanthoparmelia* aff. *chlorochroa* with *Sedum lanceolatum* and *Phlox pulvinata*, Aquarius Plateau, Utah, USA. See article by Leavitt et al. pg 1. Photo by Steven Leavitt.

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Treading in murky waters: Making sense of diversity in *Xanthoparmelia* (Parmeliaceae, Ascomycota) in the Western United States

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Introduction

Our understanding of species diversity in lichen-forming fungi is currently in a state of flux (Lumbsch and Leavitt, 2011). There is mounting evidence indicating that in many cases traditional taxonomy fails to accurately represent natural groups (ex.: *Caloplaca* [Vondrák et al., 2009]; *Letharia* [Kroken and Taylor, 2001]; and *Rhizoplaca* [Leavitt et al., 2011a]. While morphological and chemical character differences have traditionally served as proxies for identifying independent evolutionary lineages (i.e. ‘species’), character evolution in lichens is still poorly understood, resulting in potentially confounding morphological and chemical taxonomic characters. It is not surprising that the phenotypic expressions of symbiotic systems, like lichens, may result in observable differences that do not necessarily reflect natural groups for individual lichen symbionts (i.e. mycobiont, photobiont, or any other ‘biont’ associated with a lichen thallus). This incongruence between traditional

species boundaries and molecular phylogenetic reconstructions of the mycobiont suggests that one of the greatest challenges to accurate species identification of lichenized fungi is finding and using appropriate character sets and analytical tools (Crespo and Pérez-Ortega, 2009; Printzen, 2009).

Few field lichenologists will be surprised to learn that a lichenized-fungus is difficult to identify. *Xanthoparmelia* (Vainio) Hale is no exception and is considered among the most notoriously difficult taxonomic groups of macrolichens (Leavitt et al., 2011b). *Xanthoparmelia* is the largest genus within the Parmeliaceae, with more than 800 recognized species (Amo de Paz et al., 2010; Blanco et al., 2004; Hale, 1990). This genus displays considerable morphological and chemical diversity; and slight morphological and/or chemical differences have often been used to distinguish species. Additionally, contrasting reproductive modes have also been considered to provide important

characters for diagnosing species within *Xanthoparmelia* (Hale, 1990), although many typically isidiate species also produce apothecia on occasion. However, the use of molecular sequence data suggests that chemical and morphological characters traditionally used to define taxonomic groups within this genus have been overemphasized (Amo de Paz et al., 2010; Leavitt et al., 2011b; Leavitt et al., 2011c). Adding to the taxonomic confusion, morphologically cryptic species are commonly hidden within

traditional *Xanthoparmelia* species (Hodkinson and Lendemer, 2011; Leavitt et al., 2011b; Thell et al., 2009). The clear conflict between traditional species boundaries and conclusions drawn from genetic data has resulted in a difficult conundrum on how we should treat diversity within this important genus.

A sizeable portion of *Xanthoparmelia* diversity is found in North America (Fig. 1). Currently, a total of 85 species are recorded for North America, 35 of which are known to occur in California. Many

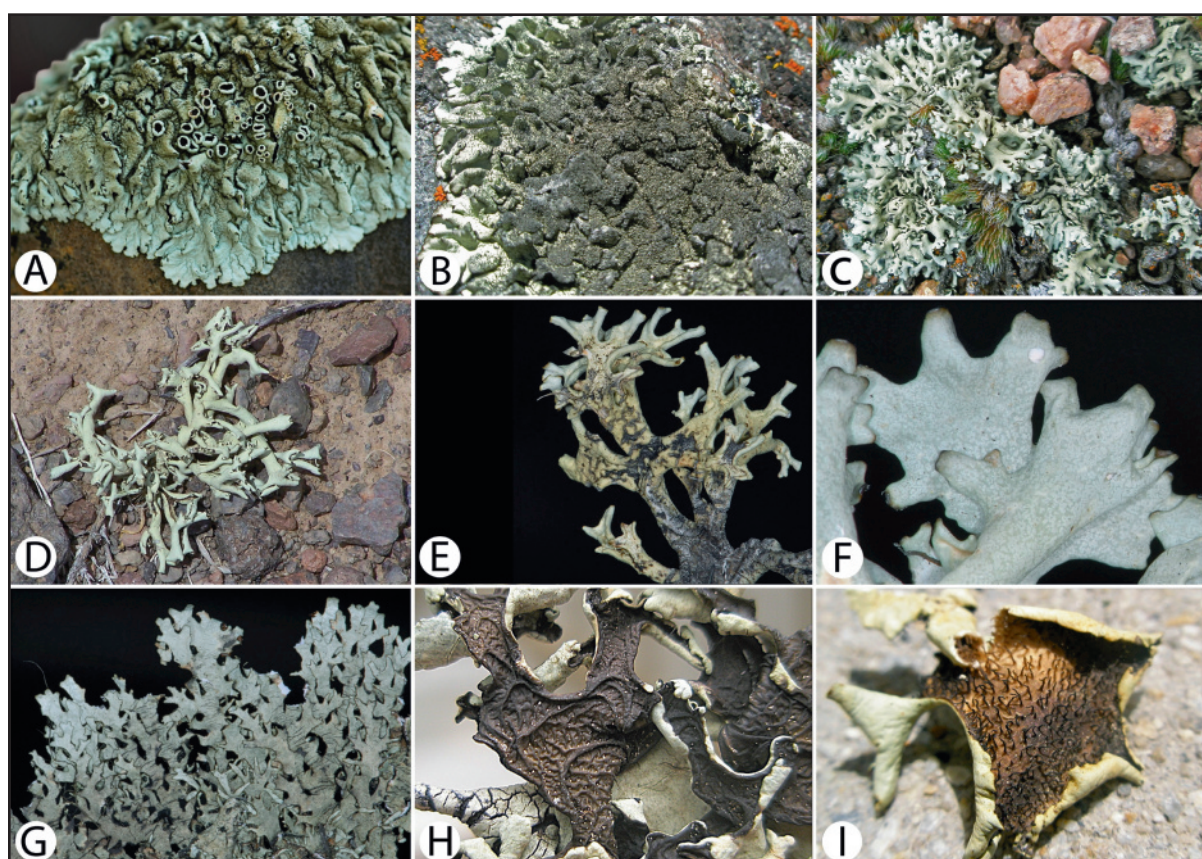


Figure 1. Variation in morphology and habit within sampled *Xanthoparmelia* in western North America. (A) saxicolous attached taxon *X. cumberlandia* sensu lato (s. l.) with apothecia; (B) saxicolous attached taxon *X. mexicana* with isidia; (C) terricolous taxon *X. wyomingica* s. l., an intermediate growth-form between attached and vagrant forms; (D) vagrant taxon *X. chlorochroa* s. l.; (E) morphology of rare vagrant or semi-attached taxon *X. idahoensis* s. l.; (F) white-maculate upper cortex on *X. camtschadalis* s. l.; (G) lobe morphology and weakly maculate surface on *X. stenophylla*; (H) erhizinate lower surface of the vagrant taxon *X. norchlorochroa* s. l.; (I) rhizine characters on the vagrant taxon *X. chlorochroa* s. l. Photos by Steven Leavitt.

species may be locally common to abundant, but identification of even the most common species is often difficult. Morphologically and chemically diverse species within *Xanthoparmelia* in western North America provide a useful model for exploring the challenges associated with integrating molecular sequence data with traditional taxonomic characters to better understand species diversity in lichenized fungi. As part of our ongoing research, we have amassed over 4000 *Xanthoparmelia* specimens from western North America and generated genetic sequence data for more than 500 individuals. Here we briefly report on our current findings and their implications for understanding lichen diversity in western North America. Using results from our research on *Xanthoparmelia* we specifically address two major issues currently facing lichenologists:

- (1) Cryptic diversity in ‘traditional’ species and
- (2) Polymorphic species representing multiple ‘traditional’ lichen fungal species within a single species-level lineage.

Here we synthesize the impact of these two common phenomena in *Xanthoparmelia* in western North America and their implications for understanding and identifying lichen species diversity.

Cryptic Species

Dealing with multiple species-level lineages hidden under one species name is hardly limited to lichen symbionts. In fact, cryptic species have been commonly documented across all forms of life, including bacteria, protists, plants, animals, and other fungi. Although cryptic diversity in lichen-forming fungi has been

frequently reviewed (Crespo and Lumbsch, 2010; Crespo and Pérez-Ortega, 2009; Lumbsch and Leavitt, 2011), it remains a controversial topic in lichenology. Consequently, even the interpretation and application of the term ‘cryptic species’ or ‘cryptic diversity’ varies widely among users. We suggest that the most practical definition of ‘cryptic’ species is simply where two or more distinct species are erroneously classified (and hidden) under one species name (Bickford et al., 2007). This does not preclude the possibility that diagnostic phenotypic characters supporting distinct species-level lineages may be identified in future studies. Simply, the distinct species are unrecognizable using current taxonomic characters. In some cases of cryptic diversity in lichenized fungi, a re-examination of morphology and/or chemistry against a molecular phylogenetic hypothesis has revealed previously overlooked morphological and/or chemical characters supporting the separation of distinct phylogenetic clades as separate species (ex. Argüello et al., 2007; Divakar et al., 2010; Leavitt et al. 2012; Spribille et al., 2011; Wirtz et al., 2008). However, it has long been known by evolutionary biologists that distinct species do not need to have diagnosable morphological differences, (e.g. as summarized by Mayr 1942; Mayr 1963). Not surprisingly, within lichenized fungi there are also cases in which no corroborating phenotypic characters have been identified supporting cryptic lineages (Baloch and Grube, 2009; Leavitt et al., 2011a; Molina et al., 2011).

In our study of the genus *Xanthoparmelia* in western North America

we have found strong evidence of cryptic species (often recovered within polymorphic lineages – discussed below) within nearly all of the traditional species we have sampled (Fig. 2; Leavitt et al., 2011b; Leavitt et al., 2011c). For example, the stictic acid containing species, *X. cumberlandia*, was found in at least four distinct species-level lineages (Table 1).

Similarly, specimens identifiable as the isidiate species *X. mexicana* and *X. plittii* were each recovered in at least three genetically distinct populations (Table 1). Among the most surprising results of our research, we found that the vagrant species *X. chlorochroa* was represented in at least six distinct species-level lineages (Table 1). Overall, the pattern of cryptic diversity

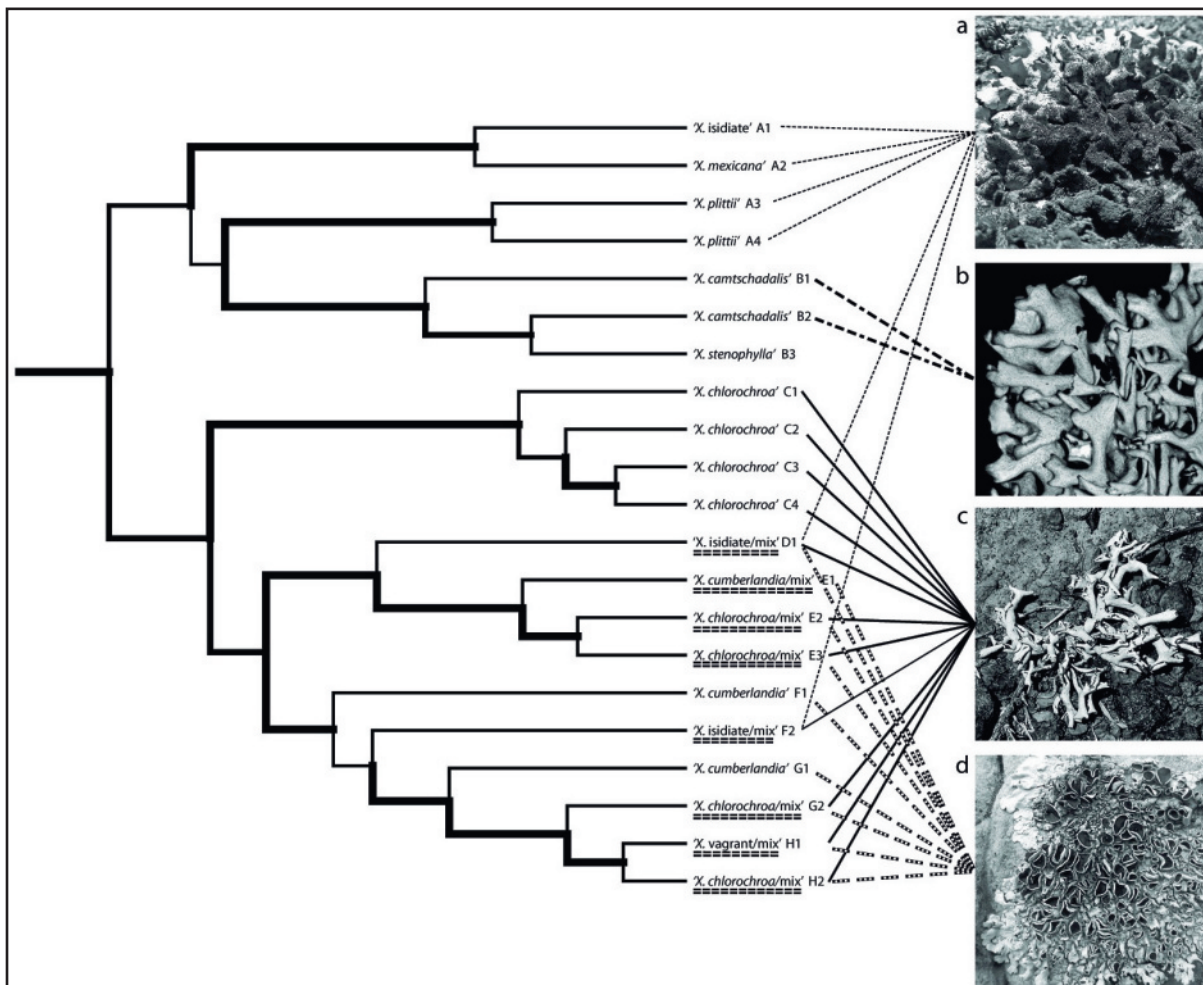


Figure 2. A multilocus species tree, representing relationships between species-level genetic clusters inferred from four ribosomal loci and two protein coding markers generated from *Xanthoparmelia* specimens collected in western North America. Traditional combinations of morphological and chemical characters used for species recognition in *Xanthoparmelia* were not supported. Major diagnostic characters are distributed across divergent lineages, including (a) presence of isidia; (b) maculate upper cortex (in vagrant forms); (c) emaculate vagrant growth form; and (d) emaculate saxicolous forms. Underlined terminal labels indicate chemically polymorphic genetic clusters. Thickened branches are proportional to the level of posterior probability support (see Leavitt et al 2011b for complete details). Photos by Steven Leavitt.

Table 1. Distribution of a total of 414 traditionally circumscribed species from western North America in species-level genetic clusters. Eight major genetic groups (A-H) were inferred from six genetic markers (ITS, IGS, group I intron, β -tubulin, and MCM7); and a total of 21 species-level genetic clusters (A1 – H2) were identified within these groups. Most inferred population clusters include multiple traditionally circumscribed species, and at the same time the most common morphological/chemical species are distributed in different population clusters. Values within each group represent the number of individuals recovered within each genetic cluster (see Leavitt et al. 2011b for complete details).

Morphological /chemical species	A			B			C				D		E			F		G		H	
	A1	A2	A3	A4	B1	B2	B3	C1	C2	C3	C4	D1	E1	E2	E3	F1	F2	G1	G2	H1	H2
vagrant species																					
' <i>X. camtschadalis</i> '					13	2															
' <i>X. chlorochroa</i> '								4	12	12	11	1		26	23		1		21	9	4
' <i>X. idahoensis</i> '						11															
' <i>X. lipochlorochroa</i> '															3						
' <i>X. neochlorochroa</i> '														2	2						4
' <i>X. norchlorochroa</i> '														2	1				1		3
' <i>X. neowyomingica</i> '													7								
' <i>X. vagans</i> '															3	1					
' <i>X. wyomingica</i> '													1	2	1				4		2
isidiate saxicolous species																					
' <i>X. dierythra</i> '	1											2					3				
' <i>X. mexicana</i> '	1	2										17					9				
' <i>X. plittii</i> '				2	2							5					2				
' <i>X. subplittii</i> '												1									
non-isidiate saxicolous species																					
' <i>X. californica</i> '														1							
' <i>X. coloradoënsis</i> '													8	5	16				1		
' <i>X. cumberlandia</i> '													32	2	3	14		13	1		1
' <i>X. lineola</i> '												8					2				
' <i>X. psoromifera</i> '																	1				
' <i>X. stenophylla</i> '								15													
'admixed genome'		0				7			6			0		7		0		5			13

within traditional *Xanthoparmelia* species was observed in 13 of the 19 currently accepted species sampled in connection with our research (Leavitt et al., 2011b).

The results of our research suggest that extensive morphological and chemical homoplasy (similarity arising from evolutionary convergence) in *Xanthoparmelia* tends to obscure recognition of natural lineages within the mycobiont - whether based on thallus morphology, medullary chemistry, or reproductive mode (Fig. 2). Evolutionary relationships between attached (saxicolous) and vagrant growth-forms in lichenized ascomycetes have long been debated (Klement, 1950; Rosentreter,

1993; Rosentreter and McCune, 1992; Weber, 1977). Our findings clearly show that the most common traditional vagrant species, *X. camtschadalis* and *X. chlorochroa*, are actually composed of multiple distinct species-lineages within each group (Table 1), necessitating a careful rethinking of current taxonomic concepts in vagrant forms of *Xanthoparmelia*. These results provide strong evidence for multiple independent origins of vagrant forms in *Xanthoparmelia* in western North America; and both vagrant and attached forms may occur within a single species-level lineage.

Uncertainty about the taxonomic

significance of thallus morphology in *Xanthoparmelia* has traditionally resulted in heavy reliance on medullary chemistry. The most common diagnostic secondary metabolites for the most *Xanthoparmelia* species in western North America are closely related β -orcinol depsidones (ex. norstictic, salazinic, and stictic acids). Genetic, ecological, and biological factors influencing the expression of this highly characteristic group of compounds are unclear (Asplund and Gauslaa, 2007; Asplund et al., 2009; Solhaug et al., 2009). Our research suggests that due to independent changes in chemical character states, medullary chemistry has only limited value in delimiting natural groups in *Xanthoparmelia* in western North America, at least as currently interpreted (Fig. 2).

At this point in our research, we have generally been unable to discern any morphological differences or striking geographic and/or ecological patterns among divergent groups with similar morphologies. However, additional *a posteriori* examination of species-level lineages inferred from genetic data may yet reveal previously overlooked morphological, chemical and/or ecological characters supporting these lineages. A careful reexamination of putative 'cryptic' *Xanthoparmelia* lineages for corroborating phenotypic characters (i.e. ecology, geography, morphology, and chemistry) will be important for developing an integrative taxonomy and robust species boundaries supported by multiple lines of evidence. In some cases the corroborating phenotypic characters supporting cryptic lineages may be practically useful for field identification (ex. Divakar et al., 2010;

Wirtz et al., 2008), while in other cases specialized instruments, such as a scanning electron microscope (SEM), may be required to observe diagnostic characters (see Pino-Bodas et al., 2012a), rendering the diagnostic character practically unusable for most researchers.

This leads to an important point of discussion. Although corroborating morphological or chemical characters may support distinct lineages hidden under a traditionally circumscribed species, these separate 'species' may remain practically 'cryptic'. Most lichenologists are experienced with taxonomy requiring a hand lens, dissecting microscope, and chemical spot tests for accurate identifications. In addition, the majority of lichenologist likely have access to somewhat more sophisticated tools, such as a compound microscope or thin-layer chromatography; and accurate species identification using these more advanced approaches for identifying diagnostic characters are standard for many lichen groups. However, the use of more specialized tools, such as SEM, high-performance liquid chromatography (HPLC), and polymerase chain reaction (PCR) amplification of genetic data, is not standard in the vast majority of taxonomic treatments. In spite of the fact that SEM, HPLC, and genetic data can provide valuable characters for accurate species identification, incorporating this data into practical taxonomic treatments remains a challenge.

Polymorphic Species

Understanding the differences between morphological variation within a species and among closely related groups is

central to identifying the diagnostic characters required for establishing accurate taxonomic boundaries. However, in practice a clear demarcation between intraspecific and interspecific variation is subject to observational bias and individual interpretation. Accurate taxonomic circumscriptions may be confounded by varying levels of intraspecific variation among different species groups. While some species may have little variation, high levels of intraspecific phenotypic variation are well-documented in some lichen-forming fungi. A striking example is found in the terricolous cosmopolitan lichen-forming species *Cetraria aculeata*, where in steppe areas of Central Spain, Iran, and Ukraine vagrant specimens display an exceptional morphology that deviates from their typical fruticose pattern (Pérez-Ortega et al., 2012). Culberson et al. (1988) artfully demonstrated that in *Cladonia* neither morphological tendencies nor distinct patterns of secondary metabolite production are necessarily correlated to reproductive barriers among different forms. In some cases, intraspecific phenotypic variation within this genus has been interpreted as evidence supporting distinct species (Ahti, 2000), which may not reflect natural groups. For example, it has recently been shown that several traditionally circumscribed species within the *Cladonia gracilis* group (*C. coniocraea*, *C. cornuta* subsp. *groenlandica*, and *C. ochrochlora*) likely belong to a single morphologically polymorphic species (Pino-Bodas et al., 2011). In other cases in *Cladonia*, molecular sequence data supports chemically and morphologically

polymorphic species within this genus (ex. the *Cladonia gracilis* group [Pino-Bodas et al., 2011]; *Cladonia arbuscula* sensu lato [Piercey-Normore et al., 2010]).

Species identification in the morphologically, biochemically, and reproductively diverse lichen genus *Xanthoparmelia* is notoriously challenging. Our research on *Xanthoparmelia* using molecular sequence data provides some insights into why species identifications may be so difficult. In many cases, species-level genetic groups were shown to be morphologically and chemically polymorphic, containing up to eight traditionally circumscribed *Xanthoparmelia* species within a single species-level lineage (Table 1). For example, one genetic cluster, 'X. isidiate/mix' D1 (Fig. 2) was dominated by four currently accepted species (*X. dierythra* [with norstictic acid]; *X. mexicana* [with salazinic acid]; *X. plittii* [with stictic acid]; and *X. subplittii* [with stictic acid]), but also contained a vagrant specimen identified as *X. chlorochroa* and non-isidiate specimens producing abundant apothecia (Leavitt et al., 2011c).

A similar pattern of high intraspecific morphological polymorphism is found in non-isidiate saxicolous and vagrant *Xanthoparmelia* specimens common in the intermountain region of western North America (Leavitt et al., 2011b). Again, using genetic data we identified distinct genetic clusters corresponding to 'species'-level lineages each containing the morphologically-circumscribed species *X. chlorochroa* (vagrant species containing salazinic acid), *X. coloradoënsis* (saxicolous species containing salazinic acid), and *X. cumberlandia* (saxicolous

species containing stictic acid) (Fig. 2). Clearly, our results indicated that characters traditionally used to separate *Xanthoparmelia* species are commonly polymorphic within the population clusters inferred from genetic data. However, in most cases each distinct population cluster showed a general trend in the expression of secondary metabolites, suggesting at least some level of reproductive isolation between salazinic and stictic acid chemotypes.

Intraspecific polymorphisms are even common in vagrant forms of *Xanthoparmelia*. Our results indicate that in one case a total of six traditionally circumscribed vagrant species (*X. chlorochroa*, *X. lipochlorochroa*, *X. norchlorochroa*, *X. neochlorochroa*, *X. vagans*, and *X. wyomingica*) were recovered within a single species-level genetic cluster, in addition to the saxicolous species *X. coloradoënsis* and *X. cumberlandia* (Table 1). Our research results indicate that a clear demarcation between intraspecific and interspecific morphological and/or chemical variation does not exist for a large proportion of *Xanthoparmelia* species in western North America (Fig. 2), in spite of general trends of morphological similarity within some species-level lineages.

Our research clearly indicates that our current interpretation of morphological and chemical characters in *Xanthoparmelia* is inadequate to accurately characterize species diversity. As in other groups of lichen-forming fungi, such as *Bryoria* (Velmalá et al., 2009), *Cladonia* (Pino-Bodas et al., 2012b), *Cetraria* (Pérez-Ortega et al., 2012), a high degree of morphological and

chemical polymorphism may also occur within species-level lineages in *Xanthoparmelia*. While these results highlight the limitations of using traditional taxonomic characters for separating natural groups within *Xanthoparmelia*, they also provide a valuable perspective on the importance of ongoing research in even the best-studied lichen groups.

Where do we go from here?

Accurate species circumscriptions and identifications are essential for various sub-disciplines of biology. The availability of genetic data has allowed researchers to identify species and to rigorously test species boundaries in lichen-forming fungi with a level of precision that was unimaginable a decade ago. In spite of our progress with accurately recognizing diversity using molecular sequence data, successfully implementing these results into a working taxonomy remains challenging.

While our results may contradict traditional species boundaries within *Xanthoparmelia* in western North America, we are optimistic that our research represents substantial progress towards a more accurate perspective on species diversity in this important genus. As a result of our research, the taxonomic value of phenotypic characters in *Xanthoparmelia* in western North America is now better understood. For example, in arid continental regions of western North America the vast majority of isidiate *Xanthoparmelia* specimens belong to a single species-level lineage, regardless of whether the specimens produce salazinic, stictic, or norstictic acid as the major

extrolite. In spite of the morphological and chemical similarities of isidiate *Xanthoparmelia* specimens from more humid regions they all appear to belong to completely distinct species-level lineages. Hence, understanding ecological and geographic patterns associated with the distinct genetic groups will be important in developing a working taxonomy with some *Xanthoparmelia* species. A second example includes *Xanthoparmelia* specimens collected from the Intermountain Area of western North America. In this region specimens producing salazinic acid generally belong to a lineage distinct from co-occurring specimens producing stictic acid, in spite of the high degree of variation in thallus morphology. In this case, species traditionally identified as '*X. chlorochroa*', '*X. coloradoënsis*', and '*X. wyomingica*' should likely be treated as a single morphological polymorphic species (all containing salazinic acid), separate from '*X. cumberlandia*' (which produces stictic acid). However, it is important to keep in mind that this is a region-specific pattern, and each of these traditional species can be found in other distinct species-level lineages.

While we are strong advocates for the application of independent data types in developing an integrative taxonomy, there is an increasing need to formally recognize the existence of phenotypically cryptic species-level lineages in lichen-forming fungi (see Crespo and Lumbsch, 2010; Crespo and Pérez-Ortega, 2009; Hibbett et al., 2011; Lumbsch and Leavitt, 2011). In some cases, a molecular taxonomy may provide the most practical approach to consistent treatment of mycobiont species

within lichen groups where diagnostic morphological characters are unidentifiable or practically not feasible.

These are exciting times for lichenologists. A closer look at lichen taxonomy, with the inclusion of new data, will help us to better understand the diversity of lichenized fungi, accurately interpret distribution patterns, and play a more important role in meaningful conservation practices. However, progress will be accompanied by some level of uncertainty. In many taxonomic groups, including *Xanthoparmelia*, our traditional approach for species identification will likely need to be substantially modified. The search for corroborating morphological support for cryptic species identified using molecular data will require meticulous and creative approaches to assess phenotypic variation in potentially unorthodox ways. We are hopeful that lichenologists, who traditionally have been eager to include new methods, such as chromatography, in their routine identifications, will be amenable to include molecular techniques to their routine examination of specimens for identification and classification. Although this may prove difficult to achieve by single individuals, especially citizen scientists that traditionally play an important role in lichen taxonomy (Poelt, 1992), the increasing number of collaborative projects in the discipline (e.g., Crespo et al., 2010; Gueidan et al., 2009; Lumbsch et al., 2011) make us optimistic that broad-scale collaborative approaches will facilitate the inclusion of molecular data in lichen research at all levels. Integrating new data (including novel morphological characters and

genetic data) will be essential to accurately represent lichen diversity in *Xanthoparmelia* and other lichen groups. Hopefully, an improved perspective on lichen diversity also increases our appreciation of these incredible symbiotic systems.

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Xanthoparmelia aff. *cumberlandia*, Aquarius Plateau, Utah, USA. Photo by Steven Leavitt.

Survey of the Lichen Flora of Palos Verdes, Southern California

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A preliminary lichen survey of the Palos Verdes Peninsula has yielded 64 species, 57 of which are here reported as new to the area. Of these, 16 are shown to be substantially more abundant on the Channel Islands than on the mainland, while 5 appear to be more common on the mainland. Six - Caloplaca stipitata Wetmore, Dendrographa leucophaea (Tuck.) Darb., Lecidella scabra (Taylor) Hertel & Leuckert, Niebla ceruchis Rundel & Bowler, Niebla combeoides (Nyl.) Rundel & Bowler and Roccella gracilis Bory - are rarely reported from mainland southern California; their occurrence adjacent to one of the most densely populated areas in the U.S. is noteworthy. The richest lichen communities occur on coastal sage and chaparral on north- and northwest-facing slopes, although further

work on saxicolous communities is needed. Bluff Cove is identified as a promising site for further study.

Introduction

Palos Verdes Peninsula juts into the ocean in southern Los Angeles County between San Pedro and Redondo Beach (Figure 1). It is justly famous for its dramatic, nearly continuous ring of sea cliffs. Its wild, rugged prospect stands in stark contrast to the nearby Los Angeles basin, one of the most heavily urbanized and fastest growing regions in North America with a population of nearly 18 million. Only in recent decades has suburban development begun to encroach, especially in the western portions.

Like many other mountain ranges in southern California, Palos Verdes Peninsula is an uplifted fault block. Roughly 1 to 2 million years ago it rose from the sea as an island, effectively part of the Channel Islands chain. Only toward the end of the Pleistocene, about 10 to 20 thousand years ago, did infilling of the Los Angeles basin finally connect it with the mainland (Byhower 2007). The rocks here consist primarily of 4 to 16 million year old sediments of the Monterey Formation (Altamira Shale, Mulaga Mudstone and Valmonte Diatomite) overlying the much older Catalina Schist. The Monterey Formation in this area is geologically complex, encompassing large quantities of siliceous, carbonaceous and

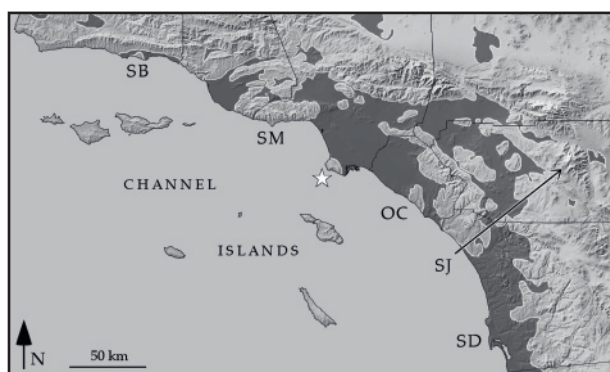


Figure 1. Map of southern California, showing Palos Verdes (star) in relation to the Channel Islands, Santa Barbara (SB), Santa Monica Mountains (SM), Orange County (OC), San Jacinto Mountains (SJ), San Diego (SD), and urban and agricultural lands (dark areas).

phosphatic sediments and extensive tuff beds in the sea cliffs and hills above, as well as basalt intrusions often exposed at their base (Conrad & Ehlig 1987). Owing to the inclination of the strata and the chemical nature of the underlying sediments, portions of the southern half of the peninsula are effectively enormous, slow-moving landslides (Morris 2000). It is this that has prevented widespread housing development here. The slope at Portuguese Bend, for example, is presently subsiding at a rate of approximately 1 to 2 m per year (Calabro et al. 2010).

Vegetationally, the coast of the peninsula is dominated by the Coastal Sage Scrub community (O'Leary 1990). Common shrubs include *Artemisia californica*, *Salvia leucophylla*, *S. mellifera*, *Lycium californicum* and *Atriplex californica*. Larger chaparral species like *Rhus integrifolia* and *Quercus* spp. occur locally on northwest-facing slopes. Several canyons with perennial streams support riparian communities, including shrubs like *Salix lasiolepis* and *Sambucus mexicana*. Occasional small fires have occurred throughout the area.

It is now well established that the flora and fauna of Palos Verdes Peninsula have their closest affinities with the Channel Islands. Several plants and animals occur nowhere else on the mainland. Examples include the plants *Dudleya virens* and *Crossosoma californicum*, (Munz 1970, Baldwin et al. 2012) and the Dusky Orange-crowned Warbler (also known to breed at Point Loma, San Diego; Bradley 1980). The *sedentarius* subspecies of Allen's Hummingbird, formerly endemic to the Channel Islands, began to colonize the mainland at Palos Verdes in the 1960s,

subsequently spreading to the Santa Monica Mountains and Orange County (Wells & Baptista 1979).

Previous Work

Notwithstanding its proximity to Los Angeles, Palos Verdes has received little attention from lichenologists. There are no lichenological papers dealing specifically with the area. A search of CNALH (<http://lichenportal.org/portal>) yielded only 41 collections: 9 by H.E. Hasse between 1895 and 1912, one by W.A. Setchell in 1896 and one by A.C. Herre in 1905, all from San Pedro, and 12 by W.A. Weber in 1952 from the hills above Portuguese Bend and Abalone Cove. Between 1908 and 1914, Hasse made 17 additional collections at nearby Clifton-by-the-Sea in southern Redondo Beach (Figure 2). Since many of these are saxicolous and are listed

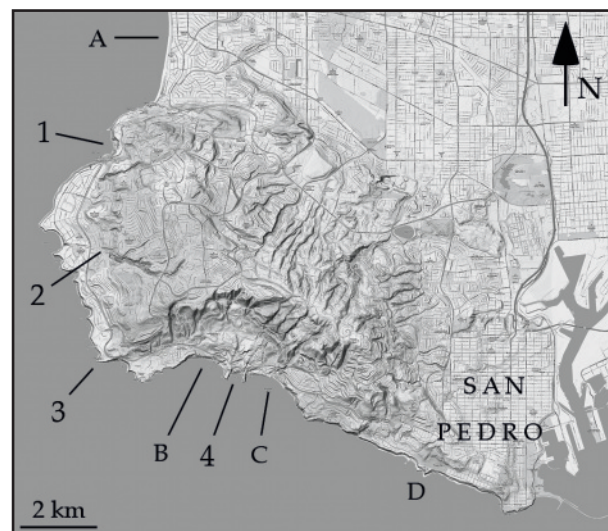


Figure 2. Map of Palos Verdes, showing locations of historical records: (A) Clifton-by-the-Sea, (B) Abalone Cove, (C) Portuguese Bend and (D) White Point. Also shown are the four localities visited in connection with the present study: (1) Bluff Cove, (2) Paseo Lunado, (3) Point Vicente and (4) Sacred Cove.

as simply “near Clifton” it seems likely that they were actually collected in Palos Verdes, the only rocky cliffs near Redondo Beach. Consequently, I have included these records in the present study.

In contrast to the meager work at Palos Verdes, other lichen hotspots in southern California (Figure 1) have received considerable attention from lichenologists. To be sure, no fewer than 13 checklists have appeared in the last two decades: the Santa Monica Mountains (Knudsen 2005, 2007, Knudsen et al. 2008, Knudsen & Kocourková 2009b, 2010b), the coast of Orange and San Diego Counties (Bratt 1997, Knudsen et al. 2008, Knudsen & Kocourková 2009a), the San Jacinto Mountains (Knudsen & Kramer 2007), Santa Barbara (Tucker 2010), and the Channel Islands (Bowler et al. 1996, Bratt 1993, 1999, Knudsen 2008, 2009, Knudsen & Kocourková 2010a, 2012). Taken together these papers report approximately 900 species of lichens, lichenicolous fungi and allied fungi from the region.

Fieldwork

On 18 January 2012, I paid a brief visit to Palos Verdes. Prior to my foray I selected four promising sites (numbered locations on Figure 2). Each of these sites was carefully surveyed and representative samples of all species encountered were collected. Below I give a brief summary of each location with notes on the lichens encountered.

Bluff Cove

By far the richest lichen flora was seen in Bluff Cove, on the northwestern corner of the peninsula, where I found 34 species,



Figure 3. Bluff Cove, looking south. Photo by Jason Hollinger.

of which 23 were epiphytes and the remaining 11 saxicoles. I attribute this rich flora to the gentle, north-facing bluffs which support a uniquely well developed sage scrub community.

As elsewhere along the coast of Palos Verdes, the ocean spray zone is essentially devoid of lichens, presumably reflecting the highly erodible nature of the rocks, here mostly shale and mudstone. Much more productive are the stable basalt sills exposed just above the spray zone. Here I found extensive gray-brown patches of *Lecania fructigena* and orange colonies of *Caloplaca luteominia* var. *luteominia*, the latter occasionally present also on stable soil.

The crumbling, almost soil-like breccia in shaded gullies supports a number of interesting species, including *Verrucaria mimicrans*, *V. viridula*, *Buellia abstracta* and the sorediate *Lecidella scabra*. It is worth noting that during my visit, these well-sheltered microsites retained dew well into the day. The southwest endemic species *Cladonia nashii* is locally abundant here.

The richest lichen communities, however, occur on the thick scrub, which support an epiphytic flora characteristic of coastal southern California, including *Cliostomum griffithii*, *Diploicia canescens*,

Flavoparmelia caperata, *Niebla cephalota*, *Pyrrhospora quernea* and *Ramalina* spp. Of particular interest is a population of *Niebla ceruchis*, now apparently rare in mainland southern California, where it has been collected recently only at Point Loma in San Diego (Bratt 4312 (SBBG), Knudsen 3257, 10009 (UCR)), Conejo Mountain in the Santa Monica Mountains (Knudsen 3950 (UCR)), and Santa Barbara (Nash 11203 (ASU)). This species is much more common in San Luis Obispo and Monterey Counties (numerous specimens at SBBG) and Baja California. On the Channel Islands it is quite common (Knudsen & Kocourková 2012).

Arroyo at top of Paseo Lunado

This long gully is accessed from the top of Paseo Lunado. The perennial watercourse is choked with willow, while the surrounding slopes are open grassland with scattered live oaks. The lichen flora here is extremely impoverished. Extensive searching turned up only two saxicolous specimens of *Caloplaca*, although I noted scattered unidentifiable fragments of various terricolous and epiphytic lichens, perhaps damaged by fire.

Cliff tops north of Point Vincente

Here as elsewhere along the top of the sea cliffs, the native vegetation is dominated by an arid, windswept sage community. These low shrubs support a limited epiphytic crustose flora, but apparently little else. More might be found on the cliffs below.

Of the three species I collected here, most notable is *Bacidina californica*, a relatively rare lichen on the mainland of



Figure 4. Looking north from Point Vincente. Photo by Jason Hollinger.

southern California (but more common on the Channel Islands). This is an extraordinarily variable species (Figure 5). The apothecia vary from pale pink or yellow to purple-brown or almost black (often multicolored), while the thallus ranges from thin and continuous to thick and wrinkled, sometimes almost dissolving into granular areoles or soredia (Ekman 2004).

Sacred Cove

This small cove near Portuguese Bend on the southern coast of the peninsula has been set aside as an ecological reserve. The cliffs here are continuously slumping, resulting in gentle south-facing slopes. Sage scrub occurs sporadically throughout the area. A small pine grove covers a knoll some distance back from the western headland, an unusual forest community for Palos Verdes.

Of the eight species collected in this location, all crustose, five were saxicolous and three epiphytic. *Sigridea californica* is particularly abundant on rough old bark of various shrubs. The unlichenized *Arthonia*

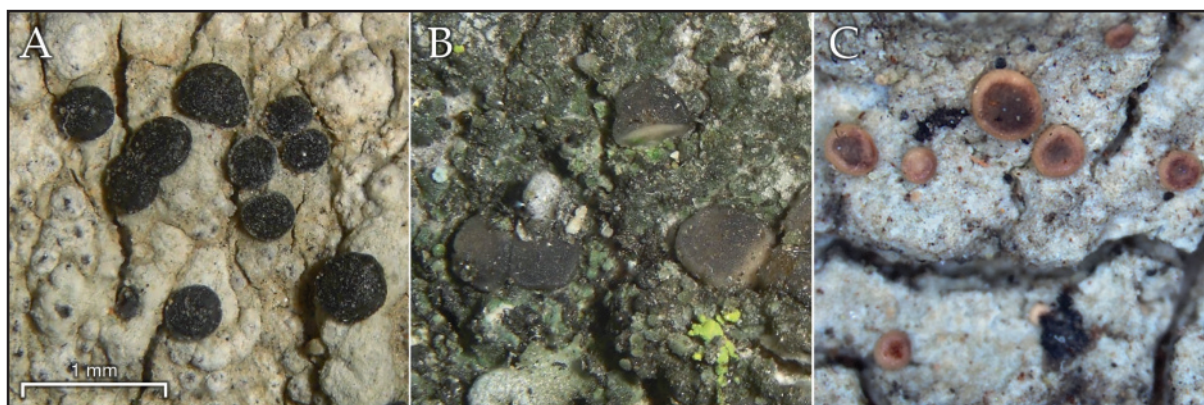


Figure 5: Variation in apothecia and thalli of *Bacidina californica*. A: Palos Verdes, *Hollinger 4424*; B: San Gabriel Mountains, *Hollinger 4528*; C: isotype at UBC. Scale bar is 1 mm. Photos A & B by Jason Hollinger. Photo C by Curtis Björk.

albopulverea is locally common on both smooth- and rough-barked stems. The apothecia of the latter species are remarkably variable (Figure 6). It forms a thin, white, unlichenized stain on living or dead bark with thin, black, epruinose apothecia. The apothecia vary from subglobose to strongly asterisk-shaped. The spores are septate to finally submuriform, but care must be taken to find mature spores free of the ascus.

Annotated Checklist

The material collected for this study, combined with historical records and reports, brings the lichen flora for Palos Verdes Peninsula to 64 species. Names marked with an asterisk (*) are new reports. Several historical records (shown

within brackets) are considered to be erroneous or questionable.

**Arthonia albopulverea* Nyl. — Bluff Cove: on limb of *Rhus* in chaparral, *Hollinger 4399, 4407*; on stalk of dead herbaceous plant near beach, *Hollinger 4410*; Sacred Cove: on limb of *Pinus*, *Hollinger 4420*; on limb of dead unknown exotic shrub, *Hollinger 4428, 4431*; all det. by K. Knudsen.

Arthonia lecanactidea Zahlbr. — White Point: 1895, *Hasse 2359* (MIN), this is the type specimen; on *Lycium californicum*, 1897 or 1899, *Hasse 1316* (MICH, MIN), isotypes.

Arthonia pruinata (Pers.) Steudel ex A.L. Sm. — Reported as *A. impolita* (Ehrh.) Borr. var. *impolita* and var. *chiodectonoides* Tuck. by Hasse (1913) on

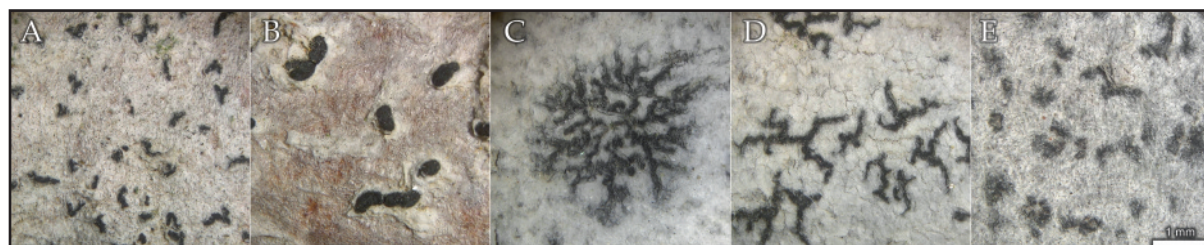


Figure 6. Variation in apothecia of *Arthonia albopulverea* at Palos Verdes. A: *Hollinger 4407*, B: *Hollinger 4399*, C-D: *Hollinger 4431*, E: *Hollinger 4420*. Scale bar is 1 mm. Photos by Jason Hollinger.

shrubs from White Point.

**Bacidina californica* S. Ekman — Point Vincente: on twig of cfr. sage, *Hollinger 4424*; on dead twig of *Cupressus macrocarpa*, *Hollinger 4426*, det. by Knudsen. The apothecia were black with dark brown exciple, dark brown to slightly greenish epihymenium, hyaline hymenium and dark brown hypothecium; the spores were hyaline, fusiform, mostly 5-septate, ~12-13 x 2.5-3 µm, both ends equally tapered; the pycnidia were in steep-sided verrucae with conidia ~2.5 x 1 µm.

**Buellia abstracta* (Nyl.) H. Olivier — Bluff Cove: on crumbling rock in gully, *Hollinger 4414*. The name *B. sequax* (Nyl.) Zahlbr. was misapplied to this species in the Sonoran Flora (Knudsen, pers. comm.).

**Buellia alboatra* (Hoffm.) Th. Fr. (= *Diplotomma alboatrum* (Hoffm.) Flotow) — Portuguese Bend: on rock, 24 Dec. 1952, *Weber S-986b* (ASU).

**Buellia halonia* (Ach.) Tuck. — Portuguese Bend: on chert, 24 Dec. 1952, *Weber S-996* (ASU), det. by F. Bungartz in 2003.

**Buellia maritima* (A. Massal.) Bagl. — Portuguese Bend: on rock, 24 Dec. 1952, *Weber S-986a* (ASU), as *B. subalbula* (Nyl.) Müll. Arg., a misapplied name (Knudsen, pers. comm.).

**Buellia punctata* (Hoffm.) A. Massal. (= *Amandinea punctata* (Hoffm.) Coppins & Scheid.) — Bluff Cove: on trunk of *Rhus* in chaparral, *Hollinger 4411*; Point Vincente: on dead twig of *Cupressus macrocarpa*, *Hollinger 4425*.

**Caloplaca bolacina* (Tuck.) Herre — Sacred Cove: on concrete wall (not collected).

[*Caloplaca fraudans* (Th. Fr.) H. Olivier

— Hasse (1913) reports this as *Blastenia ferruginea* (Huds.) Arnold var. *fraudans* T. Fries on arenaceous shale at White Point. Probably based on a misidentification (Tucker 2007).]

**Caloplaca luteominia* (Tuck.) Zahlbr. var. *luteominia* — Clifton-by-the-Sea: 1912, *Hasse s.n.* (ASU, MIN 865893, 865894), det. by C. Wetmore; Bluff Cove: abundant on outcrops above spray zone, *Hollinger 4403a*; on soil under lip at edge of cliff, *Hollinger 4402*; Paseo Lunado: on small rock on ground, *Hollinger 4422b*; Sacred Cove: on rotten rock on ground in pine grove, *Hollinger 4436b*. The thallus varied from entirely lacking to well-developed, beige and rimose.

**Caloplaca pyracea* (Ach.) Th. Fr. — Bluff Cove: common on twigs of dead sage in chaparral, *Hollinger 4396*; on exposed dead rhizome of unknown plant, *Hollinger 4395b*. In the past the name *C. holocarpa* (Hoffm. ex Ach.) A.E. Wade has been widely applied to epiphytic material of this taxon with orange apothecia and scant orange thallus, but is now restricted to a saxicolous species not yet reported from California (Arup 2009).

**Caloplaca stanfordensis* H. Magn. — Clifton-by-the-Sea: on twig, May 1914, *Hasse Exs. 207* (ASU), as *C. cerina* (Ehrh.) Zahlbr.; Bluff Cove: common on twigs of dead sage, *Hollinger 4430*. Less common than the previous species; distinguished by the gray outer thalline rims. Tucker (2007) reports a duplicate specimen at SBBG as *C. cerina*, however the one at ASU was annotated *C. stanfordensis*. Wetmore (2007) shows a dot for Palos Verdes on the map for the latter, but not the former.

**Caloplaca stipitata* Wetmore — Bluff

Cove: on twigs of dead sage in chaparral, *Hollinger 4397*, juvenile specimen, det. by K. Knudsen.

**Caloplaca subsoluta* (Nyl.) Zahlbr. — Paseo Lunado: on small rock on ground, *Hollinger 4422a*.

**Chrysothrix xanthina* (Vainio) Kalb — Bluff Cove: on sheltered twigs of dead sage in chaparral, *Hollinger 4392*.

**Cladonia nashii* Ahti — Bluff Cove: locally common on moss and soil under chaparral, *Hollinger 4413*, det. by K. Knudsen. Very similar to *C. hammeri* Ahti which is also common in the chaparral of southern California. *Cladonia nashii* is distinguished by the presence of true soredia and atranorin (best revealed by a drop of KOH in the cups, although TLC is sometimes required; Knudsen, pers. comm.).

**Cliostomum griffithii* (Sm.) Coppins — Bluff Cove: on bark and twigs of *Rhus* in chaparral, *Hollinger 4400*; Sacred Cove: on limb of dead unknown tree, *Hollinger 4427*.

**Cresponea chloroconia* (Tuck.) Egea & Torrente — San Pedro: on dead twigs of *Rhus*, Nov. 1895, *Hasse s.n.* (ASU 683703). Probably originally recorded as *Lecanactis*, but ASU records it as *Cresponea premnea* (Ach.) Egea & Torrente. Reports of *C. premnea* are apparently misidentifications of *C. chloroconia* (Egea et al. 2004a).

Dendrographa leucophaea (Tuck.) Darb. — White Point: on twigs, Dec. 1896, *Setchell 5125* (MIN); 1898, *Hasse s.n.* (MIN 664458, 900249). Reported by Hasse (1913).

**Dimelaena radiata* (Tuck.) Müll. Arg. — Bluff Cove: on outcrop along beach, *Hollinger 4409*.

**Diploicia canescens* (Dickson) A. Massal. — Clifton-by-the-Sea: on dead *Sambucus*, 5 May 1908, *Hasse s.n.* (MIN 875449, MSC 114146); Bluff Cove: common on twigs of dead sage, *Hollinger 4390*. The Hasse specimen at MSC was determined by H. Imshaug in 1982. See also notes under *Pyxine soredata*.

**Diploschistes scruposus* (Schreber) Norman — Portuguese Bend: on chert and sandstone, 24 Dec. 1952, *Weber 992* (ASU).

**Evernia prunastri* (L.) Ach. — Bluff Cove: on twigs of dead sage (not collected).

**Flavoparmelia caperata* (L.) Hale — Bluff Cove: on twigs of dead sage (not collected).

**Lecania brunonis* (Tuck.) Herre — White Point: Sep. 1912, *Hasse Exs. 36* (ASU), det. by P.P.G. van den Boom in 2003.

Lecania dudleyi Herre — White Point: Sep. 1912, *Hasse Exs. 36b* (ASU), det. by B.D. Ryan in 1999. Reported on calcareous rocks at White Point by Hasse (1913).

Lecania franciscana (Tuck.) K. Knudsen & Lendemer — Abalone Cove: 24 Dec. 1952, *Weber 18093, L-1019*, as *Catillaria franciscana* (Tuck.) Herre; Bluff Cove: on outcrop along beach, *Hollinger 4408*. This is a creamy-whitish, scurfy crust with mostly 1-septate spores, 16-22 x 4.5-5 µm. Reported for White Point by Hasse (1913) as *Catillaria franciscana*. See Knudsen & Lendemer 2007 for taxonomic notes. See notes under *L. subdispersa* (Nyl. ex B.D. Ryan) B.D. Ryan in van den Boom & Ryan 2004 for comments on Hasse's collections.

**Lecania fructigena* Zahlbr. — Bluff

Cove: abundant on outcrops along beach, *Hollinger 4401, 4403b*. This is an irregularly verrucose to subsquamulose, grayish to brownish crust with indistinctly septate spores, 10-15 x 4-5 μm and abundant pycnidia with conidia 14-24 x 1 μm .

**Lecania pacifica* Zahlbr. ex B.D. Ryan & van den Boom — Clifton-by-the-Sea: on rock, 1914, *Hasse L-79350*, as *L. angelensis* Zahlbr. nom. prov. Can be very similar to *L. brunonis* and *L. fructigena*, see van den Boom & Ryan 2004.

**Lecanographa subdryophila* (Follmann & Vězda) Egea & Torrente — Clifton-by-the-Sea or San Pedro: 1895, *Hasse s.n.* (ASU), det. by Egea & Torrente in 1994.

Lecanora crenulata Hooker — Clifton-by-the-Sea: 1914, *Hasse s.n.* (MIN 901175); Portuguese Bend: on chert and sandstone, 24 Dec. 1952, *Weber S-997* (ASU). Both originally recorded as *L. hagenii*, revised by Śliwa (2007).

**Lecanora dispersa* (Pers.) Sommerf. — Bluff Cove: on mossy outcrop in chaparral gully, *Hollinger 4416*; Sacred Cove: on rotten rock on ground in grove, *Hollinger 4436a*. All spot tests negative for my material, more commonly with P+ orange/red rims. See also *L. hagenii*.

**Lecanora expallens* Ach. — Bluff Cove: on *Rhus* limb, *Hollinger 4391*, det. by J. Lendemer. Superficially resembling a *Lepraria*, with a finely powdery leprose thallus, however very close inspection revealed a few minute fragments of intact gray-corticate thallus. Usnic and thiophanic acids are present (C+ and KC+ orange).

**Lecanora gangaleoides* Nyl. — Portuguese Bend: on chert and sandstone, 24 Dec. 1952, *Weber S-988* (ASU), det. by

H.T. Lumbsch in 2002.

**Lecanora hagenii* (Ach.) Ach. — Bluff Cove: on exposed dead rhizome, *Hollinger 4395a*. Very similar to *L. dispersa*, and both can occur on either bark or rock, but this species is distinguished by lack of POL+ granules in epihymenium and amphithecial cortex.

**Lecidella scabra* (Taylor) Hertel & Leuckert — Bluff Cove: directly on rock in chaparral gully, *Hollinger 4417*, det. by K. Knudsen. This is a greenish-yellowish, nearly leprose crust with soredia tending to clump; C+ reddish orange, KC+ orange, UV+ orange.

**Leprocaulon microscopicum* (Vill.) W. Gams ex D. Hawksw. — Abalone Cove: on soil and rock just above tide mark, 24 Dec. 1952, *Weber 1018* (ASU), det. by B.D. Ryan in 1999. Knudsen & Kocourková (2012) call this *L. americanum* Lendemer & Hodgkinson, ined.

**Mobergia angelica* (Stizenb.) H. Mayrhofer & Sheard — Clifton-by-the-Sea: 1914, *Hasse s.n.* (ASU), det. by H. Mayrhofer in 2002.

**Naetrocymbe punctiformis* (Schrank) R.C. Harris — Bluff Cove: on twigs of dead sage, *Hollinger 4406*; Point Vicente: on twig of cfr. sage, *Hollinger 4423*; both det. by K. Knudsen. This is an undercollected species. It is an unlichenized, thin, whitish crust with hemispherical, black, epruinose apothecia and 1-septate, hyaline, slightly asymmetric spores, 18-22 x 5-6 μm .

**Niebla cephalota* (Tuck.) Rundel & Bowler — Bluff Cove: locally common on twigs of dead sage, *Hollinger 4385*.

**Niebla ceruchis* Rundel & Bowler — Bluff Cove: one fair population on twigs

of dead sage, *Hollinger 4384*.

**Niebla combeoides* (Nyl.) Rundel & Bowler — San Pedro: on granite sea cliff, 28 May 1905, *Herre 510* (SBBG). Also reported tentatively by Hasse (1913) as *Ramalina combeoides* Nyl. from Clifton-by-the-Sea on dead *Sambucus* and *Isomera arborea*.

**Niebla homalea* (Ach.) Rundel & Bowler — Clifton-by-the-Sea: on limestone, 10 Sep. 1933, *Darrow 314* (ASU, WIS), as *Ramalina homalea* Ach., det. by P.A. Bowler in 2003.

Opegrapha brattiae Egea & Ertz — Abalone Cove: on rocks on seashore, 24 Dec. 1952, *Weber s.n.* (COLO 77734). Reported by Egea & Ertz (2007).

[*Opegrapha varia* Pers. — White Point: on twig, 1895, *Hasse 386* (ASU, MIN); on *Rhus integrifolia*, Dec. 1896, *Hasse 14* (ASU, SBBG), as *O. diaphora* Ach. (Hasse 1913). Possibly misidentified; most specimens in the greater Sonoran Desert region were misidentifications for other species of *Opegrapha* (Ertz & Egea 2007).]

**Opegrapha xerica* Torrente & Egea — Bluff Cove: on branch of *Rhus* at edge of beach, *Hollinger 4404a*. This was a thin, tan, scurfy, lichenized crust, with epruinose, black lirellae, carbonized exciple closed below the apothecium, and hyaline hymenium turning red in Lugol's. The spores were hyaline, 4-septate, ~20 x 6-7 µm, ±constricted at septa, all lumina equal with rounded ends.

**Physcia adscendens* (Fr.) H. Olivier — Bluff Cove: on twigs of dead sage, *Hollinger 4389*.

**Pyrrhospora quernea* (Dickson) Körber — Bluff Cove: on limb of *Rhus*; on twigs of dead sage, *Hollinger 4393*.

[*Pyxine soredata* (Ach.) Mont. — Clifton-by-the-Sea: on dead *Sambucus*, 1908, *Hasse L-74581* (ASU). Misidentification of *Diploicia canescens* (Tucker 2007). This specimen is probably a duplicate of the two given above for *D. canescens*.]

**Ramalina farinacea* (L.) Ach. — Bluff Cove: common on twigs of dead sage, *Hollinger 4386*. See notes under *R. subleptocarpha* below; Hasse may have collected this at Clifton-by-the-Sea, too.

**Ramalina leptocarpha* Tuck. — Bluff Cove: common on twigs of dead sage, *Hollinger 4387*.

**Ramalina pollinaria* (Westr.) Ach. — Bluff Cove: on twig of dead sage, *Hollinger 4388*.

**Ramalina subleptocarpha* Rundel & Bowler — Clifton-by-the-Sea: May 1908, *Hasse 116* (ASU, MIN, SBBG). These three specimens appear to be duplicates, the one at ASU determined by B.D. Ryan in 1999 as *R. farinacea*, the one in SBBG determined by H. Kashiwadani in 2002 as *R. subleptocarpha*, and the remaining one at MIN is recorded as *R. lacera* (With.) J.R. Laundon.

**Rinodina gennarii* Bagl. — Sacred Cove: on rotten rock on ground in grove, *Hollinger 4436c*.

[*Rinodina rinodinoides* (Anzi) H. Mayrhofer & Scheid. — Hasse (1913) mistakenly reported *Buellia rinodinoides* Anzi. on calcareous rocks at White Point (Sheard 2004).]

**Roccella gracilis* Bory — Clifton-by-the-Sea: 19 Jan. and 1 Jul. 1914, *Hasse 14779* (ASU), det. by A. Tehler in 2000 and 2001 as *R. difficilis* Darb. and *R. peruensis* Kremp.

[*Roccella montagnei* Bel. — Clifton-by-the-Sea: Jun. 1914, *Hasse s.n.* (MIN 2960,

664453). Probably misidentifications since this species is not known to occur north of Mexico.]

**Sarcogyne plicata* H. Magn. — Clifton-by-the-Sea: Nov. 1896, *Hasse s.n.* (NY 1221349), det. by K. Knudsen in 2011. For notes on this species and *S. "privigna"*, see Knudsen & Kocourková 2011.

**Sarcogyne regularis* — Bluff Cove: on crumbling rock in gully, *Hollinger 4415*. This calciphilous species is distinguished by pruinose black apothecia which turn reddish when wet, although note that nonpruinose species of *Sarcogyne* can develop a thin pruina when growing on calcareous or sandstone substrates (Knudsen & Standley 2007).

**Sigridea californica* (Tuck.) Tehler — Clifton-by-the-Sea: 1912, *Hasse s.n.* (MIN 875434, 875436), as *Schismatomma californicum* (Tuck.) Zahlbr.; Bluff Cove: common on twigs of dead sage, *Hollinger 4412*; Sacred Cove: on limb of dead unknown shrub in grove, *Hollinger 4429*; sheltered limb of *Rhus* on top of cliff, *Hollinger 4432*; limb of dead exotic shrub at edge of cliff, *Hollinger 4435*. My specimens determined by K. Knudsen.

**Trapelia coarctata* (Turner ex Sm. & Sow.) M. Choisy — Clifton-by-the-Sea: on soil, Apr. 1914, *Hasse 242* (ASU, SBBG), as *Lecidea coarctata* (Turn. ex Sm.) Nyl. f. *elachista* (Ach.) Schaer. The SBBG specimen was determined by S. Tucker in 1996.

[*Verrucaria maura* Wahlenb. (= *Hydropunctaria maura* (Wahlenb.) Keller, Gueidan & Thüs) — Hasse (1913) reports this on calcareous beach rocks at San Pedro. Possibly a misidentification of *V. muralis*; not treated by Breuss (2007) in the Sonoran Flora.]

**Verrucaria mimicrans* Servít — Bluff Cove: on crumbling rock in gully, *Hollinger 4418*. This had an indistinct, chalky thallus, mostly immersed perithecia, involucrellum that was thick and black in upper third, uniformly thin, black exciple, and spores ~28 x 20 µm.

[*Verrucaria muralis* Ach. — Clifton-by-the-Sea: 1912, *Hasse s.n.* (MIN 2484). This is a plausible record, being frequent on calcareous substrates in California (Knudsen & Kocourková 2012), but there is no dot for Palos Verdes on the range map in the Sonoran Flora (Breuss 2007), so it requires confirmation.]

**Verrucaria nigroumbrina* (A. Massal.) Servít — Portuguese Bend: 24 Dec. 1952, *Weber s.n.* (ASU), as *V. nigrofusca*. There is a dot shown on the range map for *V. nigrofusca* Servít in the Sonoran Flora suggesting that Breuss (2007) may have seen this specimen.

**Verrucaria viridula* (Schrader) Ach. — Bluff Cove: on crumbling rock in gully, *Hollinger 4419*. This was a rimose to areolate, greenish to brownish crust, with perithecia immersed in the center of areoles except for slightly protruding black tips, involucrellum restricted to the upper portions and flaring away from exciple, exciple thick and hyaline, and spores ~25-30 x 15-20 µm.

**Xanthomendoza hasseana* (Räsänen) Søchting, Kärnefelt & S. Kondr. — San Pedro: on *Lycium californicum*, 1895, *Hasse 118* (ASU), det. by C.M. Wetmore as *Xanthoria hasseana* Räsänen.

**Xanthoria candelaria* (L.) Th. Fr. — Clifton-by-the-Sea: on volcanic(?) rock, Dec. 1912, *Hasse Exs. 125* (ASU, MIN, SBBG); Sacred Cove: on concrete wall, *Hollinger 4434*. My material formed an

extensive colony of upright lobes on top of wall, the underside of lobes coarsely sorediate without rhizines, the pycnidia conspicuous as darker orange pimples with ±ellipsoid to rod-shaped conidia, ~4 x 1.5 µm. Hasse's material was originally labeled as *X. lychnea* (Ach.) Th. Fr. var. *pygmaea* (Bory) Herre, while the ASU specimen was determined by L. Lindblom in 2002 as *X. candelaria*, and the SBBG specimen was apparently erroneously determined by S. Tucker in 1996 as *X. mendozae* Räsänen.

**Xanthoria polycarpa* (Hoffm.) Th. Fr. ex Rieber — Clifton-by-the-Sea: Nov. 1912, *Hasse s.n.* (MIN 1954); Bluff Cove: common on twigs of dead sage, *Hollinger 4394*.

Affinities of the Palos Verdes Lichen Flora

As already mentioned, the flora and fauna of the Palos Verdes Peninsula have strong affinities with their counterparts on the Channel Islands. Whether the same is true of the lichen flora is yet to be determined, but can perhaps be roughly evaluated by examining the on-line databases of pertinent herbaria. Here I will consider only the herbarium of University of California Riverside (UCR, accessed 1 November 2012), which houses most of the material used by Kerry Knudsen and Jana Kocourková in constructing their recent checklist for the Channel Islands (Knudsen & Kocourková 2012), as well as numerous other publications regarding the adjacent mainland (see references below). My approach was as follows. For each of the 64 lichen species accepted for Palos Verdes, I counted the number of UCR records from the Channel Islands and the

number from the mainland of southern California (defined as the region between the Transverse and Peninsular Ranges and the coast, roughly the extent of the map in Figure 1). In total, this exercise yielded approximately 5500 records identified to species, 1500 from the Channel Islands, 4000 from the mainland. The ratio of the number of records of a species from the islands to the number from the mainland weighted by the factor 4000 / 1500 estimates the relative abundance of that species.

Following this procedure, sixteen species (one quarter of the total) were found to have a weighted ratio in excess of 5:1, hence can be considered substantially more common on the Channel Islands than on the mainland. Six of these are rare in mainland southern California, making their presence at Palos Verdes remarkable: *Caloplaca stipitata*, *Dendrographa leucophaea*, *Lecidella scabra*, *Niebla ceruchis*, *N. combeoides* and *Roccella gracilis*. The remaining ten species are present on the mainland but apparently much more abundant on the islands: *Arthonia pruinata*, *Bacidina californica*, *Buellia halonia*, *B. maritima*, *Lecania dudleyi*, *L. franciscana*, *L. fructigena*, *L. pacifica*, *Niebla cephalota* and *Xanthoria candelaria*. Two additional species, *Diploicia canescens* and *Niebla homalea* also had a ratio greater than 5:1, however from my personal experience, both are so common on the mainland that their presence at Palos Verdes is not significant.

The reverse is much harder to establish. Only six species had a weighted ratio in excess of 1:5. However, due to the weighting factor the uncertainty of this measurement is much higher. Five of the

six species - *Caloplaca subsoluta*, *Diploschistes scruposus*, *Physcia adscendens*, *Sarcogyne plicata*, and *Xanthoria polycarpa* - do indeed appear to be less common on the Channel Islands (Knudsen & Kocourková 2012). The third, *Evernia prunastri*, despite having no records for the Channel Islands at UCR, is described as common on three of the Channel Islands (ibid.)

These results suggest that the Palos Verdes Peninsula is indeed lichenologically more closely allied with the Channel Islands than with other portions of mainland southern California.

Future Studies

Given the close proximity of the study area to one of the most densely populated regions in North America, it would be remarkable if the lichen flora here has remained stable since the first collections more than a century ago (Hasse 1913). The number of historic records still present in Palos Verdes is unknown, and would make an interesting project for future research. Also warranting further attention is Bluff Cove, lichenologically the richest site observed in this study. Many additional species doubtless remain to be discovered here, especially on sheltered shrubs on north- or northwest-facing slopes. More work is also needed on the saxicolous communities along the extensive but largely inaccessible sea cliffs.

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Notes on the California Lichen Flora # 5: New Records for California.

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The lichens *Anaptychia ulotrichoides*, *Lecanora percrenata*, *Lecidella patavina*, and *Rinodina pycnocarpa* are reported new for California. The lichenicolous fungi *Capronia peltigerae* on *Peltigera rufescens* and *Muellerella pygmaea* on *Bellemeria alpina* are reported new for California. *Rhizocarpon subpostumum* is excluded from the California lichen flora and not recognized as occurring in North America. The distribution of *Rhizocarpon distinctum* in California is discussed.

1. *Anaptychia ulotrichoides* (Vainio) Vainio is a delicate foliose lichen with a distinctive upper cortex of periclinal hyphae. For a description, image, and key to the genus in North America see Esslinger (2007). It grows on rock or mosses over rock in Africa (Algeria), Asia, and in North America (Colorado, Idaho, Nevada, Utah) (Esslinger 2007). It is reported new for California from San Bernardino National Forest. It was collected in the San Jacinto Mountains on Black Mountain in an arid montane conifer forest at the base of a large granite boulder. It was rare. In our unpublished checklist for the San Jacinto Mountains by the authors and James C. Lendemer (NY) 280 lichens are currently listed.

Specimen examined: Riverside County:

San Bernardino National Forest, San Jacinto Mountains, Black Mountain, slope beneath the fire lookout, 33° 49' 28" N 116° 45' 31.4" W, 2349 m (7705 feet), rare on granite boulder, Aug. 10, 2012, K. Knudsen 15021 (UCR)

2. *Capronia peltigerae* (Fuckel) D. Hawksw. is a lichenicolous fungus occurring on *Peltigera* species. The species has perithecia with stiff dark brown hairs and hyaline ascospores with usually 3-septa. For description see Hawksworth (1980). It occurs in Europe and Asia (for instance Hawksworth 1980; Halici et al. 2012; Zhurbenko 2004). It is currently known from North America from a single report from Alaska (Zhurbenko & Laursen 2004). *Capronia peltigerae* is



Figure 1: *Anaptychia ulotrichoides*. Photo by Jana Kocourková.



Figure 2: *Lecidella patavina*. Photo by Jana Kocourková.

reported new for California. We collected it in the San Bernardino Mountains in the San Gorgonio Wilderness Area on a slope above Dollar Lake, a glacial cirque. It was growing on the thallus of the macrolichen *Peltigera rufescens* (Weiss) Humb. *Peltigera* are rare in southern California. *Peltigera rufescens* is the most common species. This is only the second report of *C. peltigerae* for North America.

Specimen examined: San Bernardino County: San Bernardino National Forest, San Bernardino Mountains, San Gorgonio Wilderness Area, slope above Dollar Lake, 34° 7' 22" N 116° 51' 19" W, 2678 m (8786 feet), on *Peltigera rufescens* on soil in biological soil crust, July 6, 2012, *J. Kocourková* 8152 w/ *K. Knudsen* (hb. myco. Kocourková and Knudsen).

3. *Lecanora percrenata* H. Magn. is a member of the *Lecanora dispersa* group. It has apothecia with a cracked white margin, dark discs, narrow ascospores, and an epihymenium which is pigmented, blue-green in the population reported from California. For description and illustration see Śliwa (2007). It was described from China by H. Magnusson and revised by L.

Śliwa who reported it from North America in Canada (Alberta) and in the United States (Arizona, Colorado, Idaho, Montana, Nebraska, Nevada, North Dakota, South Dakota, Utah) (Śliwa 2007). Specimens occurred on calcareous rock and on volcanic ash. *Lecanora percrenata* is reported new for California from the Mojave Desert in Joshua Tree National Park. It occurred in Berdoo Canyon in the Little San Bernardino Mountains. It was rare, growing on the decaying granite of a rock wall with seasonal water drainage. It was collected with NPS botanist Mitz Harding. Berdoo Canyon is an ancient canyon, pouring its seasonal torrents out of the Little San Bernardino Mountains onto the San Andreas fault in the Sonoran Desert. The truck trail is only accessible with 4-wheel drive vehicles with high clearance.

Specimen examined: Riverside County: Joshua Tree National Park, Little San Bernardino Mountains, Berdoo Canyon, 33° 49' 58.5" N 116° 4' 24.7" W, 1025 m (3362 feet), on granite of wall of canyon, Dec. 7, 2010, *K. Knudsen* 12855.1 w/ *M. Harding* (UCR).

4. *Lecidella patavina* (A. Massal.) Knoph & Leuckert is distinguished by an interspersed hymenium from the common *L. stigmatea* (Ach.) Hertel & Leuckert. *Lecidella patavina* is a common species in central Europe. In North America it appears to be common especially in Arizona and Colorado (CNALH 2012). Both species can be identified in California without using thin-layer chromatography because the thallus of both species often produce very low concentrations of secondary metabolites (usually only zeorin) and often are

endolithic. For a good description of both species see Fletcher et al. (2009). *Lecidella patavina* is reported new for California from the Mojave Desert in Joshua Tree National Park. It was collected on Queen Mountain, in the Wonderland of Rocks (Keys Ranch), at Squaw Tank at the end of the Hexie Mountains, and on the tors that form the wall of Hidden Valley. The medulla of one specimen of *L. patavina* had a small amount of zeorin detected with thin-layer chromatography; another had no detectable substances (Michalová 2012; Lendemer, unpublished results).

The thallus was poorly developed, eroded, or absent in all specimens. At MSC there is a collection from 1955 by Henry Imshaug of *Lecidella patavina* from the summit of Freel Peak in the Carson Range (a spur of Sierra Nevada Mountains) in Alpine and El Dorado Counties annotated by H. Hertel (CNALH 2012).

Specimens examined: Riverside County: Joshua Tree National Park, Keys Ranch, 34° 3' 54" N 116° 9' 37" W, 1283 m (4211 feet), rare on monzogranite boulders along wash, Mar. 31, 2005, *K. Knudsen et al. 2619* (UCR); Hexie Mountains, Squaw Tank, 33° 55' 44" N 116° 4' 33" W, 1071 m (3513 feet), on monzogranite, Dec. 1, 2010, *K. Knudsen 12625* (UCR); Hidden Valley, outer wall of tors, 34° 1' 14.8" N 116° 10' 29.4" W, 1244 m (4080 feet), on monzogranite, Dec. 14, 2010, *K. Knudsen 13098* (UCR); San Bernardino County: Joshua Tree National Park, Queen Mountain, 34° 3' 9.9" N 116° 6' 9.4" W, 1627 m (5337 feet), on granite, Oct. 5, 2011, *K. Knudsen 13741 w/M. Harding*.

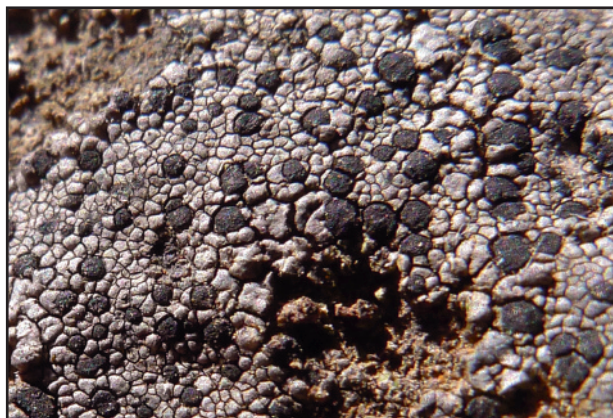


Figure 3: *Rhizocarpon distinctum* from the Santa Monica Mountains (*Knudsen 11160.2*, UCR). Photo by Jana Kocourková.

5. *Muellerella pygmaea* (Körber) D. Hawks. var. *pygmaea* is a lichenicolous fungus growing on saxicolous crustose lichens at high elevations in the mountains. It especially occurs on species of *Lecidea* and *Porpidia*. For a description see Triebel and Kainz (2004). The other two varieties of *pygmaea* in Triebel and Kainz (2004) are treated by the authors as species: *M. erratica* (A. Massal.) Hafellner & V. John [syn. var. *athallina* (Müll. Arg.) Triebel] and *M. ventosicola* (Mudd) D. Hawksw. [syn. var. *ventosicola* (Mudd) Triebel]. Both have been reported from California (Kocourková et al. 2012). *Muellerella pygmaea* is reported new from California. It was growing on *Bellemeria alpina* (Sommerf.) Clauzade & Roux at Dollar Lake in the San Bernardino Mountains at 2678 m (8786 f.). This is the first population of *Bellemeria* discovered south of the Sierra Nevada Mountains in California (Ryan & Nash 1991; Hutten et al. in prep.) Dollar Lake is a glacial cirque. Five glaciers occurred in the San Bernardino Mountains during the last ice age, all melting at the end of the Pleistocene. The site also had disjunct

populations of *Bellemeria cinereorefuscens* (Ach.) Clauzade & Roux, *Dermatocarpon miniatum* (L.) W. Mann, and *Rinodina olivaceobrunnea* C. W. Dodge & Baker (in alpine biological soil crusts), all new for southern California.

Specimen examined: San Bernardino County: San Bernardino National Forest, San Bernardino Mountains, San Gorgonio Wilderness Area, slope above Dollar Lake, 34° 7' 22" N 116° 51' 19" W, 2678 m (8786 f.), on *Bellemeria alpina*, July 6, 2012, *J. Kocourková 8137 w/ K. Knudsen* (hb. myco. Kocourková and K. Knudsen).

6. *Rinodina pycnocarpa* H. Magn. was described from China. It has a gray areolate thallus, excluded thalline margins, and relatively short Bicincta-type ascospores. For a description and image of spores see Sheard (2010). It was reported new to North America based on two Clifford Wetmore specimens from Nebraska and North Dakota (Sheard 2010). John Sheard (SASK) identified a duplicate from Joshua Tree. It is reported new to California from Joshua Tree National Park. All the collections from the Mojave Desert were on granite.

Specimens examined: Riverside County: Joshua Tree National Park, Juniper Flats, 33° 56' 8.7" N 116° 9' 39.7" W, 1448 m (4749 feet), on monzogranite, Dec. 11, 2010, *K. Knudsen 12983, 12985* (UCR); on trail from Skull Rock to Jumbo Rocks, 33° 59' 55.2" N 116° 3' 42" W, 1315 m (4313 feet), a few apothecia on monzogranite, Dec. 20, 2010, *K. Knudsen 13213* (UCR); San Bernardino County: Queen Mountain, 34° 3' 9.9" N 116° 6' 9.4" W, 34° 3' 9.9" N 116° 6' 9.4" W, 1627 m (5337 feet), on granite, Oct. 5,

2011, *K. Knudsen 13741 w/ M. Harding* (UCR).

7. *Rhizocarpon distinctum* Th. Fr. has a brown thallus, 3-septate to muriform brown ascospores, and stictic acid as a secondary metabolite. It has an amyloid medulla. For description of *R. distinctum* see Ihlen (2004). The species is relatively rare in North America, though the most common species in the Czech Republic in central Europe for instance. Alan Fryday annotated a specimen from the Santa Monica Mountains as *Rhizocarpon* cf. *subpostumum* (Nyl.) Arnold and we reported it new for North America (Knudsen & Kocourková 2009). Recently Alan revised the specimen as *R. distinctum*. *Rhizocarpon subpostumum* does not occur in North America. *Rhizocarpon distinctum* is apparently rare in California, known from the Santa Monica Mountains, a collection by Bruce McCune in Yosemite (Hutten et al. in prep.), and a collection by James C. Lendemer in the San Bernardino Mountains (NY). The historic report of *R. distinctum* from central California, based on our analysis of H.E. Hasse's description, refers to another taxon, but we have not examined the Herre specimen the report is based on (Hasse 1913).

Specimens examined: San Bernardino Co.: San Bernardino National Forest, San Bernardino Mountains, gorge on N-slope along CA 38, 34° 9' 31" N 116° 56' 26" W, 2124 m (6968 feet), on granite, Oct. 7, 2008, *J.C. Lendemer 14965 w/ K. Knudsen* (NY); Ventura Co.: Santa Monica Mountains, in canyon below parking lot for Sandstone Peak trail, 34° 6' 38" N 118° 55' 38" W, 609 m (1998 feet), on Conejo volcanics, with *Buellia spuria*, May 24,

2009, K. Knudsen 11160.2 (UCR).

Conclusion

Earlier this year we published A Checklist of the Lichenicolous Biota of California, available for free download at <http://sweetgum.nybg.org/philolichenum/> which listed 187 lichenicolous fungi and lichenicolous lichens (Kocourková et al. 2012). We recently reported *Polycoccum pulvinatum* (Eitner) R. Sant. New for California from Santa Cruz Island (Knudsen & Kocourková 2012). The reporting of 2 new records of lichenicolous fungi from the San Bernardino Mountains increases the state total to 190 species, 171 lichenicolous fungi and 19 lichenicolous lichens.

Until the checklist for California is revised (Tucker and Ryan 2006) it is uncertain the total number of lichenized fungi that occur in California. It is somewhere around 1500 taxa right now. We report 4 species of lichens new for California. The rare *Anaptychia ulotrichoides* was discovered on Black Mountain in the San Jacinto Mountains. The remaining species are all the lichens were discovered recently in Joshua Tree National Park. An annotated checklist of the lichens of Joshua Tree National Park will be published online by the National Park Service in 2013 as a Natural Resources Technical Report and will be available free for download. We are currently proposing more lichenological exploration of the wilderness areas and the highest peaks in Joshua Tree.

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Lichens of Stebbins Cold Canyon Reserve, Solano County, California

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In Spring 2000, Judy and Ron Robertson, outstanding naturalists from Sonoma, California, made several field trips for lichens at the Stebbins Cold Canyon Reserve, Solano County, California. They organized a trip there for CALS on February 26, 2000, but it was rained out and cancelled. A second on March 26, 2000 included a group of about 20 members of the Davis Botanical Society. Another trip the following year (Feb. 24, 2001) was led by Judy on lichens and Cheryl Beyer on mosses, and included 11 CALS members and several others from UCD. The weather this time also featured drenching rain (Anonymous, 2001). Three lichens were collected by Rob Weiss, which are indicated in the list.

The Stebbins Cold Canyon Reserve is one of 37 reserves of the University of California Natural Reserve System. The Stebbins Reserve is named for an internationally known geneticist at UCD, G. Ledyard Stebbins, who led field trips of students and others throughout the state including these coastal ranges. This reserve is in a steep, north-facing canyon in the California Inner Coast Range with blue oak woodlands, chaparral, and an intermittent stream in the canyon. It is close to Lake Berryessa, a large impoundment west of the town of Winters. This reserve is under the control of the



A view Northwest from the top of the Pleasants Ridge Trail at Stebbins Cold Canyon Reserve. Photo by Adam Clause. Photo Courtesy of Jeffrey Clary, Reserve Director, Stebbins Cold Canyon Reserve.

University of California at Davis.

Judy and Ron Robertson reported 52 lichen species and donated 47 lichen vouchers from this Reserve to the herbarium at UC Davis. Although Judy said that the lichen flora was not diverse, some species collected on rock are interesting and infrequently reported, such as *Caloplaca demissa*, *Catapyrenium psoromoides*, *Dermatocarpon intestiniforme*, and *Massalongia carnosa*. The corticolous species *Waynea californica* also is infrequently collected, although probably not rare but merely inconspicuous. The lichens are listed below.

Caloplaca chrysophthalma Degel. (no Robertson voucher at UCD)

- Caloplaca demissa*** (Körb.) Arup & Grube, on sandstone (misapplied name: *Lecanora demissa*) Note: Arup & Grube (1999) made the transfer.
- Caloplaca variabilis*** (Pers.) Mull. Arg., on sandstone.
- Candelaria pacifica*** Westberg, on bark (name likely misapplied as *C. concolor* (Dicks.) Stein. Note: *C. pacifica* is the prevalent species of *Candelaria* in California. Most older reports of *C. concolor* from California were incorrect (Westberg & Nash 2002).
- Catapyrenium psoromoides*** (Borrer) R. Sant., on sandstone.
- Cladonia pyxidata*** (L.) Hoffm., on moss.
- Collema nigrescens*** (Huds.) DC., on oak.
- Dermatocarpon intestiniforme*** (Körber) Hasse, on sandstone.
- Dermatocarpon miniatum*** (L.) W. Mann, on rock.
- Diploschistes scruposus*** (Schreber) Norman, on rock.
- Evernia prunastri*** (L.) Ach. (Rob Weiss collection).
- Hypogymnia imshaugii*** Krog
- Kaernefeltia merrillii*** (Du Rietz) A. Thell & Goward (misabeled as *Tuckermannopsis merrillii*).
- Lecanora muralis*** (Schreber) Rabenh., on rock.
- Lecidea tessellata*** Flörke, on sandstone.
- Leptochidium albociliatum*** (Desmaz.) Choisy, on moss.
- Leptogium lichenoides*** (L.) Zahlbr., on moss.
- Leptogium californicum*** Tuck., on moss.
- Massalongia carnosa*** (Dicks.) Körb., on moss.
- Melanelia glabra*** (Schaerer) Essl., on oak.
- Ochrolechia mexicana*** Vain., on bark.
- Parmelia sulcata*** Taylor
- Parmeliella cyanolepra*** (Tuck.) Herre
- Parmelina coleae*** Arguello, del Prado, Cubas & Crespo, on oak (misapplied name as *Parmelina quercina* (Willd.) Hale (name change in Arguello et al. 2007; McCune & Geiser 2009).
- Peltigera canina*** (L.) Willd., over moss on soil.
- Peltigera praetextata*** (Somm.) Zopf. (Rob Weiss collection).
- Peltula obscurans*** var. *hassei* (Zahlbr.) Wetmore, on rock.
- Peltula euploca*** (Ach.) Poelt, on rock.
- Pertusaria amara*** (Ach.) Nyl. (no Robertson voucher at UCD).
- Phaeophyscia hirsuta*** (Mereschk.) Essl., on oak (misapplied name: *P. cernohorski* (Nadv.) Essl. (synonymy in Esslinger 2004a).
- Physcia dubia*** (Hoffm.) Lettau
- Physcia stellaris*** (L.) Nyl. (no Robertson voucher at UCD).
- Physcia tenella*** (Scop.) DC.
- Physconia americana*** Essl., on oak.
- Physconia enteroxantha*** (Nyl.) Poelt, on oak.
- Physconia isidiigera*** (Zahlbr.) Essl., on bark.
- Physconia perisidiosa*** (Erichsen) Moberg
- Placynthium nigrum*** (Huds.) Gray, on sandstone.
- Pleopsidium flavum*** (Bell.) Körb., on sandstone (misabeled as *P. chlorophanum* (Wahlenb.) Zopf. Note: According to Hafellner (1993), many records, including all from lowland areas, are almost certainly misidentifications, because this species is arctic/alpine in Europe. *P. chlorophanum* has been collected once in CA, on Santa Cruz Island (K. Knudsen 2005d).
- Polychidium muscicola*** (Sw.) Gray, on

moss.

Psora tuckermanii R. Anderson ex Timdal

Punctelia jeckeri (Roum.) Kalb (misapplied name: *P. subrudecta*; see Lendemer & Hodkinson 2010).

Ramalina farinacea (L.) Ach.

Trapelia coarctata (Sm.) Choisy on sandstone.

Trapelia glaucopholis Nyl. ex Hasse) Printzen & McCune or *T. steppica* McCune & Camacho, on moss (misapplied name: *T. wallrothii*)

Trapelia glaucopholis Nyl. ex Hasse) Printzen & McCune on moss (misapplied name: *T. wallrothii*) (Rob Weiss collection).

Umbilicaria phaea Tuck. (no Robertson voucher at UCD).

Usnea filipendula Stirt.

Usnea glabrescens (Nyl. ex Vain.) Nyl.

Waynea californica Moberg (as misapplied name *W. stoechadiana*).

Xanthoparmelia cumberlandia (Gyel.) Hale, on sandstone.

Xanthoparmelia verruculifera (Nyl.) A. Crespo, Elix, D. Hawksw., & Lumbsch, on rock (misapplied name: *Neofuscelia verruculifera* (Nyl.) Essl.) Note: The North American species of *Neofuscelia* were moved to *Xanthoparmelia* (McCune & Geiser 2009)

Xanthoparmelia plittii (Gyel.) Hale, on sandstone.

Xanthomendoza fallax (Hepp) Søchting, Kärnefelt & S. Y. Kondr. (misapplied name: *Xanthoria fallax*).

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Lichens of Sedgwick Natural Reserve, Santa Barbara County, California

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The University of California maintains 37 Natural Reserves that protect and preserve undeveloped lands in the state for research, instruction and public outreach. Several of these reserves have been surveyed for lichens, but more of them should be studied. The California Lichen Society has held lichen forays at several of the reserves and published lichen lists for Hastings Natural History Reserve (Tucker & Bratt, 1996), the Sweeney Granite Mountains Desert Research Reserve (Doell et al. 1996), and the Santa Cruz Island Reserve (Robertson 2002b).

The Jenny Pygmy Forest Reserve in Mendocino County was established after the CALS group collected in nearby parts of this unique pygmy forest (Robertson 2002a). A weekend trip to the White Mountains Research Station run by the University of California, but not officially part of the Reserve system, yielded a remarkable lichen list (Robertson 2003).

The Bodega Marine Reserve at Bodega Bay was visited and collected by the University of California lichen workshop in 2010 (Stone & Villella 2010). Collections have been made and reported from Yosemite Nat. Park (Lendemer et al. 2010) although it is not known whether the collections were from within the Reserve area. An article is to be submitted (Robertson et al., 2012) on lichens of Stebbins Cold Canyon Reserve. Judy Robertson led trips to the Stebbins Cold Canyon Reserve in 2000 and 2001,

although no lichen list was published (a posthumous list in preparation).

Lichens of the Sedgwick Reserve in the Santa Ynez valley, Santa Barbara County, have recently been surveyed as part of a class project in the spring of 2011 at the Cheadle Center for Biodiversity and Ecological Restoration (CCBER) at the University of California, Santa Barbara. This 24 square km (9.2 square miles) reserve consists of rolling grassland and oak savanna on the slopes of the San Rafael Mountains to the north, and the Santa Ynez Range to the south. The vegetation types of interest include coast live oak forest, blue oak woodland, and valley oak savanna, with some grey pine on the ridges, as well as chaparral and coastal scrub. Elevations range from 290-790 m (950-2,600 ft). Numerous research projects are constantly under way at Sedgwick, thanks to its proximity to the campus of UC Santa Barbara in Santa Barbara, about 40 mi. distant.

Earlier lichen collections were made at Sedgwick by Amanda Heinrich and Phil Persons ("H & P" in list), Charis Bratt ("B"), Daniel Lahr ("L"), Silke Werth ("W"), and Tucker ("T" in list). Representative collections were deposited at Sedgwick, at the CCBER, and at the Santa Barbara Botanic Garden herbarium (SBBG). These herbarium collections have been augmented by collections made during the class field trips in 2011 ("C" in list). To date 150 species of lichens have

been collected at Sedgwick. A field guide with photos and descriptions of Sedgwick lichens is in preparation (Tucker, 2012 in press) at CCBER.

Lichen List

Acarospora rosulata H. Magn. - B
Acarospora socialis H. Magn. - T
Acarospora veronensis A. Massal. - T
Arthonia pinastri Anzi - T; C
Arthonia pruinata (Pers.) Steud. ex A. L. Sm. - T
Arthopyrenia lyrata R. C. Harris - T
Aspicilia calcarea (L.) Mudd - T
Buellia badia (Fr.) A. Massal. - B
Buellia disciformis (Fr.) Mudd - T
Buellia dispersa A. Massal. - T
Buellia punctata (Hoffm.) A. Massal. - T
Buellia triseptata A. Nordin - T
Buelliella physicicola Poelt & Hafellner, lichenicole on *Physciella chloantha* - T
Caloplaca arenaria (Pers.) Müll. Arg. - T
Caloplaca bolacina (Tuck.) Herre - T; B
Caloplaca ferruginea (Huds.) Th. Fr. - H & P; T
Caloplaca holocarpa (Hoffm. ex Ach.) A. E. Wade - T; C
Caloplaca ignea Arup - T
Caloplaca impolita Arup - B
Caloplaca microphyllina (Tuck.) Hasse - H & P; T
Caloplaca pellodella (Nyl.) Hasse - T
Caloplaca persimilis Wetm. - H & P; T; C
Caloplaca squamosa (de Lesd.) Zahlbr. - T
Caloplaca stanfordensis H. Magn. - W; C
Candelaria pacifica Westberg - H & P; T; C
Candelariella vitellina (Hoffm.) Müll. Arg. - B
Chrysothrix xanthina (Vain.) Kalb - L; H & P; T; C

Collema crispum (Huds.) F. H. Wigg. - H & P; C
Collema furfuraceum (Arnold) Du Rietz - C
Collema nigrescens (Huds.) DC. - H & P; T; C
Collema tenax (Sw.) Ach. - T
Dimelaena oreina (Ach.) Norman - B
Dimelaena radiata (Tuck.) Müll. Arg. - T
Diploicia canescens (Dicks.) A. Massal. - H & P; T; C
Endocarpon loscosii Müll. Arg. - T
Evernia prunastri (L.) Ach. - L; B; H & P; T; C
Flavoparmelia caperata (L.) Hale - H & P; T; C
Flavopunctelia flaventior (Stirt.) Hale - B; L; H & P; T; C
Flavopunctelia soledica (Nyl.) Hale - L; T
Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt - L; T
Kaernefeltia merrillii (Du Rietz) Thell & Goward - H & P; T
Lecania cyrtella (Ach.) Th. Fr. - T
Lecanora circumborealis Brodo & Vitik. - H & P; T; C
Lecanora cf. *densa* (Sliwa & Wetm.) Printzen - T
Lecanora mellea W. A. Weber - B; T
Lecanora muralis (Schreb.) Rabenh. - T
Lecanora pacifica Tuck. - L; H & P; C
Lecanora saligna (Schrad.) Zahl. - T
Lecanora strobilina (Spreng.) Kieff. - T; C
Lecidea atrobrunnea (Ramond ex Lam. & DC.) Schaer. - B; T
Lecidea tessellata Florke - B
Lecidella euphorea (Flörke) Hertel - T
Lepraria cf. *lobificans* - T
Leptogium tenuissimum (Dicks.) Körb. - T
Letharia vulpina (L.) Hue - H & P

- Lichenostigma cosmopolites*, lichenicole on *Xanthoparmelia* – B
Lichinella stipatula Nyl. – B
Maronea polyphaea H. Magn. – T
Melanelia exasperatula (Nyl.) Essl. – T
Melanelia multispora (A. Schneid.) Essl. – H & P
Melanelia subargentifera (Nyl.) Essl. – H & P
Melanelia subaurifera (Nyl.) Essl. – T
Melanelia subolivacea (Nyl.) Essl. – H & P; T
Micarea denigrata (Fr.) Hedl. – T
Niebla cephalota (Tuck.) Rundel & Bowler – L; H & P; T
Ochrolechia pseudopallescens Brodo - C
Parmelina coleae Arguello, etc. – H & P
Peltula bolanderi (Tuck.) Wetmore - T
Peltula clavata (Kremp.) Wetmore – H & P
Peltula euploca (Ach.) Poelt – H & P
Peltula obscurans v. *hassei* (Zahlbr.) Wetm. – B
Peltula placodizans (Zahlbr.) Wetm. – B
Pertusaria albescens (Huds.) Choisy & Werner – H & P; T
Pertusaria amara (Ach.) Nyl. – H & P
Pertusaria velata (Turner) Nyl. – C
Phaeophyscia hirsuta (Mereshk.) Essl. – T; C
Phaeophyscia orbicularis (Necker) Moberg – T; C
Phaeophyscia ciliata (Hoffm.) Moberg – H & P
Physcia adscendens (Fr.) H. Olivier – H & P; T
Physcia aipolia (Humb.) Fürnr. – H & P
Physcia biziana (A. Massal.) Zahlbr. – B; H & P; T
Physcia cf. *dimidiata* (Arn.) Nyl. – T; C
Physcia phaea Moberg – B
Physcia stellaris (L.) Nyl. – H & P; T
Physcia tenella (Scop.) DC. – H & P; T
Physcia tribacia (Ach.) Nyl. – L; H & P; T
Physciella chloantha (Ach.) Essl. – T
Physconia americana Essl. - H & P; T
Physconia californica Essl. – H & P
Physconia enteroxantha (Nyl.) Poelt – H & P; T; C
Physconia isidiigera (Zahlbr.) Essl. – H & P; T; C
Physconia perisidiosa (Erichsen) Moberg - H & P; T; C
Pleopsidium flavum (Bellardi) Körb. –B; T
Punctelia jeckeri (Roum.) Kalb - H & P; T; C
Ramalina canariensis Steiner - H & P; T; C
Ramalina farinacea (L.) Ach. – B; H & P; T
Ramalina leptocarpha Tuck. – B; L; H & P; W; T; C
Ramalina menziesii Taylor – L; H & P; T; C
Ramalina pollinaria (Westr.) Ach. – L
Ramalina puberulenta Riefner & Bowler –L; H & P; T; C
Ramalina sinensis Jatta – T
Ramalina subleptocarpha Rundel & Bowler - L; H & P; T
Ramboldia russula (Ach.) Kalb, Lumbsch, & Elix - C
Rinodina californiensis Sheard –T
Rinodina pyrina (Ach.) Arn. – C
Rinodina santae-monicae H. Magn. – T
Spilonema revertens Nyl. – B
Steinia geophana (Nyl.) B. Stein - T
Syzygospora physciacearum Diederich – B; T
Teloschistes chrysophthalmus (L.) Th. Fr. – L; H & P; T; C
Tephromela atra (Huds.) Haf. - T

Thelenella hassei (Zahlbr.) H. Mayrh. - T
Thelomma occidentale (Herre) Tibell - T;
 C
Toninia ruginosa ssp. *ruginosa* Timdal -
 B
Tuckermannopsis orbata (Nyl.) M. J. Lai
 - T
Umbilicaria phaea Tuck. - B
Usnea dasaea Stirt. - T
Usnea esperantiana P. Clerc - T
Usnea fulvoreaegens (Räsänen) Räsänen -
 W
Usnea glabrata (Ach.) Vain. - W; C
Usnea hirta (L.) F. H. Wigg. - H & P
Usnea lapponica Vain. - H & P; T; C
Usnea scabrata Nyl. - H & P; T; C
Usnea subfloridana Stirt. - H & P; W; T;
 C
Usnea substerilis Motyka - W; T
Verrucaria dolosa Hepp - T
Verrucaria fusca Pers. in Ach. - T
Vulpicida canadensis (Raes.) J.E. Matts.
 & M. J. Lai - H & P; T; C
Waynea californica Moberg - H & P; T; C
Xanthomendoza fallax (Hepp) Søchting,
 etc. - L; H & P; T; C
Xanthomendoza fulva (Hoffm.) Søchting,
 etc. - L; H & P; T
Xanthomendoza hasseana (Räsänen)
 Søchting, etc. - D; H & P; C
Xanthomendoza mendozae (Rås.) S.
 Kondr. & Kårnefelt-C.
Xanthomendoza ulophyllodes (Räsänen)
 Søchting, etc. - H & P; T
Xanthoparmelia mexicana (Gyel.) Hale -
 B
Xanthoria candelaria (L.) Th. Fr. - L; H
 & P; T
Xanthoria parietina (L.) Th. Fr. - C
Xanthoria polycarpa (Hoffm.) Th. Fr. ex
 Rieber - H & P; T
Xanthoria tenax L. Lindblom - H & P; T

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***Ingvariella bispora* (Bagl.) Guderley & Lumbsch in California**

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Ingvariella bispora (Bagl.) Guderley & Lumbsch is reported from the coastal mountains of central California, in Santa Cruz County. Barring unreported specimens not included in national online herbaria, this constitutes a range extension of approximately 225 miles. Notes on the taxonomic history of the species are included.

Lichens with apothecia that are deeply sunken into the thallus are uncommon, especially those where the disc remains visible. The characteristic is generic for the macrolichen genus *Solorina*, and for several crustose genera: *Diploschistes*, *Thelotrema*, and *Ingvariella*. Some species of *Leptogium* also have deeply concave (urceolate) apothecia, but the character does not play a part in identifying the genus. *Ingvariella* was segregated from *Diploschistes* in 1997 based on the development and morphology of the margin of the apothecia (exciple; Guderley et al. 1997); *Diploschistes* has an exciple of pseudoparenchymatous cells (more-or-less spherical; Lumbsch 2002), while *Ingvariella* has a pseudoexciple that is formed from parts of the hymenium, specifically from degenerating asci and paraphyses.

Taxonomy buffs might be interested to know that the separation of *Ingvariella* from *Diploschistes* was originally the subject of some argument (Nimis 1998), and that *Ingvariella* lacked some of the diagnostic characters of the family that

both genera were part of (Thelotremataceae). A good summary of these varying perspectives can be found in Fernández -Brime et al. (2011), whose recent genetic work on *Ingvariella* resulted in the placement of that genus in an entirely different family, the Stictidaceae.

The genus has one species: *Ingvariella bispora* (Bagl.) Guderley & Lumbsch (Figure 1). While Lumbsch (2004) describes the global distribution of this species as “subcosmopolitan”, he notes that within the scope of the Sonoran flora it occurs only once, on Santa Rosa Island. Similarly, the Consortium of North American Lichen Herbaria (CNALH) lists only two records, one from Hollister Ranch near Santa Barbara (Bratt 7177, 1990; SBBG), and another collected from the Canary Islands (Lumbsch & Mietzsch,

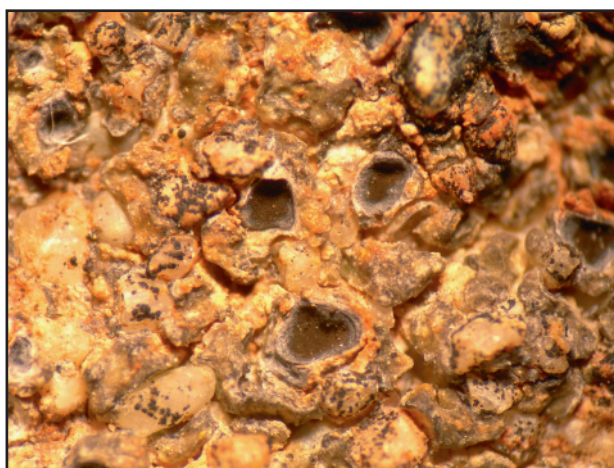


Figure 1. Urceolate apothecia of *Ingvariella bispora*.
Photo by Tom Carlberg.

L-017945, 1989; UPS). It seems that at least in California, *Ingvariella bispora* is uncommon to rare, especially considering that the southern California herbaria in CNALH, those most likely to have collections, do not report this species.

I recently found *Ingvariella bispora* in the Long Ridge Open Space Preserve in Santa Cruz County, on siliceous rock under the edge of a solitary old-growth Douglas-fir (*Pseudotsuga menziesii*) in a mixed oak/conifer grassland (*Quercus lobata*/*Q. agrifolia*). The site is southwest of a 2500' fog-catching ridge above Portola Redwoods State Park, approximately 14 miles from the Pacific Ocean. This represents a range extension of approximately 225 miles from the Hollister Ranch location. The moistness of the site is slightly puzzling because the habitat described in Lumbsch 2004 is montane and arid; this California location is montane but subject to the high-altitude summer marine layer that the California coast is so famous for.

Despite the perception of crustose lichens as being difficult to identify, *Ingvariella bispora* should in fact be easy to recognize in the field due to the brown thallus with concave-urceolate apothecia and the light dusting of pruina on the brown disc. Under a microscope the one or two large muriform spores in each ascus (Figure 2) would give an easy confirmation. Lichenologists exploring the central portions of California should consider the possibility that *Ingvariella bispora* may show up on their species lists.

Acknowledgements

My thanks to Thorsten Lumbsch who

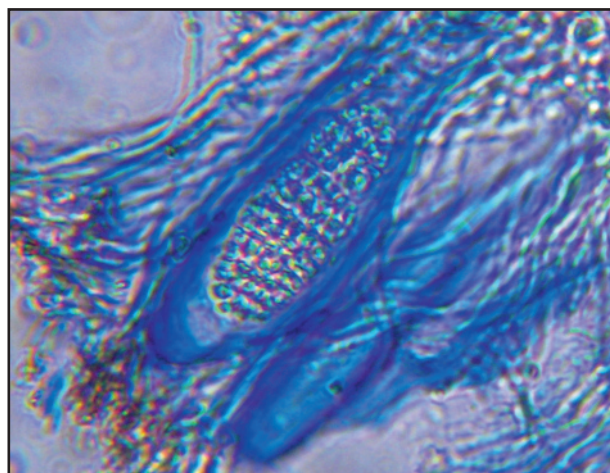


Figure 2. Ascus and spore, in IKI. Photo by Tom Carlberg.

confirmed the identification via email and photographs.

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News and Notes

California Lichen Working Group Annual Meeting

The second annual meeting of the California Lichen Working Group took place in Davis at the Pacific Southwest Research Station of the US Forest Service on September 26th 2012. This meeting included representatives from the California Native Plant Society, CALS conservation committee, National Parks, Forest Service, Jepson Herbarium and private botanical consultants. A wide ranging discussion ensued regarding work to coordinate conservation efforts of lichens by the various entities within California. This group coordinated a series of lichen walks and air quality workshops throughout the state in 2011, and we look forward to their work continuing in the future. If you are interested in getting involved contact the CALS Conservation Committee for more information.

New Checklist of Lichens of the Channel Islands National Park

Kerry Knudsen and Jana Kocourková have recently published The Annotated Checklist of the Lichens, Lichenicolous Fungi and Allied Fungi of Channel Islands National Park. It is now available for download at <http://sweetgum.nybg.org/philolichenum/>. Channel Islands National Park is a lichenological wonderland with the best preserved example of the coastal southern California flora still in existence. This comprehensive and well-illustrated list will prove to be very valuable to anyone working on lichens in coastal southern California, and the best of all it is free!

CALS Board Elections

Every two years CALS holds elections for board members. This winter, it's election time and ballots are included with your membership form in this Bulletin. All officers are currently running unopposed, however you can write in candidates on your ballots. Short biographies for each candidate are provided below. Thanks in advance for voting!

Office of President

Shelly Benson has served as the CALS Vice President for the past two years. During that term she represented CALS at speaking engagements and fungus fairs, led field trips, participated in identification workshops, and conducted lichen inventory projects. Originally from Washington State, Shelly moved to the San Francisco Bay Area in 2001. Shortly after arriving, she became a member of CALS to learn about California lichens and meet local lichen enthusiasts. Shelly studied lichen ecology in northern British Columbia, Canada for her graduate research. She currently works as a botanist and hopes that someday lichen surveys will be as routine in her daily work as botanical surveys.

Office of Vice President

Tom Carlberg has been a Member-At-Large of the CALS Board of Directors since 2004, and was Science Editor for the Society's Bulletin until 2010. He has a degree in Botany from Humboldt State University. He has been a cryptogamic botanist for 12 years, working for the

Forest Service, private contractors, and non-profit organizations. His current special interest is ageing lichens that grow on the leaves of evergreen vascular plants. He is a member of the Society's Conservation Committee, and feels that baseline inventories are essential to the conservation process. In addition to CALS, he also belongs to the American Bryological and Lichenological Society and the British Lichen Society.

Office of Secretary

Sarah Minnick is a restoration biologist at Point Reyes National Seashore. She is a native Californian with an undergraduate degree in mathematics and a masters of science in wetland conservation. She is interested in lichen conservation, sustainable collection, and the use of lichens to dye fibers. She has enjoyed participating in CALS lichen walks, workshops, and annual meetings over the last few years.

Office of Treasurer

Kathy Faircloth has been an invaluable resource to CALS by serving as Treasurer for several years and steering us through the gyrations of keeping our nonprofit status and taxes up to date. Kathy uses her background in accounting to assure that CALS financial records are accurate. She is a life member of CALS and is also a long time, active member of the San Francisco Mycological Society.

Member At Large

Erin Martin's passion for lichens began while she was an undergraduate student at Boise State University where she worked with Dr. Roger Rosentreter in the field and

as the curator for the Snake River Plains Herbarium. Erin received her PhD at Oregon State University where she studied rare lichens of the Pacific Northwest with Dr. Bruce McCune. She is currently the Coordinator of General Education and teaches in the Department of Biology at the University of South Florida Sarasota-Manatee. Erin has served as both President and Secretary of CALS in the past. She is presently the chair of the CALS Education Committee and the Production Editor of the Bulletin.

Conserving Lichens: We Need Your Time and Your Donations

Conservation of lichens is a core mission of CALS. Our Conservation Committee has worked with other conservation organizations and agencies in California to ensure a solid foundation for rare species conservation. In particular, we work with the California Native Plant Society (CNPS) and the California Natural Diversity Database (CNDDDB) from the state's Department of Fish and Game. CNPS has long been one of the primary authorities on rare plant conservation in California and the CNDDDB maintains rankings and population data for rare species.

Conservation doesn't just happen on its own; the CALS Conservation Committee needs your help. Our rigorous sponsorship process results in strongly justified decisions for lichen conservation, but needs a lot of effort to complete. In addition to species-by-species conservation, we would also like to pursue habitat-based conservation ideas. Plus, we simply need to get the word out better.

Recent discussions on getting more

attention for lichen conservation have included adding lichens to the CNPS Inventory (<http://www.rareplants.cnps.org/>) and the CalFlora database (<http://calflora.org/>), plus production of brochures or booklets on lichen conservation. Addition of lichens to either of those online databases would require funding to enhance the databases, add features to their web interfaces, and to enter data. Production of brochures and booklets also incur costs for publication.

Therefore, we are seeking funding for CALS to use specifically for lichen conservation. Membership dues go primarily toward funding the Bulletin and educational grants. An additional checkbox on CALS membership forms helps further support educational grants. We will now be adding a checkbox for donations to conservation activities.

The CALS Conservation Committee will apply donations as needed to further lichen conservation in California. The likely first step is the addition of lichens to the CNPS Inventory, as this database

receives attention from conservationists, government agencies, and contractors working on environmental permitting issues. Exact costs are still being worked out, and a formal memorandum of understanding with CNPS is being considered. We currently expect a one-time cost on the database and interface changes (possibly several thousand dollars), which could be followed by smaller annual costs for maintenance and data input.

In addition to monetary donations, we still need volunteer efforts for developing rare lichen sponsorships. Thus we are also asking for your time!

Please consider donating to the CALS Conservation Fund when you send in your membership dues for the new year. And please contact me if you wish to write-up a rare lichen sponsorship.

Thank you,

-Eric B. Peterson, Ph.D.

CALS Conservation Committee Chair
eric@theothersideofthenet.com



Calicium adsperum, ranked G4, S1?.2 for California and placed on list 2, "Rare in State, but More Common Elsewhere". Only a single location for this lichen is known within California. Photo by Eric Peterson, of an Oregon specimen (hb E. Peterson, #EBP2727). Bar = 1mm.

Upcoming Events

On-going Lichen Identification Workshops

A regular Lichen Identification Workshop is held at the College of Marin Science Building, room 191, on the 1st and 3rd Wednesday evening of the month. To attend Please RSVP Bill Hill <aropoika@earthlink.net> or 415-686-6146 - if no one replies, the workshop will not be held.

There is a regular 2nd Saturday of the month workshop at the Botanic Garden Visitor Center at Tilden Regional Park at junction of Wildcat Canyon Rd and South Park Dr. We often check some lichens in the Garden and then do some keying and discuss some lichen interests. If you would like to have some particular topics covered please let us know. Please RSVP to Irene Winston, <irenewinston@comcast.net> if you are planning to attend.

Northern California Botanists 2013 Symposium

From the Redwoods to the Sagebrush: Botany Ranging Far and Wide

Join Northern California Botanists on January 14-15, 2013 for their 5th botanical symposium. It will be held in the Bell Memorial Union Auditorium on the campus of California State University in Chico. Optional botanical workshops will be held on Wednesday January 16. A 2-day schedule of presentations by working botanists will include sessions on Biogeography, Restoration & Recovery, Redwood and North Coast Botany and Ecology, Non-seed Plants, Biology of Propagules of Northern California Seed

Plants, Great Basin/Eastern Sierra Botany, and New Discoveries.

The keynote speaker will be Todd Dawson, Professor in the Department of Integrative Biology, University of California, Berkeley; the title of his talk is *From a redwood forest to a sagebrush steppe? What coast redwoods face under a changing climate*. The Non-seed Plants session includes presentations on forest relationships with non-plants (Teresa Scholars), the moss genus *Scleropodium* (Benjamin Carter), and notes and observations on foliicolous lichens in hypermaritime environments (Tom Carlberg). Please see <http://www.norcalbotanists.org/symposia/symposium2013.htm> for more details and a copy of the draft program.

Lichen Identification Workshop - Identifying Lichens to Genus Chico State University, Chico, CA Saturday, March 9, 2013, 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 and morphology, reproduction, and many of the characters used to identify lichens. Lunch will be in the field, in conjunction with a short collecting trip. The rest of the afternoon will be in the lab, where participants will spend time working on identifying lichens, using dissecting scopes, microchemical reagents, books, keys (provided), and the material they

collected that day, supplemented by additional specimens provided by the instructor.

Please bring dissecting tools, a hand lens, and lunch. You will benefit more from the workshop if you have experience 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 11 years, working for the Forest Service, private contractors, and non-profit organizations. His current special interest is habitat modeling for rare species of lichens and vascular plants, using satellite imagery, and GIS analysis of spatial data. 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; the workshop is limited to 16 participants and is usually full. Registration information and a flyer for the workshop are on the Friends of the Chico State Herbarium website

<http://www.csuchico.edu/biol/Herb/Events.html>, and you can get additional details from Tom at tcarlberg7@yahoo.com.

Bay Area Environmental Education Resource (BAEER) Fair Lichen Exhibit, January 19

CALs will be having a lichen display table at the BAEER Fair on January 19th, 2013. This will be the first time CALs will be reaching out mainly to children of all ages, teachers, and environmental

education folks to introduce them to the fascinating lichens.

We will need some volunteers to help greet visitors, introduce lichens, and answer questions. Please RSVP to Irene Winston at irenewinston@comcast.net if you are interested in helping out.

Check the BAEER Fair website, baeerfair.org/ for more information about the resource fair held at the Marin Civic Center, San Rafael, CA from 10am to 4:30pm.

CALs 2013 Annual Meeting and Festivities

Mark your calendars for January 26, 2013, the annual celebration of the founding of CALs. The day will include a lichen walk at Olompali State Historic Park, the annual board meeting, a pot-luck dinner, and a guest speaker. Event details are listed below. Feel free to come for all or just part of the day.

Lichen Walk

Meet in the parking lot for Olompali State Historic Park at 10:00 AM (park gate opens at 10) for introductions and we will start out on the trail at 10:15. The trail is a 2.75 mile loop with 600 feet of elevation gain. Olompali offers diverse microhabitats and substrates for lichens including historic rock walls, basalt and serpentine boulders, oak woodlands, and moist, shaded slopes. Note that there is a day use fee of \$8.00 for the park. Bring good walking shoes, layers, lunch, water, a hand lens, and whatever else you would like.

Directions: The park entrance is located on Highway 101 about three miles north of Novato. The park entrance is accessible only by traveling southbound on 101. So,

for northbound travelers, pass the park and take the first exit north of the park, for Redwood Landfill. Cross over the highway overpass and head southbound on 101 to the park entrance. If you miss the exit for the landfill, you can attempt a U-turn at the left hand exit for San Antonio Creek Road. From southbound 101 the exit for the park is clearly marked.

Annual Board Meeting

The annual board meeting, open to the general membership, will be held from 3:00-5:00 PM at the Brickyard Landing in Point Richmond (see directions below).

Pot-Luck Dinner and Guest Speaker

Following the annual meeting at Brickyard Landing, there will be appetizers and drinks from 5:00'ish to 6:00 PM. Then we will continue socializing over dinner from 6:00-6:45. This is a pot-luck event, so bring appetizers, drinks or a main course to share. There is a kitchen at the facility if you need to warm up your dish. Starting at 7:00 we will have two guest speakers. The first will be Christine Walker, present preliminary findings from her work on a lichen inventory of the Valentine Eastern Sierra Reserve. The second speaker will be Martin Hutten of the National Park Service giving a talk entitled "Lichen inventory and lichen threats in Yosemite National Park."

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.

Sterile Crustose Lichen Workshop with Dr. James Lendemer at Southern Oregon University, April 5-7, 2013

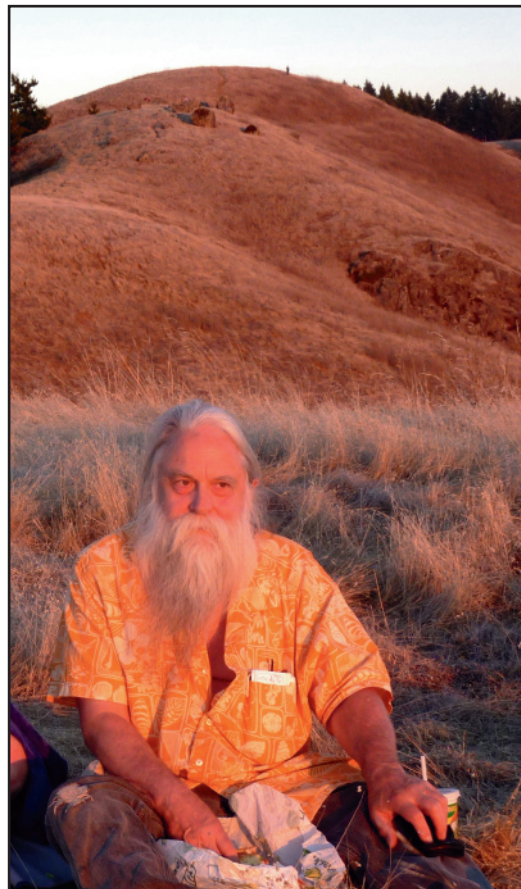
The Cryptogam Biodiversity Observatory at Southern Oregon University in Ashland is proud to welcome Dr. James Lendemer from the New York Botanical Garden for a three day workshop focusing on the sterile crustose lichens of the west. Dr. Lendemer has published many papers in recent years on this group of lichens including his monumental work on *Lepraria*. The time will be split between the lab and the field and content will focus on proper collecting techniques and identification through morphology, chemistry and photobiont recognition. The cost is \$175 and those interested in attending should contact John Villella at jvillella@siskiyoubiosurvey.com. This is the third year that this workshop series has taken place and it has sold out very early in the past, as space is limited you are encouraged to sign up early to ensure your place.

PRESIDENT'S MESSAGE

My how time flies when you're having fun! Here we are at the close of another year (the 19th for CALS), and even of an era - if you are watching the Mayan calendar. It reminds me of the close of the past millennium in the year 2000 - and we are still here, despite the prognostications at the time. Lichens are still here, and have been evolving with everything else for MUCH longer than any of our time counting (or political) systems have existed. Looking at lichens sets me in a geological time frame - a wonderful meditation on reality.

This year CALS has been moving forward continuously - with new members appearing with enthusiasm; others of us honing our abilities further, and many of our ideas and activities maturing more as well. We continue to gather new members through workshops, events, and the Internet. To mention just a few, there are new members Bert Johnson, Ken-ichi Ueda, and Andrea Williams stepping forward with enthusiasm. Bert joined us via the Tilden Botanic Garden workshop and comes with botanical knowledge and familiarity with the Benecia/Fairfield area (where CALS has not yet really explored); Ken-ichi found us via the internet and both Bert and Ken-ichi are very interested in further exploration of Mt. Diablo; and amongst other things Andrea organized the lichen fieldtrip at Lake Lagunitas in the Marin Water District (which I mentioned in the previous Bulletin). There is the continuing organizing work of our Vice President Shelly Benson and (now) Council member Irene Winston. Also our new Council is weaning itself with a few of its members helping the Board with ideas for our Agenda at a recent meeting. Finally, our Conservation Committee, rock solid as it is under the direction of Eric Peterson, is moving to another level of significance as we work to now bring rare lichens into the CNPS database of rare plants. By the way, you should notice that we are requesting donations to help implement that, similarly as we had asked for financial help with the Darrell Wright Memorial Fund to bring our late editor Darrell Wright's lichens back home to the San Francisco State herbarium from his last home in New Zealand. We are entirely a volunteer and self-supporting organization and depend on our membership to fund what we do.

We have also come to the end of another of our two-year Board election cycles. I will step down as President and focus on growing the Council as its de facto Chair. It's up to you all to elect the New Board, but I can enthusiastically see Shelly Benson moving in as



President from Vice President, Tom Carlberg as Vice President from Member-at-large, Kathy Faircloth staying on as our very capable Treasurer, and new member Sarah Minnick taking on Secretary from Erin Martin, while Erin stays on as Chair of our Student Grants Committee, Member at Large, AND Production Editor, while John Villella remains forging on as our very capable Editor. Thank you, thank you, thank you. We will also have our Annual Membership Meeting with changing of the Board for one more time at the clubhouse at Janet Doell's condo in Point Richmond, as she moves ('retires'?) to Alaska imminently.

We have much to do in the next year. I would like to see us able to do more lichenizing together - it not only helps new members get more familiar with lichens, but we inspire each other. In this regard I want to maintain an updated membership roster as a networking tool. I hope we can institute **regular** monthly fieldtrips, perhaps in the middle of each month, to explore new places where we haven't yet been, as well as to revisit some of the old standbys; and get better at recording surveys and species lists of lichens in more places. It's all up to you though - where would you like to go? Are there places you know about that beg to be investigated further? We jokingly suggest we 'annex' Florida with a field trip near Erin Martin's new digs there. What should we focus more on in our workshops? Crustose lichens and microscopic techniques come immediately to my mind. And then there is outreach, by our presence in other events and conferences. We already attend SOMA camp (Sonoma Mycological Association) with an exhibit, various Forest Service venues, and now the BAEER fair, as well as continuing with the annual Fungus Fair of the San Francisco Mycological Society, and our presence at CALday at the UC Berkeley Jepson Herbarium. Where else can we go to help open people's eyes to lichens (and incidentally find more new members)?

Let's keep at it! Happy Lichenizing -- Bill Hill

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B. *Anaptycia ulotrichiodes*; See article by K. Knudsen & J. Kocourková p. 85. Photo by J. Kocourková.

C. Stebbins Cold Canyon Reserve; See article by J. Robertson et al. p. 91; Photo by A. Clause.

D. The lichenicolous lichen *Rhizocarpon reneri* grows on *Dimelaena oreina* in Tioga Pass. Photo by Jana Kocourková.

E. *Xanthoparmelia* aff. *cumberlandia*, Aquarius Plateau, Utah, USA; See article by S. Leavitt et al. p. 58. Photo by S. Leavitt.

F. *Lecidella patavina*; See article by K. Knudsen & J. Kocourková p. 85. Photo by J. Kocourková.

G. Urceolate apothecia of *Ingvariella bispora*; See article by T. Carlberg p. 98. Photo by T. Carlberg.

H. Ascus and spore, in IKI of *Ingvariella bispora*; See article by T. Carlberg p. 98. Photo by T. Carlberg.

I. Variation in apothecia of *Arthonia albopulverea* at Palos Verdes. See article by J. Hollinger p. 71; Photo by J. Hollinger.

